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Estimation of parameters for solar cells with S-shaped current-voltage characteristics using meta-heuristic algorithms

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Abstract:	<p>Identifying the parameters of photovoltaic (PV) models based on measured current-voltage (IV) characteristic curves is crucial for simulating, evaluating, and controlling PV systems. IV characteristics of new-generation solar cells (SCs) often exhibit an S-shaped deformation. In this paper, the potential of using meta-heuristic algorithms to solve the parameter estimation problems of PV cells with S-shaped IV characteristics has been explored. The parameter estimation has been performed within the framework of the opposed two-diode model. A total of 14 algorithms from various classes were implemented to extract the SC parameters from synthetic IV curves, which were generated with a range of parameter values. The obtained results have been compared using nonparametric statistical methods, including Wilcoxon signed-rank test for pairwise comparisons, Friedman, Friedman Aligned, and Quade tests for multiple comparisons, and post-hoc Finner, Holm, Hochberg, Holland, Shaffer, and Nemenyi procedures. Research has demonstrated that utilizing a squared error-based fitness function offers clear advantages in tackling a provided problem. Comprehensive results and analyses indicate that STLBO and ADELI algorithms have highly competitive performance in terms of accuracy and reliability.</p>
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Dear Editors,

Enclosed with this letter you will find the electronic submission of manuscript entitled “Estimation of parameters for solar cells with S-shaped current–voltage characteristics using meta-heuristic algorithms” O. Olikh.

This is an original paper which has not been simultaneously submitted as a whole or in part anywhere else. No conflict of interest exists in the submission of this manuscript.

It is well known that identifying the parameters of photovoltaic (PV) models based on measured current-voltage (IV) characteristic curves is crucial for simulating, evaluating, and controlling PV systems. IV characteristics of new-generation PV devices, including thin-film, organic, perovskite, and quantum dot solar cells, often demonstrate an S-shaped deformation. Hence, accurately estimating parameters from S-shaped IV curves is of utmost importance. No Free Lunch theory states that no single meta-heuristic algorithm can solve all optimization tasks effectively. This study aimed to compare the effectiveness of parameter estimation according to the opposed two-diode model using a set of 14 meta-heuristic algorithms and determine the best-performing among them. The obtained results are compared using various nonparametric statistical methods. We believe that this work of testing and comparative analysis of different meta-heuristic algorithms for the estimation of solar cell parameters would be of interest to the readers.

We would very much appreciate if you would consider the manuscript for publication in the *Energy Conversion and Management*.

Sincerely yours,
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Highlights

Estimation of parameters for solar cells with S-shaped current–voltage characteristics using meta-heuristic algorithms

Oleg Olikh

- 14 meta-heuristic algorithms are applied to parameter estimation from S-shaped IV curves.
- The algorithms' efficiencies are compared by using nonparametric statistic methods.
- The relevance of using the square error fitness function has been demonstrated.
- STLBO and ADELI feature the superior performance in identifying parameters of opposed two-diode model.

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ABSTRACT

Identifying the parameters of photovoltaic (PV) models based on measured current-voltage (IV) characteristic curves is crucial for simulating, evaluating, and controlling PV systems. IV characteristics of new-generation solar cells (SCs) often exhibit an S-shaped deformation. In this paper, the potential of using meta-heuristic algorithms to solve the parameter estimation problems of PV cells with S-shaped IV characteristics has been explored. The parameter estimation has been performed within the framework of the opposed two-diode model. A total of 14 algorithms from various classes were implemented to extract the SC parameters from synthetic IV curves, which were generated with a range of parameter values. The obtained results have been compared using nonparametric statistical methods, including Wilcoxon signed-rank test for pairwise comparisons, Friedman, Friedman Aligned, and Quade tests for multiple comparisons, and post-hoc Finner, Holm, Hochberg, Holland, Shaffer, and Nemenyi procedures. Research has demonstrated that utilizing a squared error-based fitness function offers clear advantages in tackling a provided problem. Comprehensive results and analyses indicate that STLBO and ADELI algorithms have highly competitive performance in terms of accuracy and reliability.

1. Introduction

Photovoltaics (PV) is widely regarded as the most promising sustainable clean energy technology to meet the rising energy demand of our global population. By the end of 2021, the installed capacity of global solar PV panels reached an impressive 971 GW, with an additional 183 GW added in 2021 alone [1]. According to the International Energy Agency (IEA) reports, the cumulative installed PV capacity was predicted to increase to 1.826 TW by 2026 and 14.5 TW by 2050 [2]. Currently, silicon solar cells make up approximately 90% of the global photovoltaic production capacity. But recently, intensive research is underway for innovative developments, further experiments, and practical PV applications of various new-generation solar cells (SCs). The operating principle of new-generation solar cells is qualitatively similar to silicon-based ones. However, it is important to note that the fourth quadrant of their current-voltage (IV) characteristics often exhibits an S-shaped deformation or kink. This kink's origin has been attributed to various physical phenomena: charge trapping at the cathode interface [3, 4], rectifying Schottky junction at the anode interface [5] change of the electric field distribution [6], presence of strong interface dipoles [7], unbalanced charge transport [8]. Furthermore, it is worth noting that such a feature of the IV characteristics is typical in the most promising candidates for the next generation of photovoltaic devices. Specifically, S-shaped IV curves have been observed in silicon heterojunction SCs [9], thin-film SCs such as CdTe, CI(G)S, and amorphous silicon PV devices [9, 10], normal and inverted organic SCs [11, 12, 13], perovskite SCs [9, 14], quantum dot SCs [8, 15], and hybrid SCs [16, 7, 4].

One of the most common approaches to understanding the electrical characteristics of PV devices is to use an equivalent circuit model to fit the shape of the IV curve. Such lumped-parameter modeling allows simulation, analysis, and optimization of device performance. The most frequently used conventional solar cell lumped-parameter models are single-diode model (SDM), double-diode model (DDM), and three-diode model (TDM) models. The models incorporate parallel-connected diodes that activate in one direction, a photo-current source, a parallel shunt resistance, and a series resistance. The PV module model (PVMM) is based on SDM and is made up of several diodes in series or parallel.

Unfortunately, the conventional models failed in describing the S-shaped kink. Thus, new models are proposed to give some reasonable IV curve shape explanations on the IV curve shape from the view of electricity. One of the earliest attempts to develop such a model was proposed by Mazhari [17]. This model is essentially a simplified version of the SDM, achieved by excluding resistances and incorporating an additional diode. Up to now, Mazhari's model is the simplest circuit because the least fitting parameters are required for simulations. Mazhari's model fails to capture the linear-like rise S-shaped kink in the third quadrant, and the model, which improved by incorporating two resistance, proposed for organic SCs [18]. Gaur and Kumar [11] proposed equivalent circuit models to represent the behavior of polymer solar in the dark. This model is almost identical to the DDM, except one of the diodes is the opposite. Another way to develop equivalent models involved using multiple series diodes, unlike conventional approaches. Zuo *et al.* [5] offered to explain the S-shape by utilizing a model consisting of two series diodes connected in the same direction, two shunt resistors, and one series resistor. Another lumped-parameter equivalent circuit holds

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two opposed diodes, two opposed current sources, and no resistors [8]. De Castro et al [6] proposed a model consisting of two opposed diodes with shunt resistance for each, a series resistance, and a photo-current source. The last model represents a significant advancement as it successfully reproduces the S-shaped kink in the power-producing fourth quadrant of the illuminated IV characteristics. However, it falls short of adequately describing the IV curve beyond the open-circuit point in the first quadrant, where the current of many practical devices tends to continue increasing [19]. To address this challenge, a potential solution was suggested — incorporating a third diode that would either replace one of the shunt resistances [20] or be placed in parallel with it [21, 10]. In general, the developing models to describe S-shaped IV curves continues. For instance, a relatively recent proposal [3] is the B2BDM model: back-to-back diodes in parallel with a shunt resistor and the photo-current source, all in series with an offset voltage source, and then connected in parallel to another diode and shunt resistor, again in series with a resistor. Some review about models for PV devices with S-shaped IV curves can be found in [19, 22].

The next step after developing the model is to identify the corresponding parameters from the IV characteristics. Essentially, this task is an optimization problem. One popular approach for solving such problems is the application of meta-heuristic algorithms. In fact, there have been numerous meta-heuristic algorithms developed specifically for this purpose. No Free Lunch theory (NFL) [23] provides the foundation for such diversity, stating that no single meta-heuristic algorithm can solve all optimization tasks effectively. In other words, the optimization algorithm can have brilliant results in a specific class of problems and at the same time fails to solve other ones. As a result, each problem, including the parameter estimation of each equivalent model, necessitates a distinct algorithm selection. Numerous studies have been conducted to compare the efficiency of meta-heuristic algorithms for parameter estimation under conventional SC models. Some studies focus on a single model, such as SDM [24], DDM [25, 26], or TDM [27], while others examine both SDM and DDM concurrently [28, 29, 30, 31]. Several papers have investigated algorithms' efficiency in processing IV curves according to three models: SDM, DDM, and PVMM [32, 33, 34, 35, 36]. Indeed, the utilization of conventional SC models for testing newly developed algorithms is among the most popular approaches after using CEC20XX benchmark functions. The wide range of metaheuristic optimization methods allows for situations in which various studies examine identical models but prioritize different algorithms array.

Regarding the estimation of parameters for models of PV devices with S-shaped IV curves, the situation is not as well-explored. Certainly, meta-heuristic algorithms have been utilized in processing experimental S-shaped IV curves [37]. Nevertheless, studies aimed at identifying the most optimal approach for solving these problems are absent to our knowledge. However, the NFL theory suggests that algorithms that have demonstrated exceptional results for

silicon monocrystalline SC models may not yield the same effectiveness for models of the next-generation PV devices.

This study aimed to compare the effectiveness of parameter estimation according to the De Castro two-diode model [6] using a set of 14 meta-heuristic algorithms and determine the best-performing among them. The selection of this particular model from the diverse range is motivated by its universality. Despite the mentioned drawbacks in the first quadrant, the model attracts attention in deriving the analytical solutions of the equivalent circuits [15] and is widely used to describe experimental IV curves of SCs with different structures [38, 37, 39, 40, 41, 42, 43, 44, 45]. In particular, these include polymer [42] and polymer/fullerene [40] bulk heterojunction photocells, ternary organic solar cells [43], and other types of organic structures [37, 39], perovskite solar cells with fullerene transport layer and carbon nanotube electrode [45], and perovskite solar cells with ionic liquid gating [44]. The popularity of the De Castro model is also associated with the fact that in experiments, IV curves are typically measured only within the range from short-circuit current to open-circuit voltage, i.e., only in the fourth quadrant. The considered metaheuristic algorithms belong to different categories based on their sources of inspiration. Some of these algorithms have been well-known for a long time and have proven their effectiveness in solving a wide range of problems. Other algorithms are more recent, developed with the knowledge gained from their predecessors. The obtained results are compared using various nonparametric statistical methods.

2. Problem definition

2.1. Solar cell model

Fig. 1 vividly reveals the structure of the used model [6]. It can be seen from the figure that model contains a current source accompanied by a diode D1, a shunt resistor R_{p1} to show the leakage current, and a series resistor R_s to consider the losses associated with the load current. Besides, the second diode D2 with a second parallel resistance R_{p2} is placed opposite to the first one and is essential to simulate the non-ideal effects of the active layer/cathode interface. In this model, D1 is responsible for the exponential behavior of the IV curve, the main contribution of D2 is to simulate the S-shape. The analytical solution $V(I)$ of the opposed two-diode equivalent circuit model was obtained [46] using Lambert W -function [47]:

$$\begin{aligned} V = & (I + I_{ph} + I_{01})R_{p1} \\ & - \frac{n_1 kT}{q} W \left\{ \frac{qI_{01}R_{p1}}{n_1 kT} \exp \left[\frac{qR_{p1}(I + I_{ph} + I_{01})}{n_1 kT} \right] \right\} \\ & + \frac{n_2 kT}{q} W \left\{ \frac{qI_{02}R_{p2}}{n_2 kT} \exp \left[-\frac{qR_{p2}(I - I_{02})}{n_2 kT} \right] \right\} \\ & + (I - I_{02})R_{p2} + IR_s, \end{aligned} \quad (1)$$

where I_{01} and I_{02} are the saturation currents and n_1 and n_2 are the ideality factors for D1 and D2 respectively, and

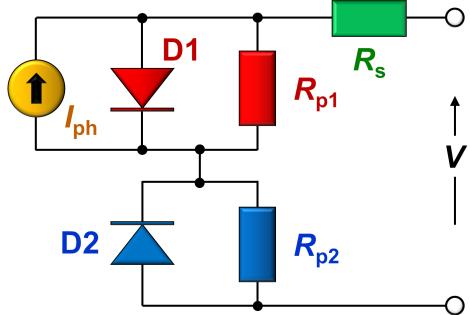


Figure 1: The opposed two-diode equivalent-circuit model of a solar cell.

I_{ph} is the ideal photocurrent. Thus, the model employs eight lumped parameters (I_{01} , n_1 , R_{p1} , I_{02} , n_2 , R_{p2} , R_s , and I_{ph}) that need to be determined from the IV curve. Thus, from an optimization perspective, the dimension of the problem is $D = 8$.

The expression (1) has a drawback in that it tends to stray from the range of numbers that can be accommodated by the standard 64-bit floating-point format owing to the presence of exponential functions for larger numbers. To overcome this drawback, the use of the g -function $g(x) = \ln(W(\exp(x)))$ was suggested [48]. The analytical solution $V(I)$ using the g -function is as follows [48]

$$V(I) = IR_s + \frac{n_1 kT}{q} g(x_1) - \frac{n_2 kT}{q} g(x_2) - \frac{n_1 kT}{q} \ln \left[\frac{qI_{01}R_{p1}}{n_1 kT} \right] + \frac{n_2 kT}{q} \ln \left[\frac{qI_{02}R_{p2}}{n_2 kT} \right], \quad (2)$$

with

$$x_1 = \ln \left(\frac{qI_{01}R_{p1}}{n_1 kT} \right) + \frac{q(I + I_{\text{ph}} + I_{01})R_{p1}}{n_1 kT}, \quad (3)$$

and

$$x_2 = \ln \left(\frac{qI_{02}R_{p2}}{n_2 kT} \right) - \frac{q(I - I_{02})R_{p2}}{n_2 kT}. \quad (4)$$

We used Eqs. (2)–(4) both for simulation IV curves and during the approximation procedure. The g -function was evaluated by using iterative procedure [48].

2.2. Synthetic IV curves

The research involved the parameter estimation of solar cells using meta-heuristic algorithms based on synthetic IV characteristics simulated using the opposed two-diode model. This approach allows for assessing the accuracy of the employed optimization methods, as the simulation was performed using known parameter values.

In first part of the study, a detailed analysis was conducted on a single IV curve, evaluating the performance of meta-heuristic algorithms for parameter estimation in a one-time application mainly. Additionally, the suitability of employing two different fitness functions was examined. In the second part, we simulated a set of IV characteristics and evaluated the average performance metrics of various algorithms.

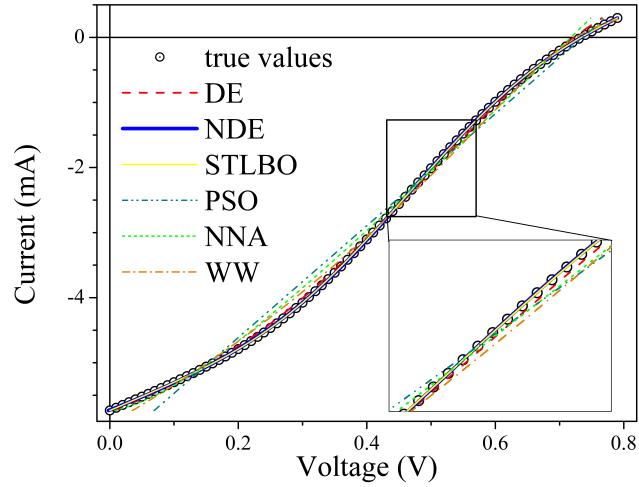


Figure 2: Fitting results (lines) for the simulated current-voltage characteristic (symbols). The values from Eq. (5) were assumed under simulation.

2.2.1. Single-IV case

Previous studies have demonstrated [42, 49] that when the ideality factor of D2 is either equal to or significantly larger than n_1 ($n_1 = n_2 = 1.92$ or $n_1 = 1.00$, $n_2 = 3.00$), the nonlinear least-squares method successfully determines a set of equivalent circuit parameters that accurately replicate the experimental data of an organic photovoltaic cell. Therefore this approach does not allow for distinguishing between similar IV curves obtained from solar cells with different parameters. To overcome this issue, Tada [49] successfully employed Bayesian estimation of parameters. To assess the capabilities of meta-heuristic methods in overcoming additional similar challenges, they were applied to a IV curve corresponding to such a problematic case. The parameter values were taken from [49]:

$$\begin{aligned} I_{01} &= 1.6 \cdot 10^{-6} \text{ mA}, \\ n_1 &= 1.92, \\ R_{p1} &= 190 \Omega, \\ I_{02} &= 0.16 \text{ mA}, \\ n_2 &= 1.92, \\ R_{p2} &= 190 \Omega, \\ R_s &= 45 \Omega, \\ I_{\text{ph}} &= 8 \text{ mA}, \end{aligned} \quad (5)$$

and the IV curve was simulated over a range of 0–0.8 V with step 10 mV at $T = 300$ K. The simulation result is presented on Fig. 2 by symbols.

2.2.2. IV-set case

Employing various meta-heuristic algorithms to analyze a single IV curve is insufficient to obtain comprehensive insights into the methods' efficacy in parameter estimation. The accuracy of parameter determination is closely tied to their absolute values. For instance, an increase in the R_p

value can pose challenges for accurately estimating resistance because the shunt will have a lesser impact on the overall shape of IV curve. In addition, the ratio between the parameter values also plays a crucial role.

To test the methods across different parameter values, we generated synthetic data in a temperature range from 260 K to 350 K. During the simulation process, we considered various temperature dependencies of the parameters. We based our approach on known physical mechanisms but focused on achieving the diversity of parameter ratio instead of attempting to replicate real-life photovoltaic converters precisely. Furthermore, an S-shaped IV curve is observed in solar cells of various types, and diverse charge transport mechanisms significantly complicate the selection of the only possible temperature dependence for each of the eight model parameters. Therefore, we assumed that the current conduction mechanism through D1 is close to tunneling, and hence, I_{01} , R_{p1} , and $(n_1 kT)$ remain constant, with $I_{01} = 0.015$ mA, $R_{p1} = 10^4$ Ω, $n_1 kT = 7$ eV. In the case of D2, the thermionic emission current was suggested and I_{02} and n_2 increased and decreased, respectively, with temperature rise [50]:

$$I_{02} = I_{002} \exp\left(-\frac{E_I}{kT}\right), \quad (6)$$

$$n_2 = 1 + \frac{T^*}{T}, \quad (7)$$

where I_{002} , E_I , and T^* are the constants which are independent of temperature. The values of $I_{002} = 500$ A, $E_I = 0.40$ eV, and $T^* = 500$ K were used. For R_{p2} , an exponential temperature dependence was employed, as it is widely observed [51] in modern solar cells for the shunt resistance:

$$R_{p2} = R_{p20} \exp\left(\frac{E_R}{kT}\right). \quad (8)$$

with $R_{p20} = 9$ mΩ, $E_R = 0.32$ eV. The linear temperature dependencies is expected for both I_{ph} [52, 53] and R_s [54, 55]:

$$y = y_0[1 + TC_y(T - 300)], \quad (9)$$

where $y = I_{ph}$ or R_s , y_0 is the parameter value at room temperature, TC_y is the temperature coefficient of parameter. For most types of monocrystalline silicon solar cells, the $TC_{I_{ph}}$ typically ranges from around -0.0004 K $^{-1}$ [56]. However, as the base thickness decreases, the temperature coefficient can increase to -0.0014 K $^{-1}$ [57]. For hydrogenated amorphous silicon solar cells, $TC_{I_{ph}}$ is equal to -10^{-3} K $^{-1}$ [58]. For organic solar cells, the temperature coefficient can reach a magnitude of -0.003 K $^{-1}$ [59]. During the simulation, we assumed $TC_{I_{ph}} = -10^{-3}$ K $^{-1}$. Furthermore, the values of $I_{ph0} = 1$ mA, $TC_{R_s} = 0.02$ K $^{-1}$, and $R_{s0} = 50$ Ω were used.

The set of I-V data was composed of 10 curves, which were simulated at 10 K intervals from 260 to 350 K; in this case, n_1 , I_{02} , n_2 , R_{p2} , R_s , and I_{ph} varied from 6.37 to 4.73, from 9 to 880 μA, from 2.92 to 2.43, from $1.4 \cdot 10^4$ to 360 Ω,

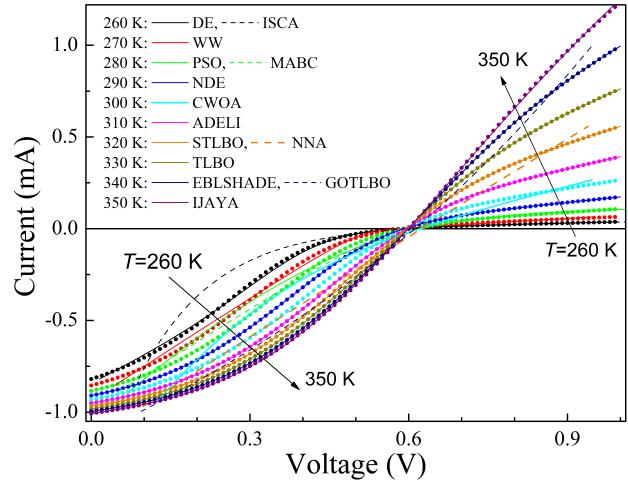


Figure 3: Fitting results (lines) for the simulated current-voltage characteristic (symbols). The values from Sec. 2.2.2 were assumed under simulation.

from 10 to 100 Ω, and from 0.96 to 1.05 mA, respectively. The simulation results are presented on Fig. 3 by symbols.

2.3. Meta-heuristic algorithms

In the literature, meta-heuristics are frequently categorized based on their sources of inspiration. This categorization involves incorporating elements of true simulations and principles that incorporate stochasticity, with the objective of emulating diverse characteristics observed in biological behavior, the lives of creatures in nature, human behavior, or natural phenomena. On this basis, any meta-heuristic algorithm can fall into one of the following main classes [60, 61, 62]: evolution-based methods (emulate the principles of evolutionary behavior observed in creatures in nature by relying on the concept of survival of the fittest), swarm intelligence-based methods (simulate the collective, dynamic, intelligent, and concerted gregarious conduct of collections of flocks or communities found in nature), bio-based methods (use biological processes unrelated to group behavior), chemical & physical-based methods (originate from the physical phenomena or chemical laws that exist in the universe), human-society-based methods (inspired by human beings, including various activities such as thinking and social behavior), and math-based methods (borrow the mathematical functions). Generally, there are hundreds of meta-heuristic optimization methods available. While we acknowledge that our selection may not be fully comprehensive, we utilized 14 methods, representing all classes mentioned above, to tackle the parameter estimation task within the framework of the opposed two-diode model for a solar cell. Hereafter, we provide a succinct description of each method alongside the parameters employed during the fitting process.

Differential evolution (DE). DE is one of the classical methods, and it is based on the natural selection law and uses the randomly generated initial population, differential

mutation, and probability crossover [63]. During the implementation, we employed a penalty function suggested by Ishaque *et al* [64]. Besides, according to Wang and Ye [63], the values of mutation scaling factor $F = 0.8$, crossover rate $Cr = 0.3$, and population size $Np = 8 \times D = 64$ were used in this work.

Adaptive differential evolution with the Lagrange interpolation argument (ADELI). The method is based on DE, which integrates an adaptive local search scheme with Lagrange interpolation [65]. This incorporation aims to enhance the exploitation capability and accelerate the convergence speed. In ADELI, the scaling factor and crossover rate are set to self-adapting to optimize the results. We used parameter values recommended by Huang *et al* [65] during the implementation process. Additionally, we set Np to 64 for our numerical experiments.

Differential evolution with neighborhood-based adaptive evolution mechanism (NDE). The method uses a mutation strategy, which takes into account neighborhood and individual information, and an adaptive evolution mechanism [66]. The determination of F and Cr values is achieved through the utilization of the weighted adaptive procedure [67], and an adaptive adjustment of the population size is implemented using a simple reduction method (from $10 \times D = 80$ to 5).

Success history based DE with hybridization mutation strategies and population size reduction (EBLSHADE). The method is the hybridization framework between *pbest* and *ord_pbest* mutation strategies and stores a set of Cr and F values that have performed well in the recent past [68]. A linear Np reduction (from $18 \times D = 144$ to 4) is used as well.

Particle swarm optimization (PSO). It is another classic method based on observations of the social behavior of animals, such as bird flocking, fish schooling, and swarm theory. According to Ye *et al.* [69], the values of learning factors $l_1 = l_2 = 2$, the final weight and the initial weight $w_{max} = 0.9$, $w_{min} = 0.4$, and $Np = 15 \times D = 120$ are used in this work.

The **modified artificial bee colony (MABC)** algorithm is based on the intelligent foraging behavior of honey bee swarms [70]. The control parameters include the population size ($Np = 8 \times D = 64$) and the maximum number of generations after which each non-improved food source is to be discarded ($L_{init} = 36$).

Chaotic Whale Optimization Algorithm (CWOA). WOA draws inspiration from the hunting behavior of humpback whales [71]. On the other hand, CWOA employs chaotic maps to compute and dynamically adjust its internal parameters [72]. In our study, we utilized the Singer chaotic map and set $Np = 100$ for the identification of the parameters of the solar cell.

The **Neural Network Algorithm (NNA)** is a meta-heuristic algorithm that draws inspiration from both biological nervous systems and artificial neural networks [73]. The recommended [73] value $Np = 50$ is used in our paper.

The **teaching learning based optimization (TLBO)** algorithm employs the concept of passing on knowledge within

a classroom. Similar to learners acquiring knowledge from a teacher and interacting with their peers, TLBO incorporates such interactions [74]. In this study, a value of $Np = 100$ is utilized.

Generalized oppositional teaching learning based optimization (GOTLBO). This method integrates a concept that incorporates both the current estimate and its opposite estimate simultaneously into the original TLBO algorithm through the initialization step and generation jumping [75]. The values of jumping rate $Jr = 1.0$ and $Np = 20$ were used.

Simplified teaching-learning based optimization algorithm (STLBO). In STLBO, an elite strategy is employed to improve the searching capability, and a the chaotic map is used to enrich the uniformity of random values in the mutation phase [76]. The logistic chaotic map and $Np = 20$ were used.

Water wave optimization (WWO) takes inspiration from shallow water wave models and borrows ideas from wave propagation, refraction, and breaking [77]. WWO is easy to implement with a small-size population, and there are four control parameters: the maximum wave height h_{max} , the wavelength reduction coefficient α , the breaking coefficient β , and the maximum number k_{max} of breaking directions. According to Zheng [77], we used the values $h_{max} = 6$, $\alpha = 1.026$, $Np = 10$, $k_{max} = \min(12, D/2) = 4$, and β linearly decreased from 0.25 to 0.001.

Improved JAYA (IJAYA). Jaya algorithm is based on the concept that the solution obtained for a given problem should move toward the best solution and should avoid the worst solution and does not require any algorithm-specific parameter [78]. In IJAYA, a self-adaptive weight is introduced to adjust the tendency of approaching the best solution and avoiding the worst solution; an experience-based learning strategy is employed to maintain the population diversity and enhance the exploration ability, and a chaotic elite learning method is proposed to refine the quality of the best solution in each generation [36]. The logistic chaotic map and $Np = 4 \times D = 32$ were used.

Improved sine cosine algorithm (ISCA). SCA based on simulating the behaviors of sine and cosine mathematical functions [79]. ISCA implementation included a modified position-updating equation based on inertia weight ($w_{start} = 1$, $w_{end} = 1$), a nonlinear conversion parameter strategy based on the Gaussian function ($a_{start} = 2$, $a_{end} = 0$) [80], the creation of the opposite population to jump out from the local optima with $Jr = 0.1$ [81], a greedy selection, and $Np = 30$.

The majority of the utilized algorithms demonstrate excellent performance when it comes to parameter estimation of SCs within conventional models (SDM or DDM) [72, 63, 75, 36, 70, 69, 76, 74, 82, 35].

In meta-heuristic optimization methods, the quality of the extracted parameters is evaluated using the fitness function at every iteration. In our investigation, absolute error and square error fitness functions were under consideration:

$$F_{AE}(Y) = \sum_{k=1}^p |V^{tr}(I_k) - V^{cal}(I_k, Y)|, \quad (10)$$

$$F_{SE}(Y) = \sum_{k=1}^p [V^{tr}(I_k) - V^{cal}(I_k, Y)]^2, \quad (11)$$

where $V^{tr}(I_k)$ is the simulated value of voltage at current I_k , $V^{cal}(I_k, Y)$ is the calculated values of voltage, which can be obtained by Eqs. (2)–(4), for given set of parameters (i.e. $Y = \{I_{01}, n_1, R_{p1}, I_{02}, n_2, R_{p2}, R_s, I_{ph}\}$) at current I_k , and p is the total number of voltage steps in the IV characteristic.

We executed each tested algorithm for $N_{\text{runs}} = 51$ independent runs on each simulated IV curve to generate the statistical results. The search ranges were set as follows: $I_{01}(\text{mA}) \in [10^{-13}, 1]$, $n_1 \in [0.5, 50]$, $R_{p1}(\Omega) \in [10, 10^6]$, $I_{02}(\text{mA}) \in [10^{-7}, 10]$, $n_2 \in [0.5, 50]$, $R_{p2}(\Omega) \in [10, 5 \cdot 10^4]$, $R_s(\Omega) \in [0.1, 1000]$, $I_{ph}(\text{mA}) \in [10^{-3}, 100]$.

2.4. Evaluation metrics

To better show the performance differences between compared algorithms, several evaluation metrics are considered, which can be described as follows:

1. Mean value (MEAN), median value (MEDIAN), standard deviance (STD), and interquartile range (IQR) for each two-diode model parameter y (y is one of $\{I_{01}, n_1, R_{p1}, I_{02}, n_2, R_{p2}, R_s, I_{ph}\}$). MEAN and MEDIAN are often used to measure the solution quality. The closer the obtained MEAN and MEDIAN values are to the actual parameter values, the closer the obtained solution is to the optimal solution. To quantify, we used the absolute percentage of error (APE):

$$APE(y) = \left| \frac{y - y^{tr}}{y^{tr}} \right|, \quad (12)$$

where y^{tr} is the parameter value used during the IV curve simulation. APE was calculated for y_i , obtained by one-run algorithm application (APE_i), MEAN (APE_{MEAN}), and MEDIAN (APE_{MEDIAN}). Reducing STD and IQR result in a more stable algorithm performance.

2. Another evaluation criterion used to compare the algorithms' performance is to compare their execution time. We used average run time t_{run} in seconds for an individual optimizer on one IV curve.
3. Root mean square percentage of error (RMSPE) is a statistical measure that indicates how well the fitted curve matches the actual IV curve:

$$RMSPE = \sqrt{\frac{1}{p} \sum_{k=1}^p \left[\frac{V^{tr}(I_k) - V^{cal}(I_k, Y)}{V^{tr}(I_k)} \right]^2}. \quad (13)$$

4. Wilcoxon signed-rank test is a nonparametric statistical test used for pairwise comparisons of algorithms. This test assigns a rank to all the scores considered as one group and then sums the ranks of each group.

5. Friedman, Friedman Aligned, and Quade tests are used for comparing the performance differences among optimization algorithms (multiple comparisons $1 \times N$ with a control method). Therefore, the average rankings of the algorithms according to the tests are reported. Besides, the post-hoc Finner, Holm, Hochberg, and Holland procedures are used to establish proper comparisons between each algorithm and a set of other algorithms.
6. Multiple Comparisons Test (Friedman) with Shaffer's static, Nemenyi, and Holm procedures are employed to compute all possible pairwise comparisons between groups ($N \times N$) and identify the differences.

3. Numerical results and discussion

3.1. Comparison of algorithms time

In meta-heuristic algorithms, a different termination can be defined. For instance, a termination condition can be a specific number of iterations N_{it} , constraints on the number of fitness function evaluations N_{FE} , a specific rate of precision, a specific time, no sign of change in solutions after a specific number of iterations, or a combination of these cases [83]. In this study, the primary focus was on the accuracy of parameter estimation. Therefore to ensure that both exploration and exploitation processes could be fully realized by each algorithm with an equal opportunity, the termination criterion used was the absence of changes in the solution. Based on this condition, the required number of iterations N_{it} was determined, and the corresponding calculation time was measured t_{run} . In addition, the N_{FE} was evaluated.

All the applied algorithms have been coded and implemented in Embarcadero®Delphi 10.3 programming software. The run time was estimated by using WinAPI-functions *QueryPerformanceCounter()* and *QueryPerformanceFrequency()*. The experiments were performed on Windows 10 Pro 64-bit, 2.9 GHz AMD Ryzen 7 4800H CPU, and 8 GB RAM.

The obtained results are listed in Table 1. As can be seen from the table, the number of iterations required for an algorithm does not always correlate directly with the number of fitness function evaluations or computation time needed to converge. The reason is the unique features of each algorithm. The run time of the algorithms varies considerably, with a range of 1.5 seconds to 93 seconds. Notably, WW, ISCA, NNA, and STLBO converge the fastest, while ADELI, TLBO, and MABC require the most time.

3.2. Fitness function selection

To choose the more suitable fitness function, we evaluated each algorithm using the IV curve generated from the parameters provided in Eq. (5) with both F_{AE} and F_{SE} functions (see Eqs. (10) and (11)). Afterward, the results obtained using each of the functions were compared through pairwise comparisons. In this case, the absolute percentage error values obtained for one-run algorithm application (APE_i) were used. Table 2 gives the statistical results produced by

Table 1

Comparison of optimization algorithms for single IV curve parameter estimation

Algorithm	N_{it}	N_{FE}	$t_{\text{run}} (\text{s})$
DE	8000	1024000	42 ± 1
EBLSHADE	3000	444600	22 ± 1
ADELI	12000	1800000	93 ± 2
NDE	5000	430000	20.2 ± 0.3
MABC	8000	1024000	48 ± 11
TLBO	5000	1000000	56.1 ± 0.3
GOTLBO	6000	360000	15 ± 1
STLBO	13000	273000	13.8 ± 0.3
PSO	4000	480000	19 ± 3
IJAYA	30000	960000	37 ± 1
ISCA	5000	150000	6.5 ± 0.1
NNA	5000	250000	10.6 ± 0.5
CWOA	3000	300000	16.6 ± 0.5
WW	3000	35000	1.4 ± 0.1

Table 2

Wilcoxon signed ranks test results of fitness functions comparisons with a level of significance $\alpha = 0.05$

Algorithm	Parameter								RMSPE
	I_{01}	n_1	R_{p1}	I_{02}	n_2	R_{p2}	R_s	I_{ph}	
DE	SE	SE	=	=	SE	SE	=	=	=
EBLSHADE	SE	=	=	=	=	=	=	=	AE
ADELI	SE	=	=	=	=	=	=	=	AE
NDE	=	=	=	=	=	=	=	SE	SE
MABC	=	SE	=	=	=	=	=	=	SE
TLBO	SE	SE	SE	SE	SE	SE	SE	SE	SE
GOTLBO	=	=	=	=	=	SE	=	=	=
STLBO	SE	=	=	=	=	=	=	=	AE
PSO	=	=	=	=	=	AE	=	=	=
IJAYA	AE	AE	=	=	SE	=	=	=	=
ISCA	=	=	=	=	=	=	=	=	=
NNA	=	=	=	=	=	=	=	=	SE
CWOA	=	=	SE	=	AE	=	=	=	SE
WW	=	=	SE	=	AE	=	=	=	SE

Wilcoxon sign-rank test with a significant level $\alpha = 0.05$. A cell marked with the symbol “SE” indicates that estimation of parameter specified in the column by the algorithm with F_{SE} outperforms result obtained by this algorithm with F_{AE} . A cell marked with the symbol “AE” indicates better results for function F_{AE} . In the case of the symbol “=”, there is no significant difference between function F_{SE} and function F_{AE} application.

As evidenced in the provided data, utilizing the square error fitness function more frequently yields better outcomes in comparison to F_{AE} . In rare cases, the absolute error fitness function can enhance the alignment between the fitted and actual curves, as well as improve the accuracy of some parameter estimations by PSO, IJAVA, CWOA, and WW algorithms. However, RMSPE is not the most crucial factor in determining model parameters, and the mentioned methods, as will be shown later, do not provide the highest

accuracy. As such, the results presented in the following sections are exclusive to the application of the F_{SE} function. Therefore, it can be recommended that researchers consider the square error fitness function as a more effective and reliable option for the task of opposed two-diode model parameter estimation.

3.3. Performance comparison

3.3.1. Evaluation of single-IV

In this subsection, we show and analyze the statistical results of different meta-heuristic algorithm applications to an IV curve, simulated with Eq. (5) values. Several typical fitting results of the synthesized curve are shown in Fig. 2. A more comprehensive version, including the fitting results obtained using each algorithm, is provided in the supplementary materials (figure S1). It can be seen, that the closest match between the approximation curves and the IV curve points is observed for EBL SHADE, ADELI, NDE, IJAYA, TLBO, and STLBO. On the contrary, the PSO and GOTLBO fitting curves had the least replication of the original data.

Fig. 4 shows the results of cell parameters estimation by comparative algorithms. In addition, the figure presents the RMSPE data, which confirms the conclusions of the visual comparison between the fitting lines and the points of the IV curve. The results in terms of MEAN, MEDIAN, STD, and IQR are tabulated as well (table S1 in the supplementary material).

We would like to stress the following. In most cases, median values are more relevant to the actual parameter values than the mean values. Possible exceptions only apply to the estimation of R_s and R_{p2} only. However, in cases where a method allows for parameter estimation with high accuracy (EBLSHADE, ADELI, TLBO, and STLBO), MEDIANs are at least as good as the MEANS. As a result, we will utilize median values as a robust measure of central tendency in nonparametric statistical tests. Secondly, the increase in algorithm stability (reduction in STD and IQR values) in determining each model parameter correlates with the accuracy of parameter estimation. Furthermore, IQR values are generally no worse than STD values. Finally, small RMSPE values (close match between the fitting curve and the IV points) do not always indicate high accuracy in determining the parameters of a solar cell — see IJAYA and NDE data. For example, the difference between the MEDIAN_{RMSPE} values for NDE and ADELI is approximately 0.0001 (about 0.08% of their absolute value). At the same time, in the ADELI case, the values of APE_{MEDIAN} do not exceed $6 \cdot 10^{-4}$ for all model parameters estimation, whereas for the NDE algorithm application, the obtained APE_{MEDIAN} values are significantly higher and range from 0.04 for I_{ph} to 11.4 for I_{01} . On one hand, this confirms the issue identified by Tada [42, 49], which arises when estimating parameters according to the opposed two-diode model from similar IV curves corresponding to photovoltaic cells with distinct characteristics. Furthermore, the results indicate that some metaheuristic algorithms, such as NDE and IJAYA, can fall into a similar trap. On the other hand,

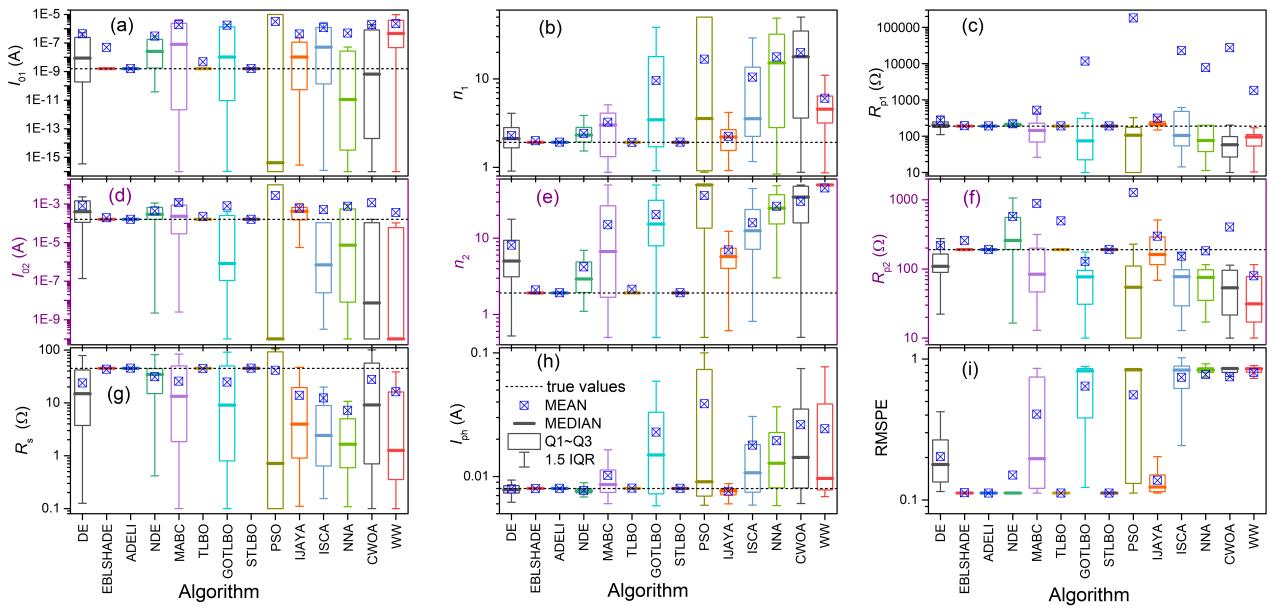


Figure 4: Box-plot of two-diode model parameter estimation from single IV curve using different optimizers. The squares are the mean values, and the dashed lines correspond to the true parameter values.

the high accuracy in parameter estimation demonstrated by EBL SHADE, ADELI, and STLBO indicates that these algorithms are able to overcome the mentioned issue when applied. It should be noted that a similar problem has been previously addressed by employing Bayesian estimation of parameters [49]. However, each Bayesian calculation took approximately half a day on a computer better equipped than ours [49]. In our case, when applying meta-heuristic algorithms, the worst-case run time did not exceed 100 seconds.

In order to statistically compare the algorithm under consideration, we use nonparametric tests. In the single-IV case, all nonparametric statistical tests were used to compare the performance of meta-heuristic algorithms in assessing each of the eight model parameters. The APE_i values were used, and the number of case problems in the study N_{pr} was equal to $N_{runs} = 51$. Additionally, algorithms were compared in terms of curve-fitting accuracy by using RMSPE values. Furthermore, tests were employed for a composite parameter as well. This parameter, referred to as “Comp” hereafter, includes APE_{MEDIAN} for each of the eight defined model parameters, the median value for RMSPE, and t_{run} . This parameter may provide the most valuable insights for comparing algorithms. However, it is important to note that the value of N_{pr} is only 10. According to Derrac *et al* [84], the number of case problems should be $N_{pr} \geq 2k$, where k is the number of algorithms ($k = 14$ in our study). Therefore, the use of the Comp parameter is not strictly rigorous. Indeed, it would have been possible to increase the N_{pr} value using, for example, APE_{MEAN} . However, considering the deliberate utilization of a suboptimal parameter would have appeared inappropriate.

Fig. 5 graphically show the non-parametric statistical results of pairwise comparisons of algorithms based on the

Wilcoxon signed-rank test. In the case of Comp comparisons, the differences in performance scores were normalized to the interval $[0, 1]$. As seen from the figure, no algorithm outperforms all others in evaluating each parameter. Furthermore, no algorithm surpasses all others in the estimation even a single parameter. For example, as the figure states, STLBO shows a significant improvement over DE, NDE, MABC, GOTLBO, PSO, IJAYA, ISCA, NNA, CWOA, and WW across all the parameters considered with a level of significance $\alpha = 0.05$. Simultaneously, it was not detected the significant differences between STLBO and both EBL SHADE and ADELI for all parameter estimations as well as between STLBO and TLBO in the Comp case. EBL SHADE outperforms nearly all other algorithms in the composite parameter, except for STLBO. According to the Wilcoxon test victories count, the worst performances are exhibited by PSO and CWOA. PSO achieved better results than ISCA, NNA, and CWOA in terms of RMSPE value, as well as outperformed WW in n_2 estimation and RMSPE. Test detected significant differences between CWOA and WW in n_2 and I_{01} estimations, between CWOA and PSO in I_{01} , I_{02} , R_s , and I_{ph} estimations, and between CWOA and both ISCA and NNA in R_s estimation case only.

Looking at the results of the Wilcoxon signed-rank test from another perspective, it can be observed that neither EBL SHADE nor STLBO had any defeats in pairwise comparisons, while ADELI had only one loss. ADELI was only outperformed by EBL SHADE in terms of the Comp parameter, primarily due to its significantly longer run time. The highest count of defeats was observed for the PSO and WW algorithms (104 and 84, respectively). The data regarding the total count of wins and losses when applying the Wilcoxon test for each algorithm are summarized in Fig. 6.

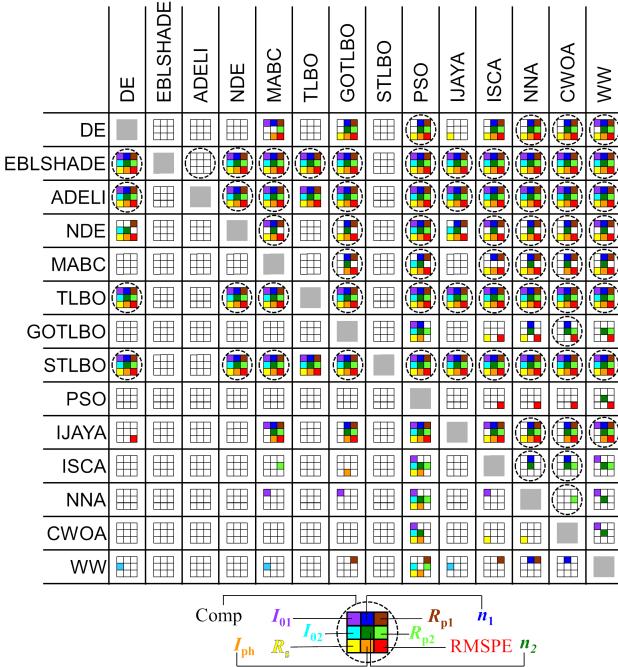


Figure 5: The results of Wilcoxon signed-rank test with a level of significance $\alpha = 0.05$ in the single-IV case. Each colored small square indicates that the algorithm specified in the row outperforms the algorithm specified in the column in evaluating one of the parameters of the two-diode model. The correspondence between the color and position of the square to a model parameter is shown in a legend at the figure bottom. The advantage of the row algorithm in the Comp parameter is indicated by the presence of a dashed circle.

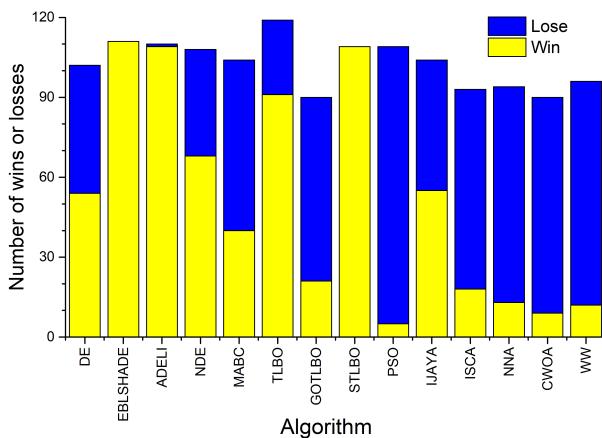


Figure 6: The total count of wins and losses for each algorithm in pairwise comparisons using the Wilcoxon signed-rank test with a significance level of $\alpha = 0.05$ in the single-IV case.

It is recommended [84] to begin the multiple comparisons tests by examining the null hypothesis H_0 , which asserts the equality of medians between the populations of results obtained by different algorithms. The null hypothesis p -values computed through the statistics of Friedman, Friedman Aligned, and Quade test and the Iman–Davenport extension are given in the supplementary material (table S2).

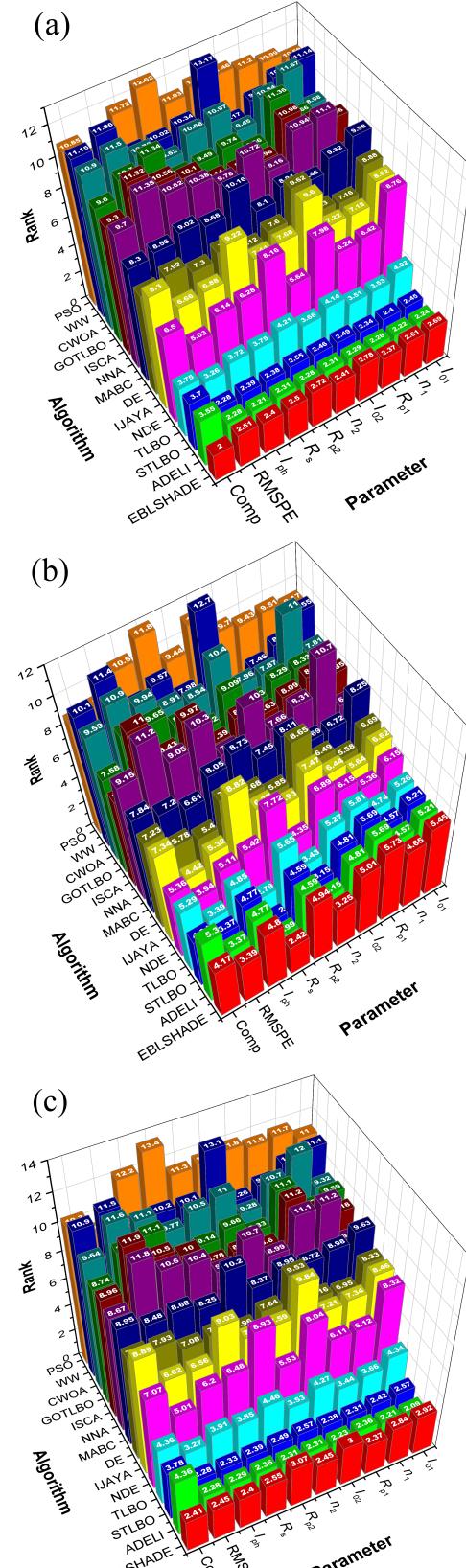


Figure 7: Ranking of the algorithms according to Friedman (a), Friedman Aligned (b), and Quade (c) tests in the single-IV case.

The highest observed $p(H_0)$ -values were found to be $2.7 \cdot 10^{-5}$ (Friedman Aligned test for the task of R_{p1} estimation), $4.4 \cdot 10^{-4}$ (Friedman Aligned test for the composite parameter case), and $8.3 \cdot 10^{-6}$ (Quade test, Comp parameter). Thus obtained data strongly suggest the existence of significant differences among the considered algorithms in the accuracy of all model parameter determination, RMSPE values, and Comp parameter.

Fig. 7 shows ranks achieved by the Friedman, Friedman Aligned, and Quade tests for applied optimization algorithms in different tasks. Ranks are tabulated in the supplementary material as well (table S3). In almost all cases, the algorithms EBL SHADE, ADELI, and STLBO consistently achieve the top (smallest value) three ranks. For example, in assessing the accuracy of model parameter estimation, ADELI has ranked first 22 times. The STLBO algorithm ranked first six times, taking the sole first place twice (I_{01} estimation according Friedman Aligned test and R_{p1} estimation according Quade test) and sharing it with ADELI four times (n_1 , R_{p1} , n_2 , and I_{ph} estimation according Friedman Aligned test). In the RMSPE value case, ADELI and STLBO achieved equal and best ranks by all three used tests. When comparing based on the Comp parameter, the STLBO algorithm obtained the top rank according to the Friedman Aligned test, while the Friedman and Quade tests recognized EBL SHADE as the best. In most cases, the TLBO algorithm secured the fourth position, and in four cases, it even ranked third. In the majority of cases, the TLBO algorithm consistently ranked fourth out of all the algorithms tested. Interestingly, in four cases (I_{01} estimation, RMSPE value, and Comp parameter by Friedman Aligned test, and Comp parameter by Quade test), it even achieved a commendable third-place ranking. We must note that overall, the absolute values of ranks for ADELI, STLBO, EBL SHADE and TLBO algorithms differ little, and the difference between the first and fourth ranks is often less than 0.5. The worst ranks are observed for PSO, NNA, CWOA, and WW.

It is known [84] that the Friedman, Friedman Aligned, and Quade tests are insufficient in establishing accurate comparisons between the algorithms considered. To compare a control method (1 of 14 compared) with a set of other algorithms (rest 13), one can define a family of hypotheses related to the control method. Applying a post-hoc test makes it possible to obtain a p -value that indicates the extent to which each hypothesis can be rejected. We calculated p -values using four post-hoc procedures (Finner, Holm, Hochberg, and Holland) for all algorithms, tests, and tasks. By following the indications given for the four post-hoc procedures considered, Table 3 shows the p -values obtained, using the ranks computed by the Friedman, Friedman Aligned, and Quade tests for the case of control algorithm ADELI and the task of R_{p1} estimation. These are typical results, the reader is referred to the supplementary material for rest of p -values (Tables S4-S143).

As we can see in the table, the Finner post-hoc procedure exhibits the most powerful behavior, reaching the lowest p -values in the comparisons. The Friedman test shows a

significant improvement in R_{p1} estimation of ADELI over DE, NDE, MABC, GOTLBO, PSO, IJAYA, ISCA, NNA, CWOA, and WW for all the post-hoc procedures considered.

The Friedman Aligned test only confirms the improvement of ADELI over the aforementioned 10 algorithms for every post-hoc procedure considered, except Holm, Hochberg, and Holland, which fail to highlight the differences between ADELI and NDE as significant.

Finally, the Quade test find significant difference between ADELI and MABC, GOTLBO, PSO, ISCA, NNA, CWOA, WW for every post-hoc procedure. In the DE and IJAYA cases, ADELI obtains better results in R_{p1} estimation according Finner post-hoc procedure only. This result supports the conclusion that, although ADELI outperforms the weaker algorithms of our study, its performance differences are not significant when compared to other power algorithms (STLBO, EBL SHADE, TLBO).

In our study, a threshold value of $p_{cr} = 0.1$ was adopted to establish a critical level for comparing the effectiveness of two algorithms in both multiple $1 \times N$ and $N \times N$ comparisons. That is, it was determined that the likelihood of obtaining a result as extreme as the observed one, under the assumption that there is no difference between the two algorithms (null hypothesis), was less than 10%.

The statistical results of the algorithm's effectiveness comparison in the task of R_{p1} estimation are shown in Fig. 8(a). In the figure, the outperforming of an algorithm in a row over the algorithm in the column is indicated by a colored hexagon in the corresponding cell. The white hexagon suggests a strong likelihood of the null hypothesis. In fact, the data in Table 3 were used to create the third row in Fig. 8(a). The panel (b) of figure presents the statistical results for I_{02} estimation. The results of the comparison of algorithms based on the other eight parameters are given in the supplementary materials (figure S2).

The results displayed in Fig. 8 demonstrate a consistent trend across all parameters. Among the compared algorithms, EBL SHADE, ADELI, and STLBO consistently outperform the others in $1 \times N$ multiple comparisons. On the other hand, algorithms such as PSO, ISCA, CWOA, and NNA consistently produce lower-quality results. The main changes observed in nonparametric statistical estimation of different parameters estimation mainly concern algorithms with moderate effectiveness.

For example, when comparing the accuracy of determining R_{p1} and I_{02} , the IJAYA algorithm performs better in the former case. As evident from Figure 3a, IJAYA outperforms GOTLBO, PSO, ISCA, NNA, CWOA, and WW in the results of Friedman and Friedman Aligned tests for every post-hoc procedure considered. While for I_{02} , IJAYA only outperforms DE, MABC, PSO, and CWOA according to the Friedman test, and in the latter case, only for Finner post-hoc procedure. For DE, the situation is similar in the case of I_{02} compared to R_{p1} . According to the results of the Friedman and Friedman Aligned tests, the algorithm loses its advantage over GOTLBO, SCA, NNA, CWOA, and

Table 3

Adjusted p -values for Friedman, Friedman Aligned, and Quade tests in single-IV case. ADELI is the control algorithm, and the task of R_{p1} estimation is under consideration.

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
GOTLBO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	2.23361E-09	6.87266E-09	6.87266E-09	6.87266E-09
	Quade	2.57827E-03	4.09880E-03	3.90245E-03	4.09117E-03
PSO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	2.57827E-03	2.58134E-03	2.58134E-03	2.57827E-03
MABC	Friedman	6.35048E-13	1.61204E-12	1.61204E-12	1.61204E-12
	Friedman Aligned	7.88131E-06	2.97065E-05	2.97065E-05	2.97062E-05
	Quade	1.73550E-02	6.56791E-02	6.56791E-02	6.38590E-02
WW	Friedman	1.84926E-10	5.69003E-10	5.69003E-10	5.69003E-10
	Friedman Aligned	3.15599E-13	8.01137E-13	8.01137E-13	8.01137E-13
	Quade	5.31725E-03	1.96611E-02	1.96611E-02	1.94928E-02
DE	Friedman	4.61292E-09	1.59678E-08	1.59678E-08	1.59678E-08
	Friedman Aligned	3.62181E-04	1.33738E-03	1.33738E-03	1.33663E-03
	Quade	7.62673E-02	2.85885E-01	2.49968E-01	2.53918E-01
IJAYA	Friedman	6.88175E-09	2.54096E-08	2.54096E-08	2.54096E-08
	Friedman Aligned	8.79672E-04	3.04543E-03	3.04543E-03	3.04172E-03
	Quade	7.62673E-02	2.85885E-01	2.49968E-01	2.53918E-01
CWOA	Friedman	8.73483E-09	3.29236E-08	3.29236E-08	3.29236E-08
	Friedman Aligned	4.27917E-09	1.58000E-08	1.58000E-08	1.58000E-08
	Quade	2.57827E-03	5.93402E-03	5.93402E-03	5.91840E-03
NNA	Friedman	1.17491E-08	4.33811E-08	4.27586E-08	4.33811E-08
	Friedman Aligned	2.23361E-09	7.25937E-09	7.25937E-09	7.25937E-09
	Quade	2.57827E-03	4.09880E-03	3.90245E-03	4.09117E-03
ISCA	Friedman	1.23525E-08	4.33811E-08	4.27586E-08	4.33811E-08
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	2.57827E-03	3.65691E-03	3.65691E-03	3.65079E-03
NDE	Friedman	2.55436E-06	7.85957E-06	7.85957E-06	7.85955E-06
	Friedman Aligned	4.19953E-02	1.29854E-01	1.29854E-01	1.23666E-01
	Quade	1.60056E-01	5.02233E-01	5.02233E-01	4.15313E-01
TLBO	Friedman	1.57702E-01	4.05499E-01	4.05499E-01	3.53159E-01
	Friedman Aligned	6.48054E-01	1.0	1.0	9.29409E-01
	Quade	7.18467E-01	1.0	1.0	9.59945E-01
EBLSHADE	Friedman	9.13338E-01	1.0	9.23824E-01	9.89059E-01
	Friedman Aligned	8.67482E-01	1.0	1.0	9.76034E-01
	Quade	9.98363E-01	1.0	1.0	9.99993E-01
STLBO	Friedman	9.23824E-01	1.0	9.23824E-01	9.89059E-01
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

WW. Additionally, the Friedman test no longer shows the improvement of DE over PSO.

In all cases, the Quade test yields higher adjusted p -values. In particular, in the case of the complex parameter, none of the conducted comparisons exceeded the chosen threshold value of the p -value.

The adjusted p -values obtained from the direct comparisons of EBL SHADE, ADELI, and STLBO do not allow for determining the best algorithm among them. However, for this purpose, the results of this top trio of algorithms can be used, obtained from their comparisons with less efficient optimization methods. Table 4 summarizes count of wins and losses for each algorithm in $1 \times N$ multiple comparisons.

The maximum possible number of wins achieved in every 10 tasks is 156, obtained from comparing with 13 algorithms in 3 tests using 4 procedures. As can be seen, among the compared algorithms, ADELI showed the highest count of statistically confirmed improvements (1093) over others, indicating its superior performance. Conversely, STLBO demonstrated the lowest count of defeats (0) in similar comparisons, suggesting its consistently strong performance.

Previously, we employed procedures that controlled the Family-Wise Error Rate (FWER) for comparisons with a control algorithm. We tested each of the 14 algorithms individually to determine if any of them were superior to the others. Below are the results of the carried out a multiple

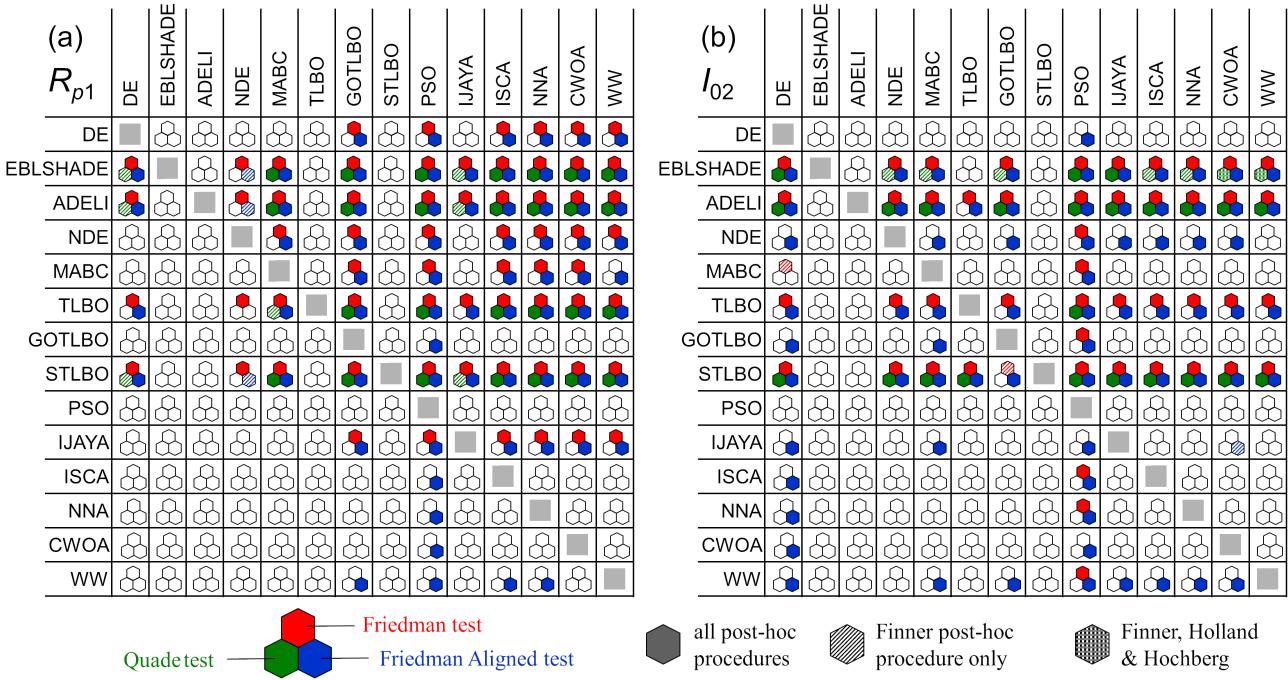


Figure 8: The results of algorithm $1 \times N$ comparisons in R_{p1} (a) and I_{02} (b) estimation by Friedman, Friedman Aligned, and Quade tests in the single-IV case. The colored hexagon indicates that the adjusted p -value, which tests the hypothesis that an algorithm in a row outperforms the algorithm in a column, is not greater than $p_{cr} = 0.1$. The solid fill signifies that every post-hoc procedure resulted in $p < p_{cr}$; the patterned fill indicates that only specific post-hoc procedures achieved this outcome. The correspondence between the color and position of the hexagon to a test as well as the fill pattern to procedures are shown in a legend at the bottom of the figure.

Table 4

The total count of wins and losses for each algorithm in $1 \times N$ multiple comparisons using the Friedman, Friedman Aligned, and Quade tests and Finner, Holm, Hochberg, and Holland post-hoc procedures in single-IV case. The criterion for victory was a adjusted p -value less than 0.1.

Algorithm	Wins / Loses task											Total
	I_{01}	n_1	R_{p1}	I_{02}	n_2	R_{p2}	R_s	I_{ph}	RMSPE	Comp		
DE	24/43	56/34	48/35	4/73	48/43	49/34	49/40	45/35	49/48	16/27	388/412	
EBL SHADE	108/0	108/0	107/0	103/0	107/0	104/0	111/2	105/0	109/0	88/0	1050/2	
ADELI	122/0	110/0	107/0	128/0	110/0	122/0	119/0	105/0	109/0	61/2	1093/2	
NDE	35/19	56/32	56/19	36/49	77/32	23/45	73/32	48/8	83/29	23/20	519/285	
MABC	8/61	28/69	44/45	9/57	40/55	4/82	32/51	32/66	44/62	8/30	249/578	
TLBO	80/3	102/0	101/0	84/13	99/0	87/18	93/10	94/0	100/0	65/2	905/46	
GOTLBO	8/60	12/73	4/84	16/49	20/74	13/54	20/61	4/80	16/85	13/28	126/648	
STLBO	109/0	110/0	107/0	125/0	107/0	119/0	116/0	105/0	109/0	81/0	1088/0	
PSO	0/84	8/88	0/100	0/108	4/101	0/96	0/124	0/96	20/70	4/49	72/916	
IJAYA	28/28	56/34	48/35	13/52	45/43	54/34	20/61	56/29	57/38	16/34	393/388	
ISCA	8/56	12/76	4/84	12/45	28/65	16/51	8/61	17/68	0/92	16/32	121/630	
NNA	33/29	0/92	4/84	12/49	12/84	12/57	8/77	12/80	0/92	0/52	93/696	
CWOA	8/60	0/96	4/80	8/52	8/84	4/83	20/61	0/88	0/92	0/52	52/748	
WW	0/96	12/76	16/76	36/43	0/108	10/60	12/77	12/66	0/92	0/52	98/844	

comparisons in which all possible pairwise comparisons need to be computed ($N \times N$ comparison), and three procedures (Shaffer's static, Nemenyi, and Holm) have been used to control FWER. These procedures take into account that the hypotheses being tested belonging to a family of all

pairwise comparisons are logically interrelated; thus not all combinations of true and false hypotheses are possible.

Starting from the analysis performed by the Friedman test over our results, we can raise the 91 hypotheses of equality among the 14 algorithms of our study for each task, and apply the methods mentioned earlier to contrast them.

Table 5

Adjusted p -values for tests for $N \times N$ multiple comparisons of I_{01} estimation among all methods in the single-IV case ($p < 1.0$ are only shown).

Hypothesis	Nemenyi	post-hoc procedure	
		Holm	Shaffer
ADELI versus WW	<1E-13	<1E-13	<1E-13
ADELI versus NDE	1.17195E-12	1.15907E-12	1.00453E-12
STLBO versus CWOA	1.17195E-12	1.15907E-12	1.00453E-12
TLBO versus PSO	1.21236E-12	1.17240E-12	1.03917E-12
STLBO versus GOTLBO	1.21236E-12	1.17240E-12	1.03917E-12
ADELI versus DE	1.73772E-12	1.64224E-12	1.48948E-12
STLBO versus DE	1.83875E-12	1.71752E-12	1.57607E-12
ADELI versus CWOA	3.83915E-12	3.50164E-12	3.29070E-12
EBLSHADE versus GOTLBO	4.20286E-12	3.78719E-12	3.60245E-12
STLBO versus NDE	5.01110E-12	4.46043E-12	4.29523E-12
ADELI versus GOTLBO	5.41522E-12	4.76064E-12	4.64162E-12
EBLSHADE versus CWOA	5.98099E-12	5.19229E-12	5.12657E-12
EBLSHADE versus ISCA	1.17195E-11	1.00453E-11	1.00453E-11
EBLSHADE versus DE	1.45282E-11	1.22931E-11	1.06966E-11
EBLSHADE versus NDE	4.17053E-11	3.43725E-11	3.07061E-11
STLBO versus ISCA	8.17133E-11	6.64482E-11	6.01625E-11
TLBO versus WW	8.82197E-11	7.07696E-11	6.49529E-11
TLBO versus MABC	1.07900E-10	8.53717E-11	7.94431E-11
EBLSHADE versus MABC	3.09961E-10	2.38431E-10	2.28213E-10
ADELI versus NNA	3.24570E-10	2.46102E-10	2.38969E-10
ADELI versus ISCA	3.83410E-10	2.86504E-10	2.82291E-10
STLBO versus MABC	1.58351E-09	1.16588E-09	1.16588E-09
STLBO versus NNA	1.83408E-09	1.33021E-09	1.33021E-09
TLBO versus ISCA	3.49326E-09	2.49519E-09	2.22648E-09
ADELI versus MABC	5.83612E-09	4.10452E-09	3.71972E-09
EBLSHADE versus NNA	1.23520E-08	8.55140E-09	7.87272E-09
EBLSHADE versus PSO	1.47150E-08	1.00256E-08	9.37877E-09
STLBO versus PSO	5.32586E-08	3.57008E-08	3.39450E-08
ADELI versus PSO	1.50038E-07	9.89261E-08	.56286E-08
TLBO versus GOTLBO	2.16253E-07	1.40208E-07	1.37831E-07
EBLSHADE versus WW	2.39169E-07	1.52438E-07	1.52438E-07
TLBO versus CWOA	2.89034E-07	1.81043E-07	1.77867E-07
TLBO versus DE	5.91345E-07	3.63905E-07	3.63905E-07
STLBO versus WW	6.86296E-07	4.14794E-07	4.14794E-07
TLBO versus NDE	1.37158E-06	8.13904E-07	7.68687E-07
TLBO versus NNA	1.17758E-04	6.72904E-05	6.59964E-05
NNA versus WW	2.21281E-02	1.24015E-02	1.24015E-02
IJAYA versus WW	2.36193E-01	1.29777E-01	1.24585E-01
NNA versus PSO	2.36193E-01	1.29777E-01	1.24585E-01
NDE versus WW	4.04596E-01	2.13413E-01	2.13413E-01
DE versus WW	6.28685E-01	3.24706E-01	3.24706E-01
CWOA versus WW	8.94683E-01	4.52257E-01	4.52257E-01
GOTLBO versus WW	1.0	5.07626E-01	5.07626E-01
IJAYA versus PSO	1.0	8.15876E-01	7.97333E-01
NNA versus MABC	1.0	9.64793E-01	9.64793E-01

Table 5 lists the part of the hypotheses and the adjusted p -values achieved on the task of I_{01} estimation. For the remaining 46 hypotheses not indicated in the table, a p -value of 1 was obtained after applying each of the procedures. The full version of the table as well as the data, obtained for other task, are given in the supplementary material (tables S144-S153).

It can be seen that using a level of significance 0.1, only 37 hypotheses of equality are rejected by the Nemenyi, Holm, and Shaffer methods. These hypotheses show the improvement of EBLSHADE, ADELI, TLBO, and STLBO over DE, NDE, MABC, GOTLBO, PSO, ISCA, NNA, CWOA, and WW, and NNA over WW. None of the remaining 54 hypotheses can be rejected using these procedures.

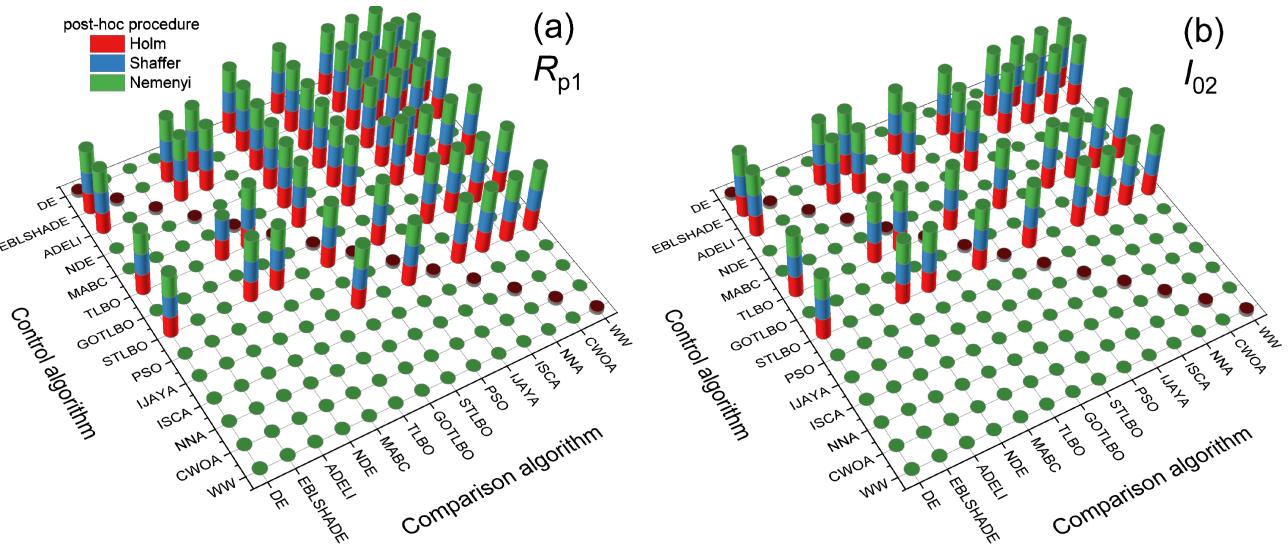


Figure 9: The results of $N \times N$ multiple comparisons of R_{p1} (a) and I_{02} (b) estimation among all algorithms in the single-IV case. The colored cylinder indicates that the adjusted p -value, which tests the control algorithm outperforms the comparison algorithm, is not greater than $p_{lim} = 0.1$. The correspondence between the color of the cylinder to a post-hoc procedure is shown in the figure's legend.

It should be noted that when testing complementary hypotheses (“algorithm A vs algorithm B” and “algorithm B vs algorithm A”), only in one out of the two cases can a p -value less than 1 be obtained. For instance, when using the Nemenyi procedure to task I_{01} evaluating of comparing “ADELI vs MABC” a p -value of $5.84 \cdot 10^{-9}$ was obtained. Conversely, when comparing “MABC vs ADEL I”, the p -value was 1. The p -values were computed for all possible hypotheses in the study to identify algorithms whose results statistically deviate from those of other algorithms. In this case, a critical value of $p_{cr} = 0.1$ was used, similar to the $1 \times N$ multiple comparisons. Typical examples of the obtained results for specific parameter cases are presented in Fig. 9. For more comprehensive data, please refer to figure S3 in the supplementary materials. Generalized results regarding the total count of victories and defeats in the $N \times N$ comparisons are listed in Table 6. In the case of $N \times N$ comparisons, the maximum possible number of wins achieved in every 10 tasks is 39, obtained from comparing 13 algorithms in 3 post-hoc procedures.

In the majority of cases, all post-hoc procedures considered lead to similar conclusions regarding the outperforming of one algorithm over another. For example, in the case of the R_{p1} estimation task, the Nemenyi procedure disagrees with Holm and Shaffer methods in only 4 out of 57 cases. Specifically, this occurs for the hypotheses “DE vs WW,” “MABC vs ISCA,” “MABC vs NNA,” and “TLBO vs NDE” — see Fig. 9(a). On the other hand, as evident from Fig. 9(b), such situations are not observed at all for the I_{02} task. The Holm procedure results, in general, differs from the Shaffer procedure ones in only two comparisons: the improvement of IJAYA over GOTLBO in the n_1 estimation and the outperforming of TLBO over NNA for the composite parameter.

Totally $1 \times N$ multiple comparisons exhibit more powerful behavior than $N \times N$ ones, reaching the lower p -values. As a result, IJAYA did not lose in any of the $N \times N$ comparisons — see Table 6. Another striking example can be observed when considering the case of the composite parameter. Based on the $1 \times N$ comparisons, conclusions were drawn about the outperforming of one algorithm over another in 67 cases, whereas for the $N \times N$ comparisons, such situations were found in only 20 cases: the improvement of EBL SHADE over MABC, GOTLBO, PSO, ISCA, NNA, CWOA, and WW, the statistically significant difference ADEL I and GOTLBO, PSO, NNA, CWOA, and WW, and outperforming of both TLBO and STLBO over PSO, NNA, CWOA, and WW. Consequently, $N \times N$ comparisons provide a less precise ranking of all algorithms. However, it is still possible to identify the best and worst-performing algorithms. The obtained data reveal that EBL SHADE, ADEL I, and STLBO are the top-performing algorithms in all tasks, while PSO, ISCA, NNA, CWOA, and WW are the worst-performing.

Thus, the results presented in this subsection demonstrate that among the examined algorithms, none can be applied for the maximally accurate determination of a specific individual parameter (e.g., only R_{p2} or only I_{ph}) in the opposed two-diode model. The algorithms that exhibit high efficiency (EBL SHADE, ADEL I, and STLBO) allow for the most precise estimation of all parameters. However, certain algorithms really display higher accuracy in determining specific parameters. Indeed, DE and IJAYA are the most effective in estimating R_{p2} and I_{ph} — see table S1. Nevertheless, this highest level of accuracy appears unworthy of significant attention when compared to other optimization methods. As a result, the performance metrics of algorithms for individual parameters will not be analyzed

Table 6

The total count of wins and losses for each algorithm in $N \times N$ multiple comparisons using the Friedman test and Shaffer's static, Nemenyi, and Holm post-hoc procedures in single-IV case. The criterion for victory was a adjusted p -value less than 0.1.

Algorithm	Wins / Loses										Total				
	task					I_{01}	n_1	R_{p1}	I_{02}	n_2	R_{p2}	R_s	I_{ph}	RMSPE	Comp
DE	0/12	17/12	17/12	0/12	12/12	14/12	5/12	17/12	15/15	0/0	97/111				
EBLSHADE	27/0	27/0	27/0	27/0	27/0	27/0	27/0	27/0	26/0	21/0	263/0				
ADELI	27/0	27/0	27/0	27/0	27/0	27/0	27/0	27/0	27/0	14/0	257/0				
NDE	0/12	21/12	18/11	3/12	18/9	3/12	18/11	21/9	24/8	0/0	126/96				
MABC	0/12	0/15	10/12	0/12	11/12	0/17	3/12	2/15	12/15	0/3	38/125				
TLBO	27/0	27/0	26/0	27/0	24/0	27/0	26/0	24/0	24/0	10/0	242/0				
GOTLBO	0/12	0/18	0/24	0/12	3/15	0/12	3/15	0/21	0/21	0/5	6/155				
STLBO	27/0	27/0	27/0	27/0	27/0	27/0	27/0	27/0	27/0	11/0	254/0				
PSO	0/12	0/21	0/24	0/15	0/24	0/21	0/34	0/23	0/18	0/12	0/204				
IJAYA	0/0	16/0	18/0	0/0	12/0	11/0	3/0	18/0	18/0	0/0	96/0				
ISCA	0/12	0/21	0/23	0/12	3/15	0/12	2/15	0/21	0/24	0/3	5/158				
NNA	3/12	0/21	0/23	0/12	0/23	0/14	0/17	0/21	0/24	0/9	3/176				
CWOA	0/12	0/21	0/21	0/12	0/24	0/18	3/15	0/21	0/24	0/12	3/180				
WW	0/15	0/21	0/20	0/12	0/30	0/18	2/15	0/20	0/24	0/12	2/187				

in the following subsection, dedicated to the analysis of IV curves with different parameter ratios.

3.3.2. Evaluation of IV-set

Fig. 3 shows several typical fitting results of a set of synthetic IV curves simulated according to the opposed two-diode model using the parameter values described in Sec. 2.2.2. A more comprehensive and enhanced version, including the fitting results obtained using each algorithm, is provided in the supplementary materials (figure S4). Similar to the single-IV case, the algorithms EBL SHADE, ADELI, NDE, IJAYA, TLBO, and STLBO show the highest agreement between the fitting curves and the points of synthesized current-voltage curves. Fig. 10 represents a portion of the results obtained from evaluating solar cell parameters using various algorithms, along with the corresponding RMSPE data. The supplementary material provides the dependencies of all parameters on synthesis temperature as determined by all the algorithms — see figures S5-S13. The results in terms of MEAN, MEDIAN, STD, and IQR are tabulated as well (table S154 in the supplementary material).

It should be noted that in several cases, the accuracy of parameter estimation depends on temperature, even for constant parameters. For instance, as the temperature increases, the errors in determining R_{p1} by NDE, MABC, GOTLBO, IJAYA, ISCA, and WW decrease. However, under the same conditions, the estimation quality of I_{01} using DE, ISCA, and WW worsens. These results indicate that the accuracy of parameter estimation depends not only on the parameter value itself but also on its ratio with other parameters. A comprehensive investigation into the specific dependencies of parameter estimation accuracy for each algorithm has not been conducted. This study aimed to determine the best algorithms rather than elucidate the peculiarities of their application in the context of opposed the two-diode model.

The presented data display several characteristics that were also observed in the single-IV case. For instance, the error in parameters estimating by mean values is higher compared to that of median values in the majority of cases. Exceptions are observed at some temperatures only when evaluating I_{01} using IJAYA, n_1 using IJAYA and DE, R_{p1} using DE and MABC, and R_s using DE and WW. However, for high-precision algorithms, the deviation of MEDIAN from the true value does not exceed the deviation of MEAN. Additionally, these algorithms exhibit small IQR values that do not exceed STD. Similar to the previous case, small RMSPE values do not always indicate high accuracy in determining the parameters of a solar cell.

At the same time, the number of algorithms exhibiting minimal errors has decreased. Significant deviations from true values are observed for median values of I_{01} , n_1 , R_{p1} , n_2 , R_s , and I_{ph} evaluated by EBL SHADE at various temperatures, as well as for median values of diode D1 characteristics and series resistor determined using TLBO at 260 K. Thus, only ADELI and STLBO remain as algorithms without visible errors. Although this claim of infallibility applies only to median values, substantial errors are observed for mean values in several cases. Simultaneously, EBL SHADE, TLBO, IJAYA, and NDE form a group of algorithms with low RMSPE values but imperfect model parameter estimation.

In the IV-set case, to assess the statistical performance of compared algorithms, the run time and all APE_{MEDIAN} and RMSPE_{MEDIAN} for each IV curve were taken into account. This approach is similar to the use of the Comp parameter in the previous subsection; however, in this scenario, $N_{pr} = 81$ is employed:

$$N_{pr} = 10 T_{values} \times (8 APE_{MEDIAN} + 1 RMSPE_{MEDIAN}) + 1 t_{run}.$$

Therefore, such an approach is well-suited for nonparametric statistical analysis of $k = 14$ meta-heuristic algorithms.

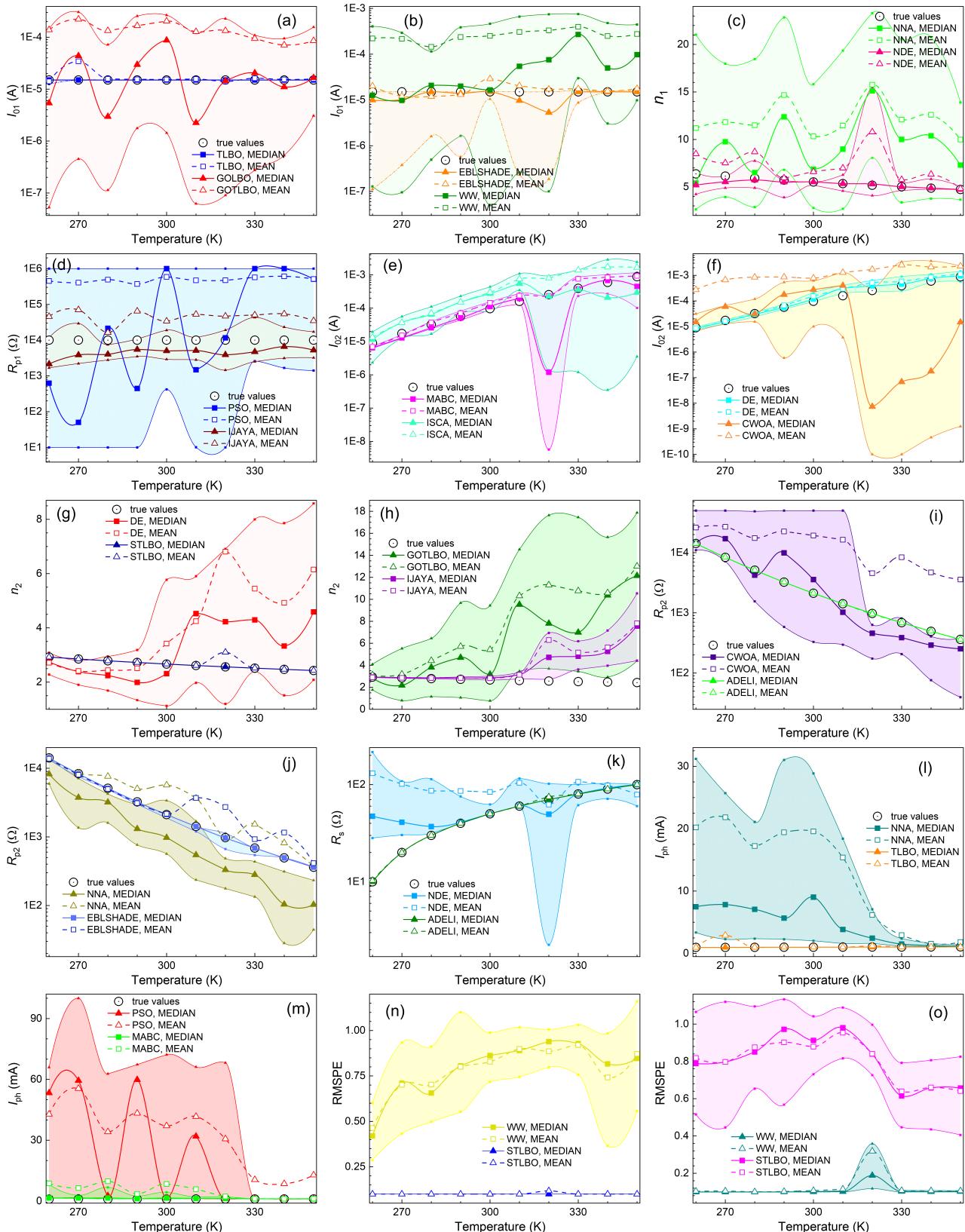


Figure 10: Dependences of the I_{01} (a, b), n_1 (c), R_{p1} (d), I_{02} (e, f), n_2 (g, h), R_{p2} (i, j), R_s (k), I_{ph} (l, m), and RMSPE (n, o) estimation by different algorithm on the synthesis temperature. The IV-set is used. The circles represent the values, which have been used in IV curve simulations, the filled marks represent the median values, and the empty marks represent the mean values. The colored regions correspond to the IQR. The lines only serve as guide to the eye.

Table 7

The results of Wilcoxon signed-rank test with a level of significance $\alpha = 0.05$ in the IV-set case. The “+” indicated that the null hypothesis was rejected, and the control algorithm (in the row) performed better than the comparison algorithm (in the column). The “0” indicates to rejection of the hypothesis about outperforming the control algorithm.

Control algorithm	Comparison algorithm												Total (+/-)		
	DE	EBLSHADE	ADELI	NDE	MABC	TLBO	GOTLBO	STLBO	PSO	IJAYA	ISCA	NNA	CWOA	WW	
DE	■	0	0	0	+	0	+	0	+	0	+	+	+	+	7/0/6
EBLSHADE	+	■	0	+	+	0	+	0	+	+	+	+	+	+	10/0/3
ADELI	+	+	■	+	+	+	+	+	+	+	+	+	+	+	13/0/0
NDE	+	0	0	■	+	0	+	0	+	+	+	+	+	+	9/0/4
MABC	0	0	0	0	■	0	+	0	+	0	+	+	+	+	6/0/7
TLBO	+	+	0	+	+	■	+	0	+	+	+	+	+	+	11/1/1
GOTLBO	0	0	0	0	0	0	■	0	+	0	+	+	+	+	5/0/8
STLBO	+	+	0	+	+	0	+	■	+	+	+	+	+	+	11/1/1
PSO	0	0	0	0	0	0	0	0	■	0	0	0	0	0	0/4/9
IJAYA	+	0	0	0	+	0	+	0	+	■	+	+	+	+	8/0/5
ISCA	0	0	0	0	0	0	0	0	0	0	■	0	0	0	0/3/10
NNA	0	0	0	0	0	0	0	0	0	0	0	■	0	0	0/3/10
CWOA	0	0	0	0	0	0	0	0	0	0	0	0	■	0	0/4/9
WW	0	0	0	0	0	0	0	0	0	0	0	+	0	■	1/3/9

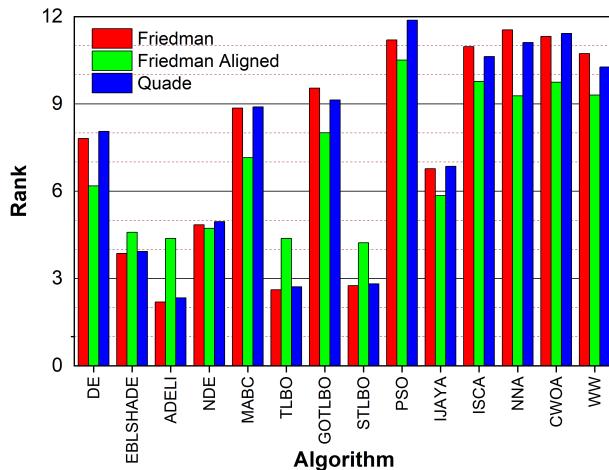


Figure 11: Ranking of the algorithms according to Friedman, Friedman Aligned, and Quade tests in the IV-set case.

Certainly, at first sight, it would be interesting to consider incorporating an additional 80 values of the interquartile range into the dataset. This approach could provide consideration into the stability of algorithm performance as well. However, it is known [84] that for multiple comparisons, a value of $N_{pr} \geq 8 \cdot k = 112$ could be too high, obtaining no significant comparisons as a result.

Table 7 gives the statistical results produced by the Wilcoxon sign–rank test. As the table states, ADELI outperforms all other algorithms with a level of significance $\alpha = 0.05$. STLBO and TLBO show an improvement over DE, EBLSHADE, NDE, MABC, GOTLBO, PSO, IJAYA, ISCA, NNA, CWOA, and WW. The counts of statistical significant cases (+/-) are presented in the last row of Table 7. It can be seen that PSO, ISCA, NNA, and CWOA did not outperform any of the algorithms, whereas WW statistically

significantly improved over NNA only. Therefore, although these algorithms have promising run times, they are not recommended for parameter estimation of a solar cell based on the opposed two-diode model.

The p -values required to test the null hypothesis, computed using the Friedman, Friedman Aligned, Quade tests, and the Iman–Davenport extension, can be found in table S2 of the supplementary materials. None of these values exceeds $2.3 \cdot 10^{-6}$, thereby rejecting the hypothesis of equivalent medians in all tests.

Ranks achieved by the Friedman, Friedman Aligned, and Quade tests are shown in Fig. 11 and table S3 in the supplementary material. As per the given results, ADELI has been placed at first rank by Friedman and Quade tests, and STLBO has ranked first by the Friedman Aligned test. TLBO has been recorded as second-best algorithm by all three tests. Furthermore, PSO was recognized as the worst-performing algorithm by the tests’ unanimous decision.

The p -values, obtained for $1 \times N$ multiple comparisons are shown in tables S155–168 in the supplementary material. There are results of applying Finner, Holm, Hochberg, and Holland procedures, as a post-hoc method after Friedman, Friedman Aligned, and Quade tests. The reader is referred to supplementary material (table S169) for p -values of applying Shaffer, Nemenyi, and Holm post-hoc procedures after the Friedman test in the case of $N \times N$ multiple comparisons. The results, which determine whether one algorithm yielded a statistically better estimation of parameters than the other (with a p -value $\leq p_{cr} = 0.1$), are summarized in Fig. 12 and 13 for $1 \times N$ and $N \times N$ comparisons, respectively. The counts of statistically significant cases are presented in the Table 8.

As can be seen, ADELI, TLBO, and STLBO were never outperformed by any of the algorithms, both in the case of $1 \times N$ and $N \times N$ multiple comparisons. By the way, for $N \times N$ comparisons, the same property is observed with

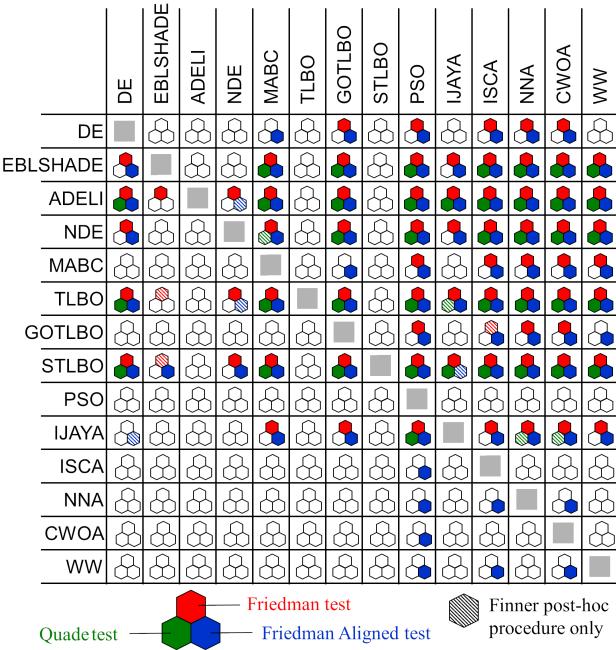


Figure 12: The results of algorithm $1 \times N$ comparisons by Friedman, Friedman Aligned, and Quade tests in the IV-set case. The colored hexagon indicates that the adjusted p -value, which tests the hypothesis that an algorithm in a row outperforms the algorithm in a column, is not greater than $p_{cr} = 0.1$. The solid fill signifies that every post-hoc procedure resulted in $p < p_{cr}$; the dashed fill indicates that the Finner post-hoc procedure was the only method that produced this result. The correspondence between the color of the hexagon to a test is shown in a legend at the bottom of the figure.

EBLSHADE and IJAYA. Overall, the parameter estimation results obtained from the set of IV curves using ADELI, TLBO, and STLBO algorithms for $N \times N$ comparisons in the opposed two-diode model are practically indistinguishable (when it comes to precise p -values, only minor differences can be observed). In $1 \times N$ comparisons, TLBO demonstrates lower performance compared to ADELI and STLBO, in terms of efficiency when compared to the EBL SHADE algorithm. Specifically, the improvement of TLBO over EBL SHADE is proved only by the Finner procedure applied in the Friedman test. Based on $1 \times N$ comparisons, it is observed as well that there are slight differences between ADELI and STLBO, primarily when compared to the non-worst algorithms. For instance, the Quade test confirms the improvement of ADELI over EBL SHADE for every post-hoc procedure, however, the Friedman and Friedman Aligned tests did not show statistically significant differences between these algorithms. Meanwhile, the Friedman Aligned and Quade tests find a difference between STLBO and EBL SHADE for every post-hoc procedure and Finner procedure only, respectively. Regarding comparison with NDE, the Friedman Aligned test demonstrated that STLBO is better according to all post-hoc procedures. In contrast, for ADELI, this outperforming was only observed using

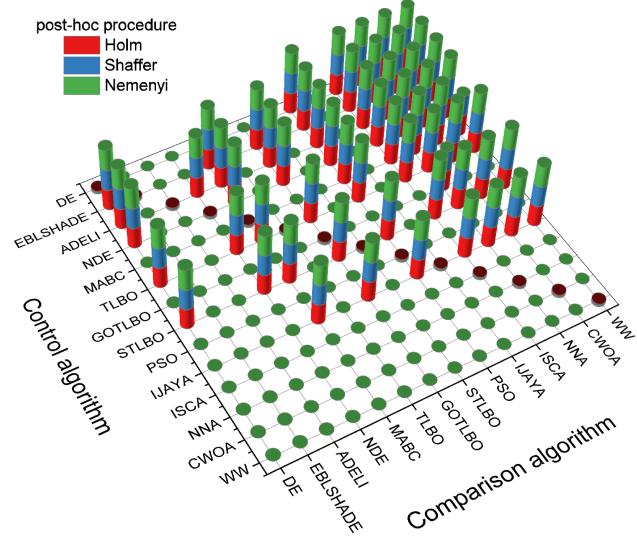


Figure 13: The results of multiple comparisons among all algorithms in the IV-set case. The colored cylinder indicates that the adjusted p -value, which tests the control algorithm outperforms the comparison algorithm, is not greater than $p_{cr} = 0.1$. The correspondence between the color of the cylinder to a post-hoc procedure is shown in the figure's legend.

Table 8

The total count of wins and losses for each algorithm in $1 \times N$ and $N \times N$ multiple comparisons using the all tests and post-hoc procedures in the IV-set case. The criterion for victory was a adjusted p -value less than 0.1. The best results are bolded.

Algorithm	Wins / Loses	
	$1 \times N$ comparisons	$N \times N$ comparisons
DE	44/53	15/15
EBLSHADE	100/6	24/0
ADELI	117/0	27/0
NDE	97/18	24/9
MABC	44/69	14/18
TLBO	111/0	27/0
GOTLBO	25/80	2/18
STLBO	118/0	27/0
PSO	0/112	0/24
IJAYA	63/46	21/0
ISCA	4/97	0/24
NNA	12/93	0/26
CWOA	4/101	0/24
WW	12/80	0/23

the Finner method. In the case of IJAYA, the results of the Friedman Aligned test show a reversal: only the Finner procedure indicates an improvement for STLBO, whereas ADELI outperforms all post-hoc methods utilized.

In deciding the optimal algorithm for parameter estimation of solar cell parameters from the IV curve using the opposed two-diode model, the practical choices boil down to EBL SHADE, ADELI, TLBO, and STLBO. However, TLBO exhibited lower performance when applied in the single-IV case. The parameter estimation error when using

EBLSHADE was not always minimal in the IV-set case. Despite the minimal advantage in terms of win counts in $1 \times N$ comparisons (see Table 8), we hesitate to declare STLBO as the best. In our opinion, STLBO and ADELI both hold the top position in the competition conducted in this study.

4. Conclusion

In this paper, the possibility of using meta-heuristic algorithms to solve the parameter estimation problems of photovoltaic cells with S-shaped current–voltage characteristics has been explored. The parameter estimation has been performed within the framework of the opposed two-diode model. A total of 14 meta-heuristic algorithms from various classes were implemented to extract the solar cell parameters from synthetic IV curves, which were generated with a range of parameter values. The obtained results have been compared using nonparametric statistical procedures, including pairwise comparisons, $1 \times N$ multiple comparisons, and $N \times N$ multiple comparisons.

Research has demonstrated that utilizing a squared error-based fitness function offers clear advantages in tackling a provided problem. The overall performance results of various algorithms generally fit the No Free Lunch theory. GOTLBO, PSO, ISCA, NNA, CWOA, and WW are completely unsuitable for parameter estimation according to the opposed two-diode model. The results of DE, NDE, MABC, and IJAYA are not as poor as those in the previous group; however, in general, it is still not recommended to use these algorithms for solving parameter identification problems. Generally, the EBLSHADE and TLBO are effective in accurately determining parameter values in most cases. However, investigation has shown that these algorithms may make mistakes under certain conditions. Therefore, EBLSHADE and TLBO applications in the case of solar cells with S-shaped IV curves should be approached with caution. Finally, results have illustrated that STLBO and ADELI have superior performance in terms of accuracy and reliability when compared with other used algorithms. In particular, these two algorithms successfully solve the task of accurately determining parameters from similar IV curves corresponding to photovoltaic cells with distinct characteristics.

It is important to note that in this study, the parameters were obtained from idealized IV curves, where the voltage-current relationships were precisely defined by Eq. (2). In a real experiment, there is a potential for errors in the measurement of both current and voltage. Hence, it would be worthwhile to explore the efficacy of various meta-heuristic algorithms in determining parameters from IV data corrupted by noise in future research.

This work of testing and comparative analysis of different meta-heuristic algorithms for the estimation of solar cell parameters should be useful for further research and development on photovoltaic systems.

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Estimation of parameters for solar cells with S-shaped current–voltage characteristics using meta–heuristic algorithms

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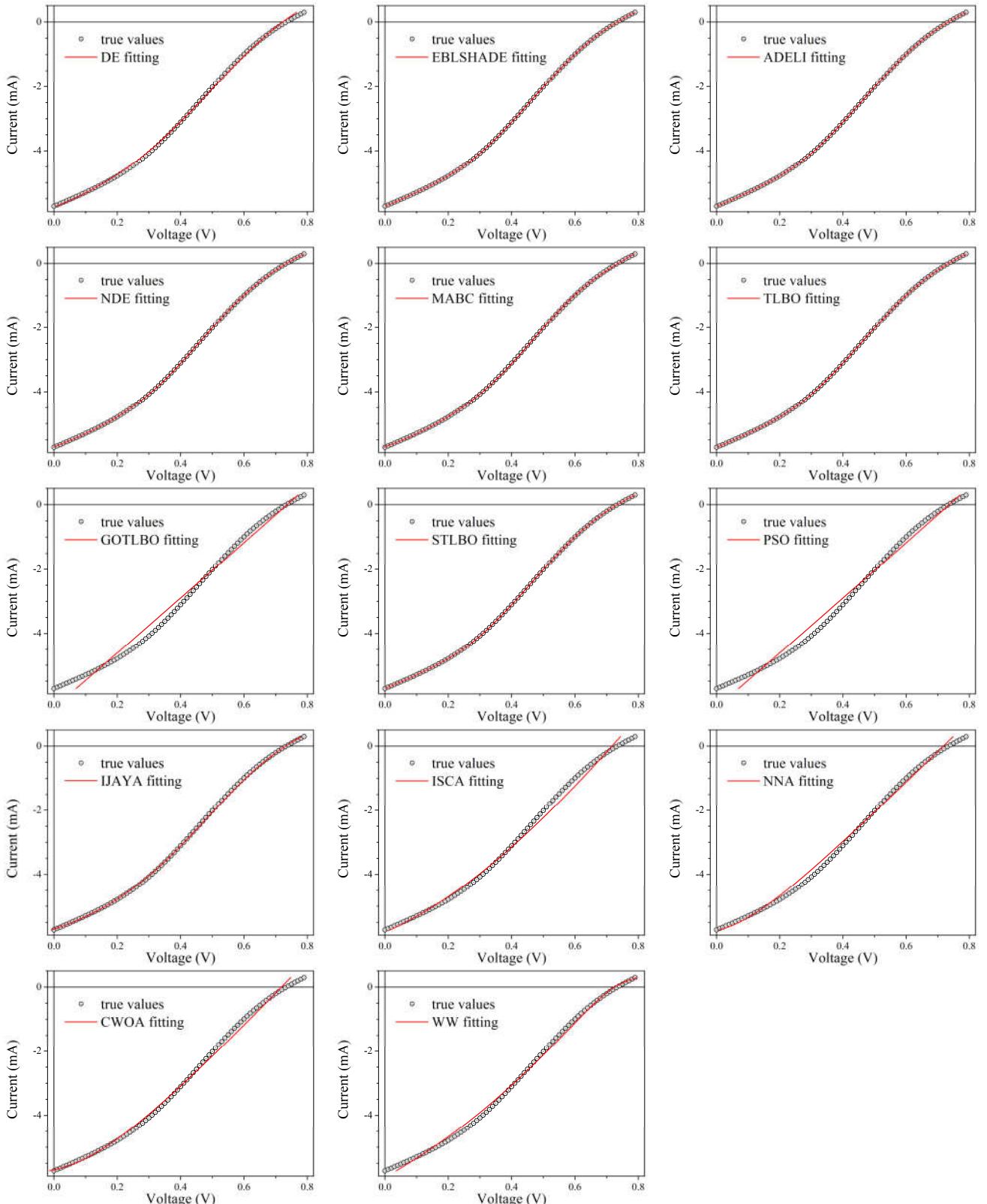
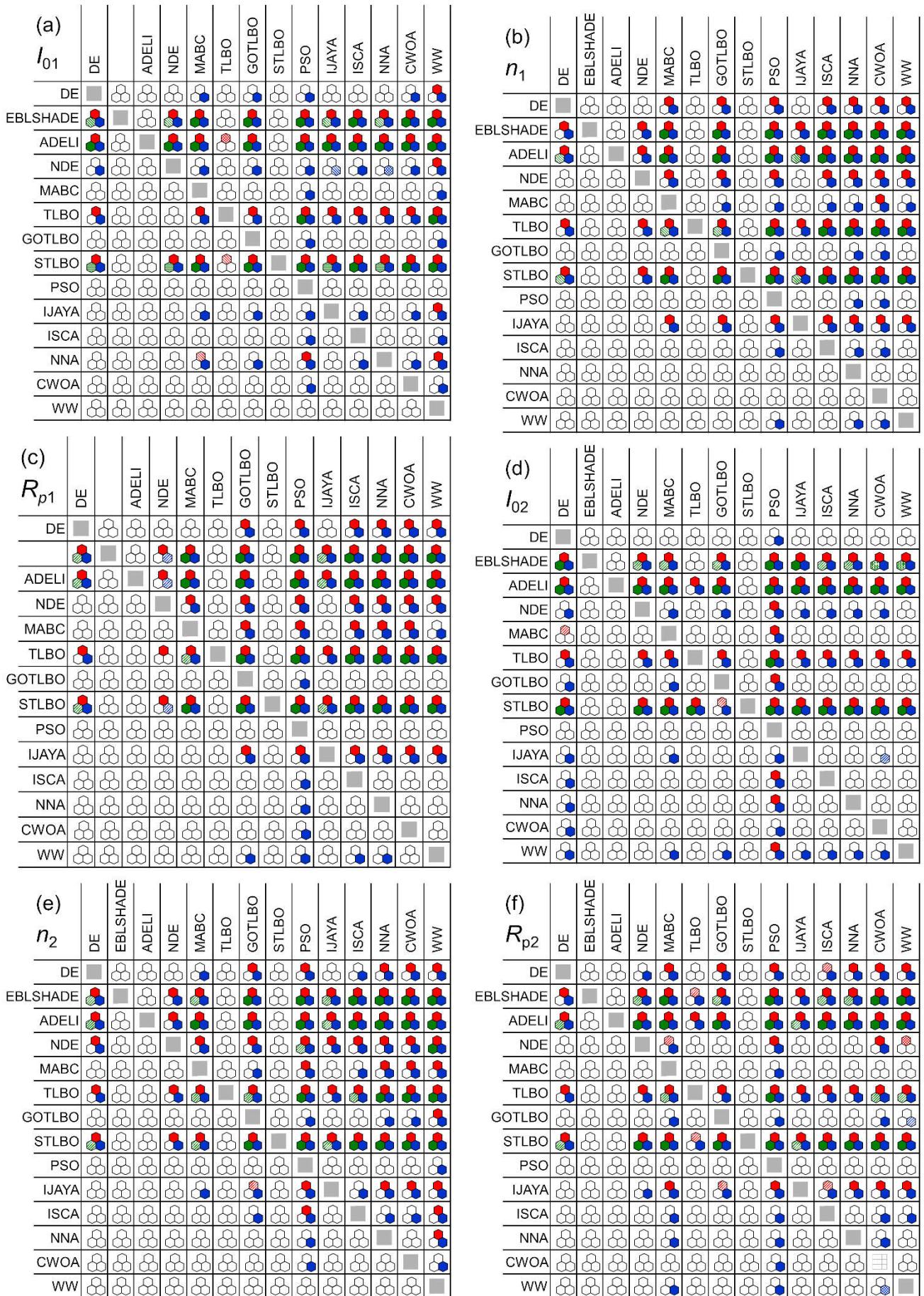


Fig.S1. Fitting results (lines) for the simulated current-voltage characteristic (symbols). The values $I_{01} = 1.6 \cdot 10^{-6}$ mA, $n_1 = 1.92$, $R_{p1} = 190 \Omega$, $I_{02} = 0.16$ mA, $n_2 = 1.92$, $R_{p2} = 190 \Omega$, $R_s = 45 \Omega$, $I_{ph} = 8$ mA were assumed under simulation.



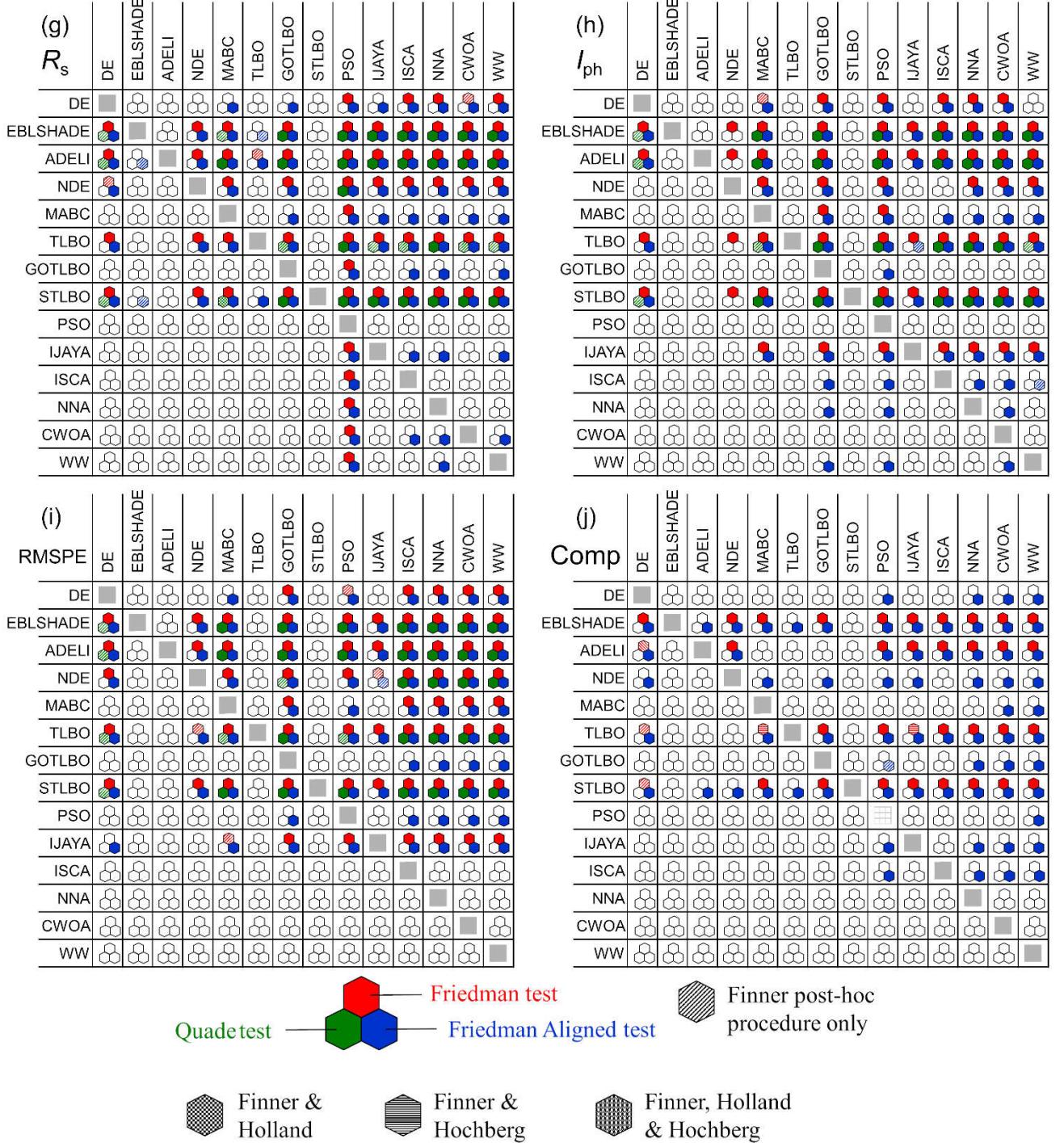
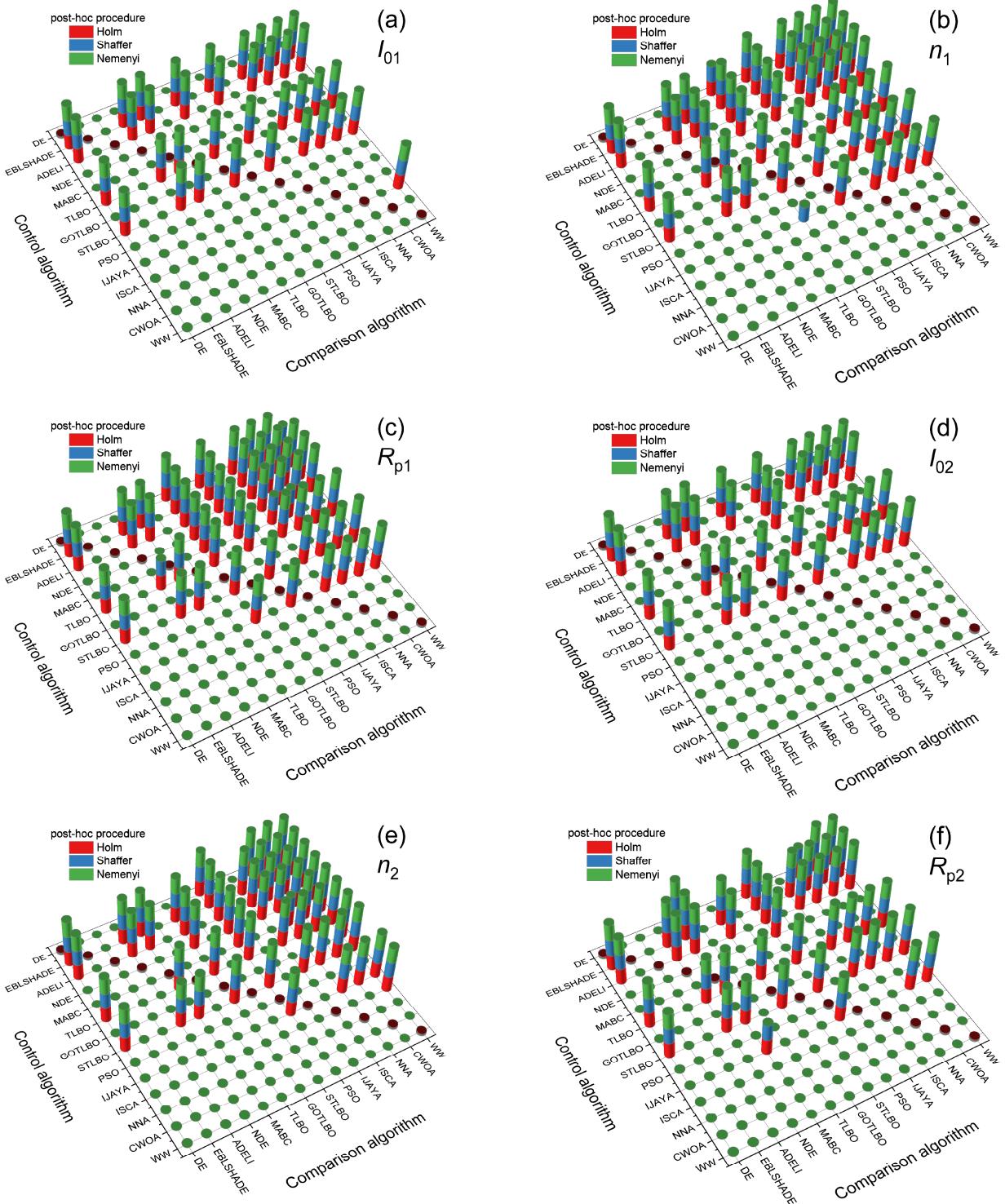


Fig.S2. The results of algorithm comparison in I_{01} (a), n_1 (b), R_{p1} (c), I_{02} (d), n_2 (e), R_{p2} (f), R_s (g), I_{ph} (h) evaluation, RMSPE (i), and Comp (j) parameters by Friedman, Friedman Aligned, and Quade tests in the single-IV case. The colored hexagon indicates that the adjusted p -value, which tests the hypothesis that an algorithm in a row outperforms an algorithm in a column, is not greater than $p_{lim} = 0.1$. The solid fill signifies that every post-hoc procedure resulted in $p < p_{lim}$; the patterned fill indicates that only specific post-hoc procedures achieved this outcome. The correspondence between the color and position of the hexagon to a test as well as the fill pattern to procedures are shown in a legend at the bottom of the figure.



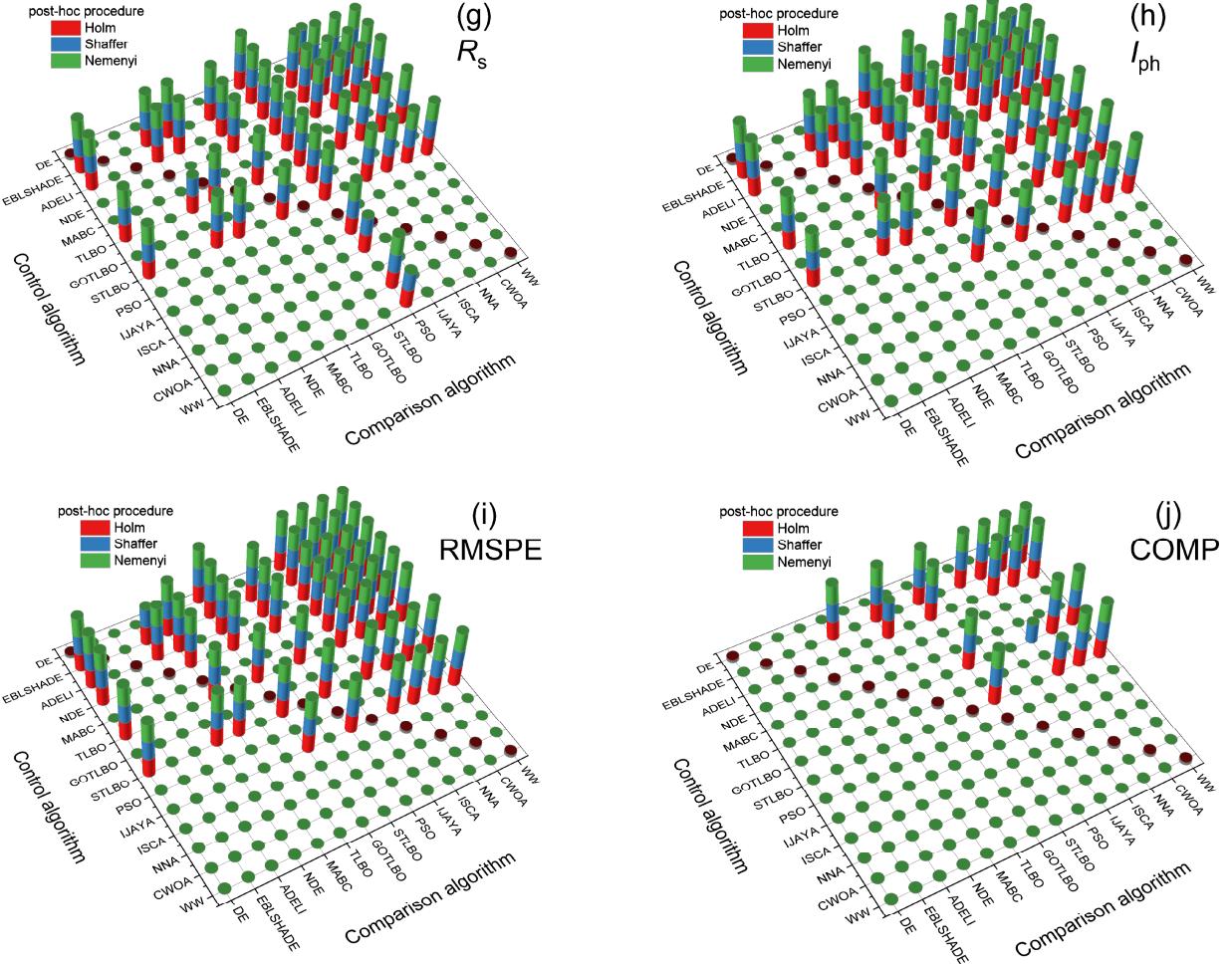


Fig.S3. The results of multiple comparisons in I_{01} (a), n_1 (b), R_{p1} (c), I_{02} (d), n_2 (e), R_{p2} (f), R_s (g), I_{ph} (h) evaluation, RMSPE (i), and Comp (j) parameters among all algorithms in the single--IV case. The colored cylinder indicates that the adjusted p -value, which tests the control algorithm outperforms the comparison algorithm, is not greater than $p_{lim} = 0.1$. The correspondence between the color of the cylinder to a post-hoc procedure is shown in the figure legend.

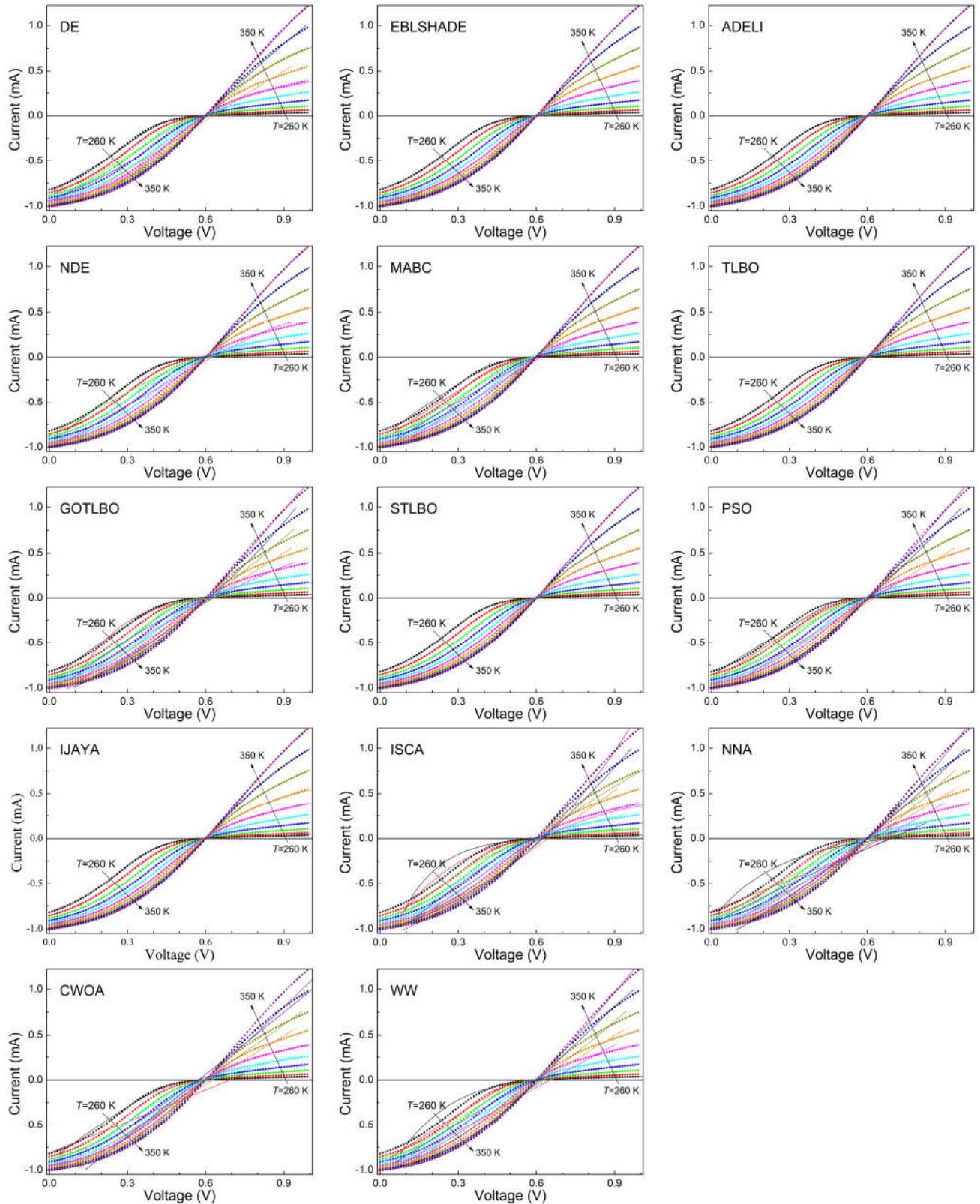


Fig.S4. Fitting results (lines) for the simulated current-voltage characteristic (symbols). The parameters values from Sec.2.2.2 were assumed under simulation.

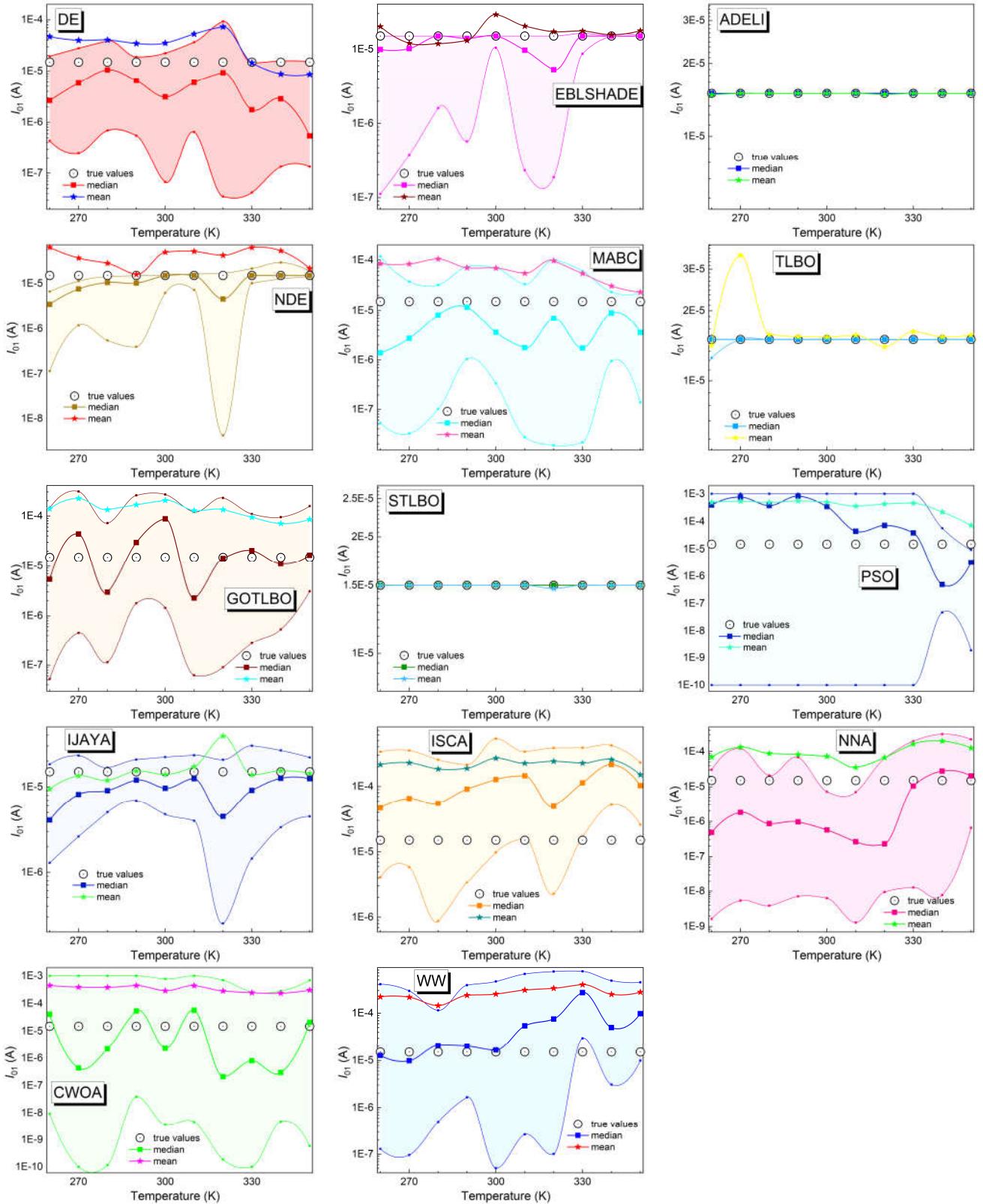


Fig.S5. Comparison of I_{01} value estimation by different algorithms on the IV curve set. Circles represent the I_{01} values, which have been used in IV curve simulations, squares represent the median values, and stars represent the mean values. The colored regions correspond to the IQR. The lines only serve as guide to the eye.

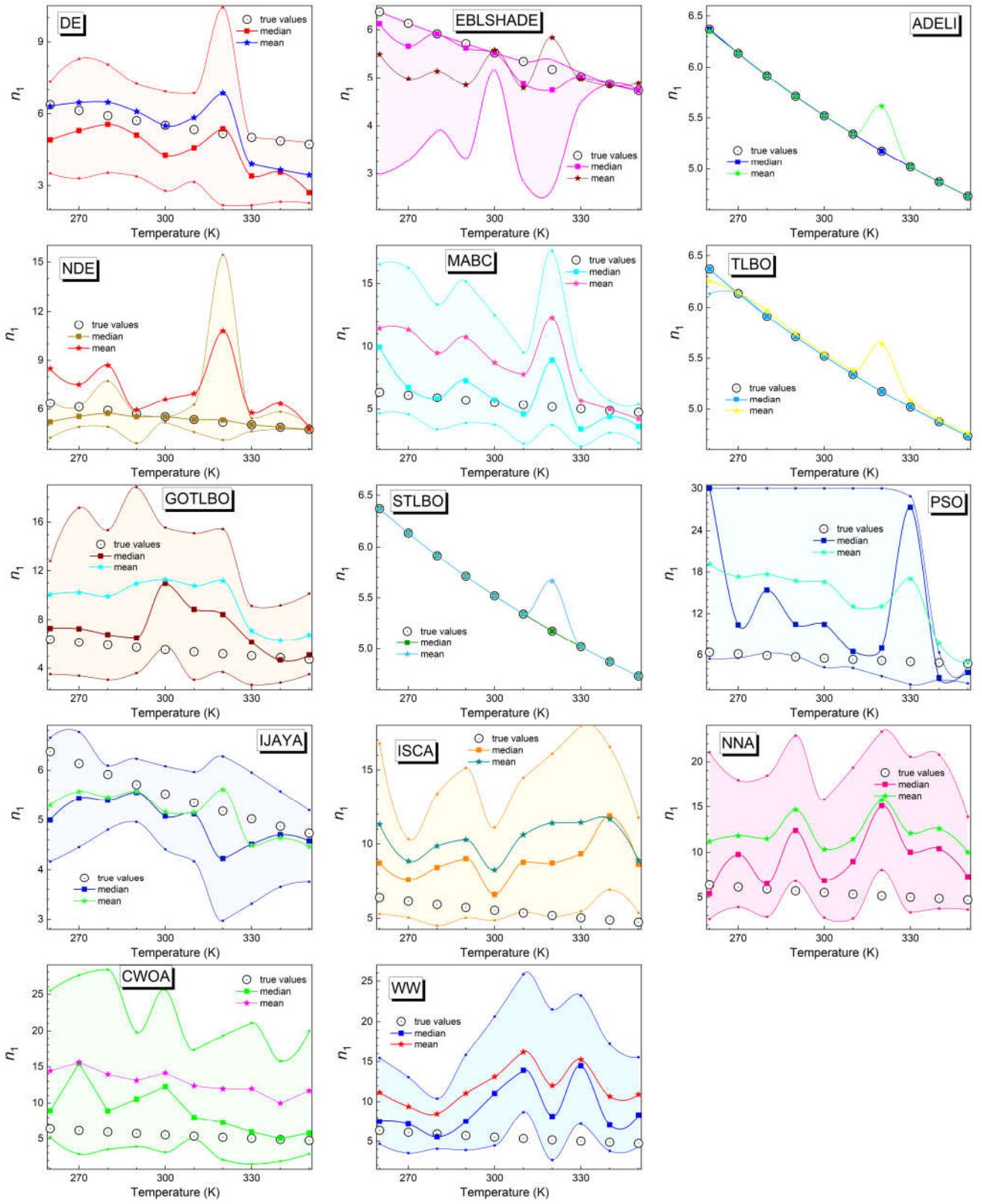


Fig.S6. Comparison of n_1 value estimation by different algorithms on the IV curve set. Circles represent the n_1 values, which have been used in IV curve simulations, squares represent the median values, and stars represent the mean values. The colored regions correspond to the IQR. The lines only serve as guide to the eye.

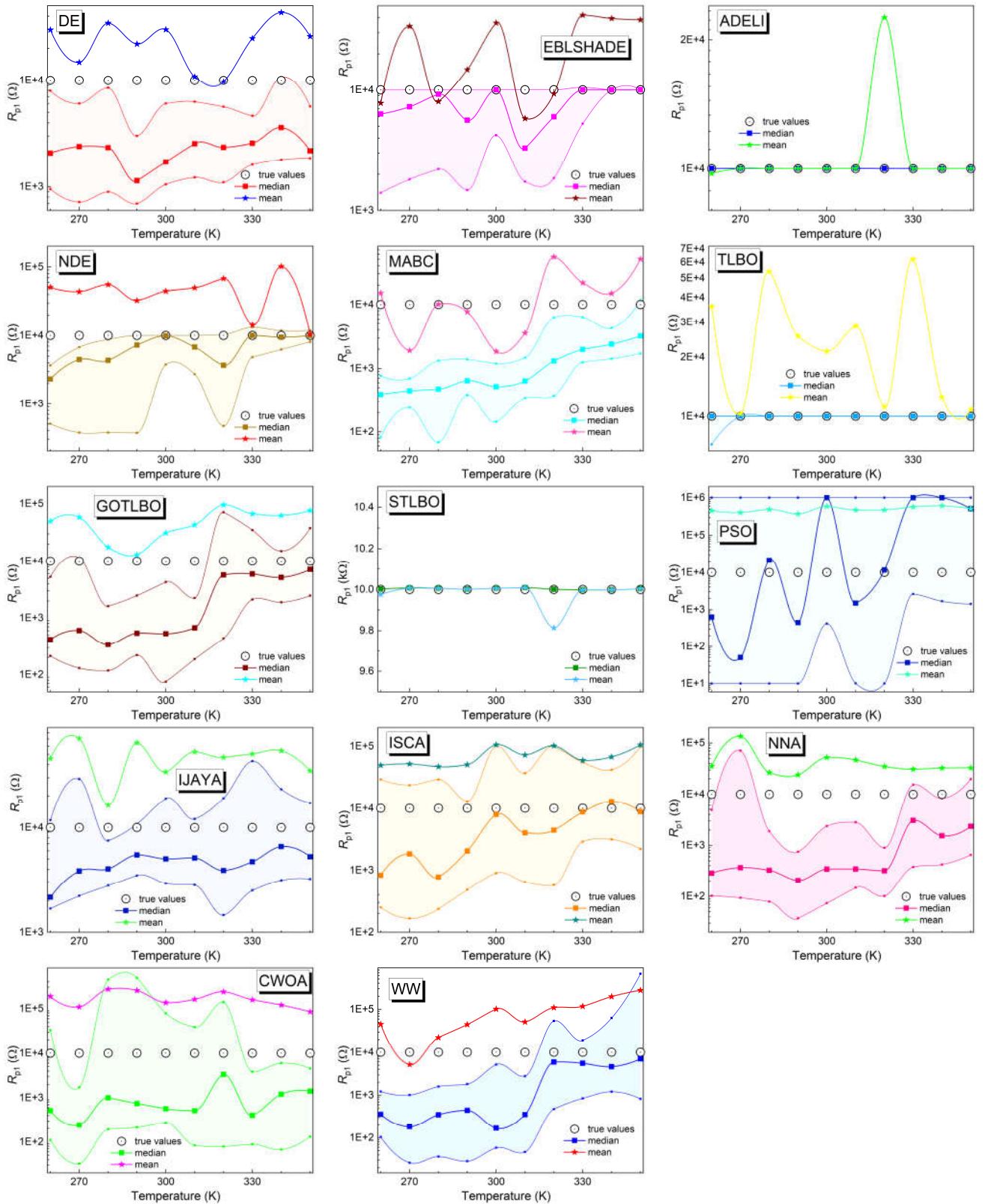


Fig.S7. Comparison of R_{p1} value estimation by different algorithms on the IV curve set. Circles represent the R_{p1} values, which have been used in IV curve simulations, squares represent the median values, and stars represent the mean values. The colored regions correspond to the IQR. The lines only serve as guide to the eye.

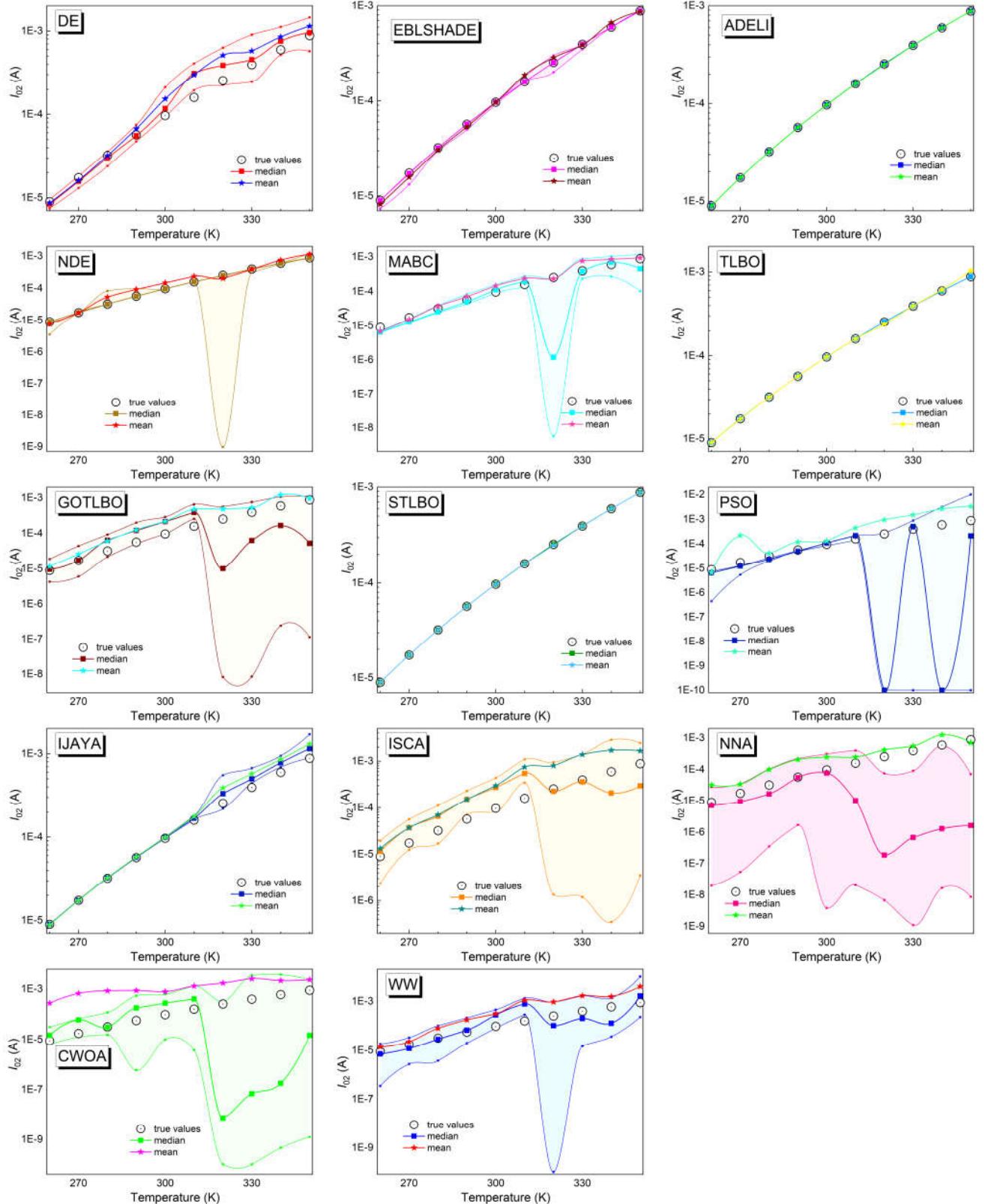


Fig.S8. Comparison of I_{02} value estimation by different algorithms on the IV curve set. Circles represent the I_{02} values, which have been used in IV curve simulations, squares represent the median values, and stars represent the mean values. The colored regions correspond to the IQR. The lines only serve as guide to the eye.

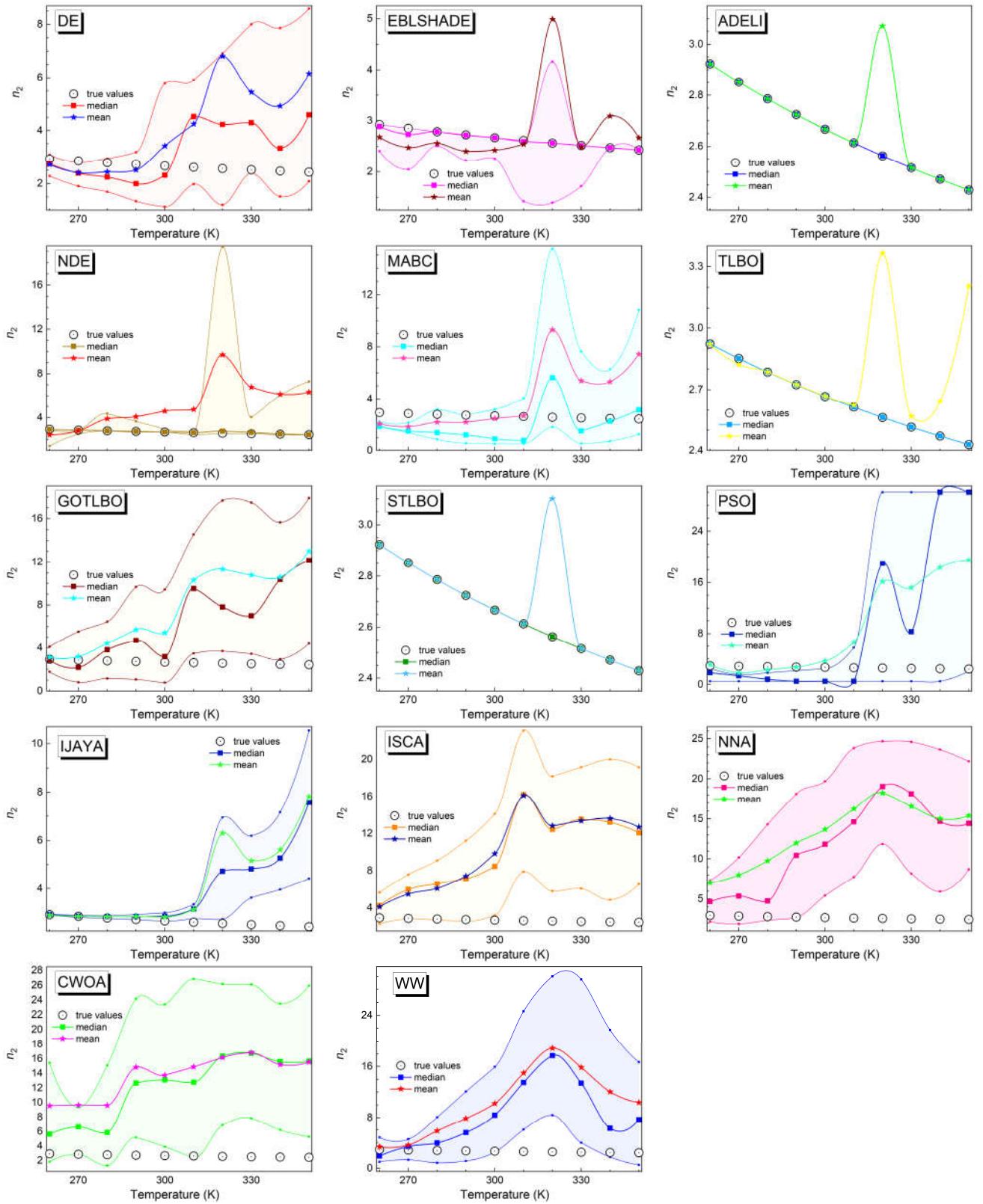


Fig.S9. Comparison of n_2 value estimation by different algorithms on the IV curve set. Circles represent the n_2 values, which have been used in IV curve simulations, squares represent the median values, and stars represent the mean values. The colored regions correspond to the IQR. The lines only serve as guide to the eye.

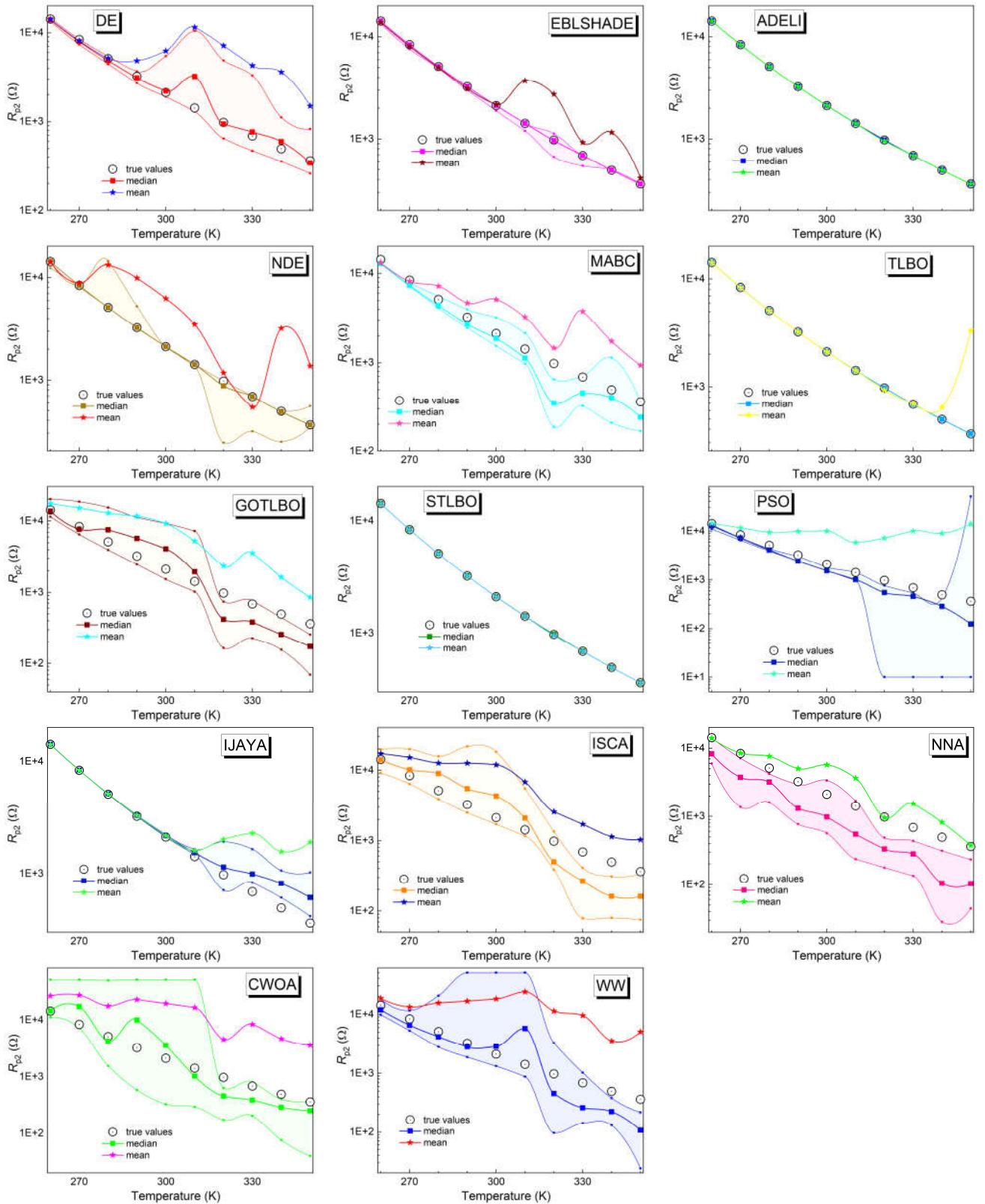


Fig.S10. Comparison of R_{p2} value estimation by different algorithms on the IV curve set. Circles represent the R_{p2} values, which have been used in IV curve simulations, squares represent the median values, and stars represent the mean values. The colored regions correspond to the IQR. The lines only serve as guide to the eye.

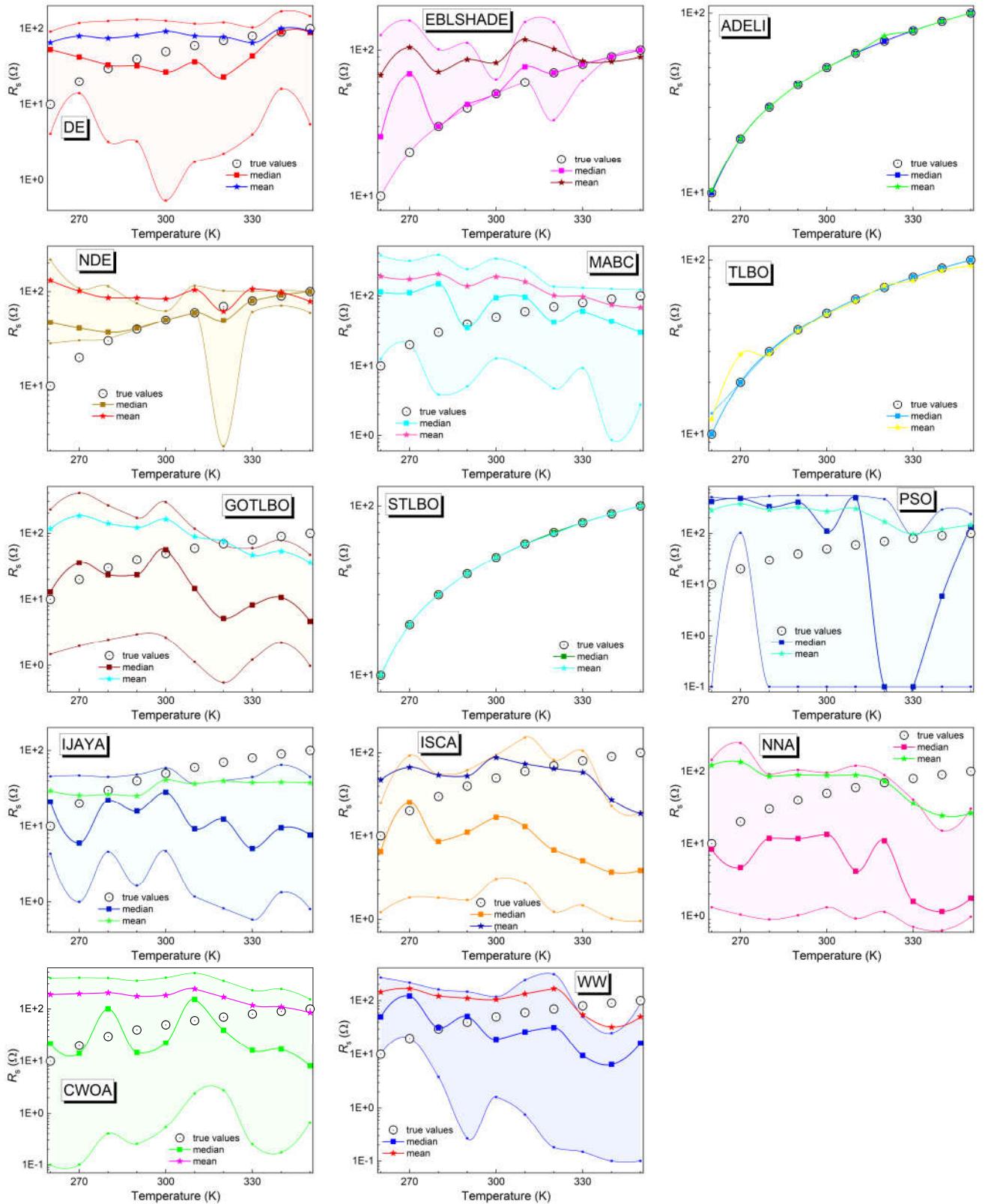


Fig.S11. Comparison of R_s value estimation by different algorithms on the IV curve set. Circles represent the R_s values, which have been used in IV curve simulations, squares represent the median values, and stars represent the mean values. The colored regions correspond to the IQR. The lines only serve as guide to the eye.

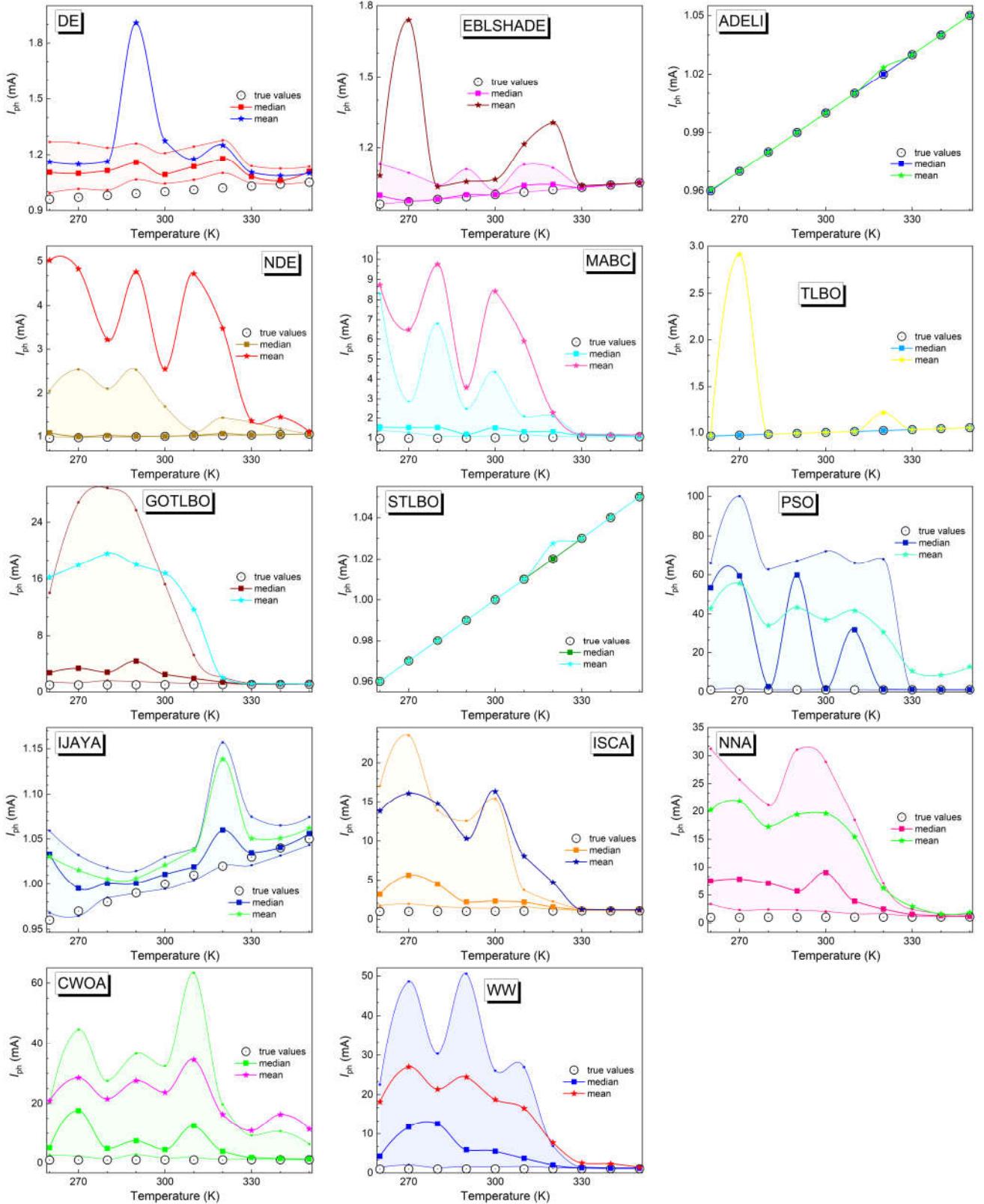


Fig.S12. Comparison of I_{ph} value estimation by different algorithms on the IV curve set. Circles represent the I_{ph} values, which have been used in IV curve simulations, squares represent the median values, and stars represent the mean values. The colored regions correspond to the IQR. The lines only serve as guide to the eye.

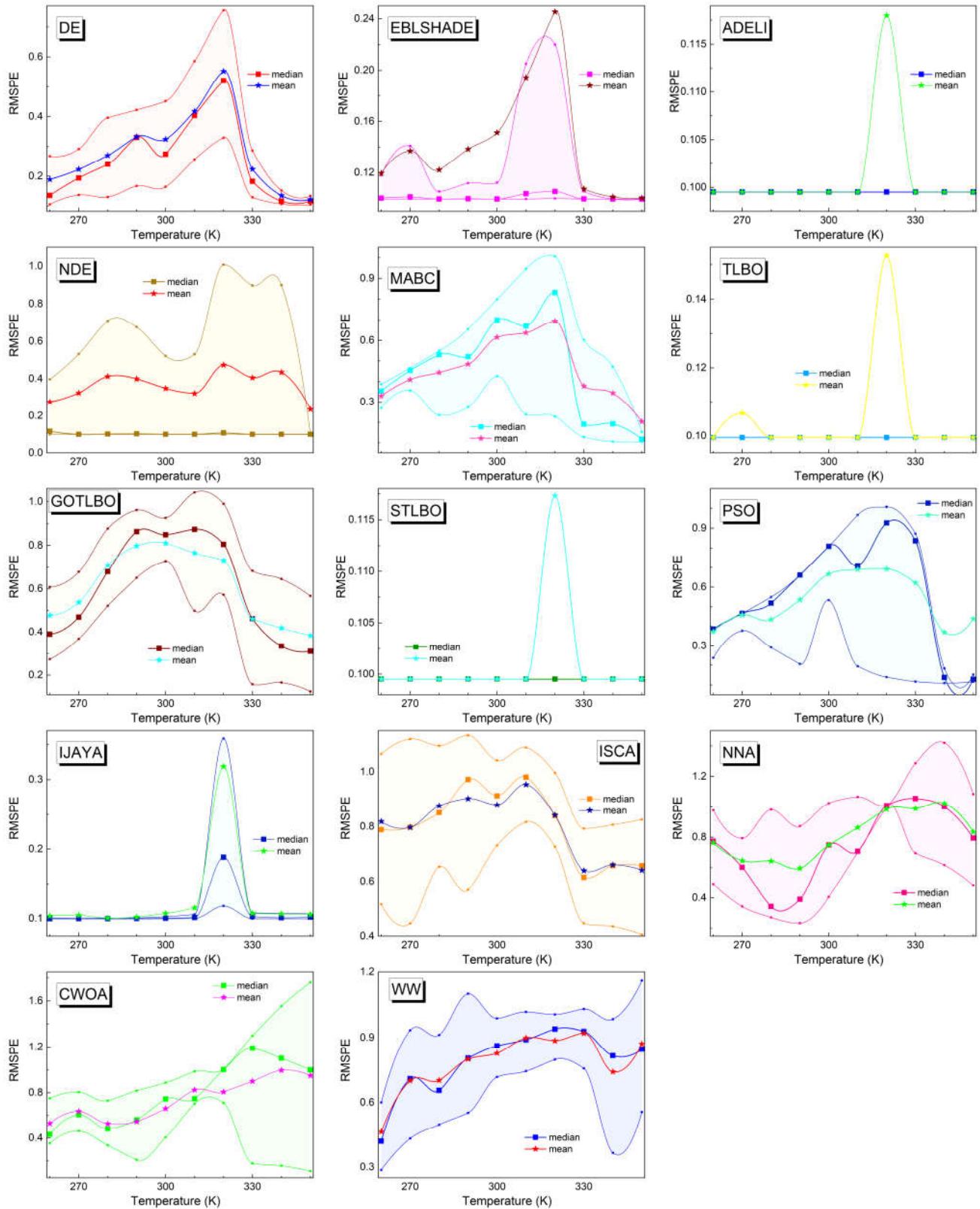


Fig.S13. Comparison of RMSPE value for different algorithms, applied to the IV curve set. Squares represent the median values, and stars represent the mean values. The colored regions correspond to the IQR. The lines only serve as guide to the eye.

Table S1. The results of the compared algorithms in the single-IV case.

		Parameter								
		I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
DE	true value	1.6e-9	1.92	190	1.6e-4	1.92	190	45	8e-3	
	MEAN	4.30612E-7	2.29342	273.866	8.17387E-4	8.08356	217.375	23.6714	0.00793327	0.202896
	MEDIAN	6.31239E-9	2.09479	200.493	3.843E-4	4.91355	106.342	14.1994	0.00776123	0.177838
	STD	9.79424E-7	0.819543	327.208	0.00101283	8.7304	448.313	22.4509	8.7897E-4	0.0818108
EBL SHADE	IQR	2.47897E-7	1.18701	73.9815	0.00118424	6.42196	73.1935	36.6225	0.00105832	0.12722
	MEAN	4.89016E-8	1.99143	191.859	1.90839E-4	2.09441	257.032	42.8834	0.00795469	0.112344
	MEDIAN	1.59673E-9	1.91973	189.998	1.59904E-4	1.91936	189.951	45.0092	0.00800011	0.111803
	STD	2.94351E-7	0.302862	7.06297	1.42778E-4	0.749826	408.471	8.42013	1.76013E-4	0.00378624
ADELI	IQR	2.45E-17	2E-9	1E-7	4E-13	2.5E-9	2.5E-7	5E-8	2E-12	0
	MEAN	1.59673E-9	1.91973	189.998	1.59904E-4	1.91936	189.951	45.0092	0.00800011	0.111803
	MEDIAN	1.59673E-9	1.91973	189.998	1.59904E-4	1.91936	189.951	45.0092	0.00800011	0.111803
	STD	2.24774E-17	1.8407E-9	8.14411E-8	2.26085E-12	1.09586E-8	1.29649E-6	8.3637E-8	1.67527E-12	5.60747E-17
NDE	IQR	2.5E-17	2E-9	1E-7	8E-13	6E-9	3.5E-7	6.5E-8	2E-12	0
	MEAN	2.96195E-7	2.42087	217.047	4.32932E-4	4.1948	572.088	31.1402	0.00768983	0.150002
	MEDIAN	1.97951E-8	2.31401	205.507	2.7074E-4	2.82514	247.163	33.9332	0.00765711	0.111897
	STD	1.06531E-6	0.585381	81.8273	3.94921E-4	6.46811	902.42	16.9948	3.9184E-4	0.149461
MABC	IQR	1.28566E-7	0.782389	32.2484	5.10535E-4	2.85309	341.063	30.0524	6.3894E-4	2.59792E-4
	MEAN	1.87007E-6	3.23398	517.263	0.00116959	14.9942	881.309	25.5168	0.0101761	0.404887
	MEDIAN	3.78613E-8	3.00104	141.578	2.22821E-4	6.65565	82.0348	12.4381	0.00855776	0.169928
	STD	3.35158E-6	3.38085	2492.2	0.00255612	17.4695	2269.68	27.1128	0.00447919	0.313895
TLBO	IQR	1.56208E-6	2.81682	158.743	7.57854E-4	23.8231	151.829	47.2398	0.00357495	0.608581
	MEAN	4.76305E-9	1.91592	189.79	2.17925E-4	2.14102	494.417	44.2879	0.00801613	0.111834
	MEDIAN	1.59673E-9	1.91973	189.998	1.59904E-4	1.91936	189.951	45.0092	0.00800011	0.111803
	STD	1.1263E-8	0.237052	9.96477	2.26679E-4	1.05125	1239.57	9.34268	2.38013E-4	9.91547E-5
	IQR	3.78381E-11	0.00312336	0.131118	2.10985E-8	0.00210025	0.0325284	0.0313024	1.92458E-6	2.0801E-6

Table S1 (continued)

	I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
	true value	1.6e-9	1.92	190	1.6e-4	1.92	190	45	8e-3
GOTLBO	MEAN	1.71767E-6	9.57122	11628.3	7.92397E-4	20.2703	128.312	24.659	0.0228366
	MEDIAN	1.03447E-8	3.41832	69.094	7.71914E-7	14.2566	74.3327	8.80183	0.0142995
	STD	3.34406E-6	11.018	44234.6	0.00216328	14.115	417.298	29.8185	0.0197114
	IQR	1.36228E-6	15.8671	216.793	2.4192E-4	23.5098	64.4833	43.6466	0.0237021
STLBO	MEAN	1.59673E-9	1.91973	189.998	1.59904E-4	1.91936	189.951	45.0092	0.00800011
	MEDIAN	1.59673E-9	1.91973	189.998	1.59904E-4	1.91936	189.951	45.0092	0.00800011
	STD	3.10035E-17	2.53498E-9	1.09935E-7	7.54905E-13	5.08363E-9	3.95897E-7	7.27714E-8	2.265E-12
	IQR	3.6E-17	2.5E-9	1E-7	1.15E-12	7.5E-9	6E-7	1E-7	3E-12
PSO	MEAN	3.14227E-6	16.6587	180118	0.00271538	36.2226	1271.15	41.1715	0.0386418
	MEDIAN	1E-16	3.52665	106.144	1E-10	50	22.0427	0.409733	0.00899564
	STD	4.55814E-6	22.0702	388032	0.00438738	21.3176	3258.81	45.3494	0.0350568
	IQR	1E-5	49.083	163.924	0.00643173	40.2401	100.011	92.3135	0.0667872
IJAYA	MEAN	4.22388E-7	2.24164	311.312	6.00966E-4	6.98969	296.131	13.8104	0.00757605
	MEDIAN	9.73093E-9	2.19089	210.625	4.10043E-4	5.6748	159.549	3.75794	0.00761625
	STD	1.1024E-6	0.833675	469.522	9.60642E-4	5.94046	532.266	18.5512	6.09311E-4
	IQR	1.12926E-7	1.11574	61.1361	5.19021E-4	3.36356	169.582	18.6422	8.92576E-4
ISCA	MEAN	1.15274E-6	10.4396	22799	5.06103E-4	15.9083	152.337	12.3251	0.0178729
	MEDIAN	2.08898E-8	3.5363	102.061	6.45362E-7	12.4266	76.6075	2.41391	0.0104324
	STD	2.29412E-6	12.3668	98896.9	0.00127207	11.5125	585.368	23.4796	0.0187227
	IQR	1.16327E-6	11.1835	413.555	9.58418E-5	16.2615	68.6495	7.87543	0.0101581
NNA	MEAN	4.86072E-7	17.7241	7704.75	7.60416E-4	26.175	181.643	7.19023	0.0194113
	MEDIAN	4.09834E-12	13.7798	75.4677	6.53373E-6	24.3121	74.7187	1.47635	0.0127364
	STD	1.37597E-6	15.7707	23975	0.00178214	12.9398	643.998	14.9043	0.01764
	IQR	2.55487E-8	28.9827	126.308	4.49047E-4	21.3311	63.1188	3.89105	0.0132889

Table S1 (continued)

	I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
true value	1.6e-9	1.92	190	1.6e-4	1.92	190	45	8e-3	
CWOA	MEAN	1.91016E-6	19.7767	27364.9	0.00115056	30.3776	400.515	27.5457	0.026159
	MEDIAN	5.94422E-10	17.2753	56.5524	6.44204E-9	34.0434	52.5507	9.03927	0.0141445
	STD	3.8446E-6	17.5006	145161	0.00303351	17.6242	1479.81	32.8588	0.0257545
	IQR	5.44157E-7	30.0379	70.4671	9.36563E-5	32.9741	74.873	53.057	0.0233644
WW	MEAN	2.25657E-6	6.01898	1815.69	3.60402E-4	45.528	79.1659	16.1267	0.0242362
	MEDIAN	4.28549E-7	4.43733	94.2486	1E-10	50	31.019	1.15863	0.00961191
	STD	3.10815E-6	7.02418	7319.67	0.00147962	11.7448	227.327	25.8349	0.0246133
	IQR	3.2253E-6	3.28317	58.5468	5.44421E-5	0	61.1333	15.4329	0.0241842

Table S2. The statistical significance of the null hypothesis in Friedman, Friedman Aligned, and Quade tests and the Iman–Davenport extension

Test	<i>p</i> -value										IV-set case
	Single IV case										
	I_{01}	n_1	R_{p1}	I_{02}	n_2	R_{p2}	R_s	I_{ph}	RMSPE	Comp	
Friedman	4.9664E-07	0.0000E+00	0.0000E+00	3.0381E-07	0.0000E+00	6.8597E-07	2.3210E-06	0.0000E+00	0.0000E+00	0.0000E+00	2.2964E-06
Iman-Davenport	0.0000E+00	1.4774E-09	1.4310E-09	0.0000E+00	1.3797E-09	0.0000E+00	1.5223E-09	1.4438E-09	1.2472E-09	0.0000E+00	0.0000E+00
Friedman Aligned	4.0411E-07	5.9524E-07	2.7010E-05	1.4847E-06	0.0000E+00	4.9647E-06	0.0000E+00	5.0555E-07	0.0000E+00	4.3982E-04	0.0000E+00
Quade	1.1191E-09	0.0000E+00	0.0000E+00	1.1432E-09	0.0000E+00	1.0869E-09	0.0000E+00	0.0000E+00	0.0000E+00	8.3247E-06	0.0000E+00

Table S3. Ranking of the algorithms according to Friedman, Friedman Aligned, and Quade tests.

Test	DE	EBLSHADE	ADELI	NDE	MABC	TLBO	GOTLBO	STLBO	PSO	IJAYA	ISCA	NNA	CWOA	WW
<i>Single-IV case</i>														
<i>I₀₁</i>														
Friedman	8.88	2.69	2.24	8.76	9.98	4.02	9.02	2.45	10.59	8.62	9.56	8.07	8.98	11.14
Friedman Aligned	6.695	5.448	5.210	6.149	8.248	5.261	8.254	5.209	9.168	6.618	7.847	6.668	7.814	9.552
Quade	8.332	2.921	2.091	8.318	9.632	4.337	9.587	2.568	11	8.464	9.183	8.156	9.323	11.09
<i>n₁</i>														
Friedman	7.16	2.61	2.22	6.42	9.32	3.53	9.66	2.4	10.99	7.18	9.98	11.1	11.67	10.76
Friedman Aligned	5.581	4.653	4.570	5.362	6.718	4.740	8.325	4.570	9.506	5.645	8.593	10.701	10.971	8.205
Quade	6.952	2.835	2.211	6.122	8.978	3.66	9.123	2.415	11.65	7.343	9.886	11.23	11.96	10.64
<i>R_{p1}</i>														
Friedman	7.3	2.37	2.26	6.24	8.46	3.51	11.36	2.34	11.2	7.22	10.98	10.94	10.84	9.98
Friedman Aligned	6.493	5.73	5.687	6.154	6.691	5.806	8.293	5.687	9.425	6.435	8.094	8.308	7.875	7.462
Quade	7.162	2.367	2.358	6.113	8.725	3.444	11.05	2.311	11.48	7.213	11.21	11.08	10.71	9.781
<i>I₀₂</i>														
Friedman	9.62	2.78	2.29	7.98	8.94	4.14	8.96	2.49	11.46	9.6	8.96	9.16	9.45	9.17
Friedman Aligned	8.649	5.008	4.807	6.892	8.111	5.275	7.530	4.808	9.699	7.469	7.632	7.663	7.958	6.640
Quade	9.531	2.999	2.227	8.038	8.985	4.273	8.831	2.375	11.78	9.843	8.599	8.987	9.276	9.257
<i>n₂</i>														
Friedman	7.6	2.41	2.31	5.64	8.1	3.66	9.74	2.46	11.44	7.68	9.1	10.72	10.97	13.17
Friedman Aligned	5.849	3.254	3.145	4.351	7.446	3.433	9.089	3.145	11.052	5.934	8.362	10.019	10.405	12.657
Quade	7.642	2.454	2.311	5.532	8.369	3.533	9.656	2.572	11.54	7.591	8.989	10.71	10.97	13.14
<i>R_{p2}</i>														
Friedman	7.12	2.72	2.28	8.16	10.16	4.21	9.49	2.55	11.03	7.44	9.14	9.78	10.58	10.34
Friedman Aligned	6.683	4.937	4.592	7.716	8.735	5.646	7.424	4.593	9.445	6.769	7.389	7.690	8.544	7.978
Quade	6.956	3.071	2.309	8.925	10.21	4.462	9.142	2.491	11.34	7.465	8.784	9.207	10.54	10.1
<i>R_s</i>														
Friedman	7.8	2.5	2.31	6.28	8.68	3.75	9.34	2.38	12.62	9.22	10.1	10.38	9.62	10.02
Friedman Aligned	7.358	2.416	1.994	5.419	8.051	2.793	8.732	1.995	11.78	8.819	9.974	10.33	8.905	9.572
Quade	7.349	2.553	2.359	6.479	8.252	3.846	9.004	2.394	13.41	9.028	10.04	10.35	9.766	10.18
<i>I_{ph}</i>														
Friedman	7.3	2.4	2.21	6.14	9.02	3.72	11.34	2.39	11.72	6.88	10.56	10.62	10.72	9.98
Friedman Aligned	5.405	4.803	4.765	5.112	6.609	4.848	9.646	4.765	10.50	5.322	8.428	9.055	9.944	8.934
Quade	7.083	2.399	2.293	6.202	8.682	3.905	11.09	2.331	12.19	6.56	10.54	10.61	11.13	9.974

Table S3 (continued)

Test	DE	EBLSHADE	ADELI	NDE	MABC	TLBO	GOTLBO	STLBO	PSO	IJAYA	ISCA	NNA	CWOA	WW
RMSPE														
Friedman	7.92	2.51	2.28	5.03	8.56	3.26	10.7	2.28	9.74	6.66	11.32	11.38	11.5	11.86
Friedman Aligned	5.783	3.392	3.367	3.943	7.203	3.387	9.803	3.367	8.968	4.422	11.03	11.16	10.89	11.42
Quade	7.93	2.449	2.281	5.009	8.478	3.272	10.6	2.281	9.312	6.623	11.92	11.75	11.59	11.51
Comp														
Friedman	7.4	2	3.55	6.5	8.3	3.75	9.6	3.7	10.85	8.3	9.3	9.7	10.9	11.15
Friedman Aligned	7.23	4.165	5.305	5.36	7.84	5.295	7.58	4.045	8.685	7.34	7.05	9.15	9.59	10.06
Quade	7.945	2.409	4.364	7.073	8.945	4.355	8.745	3.782	10.31	8.891	8.964	8.673	9.636	10.91
<i>IV set case</i>														
Friedman	7.81	3.86	2.19	4.84	8.86	2.61	9.54	2.75	11.2	6.77	10.9	11.6	11.3	10.7
Friedman Aligned	6.181	4.583	4.379	4.722	7.154	4.378	8.004	4.226	10.50	5.850	9.774	9.278	9.743	9.302
Quade	8.056	3.931	2.336	4.956	8.895	2.71	9.135	2.812	11.88	6.855	10.63	11.11	11.42	10.27

Table S4. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (DE is the control algorithm, I_{01} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	8.61820E-02	8.98122E-02	8.98122E-02	8.61820E-02
WW	Friedman Aligned	2.30441E-08	7.09049E-08	7.09049E-08	7.09049E-08
WW	Quade	9.80292E-01	1.0	1.0	9.80292E-01
PSO	Friedman	2.38076E-01	4.91631E-01	4.91631E-01	3.94673E-01
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	9.80292E-01	1.0	1.0	9.80292E-01
MABC	Friedman	5.95703E-01	1.0	1.0	8.99625E-01
MABC	Friedman Aligned	6.53233E-12	1.32871E-11	1.32871E-11	1.32871E-11
MABC	Quade	9.80292E-01	1.0	1.0	9.99953E-01
ISCA	Friedman	8.26230E-01	1.0	1.0	9.95414E-01
ISCA	Friedman Aligned	3.32249E-07	1.15009E-06	1.15009E-06	1.15009E-06
ISCA	Quade	9.80292E-01	1.0	1.0	9.99970E-01
GOTLBO	Friedman	9.94739E-01	1.0	1.0	1.0
GOTLBO	Friedman Aligned	6.53233E-12	1.20597E-11	1.20597E-11	1.20597E-11
GOTLBO	Quade	9.80292E-01	1.0	1.0	9.99953E-01
CWOA	Friedman	9.94739E-01	1.0	1.0	1.0
CWOA	Friedman Aligned	6.22265E-07	2.29759E-06	2.29759E-06	2.29759E-06
CWOA	Quade	9.80292E-01	1.0	1.0	9.99970E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0

Table S4 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	9.97117E-01	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0

Table S5. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (EBLSHADE is the control algorithm, I_{01} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
DE	Friedman	6.00409E-13	1.59650E-12	1.59650E-12	1.59650E-12
DE	Friedman Aligned	2.11188E-08	7.96017E-08	7.96017E-08	7.96017E-08
DE	Quade	4.39270E-02	1.66115E-01	1.30659E-01	1.54746E-01
GOTLBO	Friedman	6.00409E-13	6.00409E-13	6.00409E-13	6.00409E-13
GOTLBO	Friedman Aligned	1.14652E-08	3.96874E-08	3.70043E-08	3.96874E-08
GOTLBO	Quade	2.64966E-02	6.79570E-02	6.52926E-02	6.58962E-02
ISCA	Friedman	6.00409E-13	1.41664E-12	1.41664E-12	1.41664E-12
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	2.64966E-02	8.49735E-02	8.49735E-02	8.18808E-02
CWOA	Friedman	6.00409E-13	7.88702E-13	7.88702E-13	7.88702E-13
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	2.64966E-02	8.09879E-02	8.09879E-02	7.81332E-02
NDE	Friedman	1.19158E-12	4.12470E-12	4.12470E-12	4.12470E-12
NDE	Friedman Aligned	1.71258E-03	5.27053E-03	5.27053E-03	5.26012E-03
NDE	Quade	4.39270E-02	1.66115E-01	1.30659E-01	1.54746E-01
IJAYA	Friedman	3.31860E-12	1.22533E-11	1.22533E-11	1.22533E-11
IJAYA	Friedman Aligned	1.17856E-07	4.07961E-07	4.07961E-07	4.07961E-07
IJAYA	Quade	4.36225E-02	1.66115E-01	1.30659E-01	1.54746E-01
MABC	Friedman	6.32573E-12	2.38431E-11	2.38431E-11	2.38431E-11
MABC	Friedman Aligned	1.14652E-08	3.96874E-08	3.70043E-08	3.96874E-08
MABC	Quade	2.64966E-02	6.79570E-02	6.52926E-02	6.58962E-02
NNA	Friedman	2.20572E-10	8.14419E-10	8.08514E-10	8.14419E-10
NNA	Friedman Aligned	3.72214E-08	1.37433E-07	1.37433E-07	1.37433E-07
NNA	Quade	4.39270E-02	1.66115E-01	1.30659E-01	1.54746E-01

Table S5 (*continued*)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	2.33571E-10	8.14419E-10	8.08514E-10	8.14419E-10
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	1.11341E-02	1.17606E-02	1.17606E-02	1.16974E-02
WW	Friedman	3.41671E-09	1.05129E-08	1.05129E-08	1.05129E-08
WW	Friedman Aligned	3.32036E-11	1.02165E-10	1.02165E-10	1.02165E-10
WW	Quade	1.11341E-02	1.11918E-02	1.11918E-02	1.11341E-02
TLBO	Friedman	1.30872E-01	3.35738E-01	3.35738E-01	2.99567E-01
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	6.24383E-01	1.0	1.0	9.16727E-01
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S6. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ADELI is the control algorithm, I_{01} evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
WW	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
WW	Friedman Aligned	4.81753E-11	1.66761E-10	1.66761E-10	1.66761E-10
WW	Quade	3.13831E-03	3.14287E-03	3.14287E-03	3.13831E-03
DE	Friedman	<1E-13	2.10054E-13	2.10054E-13	2.10054E-13
DE	Friedman Aligned	3.56117E-11	1.09575E-10	1.09575E-10	1.09575E-10
DE	Quade	1.76412E-02	6.53596E-02	5.33566E-02	6.36053E-02
NDE	Friedman	<1E-13	1.54543E-13	1.54543E-13	1.54543E-13
NDE	Friedman Aligned	2.17264E-05	6.68505E-05	6.68505E-05	6.68488E-05
NDE	Quade	1.76412E-02	6.53596E-02	5.33566E-02	6.36053E-02
IJAYA	Friedman	<1E-13	3.04201E-13	3.04201E-13	3.04201E-13
IJAYA	Friedman Aligned	2.12767E-10	8.01968E-10	8.01968E-10	8.01968E-10
IJAYA	Quade	1.72505E-02	6.52823E-02	5.33566E-02	6.34840E-02
CWOA	Friedman	1.09690E-13	3.79696E-13	3.79696E-13	3.79696E-13
CWOA	Friedman Aligned	1.10735E-09	4.08867E-09	4.08867E-09	4.08867E-09
CWOA	Quade	9.04167E-03	2.85526E-02	2.85526E-02	2.81930E-02
GOTLBO	Friedman	1.28934E-13	4.76064E-13	4.76064E-13	4.76064E-13
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	9.04167E-03	2.30322E-02	2.22560E-02	2.27926E-02
NNA	Friedman	6.62388E-12	2.49669E-11	2.49669E-11	2.49669E-11
NNA	Friedman Aligned	5.41195E-11	1.99826E-10	1.99826E-10	1.99826E-10
NNA	Quade	1.76412E-02	6.53596E-02	5.33566E-02	6.36053E-02
ISCA	Friedman	6.84661E-12	2.52798E-11	2.52798E-11	2.52798E-11
ISCA	Friedman Aligned	1.38616E-09	4.79825E-09	4.79825E-09	4.79825E-09
ISCA	Quade	9.04167E-03	3.04966E-02	3.04966E-02	3.00928E-02

Table S6 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
MABC	Friedman	9.26368E-11	3.20666E-10	3.20666E-10	3.20666E-10
MABC	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
MABC	Quade	9.04167E-03	2.30322E-02	2.22560E-02	2.27926E-02
PSO	Friedman	2.14340E-09	6.59507E-09	6.59507E-09	6.59507E-09
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	3.13831E-03	3.34101E-03	3.34101E-03	3.33590E-03
TLBO	Friedman	3.93259E-02	1.00134E-01	1.00134E-01	9.68289E-02
TLBO	Friedman Aligned	8.39430E-01	1.0	1.0	9.65839E-01
TLBO	Quade	4.09330E-01	1.0	8.45736E-01	7.37234E-01
EBLSHADE	Friedman	6.20041E-01	1.0	8.01816E-01	8.32456E-01
EBLSHADE	Friedman Aligned	3.15644E-01	8.23571E-01	8.23571E-01	6.18170E-01
EBLSHADE	Quade	7.62820E-01	1.0	8.45736E-01	9.29806E-01
STLBO	Friedman	8.01816E-01	1.0	8.01816E-01	8.32456E-01
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	8.45736E-01	1.0	8.45736E-01	9.29806E-01

Table S7. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NDE is the control algorithm, I_{01} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	5.62824E-02	5.77994E-02	5.77994E-02	5.62824E-02
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	9.79432E-01	1.0	1.0	9.79432E-01
PSO	Friedman	1.72572E-01	3.44675E-01	3.44675E-01	2.95116E-01
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	9.79432E-01	1.0	1.0	9.79432E-01
MABC	Friedman	4.92255E-01	1.0	1.0	8.21025E-01
MABC	Friedman Aligned	9.56302E-10	3.31028E-09	3.29539E-09	3.31028E-09
MABC	Quade	9.79432E-01	1.0	1.0	9.99948E-01
ISCA	Friedman	7.39566E-01	1.0	1.0	9.84073E-01
ISCA	Friedman Aligned	<1E-13	1.46549E-13	1.46549E-13	1.46549E-13
ISCA	Quade	9.79432E-01	1.0	1.0	9.99966E-01
GOTLBO	Friedman	9.74456E-01	1.0	1.0	9.99997E-01
GOTLBO	Friedman Aligned	9.56302E-10	3.31028E-09	3.29539E-09	3.31028E-09
GOTLBO	Quade	9.79432E-01	1.0	1.0	9.99948E-01
CWOA	Friedman	9.74456E-01	1.0	1.0	9.99997E-01
CWOA	Friedman Aligned	<1E-13	2.86438E-13	2.86438E-13	2.86438E-13
CWOA	Quade	9.79432E-01	1.0	1.0	9.99966E-01
DE	Friedman	9.82263E-01	1.0	1.0	1.0
DE	Friedman Aligned	2.28343E-02	8.65263E-02	8.65263E-02	8.33830E-02
DE	Quade	9.99841E-01	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0

Table S7 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	4.50905E-02	1.57187E-01	1.57187E-01	1.47610E-01
IJAYA	Quade	9.96518E-01	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	2.79302E-02	1.03688E-01	1.03688E-01	9.93104E-02
NNA	Quade	1.0	1.0	1.0	1.0

Table S8. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (MABC is the control algorithm, I_{01} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	9.04976E-01	1.0	1.0	9.04976E-01
WW	Friedman Aligned	3.09282E-08	3.09282E-08	3.09282E-08	3.09282E-08
WW	Quade	9.99971E-01	1.0	1.0	9.99971E-01
PSO	Friedman	9.83045E-01	1.0	1.0	9.99462E-01
PSO	Friedman Aligned	1.62361E-04	2.99763E-04	2.99763E-04	2.99722E-04
PSO	Quade	9.99971E-01	1.0	1.0	9.99971E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0

Table S8 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0

Table S9. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (TLBO is the control algorithm, I_{01} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	1.73195E-13	1.73195E-13	1.73195E-13	1.73195E-13
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	7.37772E-02	7.87500E-02	7.87500E-02	7.59689E-02
MABC	Friedman	6.30140E-12	1.30429E-11	1.30429E-11	1.30429E-11
MABC	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
MABC	Quade	1.26592E-01	3.38277E-01	3.21918E-01	2.90779E-01
WW	Friedman	6.30140E-12	1.16334E-11	1.16334E-11	1.16334E-11
WW	Friedman Aligned	5.34616E-11	1.64497E-10	1.64497E-10	1.64497E-10
WW	Quade	7.37772E-02	7.64150E-02	7.64150E-02	7.37772E-02
ISCA	Friedman	1.24759E-10	3.83875E-10	3.83875E-10	3.83875E-10
ISCA	Friedman Aligned	8.36943E-10	3.09025E-09	2.80188E-09	3.09025E-09
ISCA	Quade	1.26592E-01	3.84352E-01	3.84352E-01	3.25573E-01
GOTLBO	Friedman	6.17865E-09	2.13876E-08	2.13876E-08	2.13876E-08
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	1.26592E-01	3.38277E-01	3.21918E-01	2.90779E-01
CWOA	Friedman	6.88175E-09	2.54096E-08	2.54096E-08	2.54096E-08
CWOA	Friedman Aligned	7.23793E-10	2.72814E-09	2.72814E-09	2.72814E-09
CWOA	Quade	1.26592E-01	3.77401E-01	3.77401E-01	3.19919E-01
DE	Friedman	1.20683E-08	4.54881E-08	4.54881E-08	4.54881E-08
DE	Friedman Aligned	1.38245E-10	4.78541E-10	4.78541E-10	4.78541E-10
DE	Quade	1.64554E-01	6.45899E-01	4.76691E-01	4.92200E-01
NDE	Friedman	2.44925E-08	9.04338E-08	9.04338E-08	9.04338E-08
NDE	Friedman Aligned	6.08400E-05	1.87201E-04	1.87201E-04	1.87188E-04
NDE	Quade	1.64554E-01	6.45899E-01	4.76691E-01	4.92200E-01

Table S9 (*continued*)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
IJAYA	Friedman	5.66935E-08	1.96247E-07	1.96247E-07	1.96247E-07
IJAYA	Friedman Aligned	8.36943E-10	3.09025E-09	2.80188E-09	3.09025E-09
IJAYA	Quade	1.64554E-01	6.45899E-01	4.76691E-01	4.92200E-01
NNA	Friedman	1.68226E-06	5.17618E-06	5.17618E-06	5.17617E-06
NNA	Friedman Aligned	2.55778E-10	9.44411E-10	9.44411E-10	9.44411E-10
NNA	Quade	1.64554E-01	6.45899E-01	4.76691E-01	4.92200E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	4.42830E-01	1.0	1.0	7.73432E-01
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S10. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (GOTLBO is the control algorithm, I_{01} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	1.37121E-01	1.46648E-01	1.46648E-01	1.37121E-01
WW	Friedman Aligned	3.61499E-08	3.61499E-08	3.61499E-08	3.61499E-08
WW	Quade	9.99959E-01	1.0	1.0	9.99959E-01
PSO	Friedman	3.33849E-01	7.27025E-01	7.27025E-01	5.27624E-01
PSO	Friedman Aligned	1.81858E-04	3.35764E-04	3.35764E-04	3.35712E-04
PSO	Quade	9.99959E-01	1.0	1.0	9.99959E-01
MABC	Friedman	7.14527E-01	1.0	1.0	9.58507E-01
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	9.07106E-01	1.0	1.0	9.99332E-01
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0

Table S10 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0

Table S11. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (STLBO is the control algorithm, I_{01} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
DE	Friedman	1.67422E-13	2.22267E-13	2.22267E-13	2.22267E-13
DE	Friedman Aligned	3.49457E-11	1.07525E-10	1.07525E-10	1.07525E-10
DE	Quade	3.02027E-02	1.13113E-01	9.04256E-02	1.07775E-01
GOTLBO	Friedman	1.67422E-13	1.67422E-13	1.59872E-13	1.67422E-13
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	1.70097E-02	4.34638E-02	4.18609E-02	4.26152E-02
CWOA	Friedman	1.67422E-13	1.67422E-13	1.59872E-13	1.67422E-13
CWOA	Friedman Aligned	1.11444E-09	4.11484E-09	4.11484E-09	4.11484E-09
CWOA	Quade	1.70097E-02	5.26703E-02	5.26703E-02	5.14540E-02
NDE	Friedman	1.78968E-13	5.50671E-13	5.50671E-13	5.50671E-13
NDE	Friedman Aligned	2.14581E-05	6.60250E-05	6.60250E-05	6.60233E-05
NDE	Quade	3.02027E-02	1.13113E-01	9.04256E-02	1.07775E-01
IJAYA	Friedman	4.96492E-13	1.71863E-12	1.71863E-12	1.71863E-12
IJAYA	Friedman Aligned	2.08974E-10	7.87669E-10	7.87669E-10	7.87669E-10
IJAYA	Quade	2.98017E-02	1.13113E-01	9.04256E-02	1.07775E-01
ISCA	Friedman	1.94555E-12	7.18359E-12	7.18359E-12	7.18359E-12
ISCA	Friedman Aligned	1.39470E-09	4.82782E-09	4.82782E-09	4.82782E-09
ISCA	Quade	1.70097E-02	5.56810E-02	5.56810E-02	5.43433E-02
MABC	Friedman	3.23165E-11	1.21808E-10	1.20929E-10	1.21808E-10
MABC	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
MABC	Quade	1.70097E-02	4.34638E-02	4.18609E-02	4.26152E-02
NNA	Friedman	3.27515E-11	1.21808E-10	1.20929E-10	1.21808E-10
NNA	Friedman Aligned	5.31237E-11	1.96149E-10	1.96149E-10	1.96149E-10
NNA	Quade	3.02027E-02	1.13113E-01	9.04256E-02	1.07775E-01

Table S11 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	8.45375E-10	2.92630E-09	2.92630E-09	2.92630E-09
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	6.58951E-03	6.97972E-03	6.97972E-03	6.95743E-03
WW	Friedman	9.80423E-09	3.01669E-08	3.01669E-08	3.01669E-08
WW	Friedman Aligned	4.82405E-11	1.66986E-10	1.66986E-10	1.66986E-10
WW	Quade	6.58951E-03	6.60964E-03	6.60964E-03	6.58951E-03
TLBO	Friedman	7.11999E-02	1.81756E-01	1.81756E-01	1.70967E-01
TLBO	Friedman Aligned	8.37421E-01	1.0	9.97806E-01	9.65045E-01
TLBO	Quade	5.28241E-01	1.0	1.0	8.51492E-01
EBLSHADE	Friedman	8.00557E-01	1.0	1.0	9.49025E-01
EBLSHADE	Friedman Aligned	3.14299E-01	8.19952E-01	8.19952E-01	6.16263E-01
EBLSHADE	Quade	9.04532E-01	1.0	1.0	9.86919E-01
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	9.97806E-01	1.0	9.97806E-01	9.97806E-01
ADELII	Quade	1.0	1.0	1.0	1.0

Table S12. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (PSO is the control algorithm, I_{01} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	9.99908E-01	1.0	1.0	9.99908E-01
WW	Friedman Aligned	6.53248E-01	1.0	1.0	6.53248E-01
WW	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBSHADE	Friedman	1.0	1.0	1.0	1.0
EBSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0

Table S12 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0

Table S13. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (IJAYA is the control algorithm, I_{01} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	3.32214E-02	3.37419E-02	3.37419E-02	3.32214E-02
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	9.87045E-01	1.0	1.0	9.87045E-01
PSO	Friedman	1.14549E-01	2.22512E-01	2.22512E-01	2.01165E-01
PSO	Friedman Aligned	1.21060E-09	3.72493E-09	3.72493E-09	3.72493E-09
PSO	Quade	9.87045E-01	1.0	1.0	9.87045E-01
MABC	Friedman	3.78814E-01	1.0	1.0	7.01392E-01
MABC	Friedman Aligned	5.00822E-13	1.02585E-12	1.02585E-12	1.02585E-12
MABC	Quade	9.87097E-01	1.0	1.0	9.99984E-01
ISCA	Friedman	6.26168E-01	1.0	1.0	9.51565E-01
ISCA	Friedman Aligned	4.74790E-08	1.64351E-07	1.64351E-07	1.64351E-07
ISCA	Quade	9.87097E-01	1.0	1.0	9.99992E-01
GOTLBO	Friedman	9.25970E-01	1.0	1.0	9.99878E-01
GOTLBO	Friedman Aligned	5.00822E-13	9.24594E-13	9.24594E-13	9.24594E-13
GOTLBO	Quade	9.87097E-01	1.0	1.0	9.99984E-01
CWOA	Friedman	9.25970E-01	1.0	1.0	9.99878E-01
CWOA	Friedman Aligned	9.31630E-08	3.43987E-07	3.43987E-07	3.43987E-07
CWOA	Quade	9.87097E-01	1.0	1.0	9.99991E-01
DE	Friedman	9.27163E-01	1.0	1.0	9.99948E-01
DE	Friedman Aligned	9.09797E-01	1.0	1.0	9.99885E-01
DE	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	9.62357E-01	1.0	1.0	9.99994E-01
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0

Table S13 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	9.37660E-01	1.0	1.0	9.99965E-01
NNA	Quade	1.0	1.0	1.0	1.0

Table S14. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ISCA is the control algorithm, I_{01} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	5.46183E-01	7.66533E-01	7.66533E-01	5.46183E-01
WW	Friedman Aligned	1.67422E-13	1.67422E-13	1.67422E-13	1.67422E-13
WW	Quade	9.99427E-01	1.0	1.0	9.99427E-01
PSO	Friedman	7.98259E-01	1.0	1.0	9.47935E-01
PSO	Friedman Aligned	9.59407E-09	1.77121E-08	1.77121E-08	1.77121E-08
PSO	Quade	9.99427E-01	1.0	1.0	9.99427E-01
MABC	Friedman	9.84137E-01	1.0	1.0	9.99973E-01
MABC	Friedman Aligned	2.43064E-01	6.84667E-01	6.59303E-01	5.06830E-01
MABC	Quade	9.99765E-01	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0

Table S14 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	2.43064E-01	6.84667E-01	6.59303E-01	5.06830E-01
GOTLBO	Quade	9.99765E-01	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	9.99765E-01	1.0	1.0	1.0

Table S15. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NNA is the control algorithm, I_{01} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	3.15655E-03	3.16116E-03	3.16116E-03	3.15655E-03
WW	Friedman Aligned	2.84215E-08	8.74507E-08	8.74507E-08	8.74507E-08
WW	Quade	9.67443E-01	1.0	1.0	9.67443E-01
PSO	Friedman	1.67510E-02	3.11464E-02	3.11464E-02	3.07056E-02
PSO	Friedman Aligned	9.00108E-10	2.28489E-09	2.28489E-09	2.28489E-09
PSO	Quade	9.67443E-01	1.0	1.0	9.67443E-01
MABC	Friedman	9.36544E-02	2.46808E-01	2.46808E-01	2.20902E-01
MABC	Friedman Aligned	5.44120E-12	6.05649E-12	6.05649E-12	6.05649E-12
MABC	Quade	9.67711E-01	1.0	1.0	9.99836E-01
ISCA	Friedman	2.23633E-01	7.49303E-01	7.49303E-01	5.41072E-01
ISCA	Friedman Aligned	1.70405E-07	5.89862E-07	5.89862E-07	5.89862E-07
ISCA	Quade	9.67711E-01	1.0	1.0	9.99883E-01
DE	Friedman	5.36748E-01	1.0	1.0	9.41253E-01
DE	Friedman Aligned	9.87042E-01	1.0	1.0	1.0
DE	Quade	9.90483E-01	1.0	1.0	1.0
GOTLBO	Friedman	5.36748E-01	1.0	1.0	9.30303E-01
GOTLBO	Friedman Aligned	5.44120E-12	5.44120E-12	5.44120E-12	5.44120E-12
GOTLBO	Quade	9.67711E-01	1.0	1.0	9.99836E-01
CWOA	Friedman	5.36748E-01	1.0	1.0	9.30303E-01
CWOA	Friedman Aligned	3.24827E-07	1.19936E-06	1.19936E-06	1.19936E-06
CWOA	Quade	9.67711E-01	1.0	1.0	9.99883E-01
NDE	Friedman	5.75197E-01	1.0	1.0	9.57621E-01
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	9.90483E-01	1.0	1.0	1.0

Table S15 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
IJAYA	Friedman	6.44122E-01	1.0	1.0	9.72022E-01
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	9.86183E-01	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S16. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (CWOA is the control algorithm, I_{01} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	1.20537E-01	1.27812E-01	1.27812E-01	1.20537E-01
WW	Friedman Aligned	2.91545E-13	2.91545E-13	2.91545E-13	2.91545E-13
WW	Quade	9.99748E-01	1.0	1.0	9.99748E-01
PSO	Friedman	3.04410E-01	6.51777E-01	6.51777E-01	4.88366E-01
PSO	Friedman Aligned	3.75852E-09	6.93880E-09	6.93880E-09	6.93880E-09
PSO	Quade	9.99748E-01	1.0	1.0	9.99748E-01
MABC	Friedman	6.81406E-01	1.0	1.0	9.45174E-01
MABC	Friedman Aligned	1.76838E-01	4.83063E-01	4.66752E-01	3.89813E-01
MABC	Quade	9.99953E-01	1.0	1.0	1.0
ISCA	Friedman	8.86583E-01	1.0	1.0	9.98766E-01
ISCA	Friedman Aligned	9.96008E-01	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	9.99795E-01	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.76838E-01	4.83063E-01	4.66752E-01	3.89813E-01
GOTLBO	Quade	9.99953E-01	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0

Table S16 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0

Table S17. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (WW is the control algorithm, I_{01} evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBSHADE	Friedman	1.0	1.0	1.0	1.0
EBSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S17 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
PSO	Friedman	1.0	1.0	1.0	1.0
PSO	Friedman Aligned	1.0	1.0	1.0	1.0
PSO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0

Table S18. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (DE is the control algorithm, n_1 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
CWOA	Friedman	9.13669E-07	9.13669E-07	9.13669E-07	9.13669E-07
CWOA	Friedman Aligned	3.17443E-10	9.76748E-10	9.76748E-10	9.76748E-10
CWOA	Quade	4.21326E-01	5.35667E-01	5.35667E-01	4.21326E-01
NNA	Friedman	1.61653E-05	2.98438E-05	2.98438E-05	2.98434E-05
NNA	Friedman Aligned	3.15806E-10	8.01662E-10	8.01662E-10	8.01662E-10
NNA	Quade	4.21326E-01	8.89041E-01	8.89041E-01	6.04273E-01
PSO	Friedman	2.03695E-05	5.17077E-05	5.17077E-05	5.17065E-05
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	4.21326E-01	6.62888E-01	6.62888E-01	4.94345E-01
WW	Friedman	5.48061E-05	1.68637E-04	1.68637E-04	1.68625E-04
WW	Friedman Aligned	2.17279E-09	7.52120E-09	7.52120E-09	7.52120E-09
WW	Quade	4.21326E-01	1.0	1.0	7.59069E-01
ISCA	Friedman	1.94934E-03	6.75178E-03	6.75178E-03	6.73155E-03
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	4.95300E-01	1.0	1.0	9.06235E-01
GOTLBO	Friedman	6.07282E-03	2.24595E-02	2.24595E-02	2.22401E-02
GOTLBO	Friedman Aligned	5.81901E-09	2.14856E-08	2.14856E-08	2.14856E-08
GOTLBO	Quade	6.39735E-01	1.0	1.0	9.76937E-01
MABC	Friedman	1.81819E-02	6.88217E-02	6.88217E-02	6.68248E-02
MABC	Friedman Aligned	3.53249E-07	1.33148E-06	1.33148E-06	1.33148E-06
MABC	Quade	6.39735E-01	1.0	1.0	9.76937E-01
IJAYA	Friedman	9.98394E-01	1.0	1.0	1.0
IJAYA	Friedman Aligned	9.08636E-01	1.0	1.0	9.99854E-01
IJAYA	Quade	9.65203E-01	1.0	1.0	9.99996E-01

Table S18 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S19. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (EBLSHADE is the control algorithm, n_1 evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
CWOA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	2.57175E-03	2.57480E-03	2.57480E-03	2.57175E-03
MABC	Friedman	2.13607E-13	3.94351E-13	3.94351E-13	3.94351E-13
MABC	Friedman Aligned	3.33763E-10	1.25803E-09	1.25803E-09	1.25803E-09
MABC	Quade	2.25210E-02	8.53328E-02	8.53328E-02	8.22748E-02
GOTLBO	Friedman	2.44012E-12	6.19416E-12	6.19416E-12	6.19416E-12
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	2.21704E-02	8.23542E-02	8.23542E-02	7.94473E-02
ISCA	Friedman	1.94065E-11	5.97122E-11	5.97122E-11	5.97122E-11
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	1.04000E-02	3.61159E-02	3.61159E-02	3.55416E-02
WW	Friedman	1.60152E-09	5.54373E-09	5.54373E-09	5.54373E-09
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	4.71779E-03	1.45400E-02	1.45400E-02	1.44453E-02
PSO	Friedman	4.11590E-09	1.51972E-08	1.51972E-08	1.51972E-08
PSO	Friedman Aligned	1.29144E-10	4.47038E-10	4.47038E-10	4.47038E-10
PSO	Quade	2.57175E-03	3.86298E-03	3.86298E-03	3.85615E-03
NNA	Friedman	5.85484E-09	2.20682E-08	2.20682E-08	2.20682E-08
NNA	Friedman Aligned	1.73241E-10	6.39659E-10	6.39659E-10	6.39659E-10
NNA	Quade	2.65209E-03	6.73911E-03	6.73911E-03	6.71851E-03
IJAYA	Friedman	7.80303E-08	2.88112E-07	2.74456E-07	2.88112E-07
IJAYA	Friedman Aligned	8.81170E-06	3.25356E-05	3.25356E-05	3.25351E-05
IJAYA	Quade	1.04801E-01	3.95158E-01	3.95158E-01	3.35534E-01

Table S19 (*continued*)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	7.92873E-08	2.88112E-07	2.74456E-07	2.88112E-07
DE	Friedman Aligned	3.00304E-05	1.03952E-04	1.03952E-04	1.03948E-04
DE	Quade	1.31444E-01	4.64771E-01	4.64771E-01	3.86031E-01
NDE	Friedman	6.84857E-06	2.10725E-05	2.10725E-05	2.10724E-05
NDE	Friedman Aligned	1.50161E-03	4.62113E-03	4.62113E-03	4.61313E-03
NDE	Quade	2.27244E-01	7.19509E-01	7.19509E-01	5.47608E-01
TLBO	Friedman	3.12274E-01	8.14506E-01	8.14506E-01	6.13379E-01
TLBO	Friedman Aligned	7.47586E-01	1.0	1.0	9.69641E-01
TLBO	Quade	7.92910E-01	1.0	1.0	9.81630E-01
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S20. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ADELI is the control algorithm, n_1 evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Friedman Aligned	1.41434E-10	4.89580E-10	4.51671E-10	4.89580E-10
PSO	Quade	9.10568E-04	1.40843E-03	1.40843E-03	1.40752E-03
NNA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Friedman Aligned	1.41434E-10	4.89580E-10	4.51671E-10	4.89580E-10
NNA	Quade	1.00825E-03	2.56039E-03	2.56039E-03	2.55742E-03
CWOA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	9.10568E-04	9.10951E-04	9.10951E-04	9.10568E-04
MABC	Friedman	2.70184E-12	8.31335E-12	8.31335E-12	8.31335E-12
MABC	Friedman Aligned	1.75948E-09	6.63187E-09	6.63187E-09	6.63187E-09
MABC	Quade	1.06705E-02	4.03192E-02	4.03192E-02	3.96291E-02
GOTLBO	Friedman	2.50012E-11	8.65428E-11	8.65428E-11	8.65428E-11
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	1.03648E-02	3.83774E-02	3.83774E-02	3.77392E-02
ISCA	Friedman	1.56474E-10	5.77749E-10	5.77749E-10	5.77749E-10
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	4.51230E-03	1.56412E-02	1.56412E-02	1.55329E-02
IJAYA	Friedman	5.89865E-09	2.22334E-08	1.97169E-08	2.22334E-08
IJAYA	Friedman Aligned	1.36159E-06	5.02741E-06	5.02741E-06	5.02740E-06
IJAYA	Quade	5.82602E-02	2.17592E-01	2.17592E-01	1.98793E-01
DE	Friedman	5.96217E-09	2.22334E-08	1.97169E-08	2.22334E-08
DE	Friedman Aligned	5.16020E-06	1.78623E-05	1.78623E-05	1.78621E-05
DE	Quade	7.57041E-02	2.65210E-01	2.65210E-01	2.38529E-01

Table S20 (*continued*)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
WW	Friedman	5.96217E-09	2.22334E-08	1.97169E-08	2.22334E-08
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	1.90142E-03	5.85437E-03	5.85437E-03	5.83897E-03
NDE	Friedman	6.71920E-07	2.06745E-06	2.06745E-06	2.06745E-06
NDE	Friedman Aligned	3.70876E-04	1.14121E-03	1.14121E-03	1.14072E-03
NDE	Quade	1.41276E-01	4.42227E-01	4.42227E-01	3.74146E-01
TLBO	Friedman	1.37223E-01	3.52222E-01	3.52222E-01	3.12487E-01
TLBO	Friedman Aligned	4.91056E-01	1.0	1.0	8.19950E-01
TLBO	Quade	6.15068E-01	1.0	9.33437E-01	9.11384E-01
EBLSHADE	Friedman	6.70491E-01	1.0	8.29657E-01	8.71202E-01
EBLSHADE	Friedman Aligned	7.33523E-01	1.0	1.0	9.12968E-01
EBLSHADE	Quade	8.24213E-01	1.0	9.33437E-01	9.59624E-01
STLBO	Friedman	8.29657E-01	1.0	8.29657E-01	8.71202E-01
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	9.33437E-01	1.0	9.33437E-01	9.59624E-01

Table S21. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NDE is the control algorithm, n_1 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
CWOA	Friedman	4.80155E-09	4.80155E-09	4.80155E-09	4.80155E-09
CWOA	Friedman Aligned	3.03064E-10	1.01341E-09	1.01341E-09	1.01341E-09
CWOA	Quade	2.02938E-01	2.24855E-01	2.24855E-01	2.02938E-01
NNA	Friedman	1.48126E-07	2.73464E-07	2.73464E-07	2.73464E-07
NNA	Friedman Aligned	3.03064E-10	9.32505E-10	9.32505E-10	9.32505E-10
NNA	Quade	2.02938E-01	4.07942E-01	4.07942E-01	3.40121E-01
PSO	Friedman	2.08081E-07	5.28205E-07	5.28205E-07	5.28205E-07
PSO	Friedman Aligned	4.93547E-11	1.25285E-10	1.25285E-10	1.25285E-10
PSO	Quade	2.02938E-01	2.88952E-01	2.88952E-01	2.53595E-01
WW	Friedman	6.93545E-07	2.13398E-06	2.13398E-06	2.13398E-06
WW	Friedman Aligned	1.17732E-08	4.43760E-08	4.43760E-08	4.43760E-08
WW	Quade	2.02938E-01	6.53907E-01	6.53907E-01	4.91488E-01
ISCA	Friedman	5.43490E-05	1.88134E-04	1.88134E-04	1.88118E-04
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	2.92346E-01	1.0	1.0	6.97900E-01
GOTLBO	Friedman	2.33350E-04	8.61656E-04	8.61656E-04	8.61331E-04
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	4.17424E-01	1.0	1.0	8.63978E-01
MABC	Friedman	9.80244E-04	3.69560E-03	3.69560E-03	3.68975E-03
MABC	Friedman Aligned	1.16884E-09	4.31572E-09	4.31572E-09	4.31572E-09
MABC	Quade	4.17424E-01	1.0	1.0	8.63978E-01
DE	Friedman	5.20298E-01	1.0	1.0	9.33618E-01
DE	Friedman Aligned	4.19991E-01	1.0	1.0	8.48253E-01
DE	Quade	8.52896E-01	1.0	1.0	9.98686E-01

Table S21 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
IJAYA	Friedman	5.20298E-01	1.0	1.0	9.33618E-01
IJAYA	Friedman Aligned	2.96026E-01	1.0	1.0	7.26390E-01
IJAYA	Quade	7.90937E-01	1.0	1.0	9.96908E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S22. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (MABC is the control algorithm, n_1 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
CWOA	Friedman	6.27529E-02	6.46470E-02	6.46470E-02	6.27529E-02
CWOA	Friedman Aligned	3.90675E-11	1.35234E-10	1.35234E-10	1.35234E-10
CWOA	Quade	9.63252E-01	1.0	1.0	9.63252E-01
PSO	Friedman	1.98011E-01	5.05235E-01	5.05235E-01	4.03816E-01
PSO	Friedman Aligned	8.64602E-09	3.19237E-08	3.19237E-08	3.19237E-08
PSO	Quade	9.63252E-01	1.0	1.0	9.79096E-01
NNA	Friedman	1.98011E-01	4.00536E-01	4.00536E-01	3.34604E-01
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	9.63252E-01	1.0	1.0	9.92351E-01
WW	Friedman	2.51369E-01	8.52274E-01	8.52274E-01	5.89672E-01
WW	Friedman Aligned	3.28118E-11	1.00959E-10	1.00959E-10	1.00959E-10
WW	Quade	9.63252E-01	1.0	1.0	9.98990E-01
ISCA	Friedman	7.68325E-01	1.0	1.0	9.93668E-01
ISCA	Friedman Aligned	7.18181E-12	1.82308E-11	1.82308E-11	1.82308E-11
ISCA	Quade	9.63252E-01	1.0	1.0	9.99986E-01
GOTLBO	Friedman	9.17851E-01	1.0	1.0	9.99902E-01
GOTLBO	Friedman Aligned	1.29896E-12	2.39808E-12	2.39808E-12	2.39808E-12
GOTLBO	Quade	9.98660E-01	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0

Table S22 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S23. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (TLBO is the control algorithm, n_1 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
ISCA	Friedman	2.30926E-13	2.30926E-13	2.30926E-13	2.30926E-13
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	2.85517E-02	9.97146E-02	9.97146E-02	9.54079E-02
GOTLBO	Friedman	1.76370E-12	3.25606E-12	3.25606E-12	3.25606E-12
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	5.51141E-02	2.06606E-01	2.06606E-01	1.88865E-01
WW	Friedman	9.56997E-12	2.42930E-11	2.42930E-11	2.42930E-11
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	1.42835E-02	4.41684E-02	4.41684E-02	4.33008E-02
MABC	Friedman	1.61944E-11	4.98290E-11	4.98290E-11	4.98290E-11
MABC	Friedman Aligned	6.35232E-11	2.19888E-10	2.19888E-10	2.19888E-10
MABC	Quade	5.51141E-02	2.10249E-01	2.10249E-01	1.92225E-01
PSO	Friedman	2.85766E-11	9.89189E-11	9.89189E-11	9.89189E-11
PSO	Friedman Aligned	9.31095E-11	3.43789E-10	3.43789E-10	3.43789E-10
PSO	Quade	9.23007E-03	1.33680E-02	1.33680E-02	1.32864E-02
NNA	Friedman	4.87447E-11	1.79980E-10	1.79980E-10	1.79980E-10
NNA	Friedman Aligned	1.82343E-10	6.87292E-10	6.87292E-10	6.87292E-10
NNA	Quade	9.23007E-03	2.20922E-02	2.20922E-02	2.18717E-02
CWOA	Friedman	1.08691E-09	4.09682E-09	4.09682E-09	4.09682E-09
CWOA	Friedman Aligned	3.22900E-11	9.93539E-11	9.93539E-11	9.93539E-11
CWOA	Quade	9.23007E-03	9.26962E-03	9.26962E-03	9.23007E-03
DE	Friedman	2.08871E-05	7.71220E-05	7.16714E-05	7.71195E-05
DE	Friedman Aligned	1.67354E-04	5.79317E-04	5.79317E-04	5.79183E-04
DE	Quade	2.48241E-01	8.96274E-01	8.96274E-01	6.27573E-01

Table S23 (*continued*)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
IJAYA	Friedman	2.08871E-05	7.71220E-05	7.16714E-05	7.71195E-05
IJAYA	Friedman Aligned	5.49245E-05	2.02800E-04	2.02800E-04	2.02783E-04
IJAYA	Quade	2.06971E-01	7.97941E-01	7.97941E-01	5.75239E-01
NDE	Friedman	7.17418E-04	2.20762E-03	2.20762E-03	2.20580E-03
NDE	Friedman Aligned	5.71229E-03	1.75879E-02	1.75879E-02	1.74722E-02
NDE	Quade	3.88843E-01	1.0	1.0	7.80209E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S24. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (GOTLBO is the control algorithm, n_1 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
CWOA	Friedman	1.92232E-01	2.11737E-01	2.11737E-01	1.92232E-01
CWOA	Friedman Aligned	6.82306E-09	1.25964E-08	1.25964E-08	1.25964E-08
CWOA	Quade	9.75324E-01	1.0	1.0	9.75324E-01
PSO	Friedman	4.39552E-01	1.0	1.0	7.28974E-01
PSO	Friedman Aligned	2.73702E-07	6.94782E-07	6.94782E-07	6.94781E-07
PSO	Quade	9.75324E-01	1.0	1.0	9.86727E-01
NNA	Friedman	4.39552E-01	1.0	1.0	6.56634E-01
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	9.75324E-01	1.0	1.0	9.95625E-01
WW	Friedman	4.92980E-01	1.0	1.0	8.76296E-01
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	9.75324E-01	1.0	1.0	9.99544E-01
ISCA	Friedman	9.57091E-01	1.0	1.0	9.99982E-01
ISCA	Friedman Aligned	5.54018E-01	1.0	1.0	9.16636E-01
ISCA	Quade	9.75324E-01	1.0	1.0	9.99997E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0

Table S24 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S25. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (STLBO is the control algorithm, n_1 evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
CWOA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	1.28896E-03	1.28973E-03	1.28973E-03	1.28896E-03
MABC	Friedman	1.27587E-12	2.35545E-12	2.35545E-12	2.35545E-12
MABC	Friedman Aligned	1.75948E-09	6.63187E-09	6.63187E-09	6.63187E-09
MABC	Quade	1.37262E-02	5.19022E-02	5.19022E-02	5.07619E-02
GOTLBO	Friedman	1.19004E-11	3.02087E-11	3.02087E-11	3.02087E-11
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	1.33923E-02	4.96280E-02	4.96280E-02	4.85638E-02
ISCA	Friedman	7.79167E-11	2.39744E-10	2.39744E-10	2.39744E-10
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	5.97483E-03	2.07202E-02	2.07202E-02	2.05304E-02
WW	Friedman	4.49481E-09	1.55589E-08	1.55589E-08	1.55589E-08
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	2.57937E-03	7.94361E-03	7.94361E-03	7.91528E-03
PSO	Friedman	1.06456E-08	3.93067E-08	3.93067E-08	3.93067E-08
PSO	Friedman Aligned	1.41434E-10	4.89580E-10	4.51671E-10	4.89580E-10
PSO	Quade	1.28896E-03	1.97444E-03	1.97444E-03	1.97266E-03
NNA	Friedman	1.46074E-08	5.50586E-08	5.50586E-08	5.50586E-08
NNA	Friedman Aligned	1.41434E-10	4.89580E-10	4.51671E-10	4.89580E-10
NNA	Quade	1.39422E-03	3.54107E-03	3.54107E-03	3.53537E-03
IJAYA	Friedman	1.85427E-08	6.84653E-08	6.55898E-08	6.84653E-08
IJAYA	Friedman Aligned	1.36159E-06	5.02741E-06	5.02741E-06	5.02740E-06
IJAYA	Quade	7.11225E-02	2.66321E-01	2.66321E-01	2.38460E-01

Table S25 (*continued*)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	1.89482E-08	6.84653E-08	6.55898E-08	6.84653E-08
DE	Friedman Aligned	5.16020E-06	1.78623E-05	1.78623E-05	1.78621E-05
DE	Quade	9.13398E-02	3.20806E-01	3.20806E-01	2.82197E-01
NDE	Friedman	2.01368E-06	6.19594E-06	6.19594E-06	6.19592E-06
NDE	Friedman Aligned	3.70876E-04	1.14121E-03	1.14121E-03	1.14072E-03
NDE	Quade	1.66209E-01	5.21958E-01	5.21958E-01	4.28391E-01
TLBO	Friedman	2.05435E-01	5.30463E-01	5.30463E-01	4.42194E-01
TLBO	Friedman Aligned	4.91056E-01	1.0	1.0	8.19950E-01
TLBO	Quade	6.72809E-01	1.0	1.0	9.41340E-01
EBLSHADE	Friedman	8.26822E-01	1.0	1.0	9.60723E-01
EBLSHADE	Friedman Aligned	7.33523E-01	1.0	1.0	9.12968E-01
EBLSHADE	Quade	8.85007E-01	1.0	1.0	9.81556E-01
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0

Table S26. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (PSO is the control algorithm, n_1 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
CWOA	Friedman	9.99088E-01	1.0	1.0	9.99088E-01
CWOA	Friedman Aligned	2.64607E-10	2.64607E-10	2.64607E-10	2.64607E-10
CWOA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	2.86786E-07	5.29452E-07	5.29452E-07	5.29452E-07
NNA	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0

Table S26 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S27. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (IJAYA is the control algorithm, n_1 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
CWOA	Friedman	1.04337E-06	1.04337E-06	1.04337E-06	1.04337E-06
CWOA	Friedman Aligned	2.99270E-10	9.20832E-10	9.20832E-10	9.20832E-10
CWOA	Quade	5.51537E-01	7.77695E-01	7.77695E-01	5.51537E-01
NNA	Friedman	1.81715E-05	3.35477E-05	3.35477E-05	3.35472E-05
NNA	Friedman Aligned	2.90478E-10	7.37368E-10	7.37368E-10	7.37368E-10
NNA	Quade	5.51537E-01	1.0	1.0	7.31301E-01
PSO	Friedman	2.28284E-05	5.79495E-05	5.79495E-05	5.79480E-05
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	5.51537E-01	9.45753E-01	9.45753E-01	6.26599E-01
WW	Friedman	6.10355E-05	1.87806E-04	1.87806E-04	1.87790E-04
WW	Friedman Aligned	1.09380E-09	3.78623E-09	3.78623E-09	3.78623E-09
WW	Quade	5.51537E-01	1.0	1.0	8.60596E-01
ISCA	Friedman	2.12534E-03	7.36176E-03	7.36176E-03	7.33772E-03
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	6.03485E-01	1.0	1.0	9.59322E-01
GOTLBO	Friedman	6.56427E-03	2.42803E-02	2.42803E-02	2.40239E-02
GOTLBO	Friedman Aligned	3.19607E-09	1.18009E-08	1.18009E-08	1.18009E-08
GOTLBO	Quade	7.44807E-01	1.0	1.0	9.93544E-01
MABC	Friedman	1.94748E-02	7.37379E-02	7.37379E-02	7.14482E-02
MABC	Friedman Aligned	1.63074E-06	6.14664E-06	6.14664E-06	6.14663E-06
MABC	Quade	7.44807E-01	1.0	1.0	9.93544E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0

Table S27 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S28. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ISCA is the control algorithm, n_1 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
CWOA	Friedman	4.38236E-01	5.64070E-01	5.64070E-01	4.38236E-01
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	9.98650E-01	1.0	1.0	9.98650E-01
PSO	Friedman	7.26197E-01	1.0	1.0	9.41422E-01
PSO	Friedman Aligned	1.22720E-04	3.11535E-04	3.11535E-04	3.11491E-04
PSO	Quade	9.98650E-01	1.0	1.0	9.99526E-01
NNA	Friedman	7.26197E-01	1.0	1.0	9.08499E-01
NNA	Friedman Aligned	2.86687E-09	5.29268E-09	5.29268E-09	5.29268E-09
NNA	Quade	9.98650E-01	1.0	1.0	9.99934E-01
WW	Friedman	7.54881E-01	1.0	1.0	9.86782E-01
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	9.98650E-01	1.0	1.0	9.99999E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0

Table S28 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S29. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NNA is the control algorithm, n_1 evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
CWOA	Friedman	9.99864E-01	1.0	1.0	9.99864E-01
CWOA	Friedman Aligned	9.57403E-01	1.0	1.0	9.57403E-01
CWOA	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBSHADE	Friedman	1.0	1.0	1.0	1.0
EBSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0

Table S29 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
PSO	Friedman	1.0	1.0	1.0	1.0
PSO	Friedman Aligned	1.0	1.0	1.0	1.0
PSO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S30. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (CWOA is the control algorithm, n_1 evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S30 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
PSO	Friedman	1.0	1.0	1.0	1.0
PSO	Friedman Aligned	1.0	1.0	1.0	1.0
PSO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S31. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (WW is the control algorithm, n_1 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
CWOA	Friedman	9.85182E-01	1.0	1.0	9.85182E-01
CWOA	Friedman Aligned	1.67199E-08	3.60651E-08	3.60651E-08	3.60651E-08
CWOA	Quade	9.99991E-01	1.0	1.0	9.99991E-01
PSO	Friedman	9.99446E-01	1.0	1.0	1.0
PSO	Friedman Aligned	1.67199E-08	3.08676E-08	3.08676E-08	3.08676E-08
PSO	Quade	9.99991E-01	1.0	1.0	9.99999E-01
NNA	Friedman	9.99446E-01	1.0	1.0	9.99999E-01
NNA	Friedman Aligned	2.58561E-09	2.58561E-09	2.58561E-09	2.58561E-09
NNA	Quade	9.99991E-01	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0

Table S31 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	8.96669E-01	1.0	1.0	9.99613E-01
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	2.25568E-01	7.56404E-01	7.56404E-01	5.44583E-01
ISCA	Quade	1.0	1.0	1.0	1.0

Table S32. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (DE is the control algorithm, R_{p1} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
GOTLBO	Friedman	1.58394E-05	1.58395E-05	1.58395E-05	1.58394E-05
GOTLBO	Friedman Aligned	1.10556E-12	2.04103E-12	2.04103E-12	2.04103E-12
GOTLBO	Quade	6.53381E-01	1.0	1.0	7.22069E-01
PSO	Friedman	2.04155E-05	3.76906E-05	3.76906E-05	3.76899E-05
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	6.53381E-01	1.0	1.0	6.53381E-01
ISCA	Friedman	4.72466E-05	1.19936E-04	1.19936E-04	1.19929E-04
ISCA	Friedman Aligned	1.10556E-12	2.72826E-12	2.72826E-12	2.72826E-12
ISCA	Quade	6.53381E-01	1.0	1.0	7.12615E-01
NNA	Friedman	4.72466E-05	1.35747E-04	1.35747E-04	1.35739E-04
NNA	Friedman Aligned	1.10556E-12	2.75335E-12	2.75335E-12	2.75335E-12
NNA	Quade	6.53381E-01	1.0	1.0	7.22069E-01
CWOA	Friedman	6.04602E-05	2.09289E-04	2.09289E-04	2.09270E-04
CWOA	Friedman Aligned	6.56553E-10	2.27268E-09	2.27268E-09	2.27268E-09
CWOA	Quade	6.53381E-01	1.0	1.0	7.63921E-01
WW	Friedman	2.94224E-03	1.08723E-02	1.08723E-02	1.08207E-02
WW	Friedman Aligned	1.94472E-05	7.18054E-05	7.18054E-05	7.18031E-05
WW	Quade	6.53381E-01	1.0	1.0	9.31924E-01
MABC	Friedman	2.85543E-01	1.0	1.0	7.18420E-01
MABC	Friedman Aligned	5.68648E-01	1.0	1.0	9.57966E-01
MABC	Quade	7.47708E-01	1.0	1.0	9.94433E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0

Table S32 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	9.98751E-01	1.0	1.0	1.0

Table S33. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (EBLSHADE is the control algorithm, R_{p1} evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
GOTLBO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Friedman Aligned	1.40443E-09	4.32133E-09	4.32133E-09	4.32133E-09
GOTLBO	Quade	2.61275E-03	4.15154E-03	3.95252E-03	4.14372E-03
PSO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	2.61275E-03	2.61590E-03	2.61590E-03	2.61275E-03
MABC	Friedman	1.66844E-12	4.23528E-12	4.23528E-12	4.23528E-12
MABC	Friedman Aligned	1.97530E-05	7.44541E-05	7.44541E-05	7.44517E-05
MABC	Quade	1.75248E-02	6.63245E-02	6.63245E-02	6.44687E-02
WW	Friedman	9.41487E-11	2.89688E-10	2.89688E-10	2.89688E-10
WW	Friedman Aligned	<1E-13	2.10054E-13	2.10054E-13	2.10054E-13
WW	Quade	5.37659E-03	1.98809E-02	1.98809E-02	1.97088E-02
CWOA	Friedman	7.48653E-09	2.59149E-08	2.59149E-08	2.59149E-08
CWOA	Friedman Aligned	1.94632E-09	7.18643E-09	7.18643E-09	7.18643E-09
CWOA	Quade	2.61275E-03	6.00747E-03	6.00747E-03	5.99146E-03
DE	Friedman	8.54237E-09	3.15410E-08	3.15118E-08	3.15410E-08
DE	Friedman Aligned	7.66528E-04	2.83067E-03	2.83067E-03	2.82734E-03
DE	Quade	7.68637E-02	2.88156E-01	2.51938E-01	2.55695E-01
NNA	Friedman	8.54237E-09	3.15410E-08	3.15118E-08	3.15410E-08
NNA	Friedman Aligned	1.40443E-09	4.60157E-09	4.60157E-09	4.60157E-09
NNA	Quade	2.61275E-03	4.15154E-03	3.95252E-03	4.14372E-03
ISCA	Friedman	8.70900E-09	3.21563E-08	3.21563E-08	3.21563E-08
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	2.61275E-03	3.70459E-03	3.70459E-03	3.69830E-03

Table S33 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
IJAYA	Friedman	1.00756E-08	3.48770E-08	3.48770E-08	3.48770E-08
IJAYA	Friedman Aligned	1.77340E-03	6.14036E-03	6.14036E-03	6.12529E-03
IJAYA	Quade	7.68637E-02	2.88156E-01	2.51938E-01	2.55695E-01
NDE	Friedman	4.85736E-06	1.49457E-05	1.49457E-05	1.49457E-05
NDE	Friedman Aligned	6.70249E-02	2.07871E-01	2.07871E-01	1.92221E-01
NDE	Quade	1.61095E-01	5.05559E-01	5.05559E-01	4.17534E-01
TLBO	Friedman	2.01098E-01	5.19063E-01	5.19063E-01	4.34434E-01
TLBO	Friedman Aligned	7.84943E-01	1.0	1.0	9.79783E-01
TLBO	Quade	7.20831E-01	1.0	1.0	9.60794E-01
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S34. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ADELI is the control algorithm, R_{p^1} evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
GOTLBO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Friedman Aligned	2.23361E-09	6.87266E-09	6.87266E-09	6.87266E-09
GOTLBO	Quade	2.57827E-03	4.09880E-03	3.90245E-03	4.09117E-03
PSO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	2.57827E-03	2.58134E-03	2.58134E-03	2.57827E-03
MABC	Friedman	6.35048E-13	1.61204E-12	1.61204E-12	1.61204E-12
MABC	Friedman Aligned	7.88131E-06	2.97065E-05	2.97065E-05	2.97062E-05
MABC	Quade	1.73550E-02	6.56791E-02	6.56791E-02	6.38590E-02
WW	Friedman	1.84926E-10	5.69003E-10	5.69003E-10	5.69003E-10
WW	Friedman Aligned	3.15599E-13	8.01137E-13	8.01137E-13	8.01137E-13
WW	Quade	5.31725E-03	1.96611E-02	1.96611E-02	1.94928E-02
DE	Friedman	4.61292E-09	1.59678E-08	1.59678E-08	1.59678E-08
DE	Friedman Aligned	3.62181E-04	1.33738E-03	1.33738E-03	1.33663E-03
DE	Quade	7.62673E-02	2.85885E-01	2.49968E-01	2.53918E-01
IJAYA	Friedman	6.88175E-09	2.54096E-08	2.54096E-08	2.54096E-08
IJAYA	Friedman Aligned	8.79672E-04	3.04543E-03	3.04543E-03	3.04172E-03
IJAYA	Quade	7.62673E-02	2.85885E-01	2.49968E-01	2.53918E-01
CWOA	Friedman	8.73483E-09	3.29236E-08	3.29236E-08	3.29236E-08
CWOA	Friedman Aligned	4.27917E-09	1.58000E-08	1.58000E-08	1.58000E-08
CWOA	Quade	2.57827E-03	5.93402E-03	5.93402E-03	5.91840E-03
NNA	Friedman	1.17491E-08	4.33811E-08	4.27586E-08	4.33811E-08
NNA	Friedman Aligned	2.23361E-09	7.25937E-09	7.25937E-09	7.25937E-09
NNA	Quade	2.57827E-03	4.09880E-03	3.90245E-03	4.09117E-03

Table S34 (*continued*)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
ISCA	Friedman	1.23525E-08	4.33811E-08	4.27586E-08	4.33811E-08
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	2.57827E-03	3.65691E-03	3.65691E-03	3.65079E-03
NDE	Friedman	2.55436E-06	7.85957E-06	7.85957E-06	7.85955E-06
NDE	Friedman Aligned	4.19953E-02	1.29854E-01	1.29854E-01	1.23666E-01
NDE	Quade	1.60056E-01	5.02233E-01	5.02233E-01	4.15313E-01
TLBO	Friedman	1.57702E-01	4.05499E-01	4.05499E-01	3.53159E-01
TLBO	Friedman Aligned	6.48054E-01	1.0	1.0	9.29409E-01
TLBO	Quade	7.18467E-01	1.0	1.0	9.59945E-01
EBLSHADE	Friedman	9.13338E-01	1.0	9.23824E-01	9.89059E-01
EBLSHADE	Friedman Aligned	8.67482E-01	1.0	1.0	9.76034E-01
EBLSHADE	Quade	9.98363E-01	1.0	1.0	9.99993E-01
STLBO	Friedman	9.23824E-01	1.0	9.23824E-01	9.89059E-01
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S35. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NDE is the control algorithm, R_{p1} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
GOTLBO	Friedman	1.27739E-08	1.27739E-08	1.27739E-08	1.27739E-08
GOTLBO	Friedman Aligned	2.60296E-09	8.00911E-09	8.00911E-09	8.00911E-09
GOTLBO	Quade	3.14219E-01	4.69400E-01	4.39320E-01	3.81037E-01
PSO	Friedman	2.06453E-08	3.81143E-08	3.81143E-08	3.81143E-08
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	3.14219E-01	3.71777E-01	3.71777E-01	3.14219E-01
ISCA	Friedman	6.53133E-08	1.65795E-07	1.65795E-07	1.65795E-07
ISCA	Friedman Aligned	4.15456E-11	1.05462E-10	1.05462E-10	1.05462E-10
ISCA	Quade	3.14219E-01	4.50989E-01	4.39320E-01	3.68516E-01
NNA	Friedman	6.53133E-08	1.98658E-07	1.98658E-07	1.98658E-07
NNA	Friedman Aligned	2.77977E-09	9.62227E-09	9.62227E-09	9.62227E-09
NNA	Quade	3.14219E-01	4.69400E-01	4.39320E-01	3.81037E-01
CWOA	Friedman	1.02048E-07	3.53244E-07	3.53244E-07	3.53244E-07
CWOA	Friedman Aligned	<1E-13	1.78524E-13	1.78524E-13	1.78524E-13
CWOA	Quade	3.14219E-01	5.48252E-01	5.48252E-01	4.32016E-01
WW	Friedman	1.69355E-05	6.25314E-05	6.25314E-05	6.25297E-05
WW	Friedman Aligned	4.63527E-09	1.71148E-08	1.71148E-08	1.71148E-08
WW	Quade	3.14219E-01	1.0	1.0	6.85077E-01
MABC	Friedman	1.47478E-02	5.57785E-02	5.57785E-02	5.44627E-02
MABC	Friedman Aligned	2.56191E-02	9.71425E-02	9.71425E-02	9.31905E-02
MABC	Quade	4.65703E-01	1.0	1.0	9.05822E-01
DE	Friedman	3.11442E-01	1.0	1.0	7.47869E-01
DE	Friedman Aligned	1.88248E-01	7.22700E-01	7.22700E-01	5.37019E-01
DE	Quade	8.21502E-01	1.0	1.0	9.98275E-01

Table S35 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
IJAYA	Friedman	3.29145E-01	1.0	1.0	7.48888E-01
IJAYA	Friedman Aligned	2.72182E-01	9.87202E-01	9.87202E-01	6.67044E-01
IJAYA	Quade	8.21502E-01	1.0	1.0	9.98275E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S36. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (MABC is the control algorithm, R_{p1} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
GOTLBO	Friedman	6.84156E-03	6.86326E-03	6.86326E-03	6.84156E-03
GOTLBO	Friedman Aligned	1.87628E-12	2.89635E-12	2.89635E-12	2.89635E-12
GOTLBO	Quade	9.80537E-01	1.0	1.0	9.89041E-01
PSO	Friedman	6.84988E-03	1.26827E-02	1.26827E-02	1.26093E-02
PSO	Friedman Aligned	7.99504E-09	2.46001E-08	2.46001E-08	2.46001E-08
PSO	Quade	9.80537E-01	1.0	1.0	9.80537E-01
ISCA	Friedman	1.11987E-02	2.85508E-02	2.85508E-02	2.81832E-02
ISCA	Friedman Aligned	5.83509E-10	1.48121E-09	1.48121E-09	1.48121E-09
ISCA	Quade	9.80537E-01	1.0	1.0	9.88524E-01
NNA	Friedman	1.11987E-02	3.03504E-02	3.03504E-02	2.99392E-02
NNA	Friedman Aligned	1.87628E-12	1.87628E-12	1.87628E-12	1.87628E-12
NNA	Quade	9.80537E-01	1.0	1.0	9.89041E-01
CWOA	Friedman	1.15188E-02	4.00150E-02	4.00150E-02	3.93107E-02
CWOA	Friedman Aligned	1.52119E-07	5.26565E-07	5.26565E-07	5.26565E-07
CWOA	Quade	9.80537E-01	1.0	1.0	9.92456E-01
WW	Friedman	1.44016E-01	5.54046E-01	5.54046E-01	4.36826E-01
WW	Friedman Aligned	8.90158E-04	3.28753E-03	3.28753E-03	3.28280E-03
WW	Quade	9.80537E-01	1.0	1.0	9.99848E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0

Table S36 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S37. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (TLBO is the control algorithm, R_{p1} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	2.04947E-13	2.04947E-13	2.04947E-13	2.04947E-13
WW	Friedman Aligned	1.71270E-13	4.34763E-13	4.34763E-13	4.34763E-13
WW	Quade	2.09412E-02	7.77621E-02	7.77621E-02	7.51674E-02
CWOA	Friedman	2.93825E-11	5.42446E-11	5.42446E-11	5.42446E-11
CWOA	Friedman Aligned	5.78031E-10	1.77856E-09	1.71036E-09	1.77856E-09
CWOA	Quade	1.35083E-02	2.74130E-02	2.74130E-02	2.70814E-02
ISCA	Friedman	3.89592E-11	1.17459E-10	1.17459E-10	1.17459E-10
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	1.35083E-02	1.83968E-02	1.83968E-02	1.82425E-02
NNA	Friedman	3.89592E-11	9.88964E-11	9.88964E-11	9.88964E-11
NNA	Friedman Aligned	5.78031E-10	1.77856E-09	1.71036E-09	1.77856E-09
NNA	Quade	1.35083E-02	2.01743E-02	1.91111E-02	1.99904E-02
PSO	Friedman	1.23417E-10	4.27212E-10	4.27212E-10	4.27212E-10
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	1.35083E-02	1.35932E-02	1.35932E-02	1.35083E-02
GOTLBO	Friedman	2.64018E-10	9.74834E-10	9.74834E-10	9.74834E-10
GOTLBO	Friedman Aligned	5.78031E-10	1.77856E-09	1.71036E-09	1.77856E-09
GOTLBO	Quade	1.35083E-02	2.01743E-02	1.91111E-02	1.99904E-02
MABC	Friedman	6.34021E-09	2.38977E-08	2.38977E-08	2.38977E-08
MABC	Friedman Aligned	9.29163E-05	3.50231E-04	3.50231E-04	3.50178E-04
MABC	Quade	5.71120E-02	2.18187E-01	2.18187E-01	1.98812E-01
DE	Friedman	9.58882E-06	3.54050E-05	3.54050E-05	3.54044E-05
DE	Friedman Aligned	2.67052E-03	9.86544E-03	9.86544E-03	9.82497E-03
DE	Quade	1.93779E-01	7.44857E-01	6.46164E-01	5.48560E-01

Table S37 (*continued*)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
IJAYA	Friedman	1.33429E-05	4.61871E-05	4.61871E-05	4.61862E-05
IJAYA	Friedman Aligned	5.66798E-03	1.96371E-02	1.96371E-02	1.94834E-02
IJAYA	Quade	1.93779E-01	7.44857E-01	6.46164E-01	5.48560E-01
NDE	Friedman	1.43301E-03	4.40998E-03	4.40998E-03	4.40270E-03
NDE	Friedman Aligned	1.41455E-01	4.42799E-01	4.42799E-01	3.74549E-01
NDE	Quade	3.43054E-01	1.0	1.0	7.25493E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S38. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (GOTLBO is the control algorithm, R_{p1} evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
PSO	Friedman	1.0	1.0	1.0	1.0
PSO	Friedman Aligned	2.72905E-06	2.72905E-06	2.72905E-06	2.72905E-06
PSO	Quade	1.0	1.0	1.0	1.0

Table S38 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S39. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (STLBO is the control algorithm, R_{p1} evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
GOTLBO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Friedman Aligned	2.23361E-09	6.87266E-09	6.87266E-09	6.87266E-09
GOTLBO	Quade	2.38776E-03	3.80690E-03	3.62535E-03	3.80032E-03
PSO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	2.38776E-03	2.39040E-03	2.39040E-03	2.38776E-03
MABC	Friedman	1.28357E-12	3.25828E-12	3.25828E-12	3.25828E-12
MABC	Friedman Aligned	7.88131E-06	2.97065E-05	2.97065E-05	2.97062E-05
MABC	Quade	1.64044E-02	6.20680E-02	6.20680E-02	6.04412E-02
WW	Friedman	1.13508E-10	3.49256E-10	3.49256E-10	3.49256E-10
WW	Friedman Aligned	3.15599E-13	8.01137E-13	8.01137E-13	8.01137E-13
WW	Quade	4.98681E-03	1.84376E-02	1.84376E-02	1.82896E-02
DE	Friedman	8.25810E-09	2.85857E-08	2.63838E-08	2.85857E-08
DE	Friedman Aligned	3.62181E-04	1.33738E-03	1.33738E-03	1.33663E-03
DE	Quade	7.29045E-02	2.73093E-01	2.38867E-01	2.43841E-01
CWOA	Friedman	8.25810E-09	2.85857E-08	2.63838E-08	2.85857E-08
CWOA	Friedman Aligned	4.27917E-09	1.58000E-08	1.58000E-08	1.58000E-08
CWOA	Quade	2.38776E-03	5.52683E-03	5.52683E-03	5.51327E-03
IJAYA	Friedman	9.53069E-09	3.59234E-08	3.04931E-08	3.59234E-08
IJAYA	Friedman Aligned	8.79672E-04	3.04543E-03	3.04543E-03	3.04172E-03
IJAYA	Quade	7.29045E-02	2.73093E-01	2.38867E-01	2.43841E-01
ISCA	Friedman	9.53069E-09	3.59234E-08	3.04931E-08	3.59234E-08
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	2.38776E-03	3.39323E-03	3.39323E-03	3.38795E-03

Table S39 (*continued*)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
NNA	Friedman	9.53069E-09	3.59234E-08	3.04931E-08	3.59234E-08
NNA	Friedman Aligned	2.23361E-09	7.25937E-09	7.25937E-09	7.25937E-09
NNA	Quade	2.38776E-03	3.80690E-03	3.62535E-03	3.80032E-03
NDE	Friedman	4.08314E-06	1.25635E-05	1.25635E-05	1.25635E-05
NDE	Friedman Aligned	4.19953E-02	1.29854E-01	1.29854E-01	1.23666E-01
NDE	Quade	1.54173E-01	4.83401E-01	4.83401E-01	4.02619E-01
TLBO	Friedman	1.88486E-01	4.85963E-01	4.85963E-01	4.11494E-01
TLBO	Friedman Aligned	6.48054E-01	1.0	1.0	9.29409E-01
TLBO	Quade	7.04858E-01	1.0	9.84554E-01	9.54846E-01
EBLSHADE	Friedman	9.78729E-01	1.0	1.0	9.99182E-01
EBLSHADE	Friedman Aligned	8.67482E-01	1.0	1.0	9.76034E-01
EBLSHADE	Quade	9.87023E-01	1.0	9.84554E-01	9.99671E-01
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	9.87023E-01	1.0	9.84554E-01	9.99671E-01

Table S40. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (PSO is the control algorithm, R_{p1} evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBSHADE	Friedman	1.0	1.0	1.0	1.0
EBSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBSHADE	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S40 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S41. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (IJAYA is the control algorithm, R_{p1} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
GOTLBO	Friedman	9.73564E-06	9.73569E-06	9.73569E-06	9.73564E-06
GOTLBO	Friedman Aligned	4.31832E-12	1.09619E-11	1.09619E-11	1.09619E-11
GOTLBO	Quade	6.70250E-01	1.0	1.0	7.37556E-01
PSO	Friedman	1.27717E-05	2.35787E-05	2.35787E-05	2.35785E-05
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	6.70250E-01	1.0	1.0	6.70250E-01
ISCA	Friedman	3.02807E-05	7.68673E-05	7.68673E-05	7.68646E-05
ISCA	Friedman Aligned	2.29483E-13	4.23661E-13	4.23661E-13	4.23661E-13
ISCA	Quade	6.70250E-01	1.0	1.0	7.28467E-01
NNA	Friedman	3.02807E-05	8.73835E-05	8.73835E-05	8.73801E-05
NNA	Friedman Aligned	5.02987E-12	1.54765E-11	1.54765E-11	1.54765E-11
NNA	Quade	6.70250E-01	1.0	1.0	7.37556E-01
CWOA	Friedman	3.93486E-05	1.36208E-04	1.36208E-04	1.36200E-04
CWOA	Friedman Aligned	1.16523E-10	4.03347E-10	4.03347E-10	4.03347E-10
CWOA	Quade	6.70250E-01	1.0	1.0	7.78072E-01
WW	Friedman	2.10239E-03	7.76707E-03	7.76707E-03	7.74073E-03
WW	Friedman Aligned	5.51419E-06	2.03601E-05	2.03601E-05	2.03600E-05
WW	Quade	6.70250E-01	1.0	1.0	9.38720E-01
MABC	Friedman	2.41545E-01	9.68227E-01	9.68227E-01	6.47281E-01
MABC	Friedman Aligned	4.01332E-01	1.0	1.0	8.55401E-01
MABC	Quade	7.60748E-01	1.0	1.0	9.95442E-01
DE	Friedman	9.84761E-01	1.0	1.0	1.0
DE	Friedman Aligned	9.21905E-01	1.0	1.0	9.99918E-01
DE	Quade	1.0	1.0	1.0	1.0

Table S41 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S42. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ISCA is the control algorithm, R_{p1} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
GOTLBO	Friedman	9.99999E-01	1.0	1.0	9.99999E-01
GOTLBO	Friedman Aligned	9.23523E-01	1.0	1.0	9.92894E-01
GOTLBO	Quade	1.0	1.0	1.0	1.0
PSO	Friedman	9.99999E-01	1.0	1.0	1.0
PSO	Friedman Aligned	1.42884E-08	1.42884E-08	1.42884E-08	1.42884E-08
PSO	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0

Table S42 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	9.23523E-01	1.0	1.0	9.91314E-01
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S43. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NNA is the control algorithm, R_{p1} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
GOTLBO	Friedman	9.99996E-01	1.0	1.0	9.99996E-01
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
PSO	Friedman	9.99996E-01	1.0	1.0	1.0
PSO	Friedman Aligned	3.95810E-06	3.95810E-06	3.95810E-06	3.95810E-06
PSO	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	9.99999E-01	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0

Table S43 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S44. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (CWOA is the control algorithm, R_{p1} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
GOTLBO	Friedman	9.99951E-01	1.0	1.0	9.99951E-01
GOTLBO	Friedman Aligned	2.69091E-01	6.09156E-01	6.09156E-01	4.65633E-01
GOTLBO	Quade	1.0	1.0	1.0	1.0
PSO	Friedman	9.99951E-01	1.0	1.0	9.99998E-01
PSO	Friedman Aligned	1.74407E-11	1.74407E-11	1.74407E-11	1.74407E-11
PSO	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	9.99951E-01	1.0	1.0	1.0
ISCA	Friedman Aligned	7.07645E-01	1.0	1.0	9.77267E-01
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	9.99951E-01	1.0	1.0	1.0
NNA	Friedman Aligned	2.69091E-01	5.64974E-01	5.64974E-01	4.39377E-01
NNA	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0

Table S44 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S45. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (WW is the control algorithm, R_{p1} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
GOTLBO	Friedman	7.42350E-01	1.0	1.0	7.42350E-01
GOTLBO	Friedman Aligned	6.80259E-04	1.52988E-03	1.52988E-03	1.52881E-03
GOTLBO	Quade	9.99837E-01	1.0	1.0	9.99953E-01
PSO	Friedman	7.42350E-01	1.0	1.0	8.46939E-01
PSO	Friedman Aligned	2.26308E-10	2.26308E-10	2.26308E-10	2.26308E-10
PSO	Quade	9.99837E-01	1.0	1.0	9.99837E-01
ISCA	Friedman	7.42350E-01	1.0	1.0	9.45174E-01
ISCA	Friedman Aligned	1.21307E-02	3.74832E-02	3.74832E-02	3.68572E-02
ISCA	Quade	9.99837E-01	1.0	1.0	9.99947E-01
NNA	Friedman	7.42350E-01	1.0	1.0	9.45174E-01
NNA	Friedman Aligned	6.80259E-04	1.25623E-03	1.25623E-03	1.25550E-03
NNA	Quade	9.99837E-01	1.0	1.0	9.99953E-01
CWOA	Friedman	7.42350E-01	1.0	1.0	9.61674E-01
CWOA	Friedman Aligned	1.44448E-01	5.24146E-01	5.24146E-01	4.17268E-01
CWOA	Quade	9.99837E-01	1.0	1.0	9.99984E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0

Table S45 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S46. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (DE is the control algorithm, I_{02} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	3.07433E-01	3.62209E-01	3.62209E-01	3.07433E-01
PSO	Friedman Aligned	1.93615E-05	1.93617E-05	1.93617E-05	1.93615E-05
PSO	Quade	9.96926E-01	1.0	1.0	9.96926E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S46 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S47. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (EBLSHADE is the control algorithm, I_{02} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
DE	Friedman	3.11751E-13	8.99281E-13	8.99281E-13	8.99281E-13
DE	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
DE	Quade	3.35107E-02	8.46505E-02	8.46505E-02	8.14674E-02
IJAYA	Friedman	3.11751E-13	8.41549E-13	8.41549E-13	8.41549E-13
IJAYA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
IJAYA	Quade	3.35107E-02	6.27616E-02	6.27616E-02	6.09874E-02
NNA	Friedman	3.11751E-13	3.32179E-13	3.32179E-13	3.32179E-13
NNA	Friedman Aligned	1.48834E-09	4.57951E-09	4.57951E-09	4.57951E-09
NNA	Quade	3.35256E-02	1.16402E-01	1.02123E-01	1.10644E-01
CWOA	Friedman	3.11751E-13	3.11751E-13	3.11751E-13	3.11751E-13
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	3.35256E-02	1.04376E-01	9.59914E-02	9.96075E-02
WW	Friedman	3.11751E-13	3.30402E-13	3.30402E-13	3.30402E-13
WW	Friedman Aligned	2.28617E-13	7.91367E-13	7.91367E-13	7.91367E-13
WW	Quade	3.35256E-02	1.04376E-01	9.59914E-02	9.96075E-02
MABC	Friedman	3.78623E-13	1.39799E-12	1.24967E-12	1.39799E-12
MABC	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
MABC	Quade	3.35256E-02	1.16402E-01	1.02123E-01	1.10644E-01
GOTLBO	Friedman	3.78623E-13	1.39799E-12	1.22324E-12	1.39799E-12
GOTLBO	Friedman Aligned	4.42446E-10	1.63365E-09	1.63365E-09	1.63365E-09
GOTLBO	Quade	3.35256E-02	1.16402E-01	1.04050E-01	1.10644E-01
ISCA	Friedman	3.78623E-13	1.39799E-12	1.22324E-12	1.39799E-12
ISCA	Friedman Aligned	1.21214E-09	4.19586E-09	4.19586E-09	4.19586E-09
ISCA	Quade	3.35256E-02	1.16402E-01	1.11569E-01	1.10644E-01

Table S47 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
NDE	Friedman	7.79360E-10	2.69779E-09	2.69779E-09	2.69779E-09
NDE	Friedman Aligned	4.65894E-12	1.72022E-11	1.72022E-11	1.72022E-11
NDE	Quade	5.14231E-02	1.59184E-01	1.59184E-01	1.49931E-01
PSO	Friedman	9.39925E-09	2.89208E-08	2.89208E-08	2.89208E-08
PSO	Friedman Aligned	6.99497E-11	2.63656E-10	2.63656E-10	2.63656E-10
PSO	Quade	4.42167E-03	4.43072E-03	4.43072E-03	4.42167E-03
TLBO	Friedman	1.21775E-01	3.12161E-01	3.12161E-01	2.80806E-01
TLBO	Friedman Aligned	2.56398E-01	6.65169E-01	6.65169E-01	5.28586E-01
TLBO	Quade	6.64444E-01	1.0	1.0	9.37458E-01
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S48. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ADELI is the control algorithm, I_{02} evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Friedman Aligned	1.37251E-10	4.75100E-10	4.75100E-10	4.75100E-10
PSO	Quade	1.26537E-03	1.26611E-03	1.26611E-03	1.26537E-03
MABC	Friedman	1.32783E-13	2.45137E-13	2.37588E-13	2.45137E-13
MABC	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
MABC	Quade	1.30356E-02	4.64870E-02	4.07958E-02	4.55525E-02
GOTLBO	Friedman	1.32783E-13	2.61346E-13	2.37588E-13	2.61346E-13
GOTLBO	Friedman Aligned	3.62435E-09	1.33822E-08	1.33822E-08	1.33822E-08
GOTLBO	Quade	1.30356E-02	4.64870E-02	4.23263E-02	4.55525E-02
ISCA	Friedman	1.32783E-13	2.61346E-13	2.37588E-13	2.61346E-13
ISCA	Friedman Aligned	7.90632E-09	2.73680E-08	2.73680E-08	2.73680E-08
ISCA	Quade	1.34430E-02	4.66302E-02	4.66302E-02	4.57685E-02
NNA	Friedman	3.34843E-13	1.15907E-12	1.12266E-12	1.15907E-12
NNA	Friedman Aligned	9.12892E-09	2.80890E-08	2.80890E-08	2.80890E-08
NNA	Quade	1.30356E-02	4.64870E-02	4.07958E-02	4.55525E-02
WW	Friedman	3.34843E-13	1.15907E-12	1.12266E-12	1.15907E-12
WW	Friedman Aligned	1.56092E-12	4.80282E-12	4.80282E-12	4.80282E-12
WW	Quade	1.30356E-02	4.02919E-02	3.71360E-02	3.95691E-02
CWOA	Friedman	2.43957E-12	9.19531E-12	9.19531E-12	9.19531E-12
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	1.30356E-02	4.02919E-02	3.71360E-02	3.95691E-02
IJAYA	Friedman	6.38042E-12	2.35585E-11	2.26019E-11	2.35585E-11
IJAYA	Friedman Aligned	2.28953E-09	8.62977E-09	8.62977E-09	8.62977E-09
IJAYA	Quade	1.22051E-02	2.26497E-02	2.26497E-02	2.24160E-02

Table S48 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	6.52944E-12	2.35585E-11	2.26019E-11	2.35585E-11
DE	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
DE	Quade	1.24297E-02	3.17044E-02	3.17044E-02	3.12514E-02
NDE	Friedman	1.48064E-11	4.55582E-11	4.55582E-11	4.55582E-11
NDE	Friedman Aligned	6.02958E-10	2.22631E-09	2.22631E-09	2.22631E-09
NDE	Quade	2.30164E-02	7.10095E-02	7.10095E-02	6.91409E-02
TLBO	Friedman	3.18582E-02	8.10716E-02	8.10716E-02	7.89005E-02
TLBO	Friedman Aligned	3.76448E-02	9.58407E-02	9.58407E-02	9.28115E-02
TLBO	Quade	4.57286E-01	1.0	9.51773E-01	7.88058E-01
EBLSHADE	Friedman	5.87176E-01	1.0	8.11070E-01	8.04727E-01
EBLSHADE	Friedman Aligned	3.79133E-01	7.11894E-01	7.11894E-01	5.85196E-01
EBLSHADE	Quade	7.80025E-01	1.0	9.51773E-01	9.38917E-01
STLBO	Friedman	8.11070E-01	1.0	8.11070E-01	8.11070E-01
STLBO	Friedman Aligned	9.94880E-01	9.94880E-01	9.94880E-01	9.94880E-01
STLBO	Quade	9.51773E-01	1.0	9.51773E-01	9.51773E-01

Table S49. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NDE is the control algorithm, I_{02} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	4.14742E-04	4.14821E-04	4.14821E-04	4.14742E-04
PSO	Friedman Aligned	3.02198E-08	5.57904E-08	5.57904E-08	5.57904E-08
PSO	Quade	8.28789E-01	1.0	1.0	8.28789E-01
DE	Friedman	2.83400E-01	5.99704E-01	5.81181E-01	4.59472E-01
DE	Friedman Aligned	5.25358E-13	5.25358E-13	5.25358E-13	5.25358E-13
DE	Quade	9.82071E-01	1.0	1.0	9.99815E-01
IJAYA	Friedman	2.83400E-01	5.99704E-01	5.81181E-01	4.59472E-01
IJAYA	Friedman Aligned	1.33614E-02	4.94618E-02	4.94618E-02	4.84535E-02
IJAYA	Quade	9.82071E-01	1.0	1.0	9.99403E-01
CWOA	Friedman	2.83400E-01	7.89202E-01	7.89202E-01	5.60486E-01
CWOA	Friedman Aligned	3.39155E-06	1.04356E-05	1.04356E-05	1.04355E-05
CWOA	Quade	9.82071E-01	1.0	1.0	9.99926E-01
NNA	Friedman	3.54469E-01	1.0	1.0	7.80203E-01
NNA	Friedman Aligned	1.07552E-03	3.72420E-03	3.72420E-03	3.71804E-03
NNA	Quade	9.82071E-01	1.0	1.0	9.99931E-01
WW	Friedman	3.54469E-01	1.0	1.0	7.80203E-01
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	9.82071E-01	1.0	1.0	9.99926E-01
MABC	Friedman	4.01459E-01	1.0	1.0	8.55518E-01
MABC	Friedman Aligned	1.04059E-07	2.64149E-07	2.64149E-07	2.64149E-07
MABC	Quade	9.82071E-01	1.0	1.0	9.99931E-01
GOTLBO	Friedman	4.01459E-01	1.0	1.0	8.55518E-01
GOTLBO	Friedman Aligned	6.40261E-03	2.41687E-02	2.41687E-02	2.39198E-02
GOTLBO	Quade	9.82071E-01	1.0	1.0	9.99931E-01

Table S49 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
ISCA	Friedman	4.01459E-01	1.0	1.0	8.55518E-01
ISCA	Friedman Aligned	1.50390E-03	5.55512E-03	5.55512E-03	5.54164E-03
ISCA	Quade	9.82071E-01	1.0	1.0	9.99931E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S50. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (MABC is the control algorithm, I_{02} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	3.32214E-02	3.37419E-02	3.37419E-02	3.32214E-02
PSO	Friedman Aligned	5.02265E-12	5.02265E-12	5.02265E-12	5.02265E-12
PSO	Quade	9.77998E-01	1.0	1.0	9.77998E-01
DE	Friedman	9.69804E-01	1.0	1.0	9.98438E-01
DE	Friedman Aligned	8.55596E-02	1.63995E-01	1.63995E-01	1.52213E-01
DE	Quade	9.99780E-01	1.0	1.0	1.0
IJAYA	Friedman	9.69804E-01	1.0	1.0	9.98438E-01
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	9.99780E-01	1.0	1.0	1.0
CWOA	Friedman	9.69804E-01	1.0	1.0	9.99595E-01
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	9.99780E-01	1.0	1.0	1.0
NNA	Friedman	9.81260E-01	1.0	1.0	9.99999E-01
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	9.81260E-01	1.0	1.0	9.99999E-01
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	9.99780E-01	1.0	1.0	1.0
GOTLBO	Friedman	9.99360E-01	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	9.99360E-01	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0

Table S50 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S51. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (TLBO is the control algorithm, I_{02} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	5.47757E-11	5.47757E-11	5.47757E-11	5.47757E-11
PSO	Friedman Aligned	5.78066E-11	2.00100E-10	2.00100E-10	2.00100E-10
PSO	Quade	2.81980E-02	2.85718E-02	2.85718E-02	2.81980E-02
DE	Friedman	4.02282E-10	7.42675E-10	7.42675E-10	7.42675E-10
DE	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
DE	Quade	1.40685E-01	3.51358E-01	3.51358E-01	3.00292E-01
IJAYA	Friedman	4.02282E-10	7.97424E-10	7.97424E-10	7.97424E-10
IJAYA	Friedman Aligned	3.62409E-09	1.33812E-08	1.33812E-08	1.33812E-08
IJAYA	Quade	1.40685E-01	2.76675E-01	2.76675E-01	2.44151E-01
CWOA	Friedman	7.58384E-10	2.33349E-09	2.33349E-09	2.33349E-09
CWOA	Friedman Aligned	2.81525E-09	1.06113E-08	1.06113E-08	1.06113E-08
CWOA	Quade	1.40685E-01	4.12529E-01	3.77842E-01	3.43793E-01
NNA	Friedman	4.96355E-09	1.71815E-08	1.64311E-08	1.71815E-08
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	1.40685E-01	4.35460E-01	3.77842E-01	3.60942E-01
WW	Friedman	4.96355E-09	1.71815E-08	1.64311E-08	1.71815E-08
WW	Friedman Aligned	8.94877E-10	3.30416E-09	3.30416E-09	3.30416E-09
WW	Quade	1.40685E-01	4.12529E-01	3.77842E-01	3.43793E-01
MABC	Friedman	1.60093E-08	6.03426E-08	4.96032E-08	6.03426E-08
MABC	Friedman Aligned	8.61753E-09	2.98299E-08	2.55256E-08	2.98299E-08
MABC	Quade	1.40685E-01	4.35460E-01	3.77842E-01	3.60942E-01
GOTLBO	Friedman	1.60093E-08	6.03426E-08	4.96032E-08	6.03426E-08
GOTLBO	Friedman Aligned	8.61753E-09	2.98299E-08	2.55256E-08	2.98299E-08
GOTLBO	Quade	1.40685E-01	4.35460E-01	3.77842E-01	3.60942E-01

Table S51 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
ISCA	Friedman	1.60093E-08	6.03426E-08	4.96032E-08	6.03426E-08
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	1.40685E-01	4.35460E-01	3.87838E-01	3.60942E-01
NDE	Friedman	5.77124E-06	1.77577E-05	1.77577E-05	1.77575E-05
NDE	Friedman Aligned	4.58966E-13	1.41220E-12	1.41220E-12	1.41220E-12
NDE	Quade	1.58827E-01	4.98296E-01	4.98296E-01	4.12676E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S52. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (GOTLBO is the control algorithm, I_{02} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	3.58882E-02	3.64967E-02	3.64967E-02	3.58882E-02
PSO	Friedman Aligned	1.81719E-08	1.81719E-08	1.81719E-08	1.81719E-08
PSO	Quade	9.66028E-01	1.0	1.0	9.66028E-01
DE	Friedman	9.74166E-01	1.0	1.0	9.98829E-01
DE	Friedman Aligned	1.92213E-06	3.54855E-06	3.54855E-06	3.54855E-06
DE	Quade	9.99387E-01	1.0	1.0	1.0
IJAYA	Friedman	9.74166E-01	1.0	1.0	9.98829E-01
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	9.99387E-01	1.0	1.0	9.99999E-01
CWOA	Friedman	9.74166E-01	1.0	1.0	9.99716E-01
CWOA	Friedman Aligned	1.53881E-01	5.01146E-01	5.01146E-01	4.01985E-01
CWOA	Quade	9.99387E-01	1.0	1.0	1.0
NNA	Friedman	9.85128E-01	1.0	1.0	1.0
NNA	Friedman Aligned	8.70151E-01	1.0	1.0	9.99147E-01
NNA	Quade	9.99387E-01	1.0	1.0	1.0
WW	Friedman	9.85128E-01	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	9.99387E-01	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0

Table S52 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	3.33973E-02	8.58886E-02	8.58886E-02	8.26128E-02
MABC	Quade	9.99387E-01	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	8.90777E-01	1.0	1.0	9.99719E-01
ISCA	Quade	1.0	1.0	1.0	1.0

Table S53. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (STLBO is the control algorithm, I_{02} evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Friedman Aligned	1.36951E-10	4.74063E-10	4.74063E-10	4.74063E-10
PSO	Quade	1.62108E-03	1.62229E-03	1.62229E-03	1.62108E-03
MABC	Friedman	1.02474E-13	1.89182E-13	1.77636E-13	1.89182E-13
MABC	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
MABC	Quade	1.57469E-02	5.58419E-02	4.90027E-02	5.44965E-02
GOTLBO	Friedman	1.02474E-13	1.89182E-13	1.73417E-13	1.89182E-13
GOTLBO	Friedman Aligned	3.57744E-09	1.32090E-08	1.32090E-08	1.32090E-08
GOTLBO	Quade	1.57469E-02	5.58419E-02	5.06633E-02	5.44965E-02
ISCA	Friedman	1.02474E-13	1.89182E-13	1.73417E-13	1.89182E-13
ISCA	Friedman Aligned	7.81461E-09	2.70506E-08	2.70506E-08	2.70506E-08
ISCA	Quade	1.60006E-02	5.58419E-02	5.55239E-02	5.44965E-02
NNA	Friedman	1.02474E-13	2.11831E-13	2.02505E-13	2.11831E-13
NNA	Friedman Aligned	9.02635E-09	2.77734E-08	2.77734E-08	2.77734E-08
NNA	Quade	1.57469E-02	5.58419E-02	4.90027E-02	5.44965E-02
WW	Friedman	1.02474E-13	2.11831E-13	2.02505E-13	2.11831E-13
WW	Friedman Aligned	1.49597E-12	4.60298E-12	4.60298E-12	4.60298E-12
WW	Quade	1.57469E-02	4.87185E-02	4.48837E-02	4.76642E-02
CWOA	Friedman	5.07213E-13	1.91180E-12	1.91180E-12	1.91180E-12
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	1.57469E-02	4.87185E-02	4.48837E-02	4.76642E-02
IJAYA	Friedman	1.45953E-12	5.38902E-12	5.23359E-12	5.38902E-12
IJAYA	Friedman Aligned	2.25780E-09	8.51019E-09	8.51019E-09	8.51019E-09
IJAYA	Quade	1.49333E-02	2.77449E-02	2.77449E-02	2.73948E-02

Table S53 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	1.51193E-12	5.38902E-12	5.23359E-12	5.38902E-12
DE	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
DE	Quade	1.51015E-02	3.85593E-02	3.85593E-02	3.78906E-02
NDE	Friedman	7.43248E-11	2.28692E-10	2.28692E-10	2.28692E-10
NDE	Friedman Aligned	5.85711E-10	2.16263E-09	2.16263E-09	2.16263E-09
NDE	Quade	2.70504E-02	8.34946E-02	8.34946E-02	8.09165E-02
TLBO	Friedman	5.71734E-02	1.45785E-01	1.45785E-01	1.38816E-01
TLBO	Friedman Aligned	3.82516E-02	9.73902E-02	9.73902E-02	9.42628E-02
TLBO	Quade	4.94637E-01	1.0	1.0	8.23149E-01
EBLSHADE	Friedman	7.56821E-01	1.0	1.0	9.26494E-01
EBLSHADE	Friedman Aligned	3.82635E-01	7.18601E-01	7.18601E-01	5.89504E-01
EBLSHADE	Quade	8.24330E-01	1.0	1.0	9.59673E-01
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0

Table S54. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (PSO is the control algorithm, I_{02} evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S54 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S55. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (IJAYA is the control algorithm, I_{02} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	2.91949E-01	3.40696E-01	3.40696E-01	2.91949E-01
PSO	Friedman Aligned	5.39802E-08	5.39802E-08	5.39802E-08	5.39802E-08
PSO	Quade	9.99326E-01	1.0	1.0	9.99326E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	4.13136E-07	7.62714E-07	7.62714E-07	7.62713E-07
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.40272E-02	3.58013E-02	3.58013E-02	3.52243E-02
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	9.38730E-01	1.0	1.0	9.99973E-01
GOTLBO	Quade	1.0	1.0	1.0	1.0

Table S55 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	7.29777E-01	1.0	1.0	9.92025E-01
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	7.04009E-01	1.0	1.0	9.85215E-01
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	7.90035E-02	2.50048E-01	2.50048E-01	2.23709E-01
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S56. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ISCA is the control algorithm, I_{02} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	3.58882E-02	3.64967E-02	3.64967E-02	3.58882E-02
PSO	Friedman Aligned	2.40712E-09	2.40712E-09	2.40712E-09	2.40712E-09
PSO	Quade	9.39986E-01	1.0	1.0	9.39986E-01
DE	Friedman	9.74166E-01	1.0	1.0	9.98829E-01
DE	Friedman Aligned	2.06881E-05	3.81937E-05	3.81937E-05	3.81931E-05
DE	Quade	9.97867E-01	1.0	1.0	9.99998E-01
IJAYA	Friedman	9.74166E-01	1.0	1.0	9.98829E-01
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	9.97867E-01	1.0	1.0	9.99988E-01
CWOA	Friedman	9.74166E-01	1.0	1.0	9.99716E-01
CWOA	Friedman Aligned	3.77795E-01	1.0	1.0	7.67754E-01
CWOA	Quade	9.97867E-01	1.0	1.0	1.0
NNA	Friedman	9.85128E-01	1.0	1.0	1.0
NNA	Friedman Aligned	9.96719E-01	1.0	1.0	1.0
NNA	Quade	9.97867E-01	1.0	1.0	1.0
WW	Friedman	9.85128E-01	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	9.97867E-01	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0

Table S56 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.17077E-01	3.11585E-01	3.11585E-01	2.71001E-01
MABC	Quade	9.97867E-01	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	9.97867E-01	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S57. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NNA is the control algorithm, I_{02} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	7.49779E-02	7.77045E-02	7.77045E-02	7.49779E-02
PSO	Friedman Aligned	1.24163E-09	1.24163E-09	1.24163E-09	1.24163E-09
PSO	Quade	9.78151E-01	1.0	1.0	9.78151E-01
DE	Friedman	9.96576E-01	1.0	1.0	9.99972E-01
DE	Friedman Aligned	4.03245E-05	7.44465E-05	7.44465E-05	7.44440E-05
DE	Quade	9.99784E-01	1.0	1.0	1.0
IJAYA	Friedman	9.96576E-01	1.0	1.0	9.99972E-01
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	9.99784E-01	1.0	1.0	1.0
CWOA	Friedman	9.96576E-01	1.0	1.0	9.99998E-01
CWOA	Friedman Aligned	4.67657E-01	1.0	1.0	8.56281E-01
CWOA	Quade	9.99784E-01	1.0	1.0	1.0
WW	Friedman	9.99994E-01	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	9.99784E-01	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0

Table S57 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.62259E-01	4.40367E-01	4.40367E-01	3.62005E-01
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0

Table S58. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (CWOA is the control algorithm, I_{02} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	1.92232E-01	2.11737E-01	2.11737E-01	1.92232E-01
PSO	Friedman Aligned	3.20410E-13	3.20410E-13	3.20410E-13	3.20410E-13
PSO	Quade	9.91529E-01	1.0	1.0	9.91529E-01
DE	Friedman	9.99993E-01	1.0	1.0	1.0
DE	Friedman Aligned	9.96242E-03	1.84702E-02	1.84702E-02	1.83146E-02
DE	Quade	9.99984E-01	1.0	1.0	1.0
IJAYA	Friedman	9.99993E-01	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	9.99984E-01	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	9.42723E-01	1.0	1.0	9.99297E-01
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0

Table S58 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S59. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (WW is the control algorithm, I_{02} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	7.76548E-02	8.05850E-02	8.05850E-02	7.76548E-02
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	9.90947E-01	1.0	1.0	9.90947E-01
DE	Friedman	9.96991E-01	1.0	1.0	9.99978E-01
DE	Friedman Aligned	2.24129E-10	5.68944E-10	5.68944E-10	5.68944E-10
DE	Quade	9.99980E-01	1.0	1.0	1.0
IJAYA	Friedman	9.96991E-01	1.0	1.0	9.99978E-01
IJAYA	Friedman Aligned	2.35391E-04	8.69175E-04	8.69175E-04	8.68860E-04
IJAYA	Quade	9.99980E-01	1.0	1.0	1.0
CWOA	Friedman	9.96991E-01	1.0	1.0	9.99998E-01
CWOA	Friedman Aligned	5.19146E-09	1.59737E-08	1.59737E-08	1.59737E-08
CWOA	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	3.36136E-01	1.0	1.0	7.57830E-01
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.10441E-10	2.03890E-10	2.03890E-10	2.03890E-10
MABC	Quade	1.0	1.0	1.0	1.0

Table S59 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	8.28991E-05	3.12472E-04	3.12472E-04	3.12430E-04
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.16470E-05	4.30045E-05	4.30045E-05	4.30037E-05
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	7.14139E-06	2.47202E-05	2.47202E-05	2.47200E-05
NNA	Quade	1.0	1.0	1.0	1.0

Table S60. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (DE is the control algorithm, n_2 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	3.92321E-10	3.92321E-10	3.92321E-10	3.92321E-10
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	2.79373E-01	3.23540E-01	3.23540E-01	2.79373E-01
PSO	Friedman	2.88559E-05	5.32730E-05	5.32730E-05	5.32717E-05
PSO	Friedman Aligned	1.74677E-10	6.44961E-10	6.44961E-10	6.44961E-10
PSO	Quade	5.37934E-01	1.0	1.0	7.59568E-01
CWOA	Friedman	2.43825E-04	6.18999E-04	6.18999E-04	6.18825E-04
CWOA	Friedman Aligned	7.59015E-11	2.62736E-10	2.62736E-10	2.62736E-10
CWOA	Quade	5.65449E-01	1.0	1.0	8.79446E-01
NNA	Friedman	6.24368E-04	1.92155E-03	1.92155E-03	1.91989E-03
NNA	Friedman Aligned	3.95173E-11	1.21592E-10	1.21592E-10	1.21592E-10
NNA	Quade	5.65449E-01	1.0	1.0	9.06685E-01
GOTLBO	Friedman	2.71581E-02	9.48059E-02	9.48059E-02	9.09078E-02
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	7.47711E-01	1.0	1.0	9.91495E-01
ISCA	Friedman	1.51455E-01	5.83984E-01	5.83984E-01	4.54688E-01
ISCA	Friedman Aligned	4.49465E-10	1.69414E-09	1.69414E-09	1.69414E-09
ISCA	Quade	8.49293E-01	1.0	1.0	9.99077E-01
MABC	Friedman	7.73122E-01	1.0	1.0	9.96269E-01
MABC	Friedman Aligned	1.26240E-12	3.20455E-12	3.20455E-12	3.20455E-12
MABC	Quade	9.33013E-01	1.0	1.0	9.99962E-01
IJAYA	Friedman	9.84761E-01	1.0	1.0	1.0
IJAYA	Friedman Aligned	8.57775E-01	1.0	1.0	9.99254E-01
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S60 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S61. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (EBLSHADE is the control algorithm, n_2 evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	1.36721E-03	2.52555E-03	2.52555E-03	2.52263E-03
ISCA	Friedman	1.78968E-13	3.30402E-13	3.30402E-13	3.30402E-13
ISCA	Friedman Aligned	1.55372E-10	5.73682E-10	5.73682E-10	5.73682E-10
ISCA	Quade	1.65281E-02	6.13009E-02	6.13009E-02	5.96818E-02
GOTLBO	Friedman	1.95883E-11	4.97242E-11	4.97242E-11	4.97242E-11
GOTLBO	Friedman Aligned	2.08030E-10	7.84112E-10	7.84112E-10	7.84112E-10
GOTLBO	Quade	8.54988E-03	2.96740E-02	2.96740E-02	2.92856E-02
MABC	Friedman	3.70161E-11	1.13896E-10	1.13896E-10	1.13896E-10
MABC	Friedman Aligned	4.17948E-11	1.28599E-10	1.28599E-10	1.28599E-10
MABC	Quade	2.91472E-02	1.10612E-01	1.10612E-01	1.05504E-01
IJAYA	Friedman	8.24453E-10	2.85388E-09	2.85388E-09	2.85388E-09
IJAYA	Friedman Aligned	2.11001E-09	7.30389E-09	7.30389E-09	7.30389E-09
IJAYA	Quade	5.50979E-02	2.05651E-01	1.80331E-01	1.88814E-01
DE	Friedman	1.26059E-09	4.65450E-09	4.65450E-09	4.65450E-09
DE	Friedman Aligned	9.99304E-10	3.68974E-09	3.68974E-09	3.68974E-09
DE	Quade	5.50979E-02	2.05651E-01	1.80331E-01	1.88814E-01
NNA	Friedman	2.52900E-09	9.53238E-09	9.53238E-09	9.53238E-09
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	2.46551E-03	7.59267E-03	7.59267E-03	7.56678E-03
CWOA	Friedman	7.00046E-09	2.58479E-08	2.31404E-08	2.58479E-08
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	2.22641E-03	5.65651E-03	5.65651E-03	5.64199E-03

Table S61 (*continued*)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
WW	Friedman	7.00046E-09	2.58479E-08	2.31404E-08	2.58479E-08
WW	Friedman Aligned	1.32567E-10	4.58885E-10	4.58885E-10	4.58885E-10
WW	Quade	1.69100E-04	1.69113E-04	1.69113E-04	1.69100E-04
NDE	Friedman	1.47046E-04	4.52458E-04	4.52458E-04	4.52382E-04
NDE	Friedman Aligned	6.50237E-07	2.00073E-06	2.00073E-06	2.00073E-06
NDE	Quade	2.62860E-01	8.36446E-01	8.36446E-01	6.08744E-01
TLBO	Friedman	1.57702E-01	4.05499E-01	4.05499E-01	3.53159E-01
TLBO	Friedman Aligned	4.66638E-01	1.0	1.0	7.97205E-01
TLBO	Quade	7.20268E-01	1.0	1.0	9.60593E-01
STLBO	Friedman	9.63022E-01	1.0	1.0	9.97729E-01
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	9.70725E-01	1.0	1.0	9.98525E-01
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0

Table S62. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ADELI is the control algorithm, n_2 evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	1.08556E-03	2.00503E-03	2.00503E-03	2.00319E-03
ISCA	Friedman	4.21441E-13	7.78044E-13	7.78044E-13	7.78044E-13
ISCA	Friedman Aligned	1.77441E-10	6.55168E-10	6.55168E-10	6.55168E-10
ISCA	Quade	1.38937E-02	5.14932E-02	5.14932E-02	5.03480E-02
MABC	Friedman	2.15926E-11	5.48119E-11	5.48119E-11	5.48119E-11
MABC	Friedman Aligned	5.46148E-11	1.68046E-10	1.68046E-10	1.68046E-10
MABC	Quade	2.48402E-02	9.41718E-02	9.41718E-02	9.04551E-02
GOTLBO	Friedman	2.92194E-11	8.99059E-11	8.99059E-11	8.99059E-11
GOTLBO	Friedman Aligned	1.87348E-10	7.06158E-10	7.06158E-10	7.06158E-10
GOTLBO	Quade	7.08114E-03	2.45652E-02	2.45652E-02	2.42987E-02
IJAYA	Friedman	3.81470E-10	1.32047E-09	1.32047E-09	1.32047E-09
IJAYA	Friedman Aligned	5.75403E-09	1.99178E-08	1.99178E-08	1.99178E-08
IJAYA	Quade	4.77133E-02	1.77825E-01	1.56099E-01	1.65159E-01
DE	Friedman	5.89532E-10	2.17673E-09	2.17673E-09	2.17673E-09
DE	Friedman Aligned	3.00876E-09	1.11092E-08	1.11092E-08	1.11092E-08
DE	Quade	4.77133E-02	1.77825E-01	1.56099E-01	1.65159E-01
NNA	Friedman	4.05858E-09	1.52977E-08	1.52977E-08	1.52977E-08
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	1.99442E-03	6.14092E-03	6.14092E-03	6.12398E-03
WW	Friedman	9.35983E-09	3.45594E-08	3.32115E-08	3.45594E-08
WW	Friedman Aligned	1.45939E-10	5.05172E-10	5.05172E-10	5.05172E-10
WW	Quade	1.29473E-04	1.29480E-04	1.29480E-04	1.29473E-04

Table S62 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
CWOA	Friedman	9.59443E-09	3.45594E-08	3.32115E-08	3.45594E-08
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	1.79060E-03	4.54851E-03	4.54851E-03	4.53912E-03
NDE	Friedman	8.95473E-05	2.75533E-04	2.75533E-04	2.75505E-04
NDE	Friedman Aligned	4.36010E-08	1.34157E-07	1.34157E-07	1.34157E-07
NDE	Quade	2.38174E-01	7.55260E-01	7.55260E-01	5.67008E-01
TLBO	Friedman	1.24750E-01	3.19870E-01	3.19870E-01	2.86976E-01
TLBO	Friedman Aligned	2.17176E-01	5.61378E-01	5.61378E-01	4.62882E-01
TLBO	Quade	6.79515E-01	1.0	9.53684E-01	9.44344E-01
STLBO	Friedman	8.79054E-01	1.0	9.04861E-01	9.79755E-01
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	9.31129E-01	1.0	9.53684E-01	9.92841E-01
EBLSHADE	Friedman	9.04861E-01	1.0	9.04861E-01	9.79755E-01
EBLSHADE	Friedman Aligned	6.46794E-01	1.0	1.0	8.53584E-01
EBLSHADE	Quade	9.53684E-01	1.0	9.53684E-01	9.92841E-01

Table S63. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NDE is the control algorithm, n_2 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	5.95906E-11	5.95906E-11	5.95906E-11	5.95906E-11
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	8.92612E-02	1.71378E-01	1.71378E-01	1.58537E-01
WW	Friedman	1.13108E-10	2.08814E-10	2.08814E-10	2.08814E-10
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	2.45418E-02	2.48242E-02	2.48242E-02	2.45418E-02
CWOA	Friedman	8.66736E-10	2.20018E-09	2.20018E-09	2.20018E-09
CWOA	Friedman Aligned	1.27564E-10	4.71006E-10	4.71006E-10	4.71006E-10
CWOA	Quade	1.10293E-01	2.92688E-01	2.92688E-01	2.56697E-01
NNA	Friedman	4.29575E-09	1.32177E-08	1.32177E-08	1.32177E-08
NNA	Friedman Aligned	1.65481E-10	5.72820E-10	5.72820E-10	5.72820E-10
NNA	Quade	1.10293E-01	3.47534E-01	3.47534E-01	2.97926E-01
GOTLBO	Friedman	2.48635E-06	8.60661E-06	8.60661E-06	8.60658E-06
GOTLBO	Friedman Aligned	7.60474E-11	2.86640E-10	2.86640E-10	2.86640E-10
GOTLBO	Quade	2.22940E-01	8.32115E-01	8.32115E-01	5.82358E-01
ISCA	Friedman	7.67415E-05	2.83359E-04	2.83359E-04	2.83324E-04
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	3.11725E-01	1.0	1.0	7.48251E-01
MABC	Friedman	6.08165E-03	2.29554E-02	2.29554E-02	2.27308E-02
MABC	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
MABC	Quade	4.09668E-01	1.0	1.0	8.62846E-01
IJAYA	Friedman	2.38708E-02	8.85474E-02	8.85474E-02	8.53440E-02
IJAYA	Friedman Aligned	1.19504E-12	4.13669E-12	4.13669E-12	4.13669E-12
IJAYA	Quade	5.51337E-01	1.0	1.0	9.48146E-01

Table S63 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	2.75393E-02	9.57372E-02	9.57372E-02	9.21405E-02
DE	Friedman Aligned	1.55452E-11	5.73976E-11	5.73976E-11	5.73976E-11
DE	Quade	5.51337E-01	1.0	1.0	9.48146E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S64. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (MABC is the control algorithm, n_2 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	1.84990E-08	1.84990E-08	1.84990E-08	1.84990E-08
WW	Friedman Aligned	2.64637E-10	8.14269E-10	8.14269E-10	8.14269E-10
WW	Quade	4.97749E-01	6.70733E-01	6.70733E-01	4.97749E-01
PSO	Friedman	4.25680E-04	7.86013E-04	7.86013E-04	7.85730E-04
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	7.58062E-01	1.0	1.0	9.27185E-01
CWOA	Friedman	2.60995E-03	6.63191E-03	6.63191E-03	6.61195E-03
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	7.72259E-01	1.0	1.0	9.76617E-01
NNA	Friedman	5.64123E-03	1.73916E-02	1.73916E-02	1.72562E-02
NNA	Friedman Aligned	1.26098E-09	4.36494E-09	4.36494E-09	4.36494E-09
NNA	Quade	7.72259E-01	1.0	1.0	9.84364E-01
GOTLBO	Friedman	1.24793E-01	4.49778E-01	4.49778E-01	3.69603E-01
GOTLBO	Friedman Aligned	2.57868E-13	6.54587E-13	6.54587E-13	6.54587E-13
GOTLBO	Quade	9.07365E-01	1.0	1.0	9.99735E-01
ISCA	Friedman	4.35559E-01	1.0	1.0	8.78968E-01
ISCA	Friedman Aligned	5.82208E-05	2.14973E-04	2.14973E-04	2.14952E-04
ISCA	Quade	9.69469E-01	1.0	1.0	9.99997E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0

Table S64 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S65. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (TLBO is the control algorithm, n_2 evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
GOTLBO	Friedman	5.46141E-12	5.46141E-12	5.46141E-12	5.46141E-12
GOTLBO	Friedman Aligned	1.85656E-10	6.85500E-10	6.85500E-10	6.85500E-10
GOTLBO	Quade	3.21257E-02	1.12323E-01	1.12323E-01	1.06876E-01
NNA	Friedman	5.46141E-12	7.30616E-12	7.30616E-12	7.30616E-12
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	1.10836E-02	3.42350E-02	3.42350E-02	3.37124E-02
CWOA	Friedman	1.70145E-11	4.31906E-11	4.31906E-11	4.31906E-11
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	1.04534E-02	2.66429E-02	2.66429E-02	2.63226E-02
PSO	Friedman	2.64060E-10	8.12492E-10	7.63813E-10	8.12492E-10
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	7.07405E-03	1.30990E-02	1.30990E-02	1.30207E-02
ISCA	Friedman	2.64060E-10	8.12492E-10	7.63813E-10	8.12492E-10
ISCA	Friedman Aligned	1.03659E-10	3.90714E-10	3.90714E-10	3.90714E-10
ISCA	Quade	5.54732E-02	2.07973E-01	2.07973E-01	1.90003E-01
WW	Friedman	3.54090E-10	1.30741E-09	1.30741E-09	1.30741E-09
WW	Friedman Aligned	9.35998E-11	3.45599E-10	3.45599E-10	3.45599E-10
WW	Quade	1.15226E-03	1.15287E-03	1.15287E-03	1.15226E-03
MABC	Friedman	2.07209E-07	7.81020E-07	7.81020E-07	7.81020E-07
MABC	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
MABC	Quade	8.81588E-02	3.39358E-01	3.39358E-01	2.93802E-01
IJAYA	Friedman	2.51710E-06	9.29391E-06	9.29391E-06	9.29387E-06
IJAYA	Friedman Aligned	3.03666E-10	1.05115E-09	1.05115E-09	1.05115E-09
IJAYA	Quade	1.47660E-01	5.61846E-01	4.88755E-01	4.45628E-01

Table S65 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	3.59231E-06	1.24349E-05	1.24349E-05	1.24349E-05
DE	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
DE	Quade	1.47660E-01	5.61846E-01	4.88755E-01	4.45628E-01
NDE	Friedman	2.32779E-02	7.18185E-02	7.18185E-02	6.99073E-02
NDE	Friedman Aligned	3.36822E-05	1.03638E-04	1.03638E-04	1.03634E-04
NDE	Quade	5.01560E-01	1.0	1.0	8.82625E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S66. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (GOTLBO is the control algorithm, n_2 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	5.37814E-04	5.37948E-04	5.37948E-04	5.37814E-04
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	8.88379E-01	1.0	1.0	8.88379E-01
PSO	Friedman	2.44230E-01	5.05979E-01	5.05979E-01	4.03667E-01
PSO	Friedman Aligned	1.12035E-10	2.06835E-10	2.06835E-10	2.06835E-10
PSO	Quade	9.77652E-01	1.0	1.0	9.99104E-01
CWOA	Friedman	4.83801E-01	1.0	1.0	8.13363E-01
CWOA	Friedman Aligned	7.28206E-09	1.84852E-08	1.84852E-08	1.84852E-08
CWOA	Quade	9.79642E-01	1.0	1.0	9.99949E-01
NNA	Friedman	5.92700E-01	1.0	1.0	9.36943E-01
NNA	Friedman Aligned	6.56552E-05	2.02020E-04	2.02020E-04	2.02002E-04
NNA	Quade	9.79642E-01	1.0	1.0	9.99984E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0

Table S66 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0

Table S67. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (STLBO is the control algorithm, n_2 evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	1.65138E-03	3.05083E-03	3.05083E-03	3.04656E-03
ISCA	Friedman	1.24123E-13	2.29150E-13	2.29150E-13	2.29150E-13
ISCA	Friedman Aligned	1.77441E-10	6.55168E-10	6.55168E-10	6.55168E-10
ISCA	Quade	1.90410E-02	7.06693E-02	7.06693E-02	6.85226E-02
GOTLBO	Friedman	1.37420E-11	3.48837E-11	3.48837E-11	3.48837E-11
GOTLBO	Friedman Aligned	1.87348E-10	7.06158E-10	7.06158E-10	7.06158E-10
GOTLBO	Quade	9.97190E-03	3.46246E-02	3.46246E-02	3.40965E-02
MABC	Friedman	5.56843E-11	1.71336E-10	1.71336E-10	1.71336E-10
MABC	Friedman Aligned	5.46148E-11	1.68046E-10	1.68046E-10	1.68046E-10
MABC	Quade	3.31985E-02	1.26107E-01	1.26107E-01	1.19493E-01
IJAYA	Friedman	1.20599E-09	4.17460E-09	4.17460E-09	4.17460E-09
IJAYA	Friedman Aligned	5.75403E-09	1.99178E-08	1.99178E-08	1.99178E-08
IJAYA	Quade	6.19298E-02	2.31468E-01	2.02790E-01	2.10260E-01
DE	Friedman	1.83414E-09	6.77223E-09	6.77223E-09	6.77223E-09
DE	Friedman Aligned	3.00876E-09	1.11092E-08	1.11092E-08	1.11092E-08
DE	Quade	6.19298E-02	2.31468E-01	2.02790E-01	2.10260E-01
NNA	Friedman	1.98348E-09	7.47618E-09	7.47618E-09	7.47618E-09
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	2.93233E-03	9.03172E-03	9.03172E-03	8.99510E-03
CWOA	Friedman	5.60543E-09	2.06970E-08	2.06949E-08	2.06970E-08
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	2.66069E-03	6.76098E-03	6.76098E-03	6.74024E-03

Table S67 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
WW	Friedman	5.97853E-09	2.06970E-08	2.06949E-08	2.06970E-08
WW	Friedman Aligned	1.45939E-10	5.05172E-10	5.05172E-10	5.05172E-10
WW	Quade	2.10491E-04	2.10511E-04	2.10511E-04	2.10491E-04
NDE	Friedman	1.87474E-04	5.76856E-04	5.76856E-04	5.76731E-04
NDE	Friedman Aligned	4.36010E-08	1.34157E-07	1.34157E-07	1.34157E-07
NDE	Quade	2.84587E-01	9.08417E-01	9.08417E-01	6.43152E-01
TLBO	Friedman	1.76463E-01	4.54482E-01	4.54482E-01	3.89108E-01
TLBO	Friedman Aligned	2.17176E-01	5.61378E-01	5.61378E-01	4.62882E-01
TLBO	Quade	7.54166E-01	1.0	1.0	9.71610E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	6.46794E-01	1.0	1.0	8.53584E-01
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0

Table S68. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (PSO is the control algorithm, n_2 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	4.01067E-01	5.02631E-01	5.02631E-01	4.01067E-01
WW	Friedman Aligned	2.83462E-12	2.83462E-12	2.83462E-12	2.83462E-12
WW	Quade	9.99914E-01	1.0	1.0	9.99914E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBSHADE	Friedman	1.0	1.0	1.0	1.0
EBSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0

Table S68 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0

Table S69. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (IJAYA is the control algorithm, n_2 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	7.43248E-10	7.43248E-10	7.43248E-10	7.43248E-10
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	2.66782E-01	3.06638E-01	3.06638E-01	2.66782E-01
PSO	Friedman	4.54207E-05	8.38553E-05	8.38553E-05	8.38520E-05
PSO	Friedman Aligned	1.35070E-10	5.09112E-10	5.09112E-10	5.09112E-10
PSO	Quade	5.22216E-01	1.0	1.0	7.44252E-01
CWOA	Friedman	3.64540E-04	9.25501E-04	9.25501E-04	9.25112E-04
CWOA	Friedman Aligned	5.32651E-11	1.96671E-10	1.96671E-10	1.96671E-10
CWOA	Quade	5.50483E-01	1.0	1.0	8.68626E-01
NNA	Friedman	9.08440E-04	2.79608E-03	2.79608E-03	2.79256E-03
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	5.50483E-01	1.0	1.0	8.97503E-01
GOTLBO	Friedman	3.55101E-02	1.24289E-01	1.24289E-01	1.17640E-01
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	7.34526E-01	1.0	1.0	9.89856E-01
ISCA	Friedman	1.84143E-01	7.17234E-01	7.17234E-01	5.28316E-01
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	8.38066E-01	1.0	1.0	9.98796E-01
MABC	Friedman	8.30669E-01	1.0	1.0	9.98761E-01
MABC	Friedman Aligned	1.20936E-11	4.18625E-11	4.18625E-11	4.18625E-11
MABC	Quade	9.24393E-01	1.0	1.0	9.99941E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	9.98735E-01	1.0	1.0	1.0

Table S69 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S70. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ISCA is the control algorithm, n_2 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	1.49117E-05	1.49118E-05	1.49118E-05	1.49117E-05
WW	Friedman Aligned	1.07945E-10	1.99283E-10	1.99283E-10	1.99283E-10
WW	Quade	7.08152E-01	1.0	1.0	7.08152E-01
PSO	Friedman	3.30715E-02	6.19271E-02	6.19271E-02	6.01993E-02
PSO	Friedman Aligned	5.28264E-09	1.62543E-08	1.62543E-08	1.62543E-08
PSO	Quade	9.00243E-01	1.0	1.0	9.85813E-01
CWOA	Friedman	1.05547E-01	2.79535E-01	2.79535E-01	2.46592E-01
CWOA	Friedman Aligned	4.87572E-10	1.23768E-09	1.23768E-09	1.23768E-09
CWOA	Quade	9.05533E-01	1.0	1.0	9.97495E-01
NNA	Friedman	1.61730E-01	5.28346E-01	5.28346E-01	4.18890E-01
NNA	Friedman Aligned	4.82059E-13	4.82059E-13	4.82059E-13	4.82059E-13
NNA	Quade	9.05533E-01	1.0	1.0	9.98649E-01
GOTLBO	Friedman	7.82941E-01	1.0	1.0	9.94947E-01
GOTLBO	Friedman Aligned	2.23133E-03	7.72913E-03	7.72913E-03	7.70263E-03
GOTLBO	Quade	9.81758E-01	1.0	1.0	9.99999E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0

Table S70 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S71. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NNA is the control algorithm, n_2 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	4.34105E-02	4.43053E-02	4.43053E-02	4.34105E-02
WW	Friedman Aligned	1.25781E-08	1.25781E-08	1.25781E-08	1.25781E-08
WW	Quade	9.93459E-01	1.0	1.0	9.93459E-01
PSO	Friedman	9.59537E-01	1.0	1.0	9.97318E-01
PSO	Friedman Aligned	1.41924E-05	2.62016E-05	2.62016E-05	2.62013E-05
PSO	Quade	9.99820E-01	1.0	1.0	1.0
CWOA	Friedman	9.98121E-01	1.0	1.0	1.0
CWOA	Friedman Aligned	2.92359E-01	8.43733E-01	8.43733E-01	5.84323E-01
CWOA	Quade	9.99978E-01	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0

Table S71 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0

Table S72. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (CWOA is the control algorithm, n_2 evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	1.05634E-01	1.11163E-01	1.11163E-01	1.05634E-01
WW	Friedman Aligned	7.79425E-08	7.79425E-08	7.79425E-08	7.79425E-08
WW	Quade	9.97790E-01	1.0	1.0	9.97790E-01
PSO	Friedman	9.96116E-01	1.0	1.0	9.99965E-01
PSO	Friedman Aligned	1.94787E-02	3.62606E-02	3.62606E-02	3.56640E-02
PSO	Quade	9.99983E-01	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0

Table S72 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0

Table S73. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (WW is the control algorithm, n_2 evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S73 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
PSO	Friedman	1.0	1.0	1.0	1.0
PSO	Friedman Aligned	1.0	1.0	1.0	1.0
PSO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0

Table S74. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (DE is the control algorithm, R_{p2} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	3.85241E-05	3.85248E-05	3.85248E-05	3.85241E-05
PSO	Friedman Aligned	1.30970E-08	3.32462E-08	3.16401E-08	3.32462E-08
PSO	Quade	6.28939E-01	9.54531E-01	9.54531E-01	6.28939E-01
CWOA	Friedman	2.30207E-04	4.25038E-04	4.25038E-04	4.24956E-04
CWOA	Friedman Aligned	1.45657E-11	1.45657E-11	1.45657E-11	1.45657E-11
CWOA	Quade	6.36202E-01	1.0	1.0	8.45375E-01
WW	Friedman	5.14600E-04	1.30655E-03	1.30655E-03	1.30577E-03
WW	Friedman Aligned	1.30970E-08	3.32462E-08	3.16401E-08	3.32462E-08
WW	Quade	6.36202E-01	1.0	1.0	8.93749E-01
MABC	Friedman	9.08440E-04	2.79608E-03	2.79608E-03	2.79256E-03
MABC	Friedman Aligned	8.90533E-10	1.64406E-09	1.64406E-09	1.64406E-09
MABC	Quade	6.36202E-01	1.0	1.0	8.93749E-01
NNA	Friedman	3.83377E-03	1.32864E-02	1.32864E-02	1.32082E-02
NNA	Friedman Aligned	8.30815E-06	3.06763E-05	3.06763E-05	3.06759E-05
NNA	Quade	6.84588E-01	1.0	1.0	9.81577E-01
GOTLBO	Friedman	9.97395E-03	3.69263E-02	3.69263E-02	3.63352E-02
GOTLBO	Friedman Aligned	1.25934E-03	4.74813E-03	4.74813E-03	4.73848E-03
GOTLBO	Quade	6.84588E-01	1.0	1.0	9.81577E-01
ISCA	Friedman	2.90759E-02	1.10340E-01	1.10340E-01	1.05257E-01
ISCA	Friedman Aligned	1.94427E-03	7.18153E-03	7.18153E-03	7.16008E-03
ISCA	Quade	6.84588E-01	1.0	1.0	9.81577E-01
NDE	Friedman	3.23617E-01	1.0	1.0	7.63942E-01
NDE	Friedman Aligned	5.67700E-06	1.96512E-05	1.96512E-05	1.96510E-05
NDE	Quade	6.84588E-01	1.0	1.0	9.81577E-01

Table S74 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
IJAYA	Friedman	8.26099E-01	1.0	1.0	9.97654E-01
IJAYA	Friedman Aligned	8.17591E-01	1.0	1.0	9.97233E-01
IJAYA	Quade	9.26311E-01	1.0	1.0	9.99880E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S75. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (EBLSHADE is the control algorithm, R_{p2} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
ISCA	Friedman	2.82885E-13	2.82885E-13	2.82885E-13	2.82885E-13
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	3.19021E-02	1.18526E-01	1.18526E-01	1.12824E-01
GOTLBO	Friedman	3.53606E-13	6.52811E-13	6.52811E-13	6.52811E-13
GOTLBO	Friedman Aligned	2.87605E-10	1.06193E-09	1.06193E-09	1.06193E-09
GOTLBO	Quade	3.16479E-02	1.10636E-01	1.05998E-01	1.05349E-01
NNA	Friedman	2.63833E-12	6.69731E-12	6.69731E-12	6.69731E-12
NNA	Friedman Aligned	4.20856E-09	1.45681E-08	1.45681E-08	1.45681E-08
NNA	Quade	3.16479E-02	1.10636E-01	1.05998E-01	1.05349E-01
MABC	Friedman	3.12516E-11	9.61586E-11	9.61586E-11	9.61586E-11
MABC	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
MABC	Quade	1.54402E-02	3.94292E-02	3.94292E-02	3.87301E-02
WW	Friedman	8.01828E-11	2.77556E-10	2.77556E-10	2.77556E-10
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	1.54402E-02	4.15868E-02	4.15868E-02	4.08171E-02
NDE	Friedman	1.83881E-10	6.78945E-10	6.78945E-10	6.78945E-10
NDE	Friedman Aligned	4.73813E-09	1.45789E-08	1.45789E-08	1.45789E-08
NDE	Quade	3.16479E-02	1.18446E-01	1.18446E-01	1.12600E-01
CWOA	Friedman	2.39580E-10	9.03031E-10	9.03031E-10	9.03031E-10
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	1.49768E-02	2.78262E-02	2.78262E-02	2.74741E-02
PSO	Friedman	2.21287E-09	8.17061E-09	8.17061E-09	8.17061E-09
PSO	Friedman Aligned	4.91679E-11	1.85325E-10	1.85325E-10	1.85325E-10
PSO	Quade	9.54010E-03	9.58237E-03	9.58237E-03	9.54010E-03

Table S75 (*continued*)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
IJAYA	Friedman	2.50012E-08	8.65425E-08	8.65425E-08	8.65425E-08
IJAYA	Friedman Aligned	9.85286E-13	3.63798E-12	3.63798E-12	3.63798E-12
IJAYA	Quade	1.03731E-01	3.65075E-01	3.65075E-01	3.15515E-01
DE	Friedman	1.88313E-07	5.79424E-07	5.79424E-07	5.79424E-07
DE	Friedman Aligned	<1E-13	2.51799E-13	2.51799E-13	2.51799E-13
DE	Quade	1.44238E-01	4.51670E-01	4.51670E-01	3.80764E-01
TLBO	Friedman	8.79380E-02	2.24791E-01	2.24791E-01	2.08368E-01
TLBO	Friedman Aligned	1.36519E-03	3.46585E-03	3.46585E-03	3.46185E-03
TLBO	Quade	6.31532E-01	1.0	1.0	9.20691E-01
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S76. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ADELI is the control algorithm, R_{p2} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
ISCA	Friedman	1.54143E-12	1.54143E-12	1.54143E-12	1.54143E-12
ISCA	Friedman Aligned	6.19721E-09	2.14519E-08	2.14519E-08	2.14519E-08
ISCA	Quade	1.33574E-02	4.94471E-02	4.94471E-02	4.84395E-02
NDE	Friedman	1.23935E-11	2.57512E-11	2.57512E-11	2.57512E-11
NDE	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NDE	Quade	1.28596E-02	4.86156E-02	4.86156E-02	4.76143E-02
GOTLBO	Friedman	1.23935E-11	2.28804E-11	2.28804E-11	2.28804E-11
GOTLBO	Friedman Aligned	7.46673E-09	2.29745E-08	2.29745E-08	2.29745E-08
GOTLBO	Quade	1.26457E-02	4.39450E-02	4.24241E-02	4.30964E-02
NNA	Friedman	4.65187E-11	1.43134E-10	1.43134E-10	1.43134E-10
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	1.26457E-02	4.39450E-02	4.24241E-02	4.30964E-02
MABC	Friedman	3.75683E-10	1.30044E-09	1.30044E-09	1.30044E-09
MABC	Friedman Aligned	2.94570E-11	1.01966E-10	1.01966E-10	1.01966E-10
MABC	Quade	5.47342E-03	1.39234E-02	1.39234E-02	1.38356E-02
WW	Friedman	8.36500E-10	3.08861E-09	3.08861E-09	3.08861E-09
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	5.47342E-03	1.48853E-02	1.48853E-02	1.47860E-02
IJAYA	Friedman	1.35369E-09	5.10235E-09	5.10235E-09	5.10235E-09
IJAYA	Friedman Aligned	2.63984E-09	9.74710E-09	9.74710E-09	9.74710E-09
IJAYA	Quade	5.07250E-02	1.76988E-01	1.76988E-01	1.64894E-01
CWOA	Friedman	2.10865E-09	7.78579E-09	7.78579E-09	7.78579E-09
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	5.10914E-03	9.45270E-03	9.45270E-03	9.41186E-03

Table S76 (*continued*)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	1.08138E-08	3.74326E-08	3.74326E-08	3.74326E-08
DE	Friedman Aligned	5.65963E-10	2.13325E-09	2.13325E-09	2.13325E-09
DE	Quade	7.46403E-02	2.31704E-01	2.31704E-01	2.12337E-01
PSO	Friedman	1.25898E-08	3.87379E-08	3.87379E-08	3.87379E-08
PSO	Friedman Aligned	1.07413E-10	3.96600E-10	3.96600E-10	3.96600E-10
PSO	Quade	2.95239E-03	2.95642E-03	2.95642E-03	2.95239E-03
TLBO	Friedman	2.48488E-02	6.31994E-02	6.31994E-02	6.18773E-02
TLBO	Friedman Aligned	1.59818E-06	4.05692E-06	4.05692E-06	4.05691E-06
TLBO	Quade	4.31217E-01	1.0	9.40692E-01	7.61251E-01
EBLSHADE	Friedman	6.28359E-01	1.0	7.46914E-01	8.39165E-01
EBLSHADE	Friedman Aligned	1.22462E-01	2.27198E-01	2.27198E-01	2.14293E-01
EBLSHADE	Quade	7.82837E-01	1.0	9.40692E-01	9.40351E-01
STLBO	Friedman	7.46914E-01	1.0	7.46914E-01	8.39165E-01
STLBO	Friedman Aligned	9.97806E-01	9.97806E-01	9.97806E-01	9.97806E-01
STLBO	Quade	9.40692E-01	1.0	9.40692E-01	9.40692E-01

Table S77. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NDE is the control algorithm, R_{p2} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	7.80942E-03	7.83771E-03	7.83771E-03	7.80942E-03
PSO	Friedman Aligned	2.30926E-13	2.30926E-13	2.30926E-13	2.30926E-13
PSO	Quade	9.93803E-01	1.0	1.0	9.93803E-01
CWOA	Friedman	2.45863E-02	4.58695E-02	4.58695E-02	4.49174E-02
CWOA	Friedman Aligned	6.34585E-04	1.61126E-03	1.61126E-03	1.61008E-03
CWOA	Quade	9.93803E-01	1.0	1.0	9.99812E-01
WW	Friedman	3.91395E-02	1.00885E-01	1.00885E-01	9.63840E-02
WW	Friedman Aligned	5.71982E-01	1.0	1.0	9.26542E-01
WW	Quade	9.93803E-01	1.0	1.0	9.99958E-01
MABC	Friedman	5.36610E-02	1.68274E-01	1.68274E-01	1.56087E-01
MABC	Friedman Aligned	1.94364E-05	3.58829E-05	3.58829E-05	3.58823E-05
MABC	Quade	9.93803E-01	1.0	1.0	9.99958E-01
NNA	Friedman	1.31625E-01	4.75511E-01	4.75511E-01	3.86475E-01
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	9.97994E-01	1.0	1.0	1.0
GOTLBO	Friedman	2.26749E-01	8.95302E-01	8.95302E-01	6.13059E-01
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	9.97994E-01	1.0	1.0	1.0
ISCA	Friedman	4.01459E-01	1.0	1.0	8.55518E-01
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0

Table S77 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S78. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (MABC is the control algorithm, R_{p^2} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	9.90021E-01	1.0	1.0	9.90021E-01
PSO	Friedman Aligned	1.47252E-02	1.48262E-02	1.48262E-02	1.47252E-02
PSO	Quade	9.99998E-01	1.0	1.0	9.99998E-01
CWOA	Friedman	9.98002E-01	1.0	1.0	9.99990E-01
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	9.99533E-01	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0

Table S78 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0

Table S79. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (TLBO is the control algorithm, R_{p2} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
CWOA	Friedman	4.24327E-13	4.24327E-13	4.24327E-13	4.24327E-13
CWOA	Friedman Aligned	1.58213E-08	5.84171E-08	5.84171E-08	5.84171E-08
CWOA	Quade	8.27070E-02	1.58322E-01	1.58322E-01	1.47324E-01
PSO	Friedman	5.47007E-13	1.00986E-12	1.00986E-12	1.00986E-12
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	6.29272E-02	6.48321E-02	6.48321E-02	6.29272E-02
WW	Friedman	1.17580E-12	2.98472E-12	2.98472E-12	2.98472E-12
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	8.27070E-02	2.15423E-01	2.15423E-01	1.95696E-01
MABC	Friedman	4.19564E-12	1.29097E-11	1.29097E-11	1.29097E-11
MABC	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
MABC	Quade	8.27070E-02	2.09263E-01	2.09263E-01	1.90452E-01
NNA	Friedman	7.84642E-11	2.71607E-10	2.71607E-10	2.71607E-10
NNA	Friedman Aligned	2.47028E-10	9.12102E-10	9.12102E-10	9.12102E-10
NNA	Quade	1.31675E-01	4.75701E-01	4.49624E-01	3.86597E-01
GOTLBO	Friedman	6.36465E-10	2.35003E-09	2.35003E-09	2.35003E-09
GOTLBO	Friedman Aligned	2.11298E-13	7.31415E-13	7.31415E-13	7.31415E-13
GOTLBO	Quade	1.31675E-01	4.75701E-01	4.49624E-01	3.86597E-01
ISCA	Friedman	7.32203E-09	2.75984E-08	2.75984E-08	2.75984E-08
ISCA	Friedman Aligned	<1E-13	2.62013E-13	2.62013E-13	2.62013E-13
ISCA	Quade	1.31675E-01	4.80357E-01	4.66941E-01	3.92032E-01
NDE	Friedman	3.81094E-06	1.40712E-05	1.40712E-05	1.40711E-05
NDE	Friedman Aligned	3.64961E-10	1.37562E-09	1.37562E-09	1.37562E-09
NDE	Quade	1.31675E-01	4.80357E-01	4.66941E-01	3.92032E-01

Table S79 (*continued*)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
IJAYA	Friedman	1.63384E-04	5.65573E-04	5.65573E-04	5.65445E-04
IJAYA	Friedman Aligned	3.87465E-07	1.34123E-06	1.34123E-06	1.34123E-06
IJAYA	Quade	3.02189E-01	1.0	1.0	7.12198E-01
DE	Friedman	6.56389E-04	2.01981E-03	2.01981E-03	2.01828E-03
DE	Friedman Aligned	2.66423E-06	8.19762E-06	8.19762E-06	8.19760E-06
DE	Quade	3.81323E-01	1.0	1.0	7.71781E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S80. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (GOTLBO is the control algorithm, R_{p2} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	5.86488E-01	8.53743E-01	8.53743E-01	5.86488E-01
PSO	Friedman Aligned	8.81758E-10	8.81758E-10	8.81758E-10	8.81758E-10
PSO	Quade	9.97484E-01	1.0	1.0	9.97484E-01
CWOA	Friedman	7.51157E-01	1.0	1.0	9.23302E-01
CWOA	Friedman Aligned	1.22647E-06	3.11335E-06	3.11335E-06	3.11335E-06
CWOA	Quade	9.97484E-01	1.0	1.0	9.99959E-01
WW	Friedman	7.99268E-01	1.0	1.0	9.83028E-01
WW	Friedman Aligned	3.57471E-02	1.11380E-01	1.11380E-01	1.05960E-01
WW	Quade	9.97484E-01	1.0	1.0	9.99994E-01
MABC	Friedman	8.32806E-01	1.0	1.0	9.95927E-01
MABC	Friedman Aligned	1.26421E-08	2.33393E-08	2.33393E-08	2.33393E-08
MABC	Quade	9.97484E-01	1.0	1.0	9.99994E-01
NNA	Friedman	9.66409E-01	1.0	1.0	9.99992E-01
NNA	Friedman Aligned	4.19070E-01	1.0	1.0	8.65391E-01
NNA	Quade	9.99955E-01	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0

Table S80 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	4.05106E-01	1.0	1.0	8.34341E-01
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0

Table S81. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (STLBO is the control algorithm, R_{p2} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
ISCA	Friedman	1.84741E-13	1.84741E-13	1.84741E-13	1.84741E-13
ISCA	Friedman Aligned	6.16534E-09	2.13416E-08	2.13416E-08	2.13416E-08
ISCA	Quade	1.65864E-02	6.14388E-02	6.14388E-02	5.98873E-02
GOTLBO	Friedman	1.50679E-12	2.78177E-12	2.78177E-12	2.78177E-12
GOTLBO	Friedman Aligned	7.42973E-09	2.28607E-08	2.28607E-08	2.28607E-08
GOTLBO	Quade	1.58830E-02	5.52505E-02	5.32410E-02	5.39130E-02
NNA	Friedman	9.56997E-12	2.42930E-11	2.42930E-11	2.42930E-11
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	1.58830E-02	5.52505E-02	5.32410E-02	5.39130E-02
NDE	Friedman	7.10301E-11	2.18554E-10	2.18554E-10	2.18554E-10
NDE	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NDE	Quade	1.60291E-02	6.06427E-02	6.06427E-02	5.90891E-02
MABC	Friedman	7.53190E-11	2.60719E-10	2.60719E-10	2.60719E-10
MABC	Friedman Aligned	2.94091E-11	1.01801E-10	1.01801E-10	1.01801E-10
MABC	Quade	7.07439E-03	1.80071E-02	1.80071E-02	1.78605E-02
WW	Friedman	1.86658E-10	6.89200E-10	6.89200E-10	6.89200E-10
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	7.07439E-03	1.91887E-02	1.91887E-02	1.90239E-02
CWOA	Friedman	6.11462E-10	2.30474E-09	2.30474E-09	2.30474E-09
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	6.66498E-03	1.23394E-02	1.23394E-02	1.22699E-02
PSO	Friedman	4.89640E-09	1.80790E-08	1.80790E-08	1.80790E-08
PSO	Friedman Aligned	1.07310E-10	3.96220E-10	3.96220E-10	3.96220E-10
PSO	Quade	3.94226E-03	3.94945E-03	3.94945E-03	3.94226E-03

Table S81 (*continued*)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
IJAYA	Friedman	7.58306E-09	2.62490E-08	2.62490E-08	2.62490E-08
IJAYA	Friedman Aligned	2.61112E-09	9.64106E-09	9.64106E-09	9.64106E-09
IJAYA	Quade	6.06906E-02	2.12098E-01	2.12098E-01	1.94851E-01
DE	Friedman	6.24243E-08	1.92075E-07	1.92075E-07	1.92075E-07
DE	Friedman Aligned	5.59014E-10	2.10705E-09	2.10705E-09	2.10705E-09
DE	Quade	8.80902E-02	2.73906E-01	2.73906E-01	2.47035E-01
TLBO	Friedman	5.55943E-02	1.41741E-01	1.41741E-01	1.35150E-01
TLBO	Friedman Aligned	1.62041E-06	4.11334E-06	4.11334E-06	4.11334E-06
TLBO	Quade	4.76082E-01	1.0	1.0	8.06197E-01
EBLSHADE	Friedman	8.61718E-01	1.0	1.0	9.74075E-01
EBLSHADE	Friedman Aligned	1.23136E-01	2.28456E-01	2.28456E-01	2.15408E-01
EBLSHADE	Quade	8.37323E-01	1.0	1.0	9.65006E-01
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0

Table S82. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (PSO is the control algorithm, R_{p2} evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S82 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S83. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (IJAYA is the control algorithm, R_{p^2} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	2.31344E-04	2.31368E-04	2.31368E-04	2.31344E-04
PSO	Friedman Aligned	6.11085E-09	1.55122E-08	1.55122E-08	1.55122E-08
PSO	Quade	7.91155E-01	1.0	1.0	7.91155E-01
CWOA	Friedman	1.13512E-03	2.09662E-03	2.09662E-03	2.09461E-03
CWOA	Friedman Aligned	9.81437E-13	9.81437E-13	9.81437E-13	9.81437E-13
CWOA	Quade	7.91155E-01	1.0	1.0	9.40998E-01
WW	Friedman	2.28574E-03	5.80737E-03	5.80737E-03	5.79207E-03
WW	Friedman Aligned	1.00298E-07	3.08611E-07	3.08611E-07	3.08611E-07
WW	Quade	7.91155E-01	1.0	1.0	9.65039E-01
MABC	Friedman	3.73238E-03	1.14991E-02	1.14991E-02	1.14398E-02
MABC	Friedman Aligned	1.20086E-10	2.21697E-10	2.21697E-10	2.21697E-10
MABC	Quade	7.91155E-01	1.0	1.0	9.65039E-01
NNA	Friedman	1.33622E-02	4.64453E-02	4.64453E-02	4.54980E-02
NNA	Friedman Aligned	5.19667E-05	1.91880E-04	1.91880E-04	1.91864E-04
NNA	Quade	8.14745E-01	1.0	1.0	9.97080E-01
GOTLBO	Friedman	3.06760E-02	1.14216E-01	1.14216E-01	1.08668E-01
GOTLBO	Friedman Aligned	4.97230E-03	1.87633E-02	1.87633E-02	1.86131E-02
GOTLBO	Quade	8.14745E-01	1.0	1.0	9.97080E-01
ISCA	Friedman	7.68884E-02	2.95155E-01	2.95155E-01	2.60335E-01
ISCA	Friedman Aligned	7.23856E-03	2.67643E-02	2.67643E-02	2.64676E-02
ISCA	Quade	8.14745E-01	1.0	1.0	9.97080E-01
NDE	Friedman	5.51498E-01	1.0	1.0	9.48214E-01
NDE	Friedman Aligned	3.71045E-05	1.28440E-04	1.28440E-04	1.28433E-04
NDE	Quade	8.14745E-01	1.0	1.0	9.97080E-01

Table S83 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S84. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ISCA is the control algorithm, R_{p2} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	2.69676E-01	3.10499E-01	3.10499E-01	2.69676E-01
PSO	Friedman Aligned	1.90081E-09	1.90081E-09	1.90081E-09	1.90081E-09
PSO	Quade	9.89623E-01	1.0	1.0	9.89623E-01
CWOA	Friedman	4.39552E-01	1.0	1.0	6.56634E-01
CWOA	Friedman Aligned	5.21440E-07	1.32366E-06	1.32366E-06	1.32366E-06
CWOA	Quade	9.89623E-01	1.0	1.0	9.99557E-01
WW	Friedman	5.09275E-01	1.0	1.0	8.35864E-01
WW	Friedman Aligned	2.25658E-02	6.99826E-02	6.99826E-02	6.78193E-02
WW	Quade	9.89623E-01	1.0	1.0	9.99883E-01
MABC	Friedman	5.59198E-01	1.0	1.0	9.19580E-01
MABC	Friedman Aligned	4.73291E-09	8.73769E-09	8.73769E-09	8.73769E-09
MABC	Quade	9.89623E-01	1.0	1.0	9.99883E-01
NNA	Friedman	7.82941E-01	1.0	1.0	9.94947E-01
NNA	Friedman Aligned	3.27655E-01	1.0	1.0	7.69104E-01
NNA	Quade	9.94298E-01	1.0	1.0	1.0
GOTLBO	Friedman	9.12830E-01	1.0	1.0	9.99878E-01
GOTLBO	Friedman Aligned	9.78655E-01	1.0	1.0	9.99999E-01
GOTLBO	Quade	9.94298E-01	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0

Table S84 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	3.13388E-01	1.0	1.0	7.27874E-01
NDE	Quade	9.96741E-01	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S85. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NNA is the control algorithm, R_{p2} evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	8.48601E-01	1.0	1.0	8.48601E-01
PSO	Friedman Aligned	4.90719E-13	4.90719E-13	4.90719E-13	4.90719E-13
PSO	Quade	9.98135E-01	1.0	1.0	9.98135E-01
CWOA	Friedman	9.32174E-01	1.0	1.0	9.93041E-01
CWOA	Friedman Aligned	3.95822E-04	1.00493E-03	1.00493E-03	1.00447E-03
CWOA	Quade	9.98135E-01	1.0	1.0	9.99976E-01
WW	Friedman	9.51791E-01	1.0	1.0	9.99546E-01
WW	Friedman Aligned	4.91869E-01	1.0	1.0	8.75460E-01
WW	Quade	9.98135E-01	1.0	1.0	9.99997E-01
MABC	Friedman	9.66929E-01	1.0	1.0	9.99972E-01
MABC	Friedman Aligned	1.10045E-05	2.03160E-05	2.03160E-05	2.03159E-05
MABC	Quade	9.98135E-01	1.0	1.0	9.99997E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	9.97980E-01	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0

Table S85 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0

Table S86. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (CWOA is the control algorithm, R_{p2} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	9.99991E-01	1.0	1.0	9.99991E-01
PSO	Friedman Aligned	4.75831E-04	4.75935E-04	4.75935E-04	4.75831E-04
PSO	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	9.56126E-01	1.0	1.0	9.96886E-01
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0

Table S86 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S87. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (WW is the control algorithm, R_{p2} evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	9.98940E-01	1.0	1.0	9.98940E-01
PSO	Friedman Aligned	2.50197E-10	2.50197E-10	2.50197E-10	2.50197E-10
PSO	Quade	9.99995E-01	1.0	1.0	9.99995E-01
CWOA	Friedman	9.99937E-01	1.0	1.0	1.0
CWOA	Friedman Aligned	4.02222E-02	1.03720E-01	1.03720E-01	9.89662E-02
CWOA	Quade	9.99997E-01	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	3.37036E-03	6.23109E-03	6.23109E-03	6.21332E-03
MABC	Quade	9.99999E-01	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0

Table S87 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0

Table S88. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (DE is the control algorithm, I_{ph} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	1.65316E-06	1.65316E-06	1.65316E-06	1.65316E-06
PSO	Friedman Aligned	1.53731E-10	5.67622E-10	5.67622E-10	5.67622E-10
PSO	Quade	3.88398E-01	4.82491E-01	4.82491E-01	3.88398E-01
GOTLBO	Friedman	8.93210E-06	1.64901E-05	1.64901E-05	1.64900E-05
GOTLBO	Friedman Aligned	4.73962E-11	1.45834E-10	1.45834E-10	1.45834E-10
GOTLBO	Quade	4.90459E-01	1.0	1.0	7.11990E-01
CWOA	Friedman	1.88793E-04	4.79278E-04	4.79278E-04	4.79174E-04
CWOA	Friedman Aligned	7.33780E-11	2.54001E-10	2.54001E-10	2.54001E-10
CWOA	Quade	4.90459E-01	1.0	1.0	7.11990E-01
NNA	Friedman	2.35379E-04	7.24303E-04	7.24303E-04	7.24067E-04
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	4.90459E-01	1.0	1.0	8.02179E-01
ISCA	Friedman	2.53779E-04	8.78536E-04	8.78536E-04	8.78193E-04
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	4.90459E-01	1.0	1.0	8.02179E-01
WW	Friedman	2.94224E-03	1.08723E-02	1.08723E-02	1.08207E-02
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	4.90459E-01	1.0	1.0	8.86478E-01
MABC	Friedman	7.26555E-02	2.78617E-01	2.78617E-01	2.47469E-01
MABC	Friedman Aligned	6.49287E-08	2.44731E-07	2.44731E-07	2.44731E-07
MABC	Quade	7.38143E-01	1.0	1.0	9.93595E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0

Table S88 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S89. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ADELI is the control algorithm, I_{ph} evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
GOTLBO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Friedman Aligned	1.34914E-10	4.67010E-10	4.67010E-10	4.67010E-10
GOTLBO	Quade	2.01733E-03	3.72749E-03	3.62027E-03	3.72113E-03
MABC	Friedman	5.02265E-13	9.27258E-13	9.27258E-13	9.27258E-13
MABC	Friedman Aligned	4.27647E-12	7.89502E-12	7.89502E-12	7.89502E-12
MABC	Quade	1.69013E-02	6.39553E-02	6.39553E-02	6.22288E-02
WW	Friedman	3.31974E-10	8.42703E-10	8.42703E-10	8.42703E-10
WW	Friedman Aligned	5.25791E-11	1.33470E-10	1.33470E-10	1.33470E-10
WW	Quade	3.73309E-03	1.37976E-02	1.37976E-02	1.37146E-02
PSO	Friedman	5.31136E-10	1.63426E-09	1.63426E-09	1.63426E-09
PSO	Friedman Aligned	2.13919E-10	8.06309E-10	8.06309E-10	8.06309E-10
PSO	Quade	6.98330E-04	6.98555E-04	6.98555E-04	6.98330E-04
DE	Friedman	3.19170E-09	1.10482E-08	1.10482E-08	1.10482E-08
DE	Friedman Aligned	5.47403E-03	2.02331E-02	2.02331E-02	2.00633E-02
DE	Quade	8.10275E-02	3.04024E-01	3.04024E-01	2.68016E-01
ISCA	Friedman	3.57233E-09	1.31901E-08	1.31901E-08	1.31901E-08
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	2.22682E-03	6.90912E-03	6.90912E-03	6.88795E-03
NNA	Friedman	4.05858E-09	1.52977E-08	1.52977E-08	1.52977E-08
NNA	Friedman Aligned	5.32343E-11	1.63798E-10	1.63798E-10	1.63798E-10
NNA	Quade	2.22682E-03	6.85703E-03	6.85703E-03	6.83591E-03
CWOA	Friedman	5.60543E-09	2.06970E-08	2.06970E-08	2.06970E-08
CWOA	Friedman Aligned	1.69719E-10	6.26656E-10	6.26656E-10	6.26656E-10
CWOA	Quade	2.01733E-03	3.72749E-03	3.62027E-03	3.72113E-03

Table S89 (*continued*)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
IJAYA	Friedman	3.52483E-08	1.22013E-07	1.22013E-07	1.22013E-07
IJAYA	Friedman Aligned	1.53493E-02	5.32586E-02	5.32586E-02	5.21360E-02
IJAYA	Quade	1.15779E-01	4.08298E-01	4.08298E-01	3.46842E-01
NDE	Friedman	3.42808E-06	1.05479E-05	1.05479E-05	1.05479E-05
NDE	Friedman Aligned	1.43525E-01	4.49397E-01	4.49397E-01	3.79176E-01
NDE	Quade	1.41545E-01	4.43086E-01	4.43086E-01	3.74750E-01
TLBO	Friedman	8.34811E-02	2.13320E-01	2.13320E-01	1.98511E-01
TLBO	Friedman Aligned	7.63709E-01	1.0	1.0	9.74324E-01
TLBO	Quade	5.70319E-01	1.0	9.87681E-01	8.82846E-01
EBLSHADE	Friedman	8.44298E-01	1.0	8.29657E-01	9.67726E-01
EBLSHADE	Friedman Aligned	8.82085E-01	1.0	1.0	9.80682E-01
EBLSHADE	Quade	9.74027E-01	1.0	9.87681E-01	9.98817E-01
STLBO	Friedman	8.44298E-01	1.0	8.29657E-01	9.67726E-01
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	9.87681E-01	1.0	9.87681E-01	9.98817E-01

Table S90. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (EBLSHADE is the control algorithm, I_{ph} evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
GOTLBO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Friedman Aligned	1.26962E-10	4.39482E-10	4.39482E-10	4.39482E-10
GOTLBO	Quade	2.37937E-03	4.39710E-03	4.26800E-03	4.38825E-03
PSO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Friedman Aligned	2.13792E-10	8.05830E-10	8.05830E-10	8.05830E-10
PSO	Quade	8.38441E-04	8.38765E-04	8.38765E-04	8.38441E-04
MABC	Friedman	<1E-13	1.83187E-13	1.83187E-13	1.83187E-13
MABC	Friedman Aligned	1.31339E-12	2.42473E-12	2.42473E-12	2.42473E-12
MABC	Quade	1.91431E-02	7.24764E-02	7.24764E-02	7.02637E-02
WW	Friedman	7.79167E-11	2.39744E-10	2.39744E-10	2.39744E-10
WW	Friedman Aligned	4.75574E-11	1.20723E-10	1.20723E-10	1.20723E-10
WW	Quade	4.31959E-03	1.59678E-02	1.59678E-02	1.58567E-02
ISCA	Friedman	1.68524E-09	5.83353E-09	5.83353E-09	5.83353E-09
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	2.60407E-03	8.07052E-03	8.07052E-03	8.04163E-03
NNA	Friedman	1.89918E-09	7.01236E-09	7.01236E-09	7.01236E-09
NNA	Friedman Aligned	4.85501E-11	1.49385E-10	1.49385E-10	1.49385E-10
NNA	Quade	2.60407E-03	8.01975E-03	8.01975E-03	7.99087E-03
CWOA	Friedman	2.65354E-09	1.00018E-08	1.00018E-08	1.00018E-08
CWOA	Friedman Aligned	1.61977E-10	5.98069E-10	5.98069E-10	5.98069E-10
CWOA	Quade	2.37937E-03	4.39710E-03	4.26800E-03	4.38825E-03
DE	Friedman	7.94319E-09	2.93287E-08	2.93287E-08	2.93287E-08
DE	Friedman Aligned	9.47613E-03	3.50528E-02	3.50528E-02	3.45449E-02
DE	Quade	8.93754E-02	3.35921E-01	3.35921E-01	2.92269E-01

Table S90 (*continued*)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
IJAYA	Friedman	1.23860E-07	4.28745E-07	4.28745E-07	4.28745E-07
IJAYA	Friedman Aligned	2.49893E-02	8.68378E-02	8.68378E-02	8.38734E-02
IJAYA	Quade	1.26669E-01	4.47523E-01	4.47523E-01	3.74268E-01
NDE	Friedman	1.01613E-05	3.12657E-05	3.12657E-05	3.12654E-05
NDE	Friedman Aligned	2.00048E-01	6.31055E-01	6.31055E-01	4.96806E-01
NDE	Quade	1.54053E-01	4.83018E-01	4.83018E-01	4.02358E-01
TLBO	Friedman	1.34018E-01	3.43902E-01	3.43902E-01	3.05986E-01
TLBO	Friedman Aligned	8.84270E-01	1.0	1.0	9.95806E-01
TLBO	Quade	5.99326E-01	1.0	1.0	9.01893E-01
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S91. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NDE is the control algorithm, I_{ph} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	3.61989E-10	3.61989E-10	3.61989E-10	3.61989E-10
PSO	Friedman Aligned	1.81743E-10	6.85032E-10	6.85032E-10	6.85032E-10
PSO	Quade	1.73209E-01	1.88818E-01	1.88818E-01	1.73209E-01
GOTLBO	Friedman	3.50712E-09	6.47468E-09	6.47468E-09	6.47468E-09
GOTLBO	Friedman Aligned	7.27926E-11	2.51974E-10	2.51974E-10	2.51974E-10
GOTLBO	Quade	2.54954E-01	5.31222E-01	5.04676E-01	4.19195E-01
CWOA	Friedman	1.94580E-07	4.93934E-07	4.93934E-07	4.93934E-07
CWOA	Friedman Aligned	1.03934E-10	3.83757E-10	3.83757E-10	3.83757E-10
CWOA	Quade	2.54954E-01	5.31222E-01	5.04676E-01	4.19195E-01
NNA	Friedman	2.78684E-07	8.57490E-07	8.57490E-07	8.57490E-07
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	2.54954E-01	7.17822E-01	6.91359E-01	5.25213E-01
ISCA	Friedman	3.30631E-07	1.14449E-06	1.14449E-06	1.14449E-06
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	2.54954E-01	7.17822E-01	6.91359E-01	5.25213E-01
WW	Friedman	9.61871E-06	3.55153E-05	3.55153E-05	3.55148E-05
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	2.54954E-01	9.90015E-01	9.90015E-01	6.52450E-01
MABC	Friedman	1.07108E-03	4.03815E-03	4.03815E-03	4.03117E-03
MABC	Friedman Aligned	2.42220E-11	7.45293E-11	7.45293E-11	7.45293E-11
MABC	Quade	4.99948E-01	1.0	1.0	9.26630E-01
DE	Friedman	2.54875E-01	9.93629E-01	9.93629E-01	6.62534E-01
DE	Friedman Aligned	2.74197E-01	1.0	1.0	6.93733E-01
DE	Quade	8.73049E-01	1.0	1.0	9.99510E-01

Table S91 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
IJAYA	Friedman	4.94513E-01	1.0	1.0	9.05728E-01
IJAYA	Friedman Aligned	4.44005E-01	1.0	1.0	8.68915E-01
IJAYA	Quade	9.55250E-01	1.0	1.0	9.99979E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S92. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (MABC is the control algorithm, I_{ph} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	1.61343E-02	1.62557E-02	1.62557E-02	1.61343E-02
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	8.83074E-01	1.0	1.0	8.83074E-01
GOTLBO	Friedman	3.55630E-02	6.66648E-02	6.66648E-02	6.46651E-02
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	9.16596E-01	1.0	1.0	9.89806E-01
CWOA	Friedman	1.70290E-01	4.63814E-01	4.63814E-01	3.77416E-01
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	9.16596E-01	1.0	1.0	9.89806E-01
ISCA	Friedman	1.70313E-01	5.91053E-01	5.91053E-01	4.57385E-01
ISCA	Friedman Aligned	6.75460E-13	2.49401E-12	2.49401E-12	2.49401E-12
ISCA	Quade	9.16596E-01	1.0	1.0	9.96412E-01
NNA	Friedman	1.70313E-01	5.58293E-01	5.58293E-01	4.37004E-01
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	9.16596E-01	1.0	1.0	9.96412E-01
WW	Friedman	4.65704E-01	1.0	1.0	9.01170E-01
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	9.16596E-01	1.0	1.0	9.99320E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0

Table S92 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S93. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (TLBO is the control algorithm, I_{ph} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
ISCA	Friedman	1.11422E-12	1.19904E-12	1.19904E-12	1.19904E-12
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	2.05739E-02	6.19145E-02	6.12106E-02	6.02176E-02
NNA	Friedman	1.11422E-12	1.82943E-12	1.82943E-12	1.82943E-12
NNA	Friedman Aligned	4.34834E-11	1.33795E-10	1.33795E-10	1.33795E-10
NNA	Quade	2.05739E-02	6.19145E-02	6.12106E-02	6.02176E-02
WW	Friedman	1.11422E-12	1.11422E-12	1.11422E-12	1.11422E-12
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	2.85496E-02	1.06236E-01	1.06236E-01	1.01427E-01
CWOA	Friedman	1.22824E-12	3.77920E-12	3.77920E-12	3.77920E-12
CWOA	Friedman Aligned	1.53052E-10	5.65116E-10	5.65116E-10	5.65116E-10
CWOA	Quade	2.05739E-02	3.83174E-02	3.68718E-02	3.76516E-02
GOTLBO	Friedman	8.01828E-11	2.77556E-10	2.77556E-10	2.77556E-10
GOTLBO	Friedman Aligned	1.18047E-10	4.08623E-10	4.08623E-10	4.08623E-10
GOTLBO	Quade	2.05739E-02	3.83174E-02	3.68718E-02	3.76516E-02
MABC	Friedman	5.45986E-10	2.01595E-09	1.96197E-09	2.01595E-09
MABC	Friedman Aligned	2.04947E-13	5.20251E-13	5.20251E-13	5.20251E-13
MABC	Quade	9.31341E-02	3.58952E-01	3.58952E-01	3.08217E-01
PSO	Friedman	5.45986E-10	2.01595E-09	1.96197E-09	2.01595E-09
PSO	Friedman Aligned	2.12199E-10	7.99827E-10	7.99827E-10	7.99827E-10
PSO	Quade	9.34861E-03	9.38919E-03	9.38919E-03	9.34861E-03
DE	Friedman	3.05182E-05	1.12683E-04	1.12683E-04	1.12678E-04
DE	Friedman Aligned	1.72967E-02	6.40787E-02	6.40787E-02	6.23920E-02
DE	Quade	2.96784E-01	1.0	1.0	7.27477E-01

Table S93 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
IJAYA	Friedman	2.29338E-04	7.93891E-04	7.93891E-04	7.93639E-04
IJAYA	Friedman Aligned	4.24809E-02	1.48029E-01	1.48029E-01	1.39519E-01
IJAYA	Quade	3.76114E-01	1.0	1.0	8.04679E-01
NDE	Friedman	4.96635E-03	1.52898E-02	1.52898E-02	1.52024E-02
NDE	Friedman Aligned	2.83997E-01	9.06459E-01	9.06459E-01	6.42247E-01
NDE	Quade	4.27401E-01	1.0	1.0	8.20144E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S94. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (GOTLBO is the control algorithm, I_{ph} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	9.99999E-01	1.0	1.0	9.99999E-01
PSO	Friedman Aligned	1.10006E-03	1.10062E-03	1.10062E-03	1.10006E-03
PSO	Quade	9.99999E-01	1.0	1.0	9.99999E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S94 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	7.09370E-01	1.0	1.0	8.97849E-01
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S95. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (STLBO is the control algorithm, I_{ph} evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
GOTLBO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Friedman Aligned	1.34914E-10	4.67010E-10	4.67010E-10	4.67010E-10
GOTLBO	Quade	2.14059E-03	3.95545E-03	3.84083E-03	3.94829E-03
PSO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Friedman Aligned	2.13919E-10	8.06309E-10	8.06309E-10	8.06309E-10
PSO	Quade	7.45736E-04	7.45992E-04	7.45992E-04	7.45736E-04
MABC	Friedman	<1E-13	1.95399E-13	1.95399E-13	1.95399E-13
MABC	Friedman Aligned	4.27647E-12	7.89502E-12	7.89502E-12	7.89502E-12
MABC	Quade	1.76757E-02	6.68978E-02	6.68978E-02	6.50101E-02
WW	Friedman	8.30101E-11	2.55416E-10	2.55416E-10	2.55416E-10
WW	Friedman Aligned	5.25791E-11	1.33470E-10	1.33470E-10	1.33470E-10
WW	Quade	3.93413E-03	1.45414E-02	1.45414E-02	1.44493E-02
ISCA	Friedman	1.77301E-09	6.13733E-09	6.13733E-09	6.13733E-09
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	2.35565E-03	7.30587E-03	7.30587E-03	7.28220E-03
NNA	Friedman	1.99588E-09	7.36942E-09	7.36942E-09	7.36942E-09
NNA	Friedman Aligned	5.32343E-11	1.63798E-10	1.63798E-10	1.63798E-10
NNA	Quade	2.35565E-03	7.25406E-03	7.25406E-03	7.23042E-03
CWOA	Friedman	2.78373E-09	1.04925E-08	1.04925E-08	1.04925E-08
CWOA	Friedman Aligned	1.69719E-10	6.26656E-10	6.26656E-10	6.26656E-10
CWOA	Quade	2.14059E-03	3.95545E-03	3.84083E-03	3.94829E-03
DE	Friedman	7.39494E-09	2.73044E-08	2.73044E-08	2.73044E-08
DE	Friedman Aligned	5.47403E-03	2.02331E-02	2.02331E-02	2.00633E-02
DE	Quade	8.39403E-02	3.15141E-01	3.15141E-01	2.76546E-01

Table S95 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
IJAYA	Friedman	1.15930E-07	4.01296E-07	4.01296E-07	4.01296E-07
IJAYA	Friedman Aligned	1.53493E-02	5.32586E-02	5.32586E-02	5.21360E-02
IJAYA	Quade	1.19590E-01	4.22010E-01	4.22010E-01	3.56536E-01
NDE	Friedman	9.60841E-06	2.95644E-05	2.95644E-05	2.95640E-05
NDE	Friedman Aligned	1.43525E-01	4.49397E-01	4.49397E-01	3.79176E-01
NDE	Quade	1.45931E-01	4.57073E-01	4.57073E-01	3.84528E-01
TLBO	Friedman	1.30872E-01	3.35738E-01	3.35738E-01	2.99567E-01
TLBO	Friedman Aligned	7.63709E-01	1.0	1.0	9.74324E-01
TLBO	Quade	5.80649E-01	1.0	1.0	8.89865E-01
EBLSHADE	Friedman	9.93529E-01	1.0	1.0	9.99909E-01
EBLSHADE	Friedman Aligned	8.82085E-01	1.0	1.0	9.80682E-01
EBLSHADE	Quade	9.83928E-01	1.0	1.0	9.99512E-01
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0

Table S96. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (PSO is the control algorithm, I_{ph} evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S96 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S97. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (IJAYA is the control algorithm, I_{ph} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	9.73246E-08	9.73246E-08	9.73246E-08	9.73246E-08
PSO	Friedman Aligned	1.70370E-10	6.29058E-10	6.29058E-10	6.29058E-10
PSO	Quade	2.46974E-01	2.80583E-01	2.80583E-01	2.46974E-01
GOTLBO	Friedman	6.35961E-07	1.17408E-06	1.17408E-06	1.17408E-06
GOTLBO	Friedman Aligned	5.77172E-11	1.77591E-10	1.77591E-10	1.77591E-10
GOTLBO	Quade	3.41083E-01	7.45945E-01	7.07294E-01	5.37051E-01
CWOA	Friedman	1.92373E-05	4.88336E-05	4.88336E-05	4.88325E-05
CWOA	Friedman Aligned	8.61309E-11	2.98146E-10	2.98146E-10	2.98146E-10
CWOA	Quade	3.41083E-01	7.45945E-01	7.07294E-01	5.37051E-01
NNA	Friedman	2.54032E-05	7.81643E-05	7.81643E-05	7.81616E-05
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	3.41083E-01	9.81080E-01	9.41198E-01	6.43922E-01
ISCA	Friedman	2.83482E-05	9.81294E-05	9.81294E-05	9.81251E-05
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	3.41083E-01	9.81080E-01	9.41198E-01	6.43922E-01
WW	Friedman	4.57580E-04	1.68973E-03	1.68973E-03	1.68849E-03
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	3.41083E-01	1.0	1.0	7.60671E-01
MABC	Friedman	1.94748E-02	7.37379E-02	7.37379E-02	7.14482E-02
MABC	Friedman Aligned	7.15972E-09	2.69866E-08	2.69866E-08	2.69866E-08
MABC	Quade	5.96552E-01	1.0	1.0	9.67332E-01
DE	Friedman	7.88581E-01	1.0	1.0	9.96777E-01
DE	Friedman Aligned	8.62956E-01	1.0	1.0	9.99350E-01
DE	Quade	9.44493E-01	1.0	1.0	9.99977E-01

Table S97 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S98. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ISCA is the control algorithm, I_{ph} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	9.04976E-01	1.0	1.0	9.04976E-01
PSO	Friedman Aligned	1.47451E-09	2.72216E-09	2.72216E-09	2.72216E-09
PSO	Quade	9.99878E-01	1.0	1.0	9.99878E-01
GOTLBO	Friedman	9.39917E-01	1.0	1.0	9.94436E-01
GOTLBO	Friedman Aligned	1.04059E-07	2.64149E-07	2.64149E-07	2.64149E-07
GOTLBO	Quade	9.99979E-01	1.0	1.0	1.0
CWOA	Friedman	9.99718E-01	1.0	1.0	1.0
CWOA	Friedman Aligned	5.38809E-11	5.38809E-11	5.38809E-11	5.38809E-11
CWOA	Quade	9.99979E-01	1.0	1.0	1.0
NNA	Friedman	9.99909E-01	1.0	1.0	1.0
NNA	Friedman Aligned	1.31567E-02	4.06680E-02	4.06680E-02	3.99318E-02
NNA	Quade	9.99994E-01	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0

Table S98 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	5.21317E-02	1.83435E-01	1.83435E-01	1.69170E-01
WW	Quade	1.0	1.0	1.0	1.0

Table S99. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NNA is the control algorithm, I_{ph} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	9.33915E-01	1.0	1.0	9.33915E-01
PSO	Friedman Aligned	4.34003E-10	4.34003E-10	4.34003E-10	4.34003E-10
PSO	Quade	9.99928E-01	1.0	1.0	9.99928E-01
GOTLBO	Friedman	9.59537E-01	1.0	1.0	9.97318E-01
GOTLBO	Friedman Aligned	2.86941E-02	7.36566E-02	7.36566E-02	7.12394E-02
GOTLBO	Quade	9.99991E-01	1.0	1.0	1.0
CWOA	Friedman	9.99963E-01	1.0	1.0	1.0
CWOA	Friedman Aligned	3.00592E-04	5.55010E-04	5.55010E-04	5.54869E-04
CWOA	Quade	9.99991E-01	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0

Table S99 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S100. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (CWOA is the control algorithm, I_{ph} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	9.67662E-01	1.0	1.0	9.67662E-01
PSO	Friedman Aligned	1.24911E-01	1.32747E-01	1.32747E-01	1.24911E-01
PSO	Quade	9.99999E-01	1.0	1.0	9.99999E-01
GOTLBO	Friedman	9.81485E-01	1.0	1.0	9.99367E-01
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0

Table S100 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S101. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (WW is the control algorithm, I_{ph} evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	3.92009E-01	4.88192E-01	4.88192E-01	3.92009E-01
PSO	Friedman Aligned	9.14469E-12	9.14469E-12	9.14469E-12	9.14469E-12
PSO	Quade	9.97302E-01	1.0	1.0	9.97302E-01
GOTLBO	Friedman	5.10410E-01	1.0	1.0	7.32463E-01
GOTLBO	Friedman Aligned	4.73013E-03	1.20291E-02	1.20291E-02	1.19636E-02
GOTLBO	Quade	9.98614E-01	1.0	1.0	9.99995E-01
ISCA	Friedman	8.70839E-01	1.0	1.0	9.97589E-01
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	9.98614E-01	1.0	1.0	1.0
NNA	Friedman	8.70839E-01	1.0	1.0	9.97192E-01
NNA	Friedman Aligned	9.40262E-01	1.0	1.0	9.99828E-01
NNA	Quade	9.98614E-01	1.0	1.0	1.0
CWOA	Friedman	8.70839E-01	1.0	1.0	9.94458E-01
CWOA	Friedman Aligned	2.40580E-05	4.44153E-05	4.44153E-05	4.44144E-05
CWOA	Quade	9.98614E-01	1.0	1.0	9.99995E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0

Table S101 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S102. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (DE is the control algorithm, R_s evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	1.12065E-07	1.12065E-07	1.12065E-07	1.12065E-07
PSO	Friedman Aligned	9.63011E-11	2.44457E-10	2.36238E-10	2.44457E-10
PSO	Quade	1.61148E-01	1.74539E-01	1.74539E-01	1.61148E-01
NNA	Friedman	1.32148E-02	2.45341E-02	2.45341E-02	2.42601E-02
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	8.03072E-01	1.0	1.0	9.50205E-01
ISCA	Friedman	2.56447E-02	6.57499E-02	6.57499E-02	6.38197E-02
ISCA	Friedman Aligned	1.65848E-09	6.12362E-09	6.12362E-09	6.12362E-09
ISCA	Quade	8.03072E-01	1.0	1.0	9.58241E-01
WW	Friedman	2.56658E-02	7.96836E-02	7.96836E-02	7.68862E-02
WW	Friedman Aligned	5.78214E-09	2.17942E-08	2.17942E-08	2.17942E-08
WW	Quade	8.03072E-01	1.0	1.0	9.56969E-01
CWOA	Friedman	7.51644E-02	2.66458E-01	2.66458E-01	2.36988E-01
CWOA	Friedman Aligned	9.81004E-12	1.81108E-11	1.81108E-11	1.81108E-11
CWOA	Quade	8.03072E-01	1.0	1.0	9.70509E-01
GOTLBO	Friedman	1.36860E-01	5.25381E-01	5.25381E-01	4.19245E-01
GOTLBO	Friedman Aligned	8.50149E-10	2.94282E-09	2.94282E-09	2.94282E-09
GOTLBO	Quade	8.03072E-01	1.0	1.0	9.95652E-01
IJAYA	Friedman	1.60075E-01	6.27579E-01	6.27579E-01	4.81863E-01
IJAYA	Friedman Aligned	9.63011E-11	2.44457E-10	2.36238E-10	2.44457E-10
IJAYA	Quade	8.03072E-01	1.0	1.0	9.95652E-01
MABC	Friedman	4.30602E-01	1.0	1.0	8.74997E-01
MABC	Friedman Aligned	2.44538E-03	9.03334E-03	9.03334E-03	8.99941E-03
MABC	Quade	8.68097E-01	1.0	1.0	9.99435E-01

Table S102 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S103. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (EBLSHADE is the control algorithm, R_s evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
IJAYA	Friedman	4.61853E-13	4.61853E-13	4.61853E-13	4.61853E-13
IJAYA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
IJAYA	Quade	1.77868E-02	6.59918E-02	5.94563E-02	6.41177E-02
GOTLBO	Friedman	6.49480E-13	1.19904E-12	1.19904E-12	1.19904E-12
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	1.77868E-02	6.59918E-02	5.94563E-02	6.41177E-02
MABC	Friedman	7.57246E-13	1.92224E-12	1.92224E-12	1.92224E-12
MABC	Friedman Aligned	1.47660E-10	4.54338E-10	4.54338E-10	4.54338E-10
MABC	Quade	3.24065E-02	1.20412E-01	1.20412E-01	1.14530E-01
CWOA	Friedman	3.15142E-12	9.69669E-12	9.69669E-12	9.69669E-12
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	9.53581E-03	2.92630E-02	2.92630E-02	2.88853E-02
WW	Friedman	4.24027E-11	1.46779E-10	1.46779E-10	1.46779E-10
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	9.53581E-03	2.05775E-02	2.05775E-02	2.03861E-02
ISCA	Friedman	5.89440E-11	2.17639E-10	2.17639E-10	2.17639E-10
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	9.53581E-03	2.25189E-02	2.25189E-02	2.22920E-02
NNA	Friedman	2.68345E-10	1.01145E-09	1.01145E-09	1.01145E-09
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	9.53581E-03	1.76760E-02	1.76760E-02	1.75335E-02
DE	Friedman	4.09489E-10	1.51196E-09	1.51196E-09	1.51196E-09
DE	Friedman Aligned	8.23115E-11	2.96018E-10	2.84924E-10	2.96018E-10
DE	Quade	7.19727E-02	2.51985E-01	2.51985E-01	2.27835E-01

Table S103 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	1.40866E-09	4.87613E-09	4.87613E-09	4.87613E-09
PSO	Friedman Aligned	8.01715E-11	2.96018E-10	2.84924E-10	2.96018E-10
PSO	Quade	1.23157E-04	1.23164E-04	1.23164E-04	1.23157E-04
NDE	Friedman	8.11697E-06	2.49753E-05	2.49753E-05	2.49751E-05
NDE	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NDE	Quade	1.39601E-01	4.36892E-01	4.36892E-01	3.70384E-01
TLBO	Friedman	1.57702E-01	4.05499E-01	4.05499E-01	3.53159E-01
TLBO	Friedman Aligned	9.86791E-02	2.52471E-01	2.52471E-01	2.31820E-01
TLBO	Quade	6.59156E-01	1.0	1.0	9.34925E-01
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S104. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ADELI is the control algorithm, R_s evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
MABC	Friedman	4.24327E-13	4.24327E-13	4.24327E-13	4.24327E-13
MABC	Friedman Aligned	1.30897E-10	4.93382E-10	4.67194E-10	4.93382E-10
MABC	Quade	2.61883E-02	9.71881E-02	9.71881E-02	9.33364E-02
IJAYA	Friedman	1.17484E-12	2.16893E-12	2.16893E-12	2.16893E-12
IJAYA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
IJAYA	Quade	1.40454E-02	5.20574E-02	4.69358E-02	5.08871E-02
GOTLBO	Friedman	2.08219E-12	5.28555E-12	5.28555E-12	5.28555E-12
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	1.40454E-02	5.20574E-02	4.69358E-02	5.08871E-02
CWOA	Friedman	1.27601E-11	3.92619E-11	3.92619E-11	3.92619E-11
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	7.23714E-03	2.25799E-02	2.25799E-02	2.23546E-02
DE	Friedman	1.39301E-10	4.82194E-10	4.57383E-10	4.82194E-10
DE	Friedman Aligned	1.37839E-10	4.93382E-10	4.77135E-10	4.93382E-10
DE	Quade	5.97508E-02	2.08782E-01	2.08782E-01	1.92059E-01
WW	Friedman	1.39301E-10	4.82194E-10	4.57383E-10	4.82194E-10
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	7.23714E-03	1.56830E-02	1.56830E-02	1.55717E-02
ISCA	Friedman	1.59993E-10	6.03050E-10	6.03050E-10	6.03050E-10
ISCA	Friedman Aligned	2.51032E-06	7.72406E-06	7.72406E-06	7.72404E-06
ISCA	Quade	7.23714E-03	1.72329E-02	1.72329E-02	1.70999E-02
NNA	Friedman	6.61310E-10	2.44176E-09	2.44176E-09	2.44176E-09
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	7.23714E-03	1.34020E-02	1.34020E-02	1.33199E-02

Table S104 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	2.30556E-09	7.98080E-09	7.98080E-09	7.98080E-09
PSO	Friedman Aligned	1.30897E-10	4.93382E-10	4.67194E-10	4.93382E-10
PSO	Quade	8.49909E-05	8.49943E-05	8.49943E-05	8.49909E-05
NDE	Friedman	2.70991E-06	8.33820E-06	8.33820E-06	8.33817E-06
NDE	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NDE	Quade	1.18862E-01	3.71008E-01	3.71008E-01	3.22508E-01
TLBO	Friedman	9.99240E-02	2.55682E-01	2.55682E-01	2.34510E-01
TLBO	Friedman Aligned	2.97627E-04	7.55533E-04	7.55533E-04	7.55343E-04
TLBO	Quade	6.04542E-01	1.0	9.88447E-01	9.05102E-01
EBLSHADE	Friedman	8.44298E-01	1.0	9.33322E-01	9.67726E-01
EBLSHADE	Friedman Aligned	5.75004E-02	1.06394E-01	1.06394E-01	1.03564E-01
EBLSHADE	Quade	9.49745E-01	1.0	9.88447E-01	9.95999E-01
STLBO	Friedman	9.33322E-01	1.0	9.33322E-01	9.67726E-01
STLBO	Friedman Aligned	9.97074E-01	9.97074E-01	9.97074E-01	9.97074E-01
STLBO	Quade	9.88447E-01	1.0	9.88447E-01	9.95999E-01

Table S105. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NDE is the control algorithm, R_s evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	5.48450E-13	5.48450E-13	5.48450E-13	5.48450E-13
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	5.93630E-02	6.10542E-02	6.10542E-02	5.93630E-02
NNA	Friedman	6.21587E-06	1.14755E-05	1.14755E-05	1.14754E-05
NNA	Friedman Aligned	8.83864E-11	3.26350E-10	3.26350E-10	3.26350E-10
NNA	Quade	5.46368E-01	1.0	1.0	7.67608E-01
ISCA	Friedman	2.15654E-05	5.47435E-05	5.47435E-05	5.47421E-05
ISCA	Friedman Aligned	5.41510E-11	2.04108E-10	2.04108E-10	2.04108E-10
ISCA	Quade	5.46368E-01	1.0	1.0	7.94113E-01
WW	Friedman	2.54032E-05	7.81643E-05	7.81643E-05	7.81616E-05
WW	Friedman Aligned	2.52162E-11	9.31060E-11	9.31060E-11	9.31060E-11
WW	Quade	5.46368E-01	1.0	1.0	7.87852E-01
CWOA	Friedman	1.70294E-04	5.89510E-04	5.89510E-04	5.89355E-04
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	5.46368E-01	1.0	1.0	8.32107E-01
GOTLBO	Friedman	5.51957E-04	2.03830E-03	2.03830E-03	2.03648E-03
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	5.46368E-01	1.0	1.0	9.41246E-01
IJAYA	Friedman	8.19698E-04	3.09021E-03	3.09021E-03	3.08612E-03
IJAYA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
IJAYA	Quade	5.46368E-01	1.0	1.0	9.41246E-01
MABC	Friedman	6.69221E-03	2.47416E-02	2.47416E-02	2.44879E-02
MABC	Friedman Aligned	1.31135E-09	4.53928E-09	4.53928E-09	4.53928E-09
MABC	Quade	6.42995E-01	1.0	1.0	9.77698E-01

Table S105 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	9.84763E-02	3.46279E-01	3.46279E-01	3.01524E-01
DE	Friedman Aligned	2.46722E-11	8.54037E-11	8.54037E-11	8.54037E-11
DE	Quade	8.43172E-01	1.0	1.0	9.98360E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S106. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (MABC is the control algorithm, R_s evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	3.23303E-05	3.23308E-05	3.23308E-05	3.23303E-05
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	3.74066E-01	4.60169E-01	4.60169E-01	3.74066E-01
NNA	Friedman	2.44230E-01	5.05979E-01	5.05979E-01	4.03667E-01
NNA	Friedman Aligned	3.04347E-08	9.36452E-08	9.36452E-08	9.36452E-08
NNA	Quade	9.60869E-01	1.0	1.0	9.97479E-01
ISCA	Friedman	3.34378E-01	9.86196E-01	9.86196E-01	6.44147E-01
ISCA	Friedman Aligned	2.68086E-11	6.80527E-11	6.80527E-11	6.80527E-11
ISCA	Quade	9.60869E-01	1.0	1.0	9.98098E-01
WW	Friedman	3.34378E-01	1.0	1.0	6.85519E-01
WW	Friedman Aligned	2.27968E-11	4.20863E-11	4.20863E-11	4.20863E-11
WW	Quade	9.60869E-01	1.0	1.0	9.98033E-01
CWOA	Friedman	5.44864E-01	1.0	1.0	9.34440E-01
CWOA	Friedman Aligned	2.33931E-04	8.09818E-04	8.09818E-04	8.09527E-04
CWOA	Quade	9.60869E-01	1.0	1.0	9.99016E-01
GOTLBO	Friedman	7.04380E-01	1.0	1.0	9.88888E-01
GOTLBO	Friedman Aligned	3.35103E-03	1.26406E-02	1.26406E-02	1.25723E-02
GOTLBO	Quade	9.60869E-01	1.0	1.0	9.99985E-01
IJAYA	Friedman	7.42795E-01	1.0	1.0	9.94013E-01
IJAYA	Friedman Aligned	9.34352E-04	3.45078E-03	3.45078E-03	3.44558E-03
IJAYA	Quade	9.60869E-01	1.0	1.0	9.99985E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0

Table S106 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S107. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (TLBO is the control algorithm, R_s evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	1.24342E-03	1.24413E-03	1.24413E-03	1.24342E-03
NNA	Friedman	1.15463E-13	2.13163E-13	2.13163E-13	2.13163E-13
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	5.08290E-02	9.59217E-02	9.59217E-02	9.18149E-02
ISCA	Friedman	1.69346E-13	4.29878E-13	4.29878E-13	4.29878E-13
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	5.08290E-02	1.14968E-01	1.14968E-01	1.09199E-01
WW	Friedman	2.55462E-13	7.86038E-13	7.86038E-13	7.86038E-13
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	5.08290E-02	1.07920E-01	1.07920E-01	1.02778E-01
CWOA	Friedman	6.62297E-12	2.29257E-11	2.29257E-11	2.29257E-11
CWOA	Friedman Aligned	1.32214E-10	4.88175E-10	4.88175E-10	4.88175E-10
CWOA	Quade	5.08290E-02	1.41499E-01	1.41499E-01	1.32919E-01
GOTLBO	Friedman	5.56590E-11	2.05510E-10	2.05510E-10	2.05510E-10
GOTLBO	Friedman Aligned	1.58709E-10	5.98211E-10	5.07874E-10	5.98211E-10
GOTLBO	Quade	7.32625E-02	2.76054E-01	2.47539E-01	2.44918E-01
IJAYA	Friedman	1.24403E-10	4.68905E-10	4.68905E-10	4.68905E-10
IJAYA	Friedman Aligned	1.58709E-10	5.98211E-10	5.07874E-10	5.98211E-10
IJAYA	Quade	7.32625E-02	2.76054E-01	2.47539E-01	2.44918E-01
MABC	Friedman	6.40678E-09	2.36558E-08	2.36558E-08	2.36558E-08
MABC	Friedman Aligned	1.58709E-10	5.98211E-10	5.07874E-10	5.98211E-10
MABC	Quade	1.14751E-01	4.33578E-01	4.33578E-01	3.62399E-01

Table S107 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	1.86918E-06	6.47023E-06	6.47023E-06	6.47021E-06
DE	Friedman Aligned	7.73811E-11	2.67858E-10	2.67858E-10	2.67858E-10
DE	Quade	2.13275E-01	7.65059E-01	7.65059E-01	5.64100E-01
NDE	Friedman	3.24249E-03	9.98062E-03	9.98062E-03	9.94333E-03
NDE	Friedman Aligned	1.10920E-09	3.41294E-09	3.41294E-09	3.41294E-09
NDE	Quade	3.50848E-01	1.0	1.0	7.35391E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S108. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (GOTLBO is the control algorithm, R_s evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	1.14886E-03	1.14947E-03	1.14947E-03	1.14886E-03
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	6.23178E-01	9.40245E-01	9.40245E-01	6.23178E-01
NNA	Friedman	7.90699E-01	1.0	1.0	9.44276E-01
NNA	Friedman Aligned	1.74782E-12	3.22675E-12	3.22675E-12	3.22675E-12
NNA	Quade	9.96635E-01	1.0	1.0	9.99973E-01
ISCA	Friedman	8.58987E-01	1.0	1.0	9.93075E-01
ISCA	Friedman Aligned	5.51352E-08	1.39958E-07	1.39958E-07	1.39958E-07
ISCA	Quade	9.96635E-01	1.0	1.0	9.99986E-01
WW	Friedman	8.58987E-01	1.0	1.0	9.95414E-01
WW	Friedman Aligned	3.83622E-04	1.18053E-03	1.18053E-03	1.17991E-03
WW	Quade	9.96635E-01	1.0	1.0	9.99983E-01
CWOA	Friedman	9.69231E-01	1.0	1.0	9.99994E-01
CWOA	Friedman Aligned	7.64084E-01	1.0	1.0	9.93258E-01
CWOA	Quade	9.96635E-01	1.0	1.0	9.99997E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0

Table S108 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	9.20605E-01	1.0	1.0	9.99913E-01
IJAYA	Quade	9.99972E-01	1.0	1.0	1.0

Table S109. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (STLBO is the control algorithm, R_s evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
MABC	Friedman	7.82263E-13	7.82263E-13	7.82263E-13	7.82263E-13
MABC	Friedman Aligned	1.30815E-10	4.93071E-10	4.68469E-10	4.93071E-10
MABC	Quade	2.72384E-02	1.01106E-01	1.01106E-01	9.69411E-02
IJAYA	Friedman	7.82263E-13	1.19904E-12	1.19904E-12	1.19904E-12
IJAYA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
IJAYA	Quade	1.46704E-02	5.43832E-02	4.90263E-02	5.31067E-02
GOTLBO	Friedman	1.18350E-12	3.00426E-12	3.00426E-12	3.00426E-12
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	1.46704E-02	5.43832E-02	4.90263E-02	5.31067E-02
CWOA	Friedman	7.72016E-12	2.37543E-11	2.37543E-11	2.37543E-11
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	7.61417E-03	2.36840E-02	2.36840E-02	2.34363E-02
WW	Friedman	9.08066E-11	3.14331E-10	3.14331E-10	3.14331E-10
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	7.61417E-03	1.64871E-02	1.64871E-02	1.63641E-02
ISCA	Friedman	1.23284E-10	4.55202E-10	4.55202E-10	4.55202E-10
ISCA	Friedman Aligned	2.50662E-06	7.71268E-06	7.71268E-06	7.71266E-06
ISCA	Quade	7.61417E-03	1.81029E-02	1.81029E-02	1.79562E-02
DE	Friedman	1.84419E-10	6.95118E-10	6.95118E-10	6.95118E-10
DE	Friedman Aligned	1.37739E-10	4.93071E-10	4.76787E-10	4.93071E-10
DE	Quade	6.18417E-02	2.16161E-01	2.16161E-01	1.98262E-01
NNA	Friedman	4.55458E-10	1.68169E-09	1.68169E-09	1.68169E-09
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	7.61417E-03	1.41024E-02	1.41024E-02	1.40116E-02

Table S109 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	1.92899E-09	6.67728E-09	6.67728E-09	6.67728E-09
PSO	Friedman Aligned	1.30815E-10	4.93071E-10	4.68469E-10	4.93071E-10
PSO	Quade	9.09831E-05	9.09869E-05	9.09869E-05	9.09831E-05
NDE	Friedman	4.08314E-06	1.25635E-05	1.25635E-05	1.25635E-05
NDE	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NDE	Quade	1.22455E-01	3.82395E-01	3.82395E-01	3.30971E-01
TLBO	Friedman	1.18855E-01	3.04601E-01	3.04601E-01	2.74721E-01
TLBO	Friedman Aligned	3.01915E-04	7.66418E-04	7.66418E-04	7.66223E-04
TLBO	Quade	6.14412E-01	1.0	1.0	9.11000E-01
EBLSHADE	Friedman	9.04828E-01	1.0	1.0	9.86993E-01
EBLSHADE	Friedman Aligned	5.79889E-02	1.07300E-01	1.07300E-01	1.04422E-01
EBLSHADE	Quade	9.59583E-01	1.0	1.0	9.97324E-01
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0

Table S110. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (PSO is the control algorithm, R_s evaluation task).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S110 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S111. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (IJAYA is the control algorithm, R_s evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	6.27525E-04	6.27707E-04	6.27707E-04	6.27525E-04
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	6.31482E-01	9.60899E-01	9.60899E-01	6.31482E-01
NNA	Friedman	6.91741E-01	1.0	1.0	8.86116E-01
NNA	Friedman Aligned	3.06237E-11	5.65361E-11	5.65361E-11	5.65361E-11
NNA	Quade	9.96978E-01	1.0	1.0	9.99978E-01
ISCA	Friedman	7.77272E-01	1.0	1.0	9.77902E-01
ISCA	Friedman Aligned	5.16236E-07	1.31045E-06	1.31045E-06	1.31045E-06
ISCA	Quade	9.96978E-01	1.0	1.0	9.99989E-01
WW	Friedman	7.77272E-01	1.0	1.0	9.84073E-01
WW	Friedman Aligned	1.81771E-03	5.59646E-03	5.59646E-03	5.58239E-03
WW	Quade	9.96978E-01	1.0	1.0	9.99987E-01
CWOA	Friedman	9.25970E-01	1.0	1.0	9.99878E-01
CWOA	Friedman Aligned	9.53239E-01	1.0	1.0	9.99975E-01
CWOA	Quade	9.96978E-01	1.0	1.0	9.99998E-01
GOTLBO	Friedman	9.90942E-01	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0

Table S111 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S112. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ISCA is the control algorithm, R_s evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	3.32214E-02	3.37419E-02	3.37419E-02	3.32214E-02
PSO	Friedman Aligned	2.88658E-12	2.88658E-12	2.88658E-12	2.88658E-12
PSO	Quade	9.10497E-01	1.0	1.0	9.10497E-01
NNA	Friedman	9.99834E-01	1.0	1.0	1.0
NNA	Friedman Aligned	5.04334E-01	1.0	1.0	7.26301E-01
NNA	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0

Table S112 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S113. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NNA is the control algorithm, R_s evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	9.22987E-02	9.64801E-02	9.64801E-02	9.22987E-02
PSO	Friedman Aligned	3.98146E-10	3.98146E-10	3.98146E-10	3.98146E-10
PSO	Quade	9.54610E-01	1.0	1.0	9.54610E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0

Table S113 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	1.0	1.0	1.0	1.0
WW	Quade	1.0	1.0	1.0	1.0

Table S114. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (CWOA is the control algorithm, R_s evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	4.36171E-03	4.37052E-03	4.37052E-03	4.36171E-03
PSO	Friedman Aligned	5.39684E-08	9.96340E-08	9.96340E-08	9.96340E-08
PSO	Quade	8.53378E-01	1.0	1.0	8.53378E-01
NNA	Friedman	9.47047E-01	1.0	1.0	9.95593E-01
NNA	Friedman Aligned	9.03118E-10	9.03118E-10	9.03118E-10	9.03118E-10
NNA	Quade	9.99981E-01	1.0	1.0	1.0
ISCA	Friedman	9.73183E-01	1.0	1.0	9.99898E-01
ISCA	Friedman Aligned	4.17781E-06	1.06052E-05	1.06052E-05	1.06052E-05
ISCA	Quade	9.99981E-01	1.0	1.0	1.0
WW	Friedman	9.73183E-01	1.0	1.0	9.99955E-01
WW	Friedman Aligned	7.30958E-03	2.25482E-02	2.25482E-02	2.23207E-02
WW	Quade	9.99981E-01	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0

Table S114 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S115. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (WW is the control algorithm, R_s evaluation task).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	2.42446E-02	2.45202E-02	2.45202E-02	2.42446E-02
PSO	Friedman Aligned	3.88231E-08	3.88231E-08	3.88231E-08	3.88231E-08
PSO	Quade	9.32459E-01	1.0	1.0	9.32459E-01
NNA	Friedman	9.99213E-01	1.0	1.0	9.99998E-01
NNA	Friedman Aligned	3.27961E-03	6.06308E-03	6.06308E-03	6.04626E-03
NNA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	9.99986E-01	1.0	1.0	1.0
ISCA	Friedman Aligned	2.53096E-01	7.16378E-01	7.16378E-01	5.23253E-01
ISCA	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0

Table S115 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0

Table S116. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (DE is the control algorithm, RMSPE value).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	3.23303E-05	3.23308E-05	3.23308E-05	3.23303E-05
WW	Friedman Aligned	3.09062E-10	8.13039E-10	7.96436E-10	8.13039E-10
WW	Quade	7.59275E-01	1.0	1.0	7.97323E-01
CWOA	Friedman	1.22067E-04	2.25367E-04	2.25367E-04	2.25343E-04
CWOA	Friedman Aligned	3.09062E-10	7.84543E-10	7.65346E-10	7.84543E-10
CWOA	Quade	7.59275E-01	1.0	1.0	7.97323E-01
NNA	Friedman	1.53477E-04	3.89619E-04	3.89619E-04	3.89550E-04
NNA	Friedman Aligned	3.09062E-10	8.13039E-10	7.74680E-10	8.13039E-10
NNA	Quade	7.59275E-01	1.0	1.0	7.81433E-01
ISCA	Friedman	1.56918E-04	4.82851E-04	4.82851E-04	4.82746E-04
ISCA	Friedman Aligned	3.09062E-10	8.13039E-10	7.65346E-10	8.13039E-10
ISCA	Quade	7.59275E-01	1.0	1.0	7.59275E-01
GOTLBO	Friedman	2.31597E-03	8.02254E-03	8.02254E-03	7.99400E-03
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	7.59275E-01	1.0	1.0	9.45886E-01
PSO	Friedman	6.30413E-02	2.36852E-01	2.36852E-01	2.13709E-01
PSO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
PSO	Quade	8.41580E-01	1.0	1.0	9.98890E-01
MABC	Friedman	6.64164E-01	1.0	1.0	9.83637E-01
MABC	Friedman Aligned	3.09062E-10	8.13039E-10	7.65346E-10	8.13039E-10
MABC	Quade	9.59880E-01	1.0	1.0	9.99995E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0

Table S116 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S117. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (EBLSHADE is the control algorithm, RMSPE value).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
ISCA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	1.45556E-03	1.45654E-03	1.45654E-03	1.45556E-03
NNA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	1.45556E-03	1.77232E-03	1.77232E-03	1.77088E-03
CWOA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	1.45556E-03	2.10264E-03	2.10264E-03	2.10063E-03
WW	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	1.45556E-03	2.18579E-03	2.18579E-03	2.18364E-03
MABC	Friedman	1.41904E-12	4.91207E-12	4.91207E-12	4.91207E-12
MABC	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
MABC	Quade	2.56699E-02	9.73363E-02	9.73363E-02	9.33686E-02
PSO	Friedman	4.78499E-12	1.76676E-11	1.76676E-11	1.76676E-11
PSO	Friedman Aligned	1.80279E-10	6.65645E-10	6.65645E-10	6.65645E-10
PSO	Quade	1.10383E-02	4.08787E-02	4.08787E-02	4.01550E-02
DE	Friedman	1.99447E-10	7.51762E-10	7.51762E-10	7.51762E-10
DE	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
DE	Quade	4.08670E-02	1.52102E-01	1.52102E-01	1.42782E-01
GOTLBO	Friedman	1.22587E-09	4.52629E-09	4.52629E-09	4.52629E-09
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	2.30921E-03	7.99910E-03	7.99910E-03	7.97072E-03

Table S117 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
IJAYA	Friedman	1.01726E-06	3.52129E-06	3.52129E-06	3.52128E-06
IJAYA	Friedman Aligned	3.40542E-06	1.17880E-05	1.17880E-05	1.17879E-05
IJAYA	Quade	1.25398E-01	4.42937E-01	4.42937E-01	3.71110E-01
NDE	Friedman	3.37287E-03	1.03821E-02	1.03821E-02	1.03418E-02
NDE	Friedman Aligned	1.50714E-02	4.64546E-02	4.64546E-02	4.56516E-02
NDE	Quade	3.66833E-01	1.0	1.0	7.54932E-01
TLBO	Friedman	4.20792E-01	1.0	1.0	7.49986E-01
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	7.93916E-01	1.0	1.0	9.81856E-01
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S118. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ADELI is the control algorithm, RMSPE value).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
ISCA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	1.09625E-03	1.09680E-03	1.09680E-03	1.09625E-03
NNA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	1.09625E-03	1.34054E-03	1.34054E-03	1.33971E-03
CWOA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	1.09625E-03	1.59708E-03	1.59708E-03	1.59592E-03
MABC	Friedman	2.33813E-13	7.19425E-13	7.19425E-13	7.19425E-13
MABC	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
MABC	Quade	2.11738E-02	8.02031E-02	8.02031E-02	7.74983E-02
PSO	Friedman	2.85766E-11	9.89189E-11	9.89189E-11	9.89189E-11
PSO	Friedman Aligned	1.82294E-10	6.73084E-10	6.73084E-10	6.73084E-10
PSO	Quade	8.90739E-03	3.29680E-02	3.29680E-02	3.24964E-02
DE	Friedman	3.71229E-11	1.37069E-10	1.37069E-10	1.37069E-10
DE	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
DE	Quade	3.41907E-02	1.27086E-01	1.27086E-01	1.20544E-01
WW	Friedman	3.79121E-10	1.42899E-09	1.42899E-09	1.42899E-09
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	1.09625E-03	1.66392E-03	1.66392E-03	1.66267E-03
GOTLBO	Friedman	3.71983E-09	1.37348E-08	1.37348E-08	1.37348E-08
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	1.80120E-03	6.23839E-03	6.23839E-03	6.22112E-03

Table S118 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
IJAYA	Friedman	2.38212E-07	8.24579E-07	8.24579E-07	8.24578E-07
IJAYA	Friedman Aligned	1.92652E-06	6.66873E-06	6.66873E-06	6.66871E-06
IJAYA	Quade	1.08536E-01	3.82291E-01	3.82291E-01	3.28134E-01
NDE	Friedman	1.31676E-03	4.05218E-03	4.05218E-03	4.04603E-03
NDE	Friedman Aligned	1.08197E-02	3.33332E-02	3.33332E-02	3.29189E-02
NDE	Quade	3.30743E-01	1.0	1.0	7.09355E-01
TLBO	Friedman	2.78642E-01	7.24406E-01	7.24406E-01	5.63564E-01
TLBO	Friedman Aligned	9.40972E-01	1.0	1.0	9.99241E-01
TLBO	Quade	7.45664E-01	1.0	1.0	9.69051E-01
EBLSHADE	Friedman	8.09315E-01	1.0	1.0	9.53081E-01
EBLSHADE	Friedman Aligned	9.40972E-01	1.0	1.0	9.99241E-01
EBLSHADE	Quade	9.56989E-01	1.0	1.0	9.96998E-01
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S119. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NDE is the control algorithm, RMSPE value).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
CWOA	Friedman	2.04947E-13	2.04947E-13	2.04947E-13	2.04947E-13
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	6.08936E-02	7.94811E-02	7.94811E-02	7.66710E-02
NNA	Friedman	2.51132E-13	4.63629E-13	4.63629E-13	4.63629E-13
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	6.08936E-02	7.13516E-02	7.13516E-02	6.90638E-02
ISCA	Friedman	2.84809E-13	7.22977E-13	7.22977E-13	7.22977E-13
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	6.08936E-02	6.26749E-02	6.26749E-02	6.08936E-02
WW	Friedman	2.98039E-13	9.17044E-13	9.17044E-13	9.17044E-13
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	6.08936E-02	7.99347E-02	7.99347E-02	7.71198E-02
GOTLBO	Friedman	3.48809E-11	1.20741E-10	1.20741E-10	1.20741E-10
GOTLBO	Friedman Aligned	1.79116E-10	6.61351E-10	6.61351E-10	6.61351E-10
GOTLBO	Quade	6.08936E-02	2.03799E-01	2.03799E-01	1.86283E-01
PSO	Friedman	4.01794E-08	1.48355E-07	1.48355E-07	1.48355E-07
PSO	Friedman Aligned	1.19200E-10	4.49293E-10	4.49293E-10	4.49293E-10
PSO	Quade	1.63536E-01	6.32903E-01	6.32903E-01	4.82809E-01
MABC	Friedman	4.55403E-05	1.71654E-04	1.71654E-04	1.71641E-04
MABC	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
MABC	Quade	2.71658E-01	1.0	1.0	6.97232E-01
DE	Friedman	8.96693E-04	3.31144E-03	3.31144E-03	3.30687E-03
DE	Friedman Aligned	1.27875E-12	4.72156E-12	4.72156E-12	4.72156E-12
DE	Quade	3.50621E-01	1.0	1.0	7.96911E-01

Table S119 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
IJAYA	Friedman	7.33717E-02	2.56942E-01	2.56942E-01	2.31857E-01
IJAYA	Friedman Aligned	4.02808E-02	1.40313E-01	1.40313E-01	1.32656E-01
IJAYA	Quade	6.43209E-01	1.0	1.0	9.71773E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S120. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (MABC is the control algorithm, RMSPE value).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	1.04014E-03	1.04064E-03	1.04064E-03	1.04014E-03
WW	Friedman Aligned	3.59772E-11	1.24536E-10	1.24536E-10	1.24536E-10
WW	Quade	8.97219E-01	1.0	1.0	9.18511E-01
CWOA	Friedman	2.86600E-03	5.29751E-03	5.29751E-03	5.28467E-03
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	8.97219E-01	1.0	1.0	9.18511E-01
ISCA	Friedman	3.24679E-03	9.70884E-03	9.70884E-03	9.66653E-03
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	8.97219E-01	1.0	1.0	8.97219E-01
NNA	Friedman	3.24679E-03	8.25217E-03	8.25217E-03	8.22129E-03
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	8.97219E-01	1.0	1.0	9.09994E-01
GOTLBO	Friedman	2.71581E-02	9.48059E-02	9.48059E-02	9.09078E-02
GOTLBO	Friedman Aligned	1.40579E-09	5.19061E-09	5.19061E-09	5.19061E-09
GOTLBO	Quade	8.97219E-01	1.0	1.0	9.87898E-01
PSO	Friedman	3.11831E-01	1.0	1.0	7.48395E-01
PSO	Friedman Aligned	1.73195E-13	5.32907E-13	5.32907E-13	5.32907E-13
PSO	Quade	9.43078E-01	1.0	1.0	9.99975E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0

Table S120 (*continued*)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S121. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (TLBO is the control algorithm, RMSPE value).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	1.96287E-13	1.96287E-13	1.96287E-13	1.96287E-13
PSO	Friedman Aligned	1.80688E-10	6.67154E-10	6.67154E-10	6.67154E-10
PSO	Quade	2.94896E-02	1.09763E-01	1.09763E-01	1.04634E-01
GOTLBO	Friedman	6.25031E-11	1.15390E-10	1.15390E-10	1.15390E-10
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	7.28397E-03	2.52705E-02	2.52705E-02	2.49885E-02
MABC	Friedman	1.09197E-09	2.77193E-09	2.77193E-09	2.77193E-09
MABC	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
MABC	Quade	6.15993E-02	2.35585E-01	2.35585E-01	2.13090E-01
ISCA	Friedman	1.25475E-09	3.86077E-09	3.86077E-09	3.86077E-09
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	5.44202E-03	5.45574E-03	5.45574E-03	5.44202E-03
NNA	Friedman	1.37295E-09	4.75250E-09	4.75250E-09	4.75250E-09
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	5.44202E-03	6.49673E-03	6.49673E-03	6.47742E-03
CWOA	Friedman	2.09713E-09	7.74326E-09	7.74326E-09	7.74326E-09
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	5.44202E-03	7.55156E-03	7.55156E-03	7.52569E-03
WW	Friedman	9.53069E-09	3.59234E-08	3.59234E-08	3.59234E-08
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	5.44202E-03	7.76630E-03	7.76630E-03	7.73921E-03
DE	Friedman	4.24571E-08	1.56765E-07	1.56765E-07	1.56765E-07
DE	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
DE	Quade	9.15391E-02	3.44207E-01	3.44207E-01	2.98458E-01

Table S121 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
IJAYA	Friedman	6.97445E-05	2.41426E-04	2.41426E-04	2.41402E-04
IJAYA	Friedman Aligned	3.05560E-06	1.05771E-05	1.05771E-05	1.05770E-05
IJAYA	Quade	2.37971E-01	8.57542E-01	8.57542E-01	6.09662E-01
NDE	Friedman	4.44651E-02	1.37531E-01	1.37531E-01	1.30599E-01
NDE	Friedman Aligned	1.41555E-02	4.36271E-02	4.36271E-02	4.29185E-02
NDE	Quade	5.71073E-01	1.0	1.0	9.26061E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	9.91583E-01	1.0	1.0	9.99995E-01
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S122. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (GOTLBO is the control algorithm, RMSPE value).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	9.04976E-01	1.0	1.0	9.04976E-01
WW	Friedman Aligned	1.67999E-12	1.67999E-12	1.67999E-12	1.67999E-12
WW	Quade	9.99991E-01	1.0	1.0	9.99997E-01
ISCA	Friedman	9.32174E-01	1.0	1.0	9.97839E-01
ISCA	Friedman Aligned	7.66599E-08	1.94598E-07	1.94598E-07	1.94598E-07
ISCA	Quade	9.99991E-01	1.0	1.0	9.99991E-01
NNA	Friedman	9.32174E-01	1.0	1.0	9.97323E-01
NNA	Friedman Aligned	3.08669E-09	5.69850E-09	5.69850E-09	5.69850E-09
NNA	Quade	9.99991E-01	1.0	1.0	9.99995E-01
CWOA	Friedman	9.32174E-01	1.0	1.0	9.93041E-01
CWOA	Friedman Aligned	2.23479E-06	6.87627E-06	6.87627E-06	6.87625E-06
CWOA	Quade	9.99991E-01	1.0	1.0	9.99997E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0

Table S122 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
PSO	Friedman	1.0	1.0	1.0	1.0
PSO	Friedman Aligned	1.0	1.0	1.0	1.0
PSO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S123. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (STLBO is the control algorithm, RMSPE value).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
ISCA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	1.09625E-03	1.09680E-03	1.09680E-03	1.09625E-03
NNA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	1.09625E-03	1.34054E-03	1.34054E-03	1.33971E-03
CWOA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	1.09625E-03	1.59708E-03	1.59708E-03	1.59592E-03
MABC	Friedman	2.33813E-13	7.19425E-13	7.19425E-13	7.19425E-13
MABC	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
MABC	Quade	2.11738E-02	8.02031E-02	8.02031E-02	7.74983E-02
PSO	Friedman	2.85766E-11	9.89189E-11	9.89189E-11	9.89189E-11
PSO	Friedman Aligned	1.82294E-10	6.73084E-10	6.73084E-10	6.73084E-10
PSO	Quade	8.90739E-03	3.29680E-02	3.29680E-02	3.24964E-02
DE	Friedman	3.71229E-11	1.37069E-10	1.37069E-10	1.37069E-10
DE	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
DE	Quade	3.41907E-02	1.27086E-01	1.27086E-01	1.20544E-01
WW	Friedman	3.79121E-10	1.42899E-09	1.42899E-09	1.42899E-09
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	1.09625E-03	1.66392E-03	1.66392E-03	1.66267E-03
GOTLBO	Friedman	3.71983E-09	1.37348E-08	1.37348E-08	1.37348E-08
GOTLBO	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
GOTLBO	Quade	1.80120E-03	6.23839E-03	6.23839E-03	6.22112E-03

Table S123 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
IJAYA	Friedman	2.38212E-07	8.24579E-07	8.24579E-07	8.24578E-07
IJAYA	Friedman Aligned	1.92652E-06	6.66873E-06	6.66873E-06	6.66871E-06
IJAYA	Quade	1.08536E-01	3.82291E-01	3.82291E-01	3.28134E-01
NDE	Friedman	1.31676E-03	4.05218E-03	4.05218E-03	4.04603E-03
NDE	Friedman Aligned	1.08197E-02	3.33332E-02	3.33332E-02	3.29189E-02
NDE	Quade	3.30743E-01	1.0	1.0	7.09355E-01
TLBO	Friedman	2.78642E-01	7.24406E-01	7.24406E-01	5.63564E-01
TLBO	Friedman Aligned	9.40972E-01	1.0	1.0	9.99241E-01
TLBO	Quade	7.45664E-01	1.0	1.0	9.69051E-01
EBLSHADE	Friedman	8.09315E-01	1.0	1.0	9.53081E-01
EBLSHADE	Friedman Aligned	9.40972E-01	1.0	1.0	9.99241E-01
EBLSHADE	Quade	9.56989E-01	1.0	1.0	9.96998E-01
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0

Table S124. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (PSO is the control algorithm, RMSPE value).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	1.37121E-01	1.46648E-01	1.46648E-01	1.37121E-01
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	9.87878E-01	1.0	1.0	9.91564E-01
ISCA	Friedman	2.08923E-01	5.89641E-01	5.89641E-01	4.55419E-01
ISCA	Friedman Aligned	7.82109E-10	1.98535E-09	1.98535E-09	1.98535E-09
ISCA	Quade	9.87878E-01	1.0	1.0	9.87878E-01
NNA	Friedman	2.08923E-01	5.49729E-01	5.49729E-01	4.31038E-01
NNA	Friedman Aligned	7.43077E-09	2.28639E-08	2.28639E-08	2.28639E-08
NNA	Quade	9.87878E-01	1.0	1.0	9.90189E-01
CWOA	Friedman	2.08923E-01	4.24958E-01	4.24958E-01	3.51222E-01
CWOA	Friedman Aligned	3.54082E-11	6.53690E-11	6.53690E-11	6.53690E-11
CWOA	Quade	9.87878E-01	1.0	1.0	9.91564E-01
GOTLBO	Friedman	5.28655E-01	1.0	1.0	9.25997E-01
GOTLBO	Friedman Aligned	3.35675E-04	1.16207E-03	1.16207E-03	1.16147E-03
GOTLBO	Quade	9.87878E-01	1.0	1.0	9.99741E-01
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0

Table S124 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S125. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (IJAYA is the control algorithm, RMSPE value).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	7.01424E-09	7.01424E-09	7.01424E-09	7.01424E-09
WW	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
WW	Quade	3.33895E-01	4.68680E-01	4.61937E-01	3.80571E-01
CWOA	Friedman	4.86623E-08	8.98381E-08	8.98381E-08	8.98381E-08
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	3.33895E-01	4.68680E-01	4.61937E-01	3.80571E-01
NNA	Friedman	7.50035E-08	1.90393E-07	1.90393E-07	1.90393E-07
NNA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
NNA	Quade	3.33895E-01	4.37241E-01	4.37241E-01	3.59435E-01
ISCA	Friedman	8.49143E-08	2.61275E-07	2.61275E-07	2.61275E-07
ISCA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
ISCA	Quade	3.33895E-01	4.00024E-01	4.00024E-01	3.33895E-01
GOTLBO	Friedman	3.57285E-06	1.23676E-05	1.23676E-05	1.23675E-05
GOTLBO	Friedman Aligned	2.09884E-10	7.74957E-10	7.74957E-10	7.74957E-10
GOTLBO	Quade	3.33895E-01	9.45824E-01	9.45824E-01	6.31865E-01
PSO	Friedman	5.02694E-04	1.85635E-03	1.85635E-03	1.85485E-03
PSO	Friedman Aligned	7.43825E-11	2.57478E-10	2.57478E-10	2.57478E-10
PSO	Quade	4.98202E-01	1.0	1.0	9.21610E-01
MABC	Friedman	4.25676E-02	1.62057E-01	1.62057E-01	1.51226E-01
MABC	Friedman Aligned	6.05896E-09	2.23716E-08	2.23716E-08	2.23716E-08
MABC	Quade	6.69600E-01	1.0	1.0	9.84613E-01
DE	Friedman	2.05603E-01	7.92421E-01	7.92421E-01	5.72528E-01
DE	Friedman Aligned	8.71728E-10	3.28574E-09	3.28574E-09	3.28574E-09
DE	Quade	7.68822E-01	1.0	1.0	9.95518E-01

Table S125 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S126. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ISCA is the control algorithm, RMSPE value).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	9.99926E-01	1.0	1.0	9.99926E-01
WW	Friedman Aligned	6.29593E-01	9.56165E-01	9.56165E-01	6.29593E-01
WW	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	9.99990E-01	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	9.99996E-01	1.0	1.0	1.0
NNA	Friedman Aligned	9.94434E-01	1.0	1.0	9.99931E-01
NNA	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0

Table S126 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
PSO	Friedman	1.0	1.0	1.0	1.0
PSO	Friedman Aligned	1.0	1.0	1.0	1.0
PSO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S127. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NNA is the control algorithm, RMSPE value).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
WW	Friedman	9.99981E-01	1.0	1.0	9.99981E-01
WW	Friedman Aligned	9.68408E-01	1.0	1.0	9.68408E-01
WW	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	9.99999E-01	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0

Table S127 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
PSO	Friedman	1.0	1.0	1.0	1.0
PSO	Friedman Aligned	1.0	1.0	1.0	1.0
PSO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0

Table S128. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (CWOA is the control algorithm, RMSPE value).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	9.99999E-01	1.0	1.0	9.99999E-01
WW	Friedman Aligned	1.65346E-01	1.79488E-01	1.79488E-01	1.65346E-01
WW	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBSHADE	Friedman	1.0	1.0	1.0	1.0
EBSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0

Table S128 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
PSO	Friedman	1.0	1.0	1.0	1.0
PSO	Friedman Aligned	1.0	1.0	1.0	1.0
PSO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	9.50839E-01	1.0	1.0	9.99523E-01
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	7.72845E-01	1.0	1.0	9.35186E-01
NNA	Quade	1.0	1.0	1.0	1.0

Table S129. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (WW is the control algorithm, RMSPE value).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S129 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
PSO	Friedman	1.0	1.0	1.0	1.0
PSO	Friedman Aligned	1.0	1.0	1.0	1.0
PSO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0

Table S130. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (DE is the control algorithm, Comp parameter).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	4.50560E-01	7.36426E-01	7.16850E-01	5.32330E-01
PSO	Friedman Aligned	1.31972E-02	4.07936E-02	4.07936E-02	4.00528E-02
PSO	Quade	9.99988E-01	1.0	1.0	9.99998E-01
CWOA	Friedman	4.50560E-01	7.36426E-01	7.16850E-01	5.32330E-01
CWOA	Friedman Aligned	2.07247E-05	3.82613E-05	3.82613E-05	3.82606E-05
CWOA	Quade	9.99988E-01	1.0	1.0	1.0
WW	Friedman	4.50560E-01	5.85271E-01	5.85271E-01	4.50560E-01
WW	Friedman Aligned	2.92524E-07	2.92524E-07	2.92524E-07	2.92524E-07
WW	Quade	9.99988E-01	1.0	1.0	9.99988E-01
GOTLBO	Friedman	5.52020E-01	1.0	1.0	9.15482E-01
GOTLBO	Friedman Aligned	7.67176E-01	1.0	1.0	9.95399E-01
GOTLBO	Quade	9.99988E-01	1.0	1.0	1.0
NNA	Friedman	5.52020E-01	1.0	1.0	9.15482E-01
NNA	Friedman Aligned	6.53162E-04	1.65844E-03	1.65844E-03	1.65719E-03
NNA	Quade	9.99988E-01	1.0	1.0	1.0
ISCA	Friedman	5.52204E-01	1.0	1.0	9.48515E-01
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	9.99988E-01	1.0	1.0	1.0
MABC	Friedman	8.42576E-01	1.0	1.0	9.99059E-01
MABC	Friedman Aligned	4.90703E-01	1.0	1.0	9.03246E-01
MABC	Quade	9.99988E-01	1.0	1.0	1.0
IJAYA	Friedman	8.42576E-01	1.0	1.0	9.99059E-01
IJAYA	Friedman Aligned	9.62004E-01	1.0	1.0	9.99996E-01
IJAYA	Quade	9.99988E-01	1.0	1.0	1.0

Table S130 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S131. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (EBLSHADE is the control algorithm, Comp parameter).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	1.30508E-05	2.46344E-05	2.46344E-05	2.46341E-05
PSO	Friedman Aligned	4.90853E-11	1.24601E-10	1.24601E-10	1.24601E-10
PSO	Quade	7.93250E-01	1.0	7.98639E-01	8.40980E-01
CWOA	Friedman	1.30508E-05	2.35507E-05	2.35507E-05	2.35504E-05
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	7.93250E-01	1.0	7.98639E-01	8.86126E-01
WW	Friedman	1.30508E-05	1.30509E-05	1.30509E-05	1.30508E-05
WW	Friedman Aligned	8.76076E-10	3.03257E-09	3.03257E-09	3.03257E-09
WW	Quade	7.93250E-01	1.0	7.98639E-01	7.93250E-01
NNA	Friedman	1.25380E-04	3.85802E-04	3.85802E-04	3.85735E-04
NNA	Friedman Aligned	1.73171E-09	6.52721E-09	6.52721E-09	6.52721E-09
NNA	Quade	7.93250E-01	1.0	7.98639E-01	9.19984E-01
GOTLBO	Friedman	1.26295E-04	4.37193E-04	4.37193E-04	4.37109E-04
GOTLBO	Friedman Aligned	5.58257E-11	1.71771E-10	1.71771E-10	1.71771E-10
GOTLBO	Quade	7.93250E-01	1.0	7.98639E-01	9.19984E-01
ISCA	Friedman	2.06680E-04	7.63167E-04	7.63167E-04	7.62912E-04
ISCA	Friedman Aligned	1.83740E-08	6.36024E-08	6.36024E-08	6.36024E-08
ISCA	Quade	7.93250E-01	1.0	7.98639E-01	9.19984E-01
MABC	Friedman	1.40828E-03	5.30987E-03	4.55132E-03	5.29780E-03
MABC	Friedman Aligned	3.00493E-12	5.54756E-12	5.54756E-12	5.54756E-12
MABC	Quade	7.93250E-01	1.0	7.98639E-01	9.19984E-01
IJAYA	Friedman	1.40828E-03	5.30987E-03	4.55132E-03	5.29780E-03
IJAYA	Friedman Aligned	8.76076E-10	3.10840E-09	3.10840E-09	3.10840E-09
IJAYA	Quade	7.93250E-01	1.0	7.98639E-01	9.19984E-01

Table S131 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	5.62340E-03	1.94825E-02	1.94825E-02	1.93313E-02
DE	Friedman Aligned	2.45853E-09	9.07765E-09	9.07765E-09	9.07765E-09
DE	Quade	7.93250E-01	1.0	7.98639E-01	9.19984E-01
NDE	Friedman	2.09529E-02	6.46277E-02	6.46277E-02	6.30782E-02
NDE	Friedman Aligned	2.37713E-02	7.33451E-02	5.14343E-02	7.13523E-02
NDE	Quade	7.93250E-01	1.0	7.98639E-01	9.19984E-01
TLBO	Friedman	3.98503E-01	1.0	4.07382E-01	7.24836E-01
TLBO	Friedman Aligned	2.88150E-02	7.33451E-02	5.14343E-02	7.15329E-02
TLBO	Quade	7.93250E-01	1.0	7.98639E-01	9.77197E-01
STLBO	Friedman	3.98503E-01	1.0	4.07382E-01	7.24836E-01
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	7.98639E-01	1.0	7.98639E-01	9.77197E-01
ADELII	Friedman	4.07382E-01	1.0	4.07382E-01	7.24836E-01
ADELII	Friedman Aligned	2.88150E-02	7.33451E-02	5.14343E-02	7.15329E-02
ADELII	Quade	7.93250E-01	1.0	7.98639E-01	9.77197E-01

Table S132. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ADELI is the control algorithm, Comp parameter).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	6.31318E-04	1.04935E-03	1.04935E-03	1.04885E-03
PSO	Friedman Aligned	1.18842E-10	3.01677E-10	3.01677E-10	3.01677E-10
PSO	Quade	9.62893E-01	1.0	1.0	9.76795E-01
CWOA	Friedman	6.31318E-04	1.02471E-03	1.02471E-03	1.02423E-03
CWOA	Friedman Aligned	4.50306E-12	8.31335E-12	8.31335E-12	8.31335E-12
CWOA	Quade	9.62893E-01	1.0	1.0	9.87201E-01
WW	Friedman	6.31318E-04	6.31502E-04	6.31502E-04	6.31318E-04
WW	Friedman Aligned	4.21371E-10	1.29653E-09	1.29653E-09	1.29653E-09
WW	Quade	9.62893E-01	1.0	1.0	9.62893E-01
GOTLBO	Friedman	3.28358E-03	1.09916E-02	1.09916E-02	1.09381E-02
GOTLBO	Friedman Aligned	1.53943E-05	5.68406E-05	5.68406E-05	5.68392E-05
GOTLBO	Quade	9.62893E-01	1.0	1.0	9.93168E-01
NNA	Friedman	3.28358E-03	1.01148E-02	1.01148E-02	1.00689E-02
NNA	Friedman Aligned	5.08038E-13	5.08038E-13	5.08038E-13	5.08038E-13
NNA	Quade	9.62893E-01	1.0	1.0	9.93168E-01
ISCA	Friedman	4.57816E-03	1.69249E-02	1.69249E-02	1.68001E-02
ISCA	Friedman Aligned	8.26661E-04	2.86188E-03	2.86188E-03	2.85861E-03
ISCA	Quade	9.62893E-01	1.0	1.0	9.93168E-01
MABC	Friedman	2.05485E-02	7.78229E-02	6.67054E-02	7.52749E-02
MABC	Friedman Aligned	1.46218E-06	5.06140E-06	5.06140E-06	5.06139E-06
MABC	Quade	9.62893E-01	1.0	1.0	9.93168E-01
IJAYA	Friedman	2.05485E-02	7.78229E-02	6.67054E-02	7.52749E-02
IJAYA	Friedman Aligned	1.09560E-04	4.12967E-04	4.12967E-04	4.12893E-04
IJAYA	Quade	9.62893E-01	1.0	1.0	9.93168E-01

Table S132 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	5.66909E-02	1.97993E-01	1.97993E-01	1.82921E-01
DE	Friedman Aligned	2.35433E-04	8.69330E-04	8.69330E-04	8.69015E-04
DE	Quade	9.62893E-01	1.0	1.0	9.93168E-01
NDE	Friedman	1.46638E-01	4.59328E-01	4.59328E-01	3.86093E-01
NDE	Friedman Aligned	9.58524E-01	1.0	1.0	9.99944E-01
NDE	Quade	9.62893E-01	1.0	1.0	9.93168E-01
TLBO	Friedman	9.45602E-01	1.0	1.0	9.99383E-01
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	9.49185E-01	1.0	1.0	9.99383E-01
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0

Table S133. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NDE is the control algorithm, Comp parameter).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	1.55714E-01	2.24134E-01	2.20690E-01	2.02484E-01
PSO	Friedman Aligned	2.45681E-10	6.23651E-10	6.23651E-10	6.23651E-10
PSO	Quade	9.99775E-01	1.0	1.0	9.99926E-01
CWOA	Friedman	1.55714E-01	2.24134E-01	2.20690E-01	2.02484E-01
CWOA	Friedman Aligned	2.18658E-12	4.03677E-12	4.03677E-12	4.03677E-12
CWOA	Quade	9.99775E-01	1.0	1.0	9.99984E-01
WW	Friedman	1.55714E-01	1.68167E-01	1.68167E-01	1.55714E-01
WW	Friedman Aligned	2.49057E-10	7.66329E-10	7.66329E-10	7.66329E-10
WW	Quade	9.99775E-01	1.0	1.0	9.99775E-01
GOTLBO	Friedman	2.56546E-01	8.77639E-01	8.77639E-01	6.02847E-01
GOTLBO	Friedman Aligned	2.54839E-05	9.40951E-05	9.40951E-05	9.40913E-05
GOTLBO	Quade	9.99775E-01	1.0	1.0	9.99998E-01
NNA	Friedman	2.56546E-01	8.71786E-01	8.71786E-01	5.98341E-01
NNA	Friedman Aligned	1.12288E-12	1.12288E-12	1.12288E-12	1.12288E-12
NNA	Quade	9.99775E-01	1.0	1.0	9.99998E-01
ISCA	Friedman	2.68694E-01	1.0	1.0	6.85071E-01
ISCA	Friedman Aligned	1.22826E-03	4.25249E-03	4.25249E-03	4.24526E-03
ISCA	Quade	9.99775E-01	1.0	1.0	9.99998E-01
MABC	Friedman	5.32517E-01	1.0	1.0	9.43079E-01
MABC	Friedman Aligned	2.55400E-06	8.84079E-06	8.84079E-06	8.84076E-06
MABC	Quade	9.99775E-01	1.0	1.0	9.99998E-01
IJAYA	Friedman	5.32517E-01	1.0	1.0	9.43079E-01
IJAYA	Friedman Aligned	1.72659E-04	6.50817E-04	6.50817E-04	6.50635E-04
IJAYA	Quade	9.99775E-01	1.0	1.0	9.99998E-01

Table S133 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	7.62590E-01	1.0	1.0	9.93109E-01
DE	Friedman Aligned	3.62802E-04	1.33967E-03	1.33967E-03	1.33892E-03
DE	Quade	9.99775E-01	1.0	1.0	9.99998E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S134. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (MABC is the control algorithm, Comp parameter).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	8.30603E-01	1.0	1.0	8.84463E-01
PSO	Friedman Aligned	2.77918E-01	9.53341E-01	9.53341E-01	6.32817E-01
PSO	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	8.30603E-01	1.0	1.0	8.84463E-01
CWOA	Friedman Aligned	3.58148E-03	6.62200E-03	6.62200E-03	6.60193E-03
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	8.30603E-01	1.0	1.0	8.30603E-01
WW	Friedman Aligned	1.46115E-04	1.46124E-04	1.46124E-04	1.46115E-04
WW	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	8.60298E-01	1.0	1.0	9.97657E-01
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	8.60298E-01	1.0	1.0	9.99247E-01
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	8.60298E-01	1.0	1.0	9.97657E-01
NNA	Friedman Aligned	4.14291E-02	1.06884E-01	1.06884E-01	1.01840E-01
NNA	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0

Table S134 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S135. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (TLBO is the control algorithm, Comp parameter).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	9.92560E-04	1.62336E-03	1.62336E-03	1.62216E-03
PSO	Friedman Aligned	1.04019E-10	2.64048E-10	2.64048E-10	2.64048E-10
PSO	Quade	9.62491E-01	1.0	1.0	9.76514E-01
CWOA	Friedman	9.92560E-04	1.58954E-03	1.58954E-03	1.58839E-03
CWOA	Friedman Aligned	5.11791E-12	9.44844E-12	9.44844E-12	9.44844E-12
CWOA	Quade	9.62491E-01	1.0	1.0	9.87026E-01
WW	Friedman	9.92560E-04	9.93015E-04	9.93015E-04	9.92560E-04
WW	Friedman Aligned	4.62743E-10	1.42383E-09	1.42383E-09	1.42383E-09
WW	Quade	9.62491E-01	1.0	1.0	9.62491E-01
GOTLBO	Friedman	4.77179E-03	1.58963E-02	1.58963E-02	1.57845E-02
GOTLBO	Friedman Aligned	1.40291E-05	5.17999E-05	5.17999E-05	5.17987E-05
GOTLBO	Quade	9.62491E-01	1.0	1.0	9.93062E-01
NNA	Friedman	4.77179E-03	1.47067E-02	1.47067E-02	1.46098E-02
NNA	Friedman Aligned	4.38760E-13	4.38760E-13	4.38760E-13	4.38760E-13
NNA	Quade	9.62491E-01	1.0	1.0	9.93062E-01
ISCA	Friedman	6.51265E-03	2.40890E-02	2.40890E-02	2.38367E-02
ISCA	Friedman Aligned	7.68321E-04	2.65989E-03	2.65989E-03	2.65706E-03
ISCA	Quade	9.62491E-01	1.0	1.0	9.93062E-01
MABC	Friedman	2.77009E-02	1.05088E-01	9.00750E-02	1.00471E-01
MABC	Friedman Aligned	1.31956E-06	4.56772E-06	4.56772E-06	4.56771E-06
MABC	Quade	9.62491E-01	1.0	1.0	9.93062E-01
IJAYA	Friedman	2.77009E-02	1.05088E-01	9.00750E-02	1.00471E-01
IJAYA	Friedman Aligned	1.00742E-04	3.79729E-04	3.79729E-04	3.79667E-04
IJAYA	Quade	9.62491E-01	1.0	1.0	9.93062E-01

Table S135 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	7.29030E-02	2.55281E-01	2.55281E-01	2.30511E-01
DE	Friedman Aligned	2.17370E-04	8.02629E-04	8.02629E-04	8.02360E-04
DE	Quade	9.62491E-01	1.0	1.0	9.93062E-01
NDE	Friedman	1.80006E-01	5.66315E-01	5.66315E-01	4.56998E-01
NDE	Friedman Aligned	9.48516E-01	1.0	1.0	9.99891E-01
NDE	Quade	9.62491E-01	1.0	1.0	9.93062E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	9.92596E-01	1.0	1.0	9.99996E-01
ADELII	Quade	9.99595E-01	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S136. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (GOTLBO is the control algorithm, Comp parameter).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	9.98888E-01	1.0	1.0	9.99669E-01
PSO	Friedman Aligned	9.17453E-02	2.91753E-01	2.91753E-01	2.56282E-01
PSO	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	9.98888E-01	1.0	1.0	9.99669E-01
CWOA	Friedman Aligned	4.72107E-04	8.71757E-04	8.71757E-04	8.71408E-04
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	9.98888E-01	1.0	1.0	9.98888E-01
WW	Friedman Aligned	1.21443E-05	1.21444E-05	1.21444E-05	1.21443E-05
WW	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	9.99965E-01	1.0	1.0	1.0
NNA	Friedman Aligned	8.38840E-03	2.13627E-02	2.13627E-02	2.11564E-02
NNA	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.0	1.0	1.0	1.0
ADELII	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0

Table S136 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	9.12281E-01	1.0	1.0	9.99780E-01
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0

Table S137. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (STLBO is the control algorithm, Comp parameter).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	8.87311E-04	1.45708E-03	1.45708E-03	1.45612E-03
PSO	Friedman Aligned	1.30579E-10	4.01781E-10	4.01781E-10	4.01781E-10
PSO	Quade	9.30369E-01	1.0	1.0	9.53136E-01
CWOA	Friedman	8.87311E-04	1.42576E-03	1.42576E-03	1.42483E-03
CWOA	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
CWOA	Quade	9.30369E-01	1.0	1.0	9.71605E-01
WW	Friedman	8.87311E-04	8.87675E-04	8.87675E-04	8.87311E-04
WW	Friedman Aligned	1.11147E-09	4.18940E-09	4.18940E-09	4.18940E-09
WW	Quade	9.30369E-01	1.0	1.0	9.30369E-01
GOTLBO	Friedman	4.35052E-03	1.45102E-02	1.45102E-02	1.44170E-02
GOTLBO	Friedman Aligned	1.44695E-11	3.67302E-11	3.67302E-11	3.67302E-11
GOTLBO	Quade	9.30369E-01	1.0	1.0	9.83227E-01
NNA	Friedman	4.35052E-03	1.34064E-02	1.34064E-02	1.33258E-02
NNA	Friedman Aligned	3.90710E-09	1.44262E-08	1.44262E-08	1.44262E-08
NNA	Quade	9.30369E-01	1.0	1.0	9.83227E-01
ISCA	Friedman	5.96940E-03	2.20764E-02	2.20764E-02	2.18643E-02
ISCA	Friedman Aligned	4.50262E-09	1.55860E-08	1.55860E-08	1.55860E-08
ISCA	Quade	9.30369E-01	1.0	1.0	9.83227E-01
MABC	Friedman	2.57340E-02	9.75806E-02	8.36406E-02	9.35933E-02
MABC	Friedman Aligned	5.23914E-13	9.67226E-13	9.67226E-13	9.67226E-13
MABC	Quade	9.30369E-01	1.0	1.0	9.83227E-01
IJAYA	Friedman	2.57340E-02	9.75806E-02	8.36406E-02	9.35933E-02
IJAYA	Friedman Aligned	2.18045E-10	7.54772E-10	7.54772E-10	7.54772E-10
IJAYA	Quade	9.30369E-01	1.0	1.0	9.83227E-01

Table S137 (continued)

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	6.85289E-02	2.39794E-01	2.39794E-01	2.17870E-01
DE	Friedman Aligned	7.42368E-10	2.74105E-09	2.74105E-09	2.74105E-09
DE	Quade	9.30369E-01	1.0	1.0	9.83227E-01
NDE	Friedman	1.71181E-01	5.37924E-01	5.37924E-01	4.38814E-01
NDE	Friedman Aligned	1.22573E-02	3.77682E-02	2.72258E-02	3.72367E-02
NDE	Quade	9.30369E-01	1.0	1.0	9.83227E-01
TLBO	Friedman	9.89408E-01	1.0	1.0	9.99990E-01
TLBO	Friedman Aligned	1.52045E-02	3.86414E-02	2.72258E-02	3.81458E-02
TLBO	Quade	9.44870E-01	1.0	1.0	9.99362E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	8.12763E-01	8.12763E-01	8.12763E-01	8.12763E-01
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELII	Friedman	1.0	1.0	1.0	1.0
ADELII	Friedman Aligned	1.52045E-02	3.86414E-02	2.72258E-02	3.81458E-02
ADELII	Quade	9.44870E-01	1.0	1.0	9.99362E-01

Table S138. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (PSO is the control algorithm, Comp parameter).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBSHADE	Friedman	1.0	1.0	1.0	1.0
EBSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S138 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	8.54143E-01	1.0	1.0	9.92455E-01
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	3.93493E-01	8.88533E-01	8.88533E-01	6.02734E-01
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	8.06951E-02	8.38658E-02	8.38658E-02	8.06951E-02
WW	Quade	1.0	1.0	1.0	1.0

Table S139. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (IJAYA is the control algorithm, Comp parameter).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	8.30603E-01	1.0	1.0	8.84463E-01
PSO	Friedman Aligned	2.55584E-02	7.93472E-02	7.93472E-02	7.65731E-02
PSO	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	8.30603E-01	1.0	1.0	8.84463E-01
CWOA	Friedman Aligned	5.81546E-05	1.07365E-04	1.07365E-04	1.07360E-04
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	8.30603E-01	1.0	1.0	8.30603E-01
WW	Friedman Aligned	9.75209E-07	9.75209E-07	9.75209E-07	9.75209E-07
WW	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	8.60298E-01	1.0	1.0	9.97657E-01
GOTLBO	Friedman Aligned	8.87840E-01	1.0	1.0	9.99690E-01
GOTLBO	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	8.60298E-01	1.0	1.0	9.99247E-01
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	8.60298E-01	1.0	1.0	9.97657E-01
NNA	Friedman Aligned	1.53028E-03	3.88684E-03	3.88684E-03	3.87999E-03
NNA	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0

Table S139 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	6.38258E-01	1.0	1.0	9.70394E-01
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S140. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (ISCA is the control algorithm, Comp parameter).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	9.93692E-01	1.0	1.0	9.97469E-01
PSO	Friedman Aligned	4.05630E-03	1.24985E-02	1.24985E-02	1.24284E-02
PSO	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	9.93692E-01	1.0	1.0	9.97469E-01
CWOA	Friedman Aligned	3.47277E-06	6.41127E-06	6.41127E-06	6.41126E-06
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	9.93692E-01	1.0	1.0	9.93692E-01
WW	Friedman Aligned	3.59568E-08	3.59568E-08	3.59568E-08	3.59568E-08
WW	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	9.96887E-01	1.0	1.0	1.0
GOTLBO	Friedman Aligned	5.31817E-01	1.0	1.0	9.39316E-01
GOTLBO	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	9.96887E-01	1.0	1.0	1.0
NNA	Friedman Aligned	1.47184E-04	3.73641E-04	3.73641E-04	3.73578E-04
NNA	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	8.75367E-01	1.0	1.0	9.99542E-01
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0

Table S140 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	2.80474E-01	1.0	1.0	6.79991E-01
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	7.88732E-01	1.0	1.0	9.97148E-01
IJAYA	Quade	1.0	1.0	1.0	1.0

Table S141. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (NNA is the control algorithm, Comp parameter).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
PSO	Friedman	9.99446E-01	1.0	1.0	9.99855E-01
PSO	Friedman Aligned	1.0	1.0	1.0	1.0
PSO	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	9.99446E-01	1.0	1.0	9.99855E-01
CWOA	Friedman Aligned	9.57624E-01	1.0	1.0	9.97079E-01
CWOA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	9.99446E-01	1.0	1.0	9.99446E-01
WW	Friedman Aligned	6.15608E-01	9.21781E-01	9.21781E-01	6.15608E-01
WW	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBSHADE	Friedman	1.0	1.0	1.0	1.0
EBSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBSHADE	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
ADELI	Friedman Aligned	1.0	1.0	1.0	1.0
ADELI	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0

Table S141 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0

Table S142. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (CWOA is the control algorithm, Comp parameter).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBSHADE	Friedman	1.0	1.0	1.0	1.0
EBSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S142 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
PSO	Friedman	1.0	1.0	1.0	1.0
PSO	Friedman Aligned	1.0	1.0	1.0	1.0
PSO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
WW	Friedman Aligned	9.96187E-01	1.0	1.0	9.96187E-01
WW	Quade	1.0	1.0	1.0	1.0

Table S143. Adjusted p -values for multiple comparisons $1 \times N$ tests in single-IV case (WW is the control algorithm, Comp parameter).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
DE	Friedman	1.0	1.0	1.0	1.0
DE	Friedman Aligned	1.0	1.0	1.0	1.0
DE	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
EBLSHADE	Friedman Aligned	1.0	1.0	1.0	1.0
EBLSHADE	Quade	1.0	1.0	1.0	1.0
ADEL1	Friedman	1.0	1.0	1.0	1.0
ADEL1	Friedman Aligned	1.0	1.0	1.0	1.0
ADEL1	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
NDE	Friedman Aligned	1.0	1.0	1.0	1.0
NDE	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
MABC	Friedman Aligned	1.0	1.0	1.0	1.0
MABC	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
TLBO	Friedman Aligned	1.0	1.0	1.0	1.0
TLBO	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
GOTLBO	Friedman Aligned	1.0	1.0	1.0	1.0
GOTLBO	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
STLBO	Friedman Aligned	1.0	1.0	1.0	1.0
STLBO	Quade	1.0	1.0	1.0	1.0

Table S143 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
PSO	Friedman	1.0	1.0	1.0	1.0
PSO	Friedman Aligned	1.0	1.0	1.0	1.0
PSO	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
IJAYA	Friedman Aligned	1.0	1.0	1.0	1.0
IJAYA	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
ISCA	Friedman Aligned	1.0	1.0	1.0	1.0
ISCA	Quade	1.0	1.0	1.0	1.0
NNA	Friedman	1.0	1.0	1.0	1.0
NNA	Friedman Aligned	1.0	1.0	1.0	1.0
NNA	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
CWOA	Friedman Aligned	1.0	1.0	1.0	1.0
CWOA	Quade	1.0	1.0	1.0	1.0

Table S144. Adjusted p -values for tests for multiple comparisons among all methods in the single-IV case. I_{01} evaluation task.

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
ADELI versus WW	<1E-13	<1E-13	<1E-13
ADELI versus NDE	1.17195E-12	1.15907E-12	1.00453E-12
STLBO versus CWOA	1.17195E-12	1.15907E-12	1.00453E-12
TLBO versus PSO	1.21236E-12	1.17240E-12	1.03917E-12
STLBO versus GOTLBO	1.21236E-12	1.17240E-12	1.03917E-12
ADELI versus DE	1.73772E-12	1.64224E-12	1.48948E-12
STLBO versus DE	1.83875E-12	1.71752E-12	1.57607E-12
ADELI versus CWOA	3.83915E-12	3.50164E-12	3.29070E-12
EBLSHADE versus GOTLBO	4.20286E-12	3.78719E-12	3.60245E-12
STLBO versus NDE	5.01110E-12	4.46043E-12	4.29523E-12
ADELI versus GOTLBO	5.41522E-12	4.76064E-12	4.64162E-12
EBLSHADE versus CWOA	5.98099E-12	5.19229E-12	5.12657E-12
EBLSHADE versus ISCA	1.17195E-11	1.00453E-11	1.00453E-11
EBLSHADE versus DE	1.45282E-11	1.22931E-11	1.06966E-11
EBLSHADE versus NDE	4.17053E-11	3.43725E-11	3.07061E-11
STLBO versus ISCA	8.17133E-11	6.64482E-11	6.01625E-11
TLBO versus WW	8.82197E-11	7.07696E-11	6.49529E-11
TLBO versus MABC	1.07900E-10	8.53717E-11	7.94431E-11
EBLSHADE versus MABC	3.09961E-10	2.38431E-10	2.28213E-10
ADELI versus NNA	3.24570E-10	2.46102E-10	2.38969E-10
ADELI versus ISCA	3.83410E-10	2.86504E-10	2.82291E-10
STLBO versus MABC	1.58351E-09	1.16588E-09	1.16588E-09
STLBO versus NNA	1.83408E-09	1.33021E-09	1.33021E-09
TLBO versus ISCA	3.49326E-09	2.49519E-09	2.22648E-09
ADELI versus MABC	5.83612E-09	4.10452E-09	3.71972E-09
EBLSHADE versus NNA	1.23520E-08	8.55140E-09	7.87272E-09
EBLSHADE versus PSO	1.47150E-08	1.00256E-08	9.37877E-09
STLBO versus PSO	5.32586E-08	3.57008E-08	3.39450E-08
ADELI versus PSO	1.50038E-07	9.89261E-08	9.56286E-08
TLBO versus GOTLBO	2.16253E-07	1.40208E-07	1.37831E-07
EBLSHADE versus WW	2.39169E-07	1.52438E-07	1.52438E-07
TLBO versus CWOA	2.89034E-07	1.81043E-07	1.77867E-07
TLBO versus DE	5.91345E-07	3.63905E-07	3.63905E-07
STLBO versus WW	6.86296E-07	4.14794E-07	4.14794E-07
TLBO versus NDE	1.37158E-06	8.13904E-07	7.68687E-07
TLBO versus NNA	1.17758E-04	6.72904E-05	6.59964E-05
NNA versus WW	2.21281E-02	1.24015E-02	1.24015E-02
IJAYA versus WW	2.36193E-01	1.29777E-01	1.24585E-01
NNA versus PSO	2.36193E-01	1.29777E-01	1.24585E-01
NDE versus WW	4.04596E-01	2.13413E-01	2.13413E-01
DE versus WW	6.28685E-01	3.24706E-01	3.24706E-01

Table S144 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
CWOA versus WW	8.94683E-01	4.52257E-01	4.52257E-01
GOTLBO versus WW	1.0	5.07626E-01	5.07626E-01
IJAYA versus PSO	1.0	8.15876E-01	7.97333E-01
NNA versus MABC	1.0	9.64793E-01	9.64793E-01
DE versus EBL SHADE	1.0	1.0	1.0
DE versus ADELI	1.0	1.0	1.0
DE versus NDE	1.0	1.0	1.0
DE versus MABC	1.0	1.0	1.0
DE versus TLBO	1.0	1.0	1.0
DE versus GOTLBO	1.0	1.0	1.0
DE versus STLBO	1.0	1.0	1.0
DE versus PSO	1.0	1.0	1.0
DE versus IJAYA	1.0	1.0	1.0
DE versus ISCA	1.0	1.0	1.0
DE versus NNA	1.0	1.0	1.0
DE versus CWOA	1.0	1.0	1.0
EBL SHADE versus ADELI	1.0	1.0	1.0
EBL SHADE versus TLBO	1.0	1.0	1.0
EBL SHADE versus STLBO	1.0	1.0	1.0
EBL SHADE versus IJAYA	1.0	1.0	1.0
ADELI versus EBL SHADE	1.0	1.0	1.0
ADELI versus TLBO	1.0	1.0	1.0
ADELI versus STLBO	1.0	1.0	1.0
ADELI versus IJAYA	1.0	1.0	1.0
NDE versus DE	1.0	1.0	1.0
NDE versus EBL SHADE	1.0	1.0	1.0
NDE versus ADELI	1.0	1.0	1.0
NDE versus MABC	1.0	1.0	1.0
NDE versus TLBO	1.0	1.0	1.0
NDE versus GOTLBO	1.0	1.0	1.0
NDE versus STLBO	1.0	1.0	1.0
NDE versus PSO	1.0	1.0	1.0
NDE versus IJAYA	1.0	1.0	1.0
NDE versus ISCA	1.0	1.0	1.0
NDE versus NNA	1.0	1.0	1.0
NDE versus CWOA	1.0	1.0	1.0
MABC versus DE	1.0	1.0	1.0
MABC versus EBL SHADE	1.0	1.0	1.0
MABC versus ADELI	1.0	1.0	1.0
MABC versus NDE	1.0	1.0	1.0
MABC versus TLBO	1.0	1.0	1.0
MABC versus GOTLBO	1.0	1.0	1.0
MABC versus STLBO	1.0	1.0	1.0

Table S144 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
MABC versus PSO	1.0	1.0	1.0
MABC versus IJAYA	1.0	1.0	1.0
MABC versus ISCA	1.0	1.0	1.0
MABC versus NNA	1.0	1.0	1.0
MABC versus CWOA	1.0	1.0	1.0
MABC versus WW	1.0	1.0	1.0
TLBO versus EBL SHADE	1.0	1.0	1.0
TLBO versus ADELI	1.0	1.0	1.0
TLBO versus STLBO	1.0	1.0	1.0
TLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus DE	1.0	1.0	1.0
GOTLBO versus EBL SHADE	1.0	1.0	1.0
GOTLBO versus ADELI	1.0	1.0	1.0
GOTLBO versus NDE	1.0	1.0	1.0
GOTLBO versus MABC	1.0	1.0	1.0
GOTLBO versus TLBO	1.0	1.0	1.0
GOTLBO versus STLBO	1.0	1.0	1.0
GOTLBO versus PSO	1.0	1.0	1.0
GOTLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus ISCA	1.0	1.0	1.0
GOTLBO versus NNA	1.0	1.0	1.0
GOTLBO versus CWOA	1.0	1.0	1.0
STLBO versus EBL SHADE	1.0	1.0	1.0
STLBO versus ADELI	1.0	1.0	1.0
STLBO versus TLBO	1.0	1.0	1.0
STLBO versus IJAYA	1.0	1.0	1.0
PSO versus DE	1.0	1.0	1.0
PSO versus EBL SHADE	1.0	1.0	1.0
PSO versus ADELI	1.0	1.0	1.0
PSO versus NDE	1.0	1.0	1.0
PSO versus MABC	1.0	1.0	1.0
PSO versus TLBO	1.0	1.0	1.0
PSO versus GOTLBO	1.0	1.0	1.0
PSO versus STLBO	1.0	1.0	1.0
PSO versus IJAYA	1.0	1.0	1.0
PSO versus ISCA	1.0	1.0	1.0
PSO versus NNA	1.0	1.0	1.0
PSO versus CWOA	1.0	1.0	1.0
PSO versus WW	1.0	1.0	1.0
IJAYA versus DE	1.0	1.0	1.0
IJAYA versus EBL SHADE	1.0	1.0	1.0
IJAYA versus ADELI	1.0	1.0	1.0
IJAYA versus NDE	1.0	1.0	1.0

Table S144 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
IJAYA versus MABC	1.0	1.0	1.0
IJAYA versus TLBO	1.0	1.0	1.0
IJAYA versus GOTLBO	1.0	1.0	1.0
IJAYA versus STLBO	1.0	1.0	1.0
IJAYA versus ISCA	1.0	1.0	1.0
IJAYA versus NNA	1.0	1.0	1.0
IJAYA versus CWOA	1.0	1.0	1.0
ISCA versus DE	1.0	1.0	1.0
ISCA versus EBL SHADE	1.0	1.0	1.0
ISCA versus ADELI	1.0	1.0	1.0
ISCA versus NDE	1.0	1.0	1.0
ISCA versus MABC	1.0	1.0	1.0
ISCA versus TLBO	1.0	1.0	1.0
ISCA versus GOTLBO	1.0	1.0	1.0
ISCA versus STLBO	1.0	1.0	1.0
ISCA versus PSO	1.0	1.0	1.0
ISCA versus IJAYA	1.0	1.0	1.0
ISCA versus NNA	1.0	1.0	1.0
ISCA versus CWOA	1.0	1.0	1.0
ISCA versus WW	1.0	1.0	1.0
NNA versus DE	1.0	1.0	1.0
NNA versus EBL SHADE	1.0	1.0	1.0
NNA versus ADELI	1.0	1.0	1.0
NNA versus NDE	1.0	1.0	1.0
NNA versus TLBO	1.0	1.0	1.0
NNA versus GOTLBO	1.0	1.0	1.0
NNA versus STLBO	1.0	1.0	1.0
NNA versus IJAYA	1.0	1.0	1.0
NNA versus ISCA	1.0	1.0	1.0
NNA versus CWOA	1.0	1.0	1.0
CWOA versus DE	1.0	1.0	1.0
CWOA versus EBL SHADE	1.0	1.0	1.0
CWOA versus ADELI	1.0	1.0	1.0
CWOA versus NDE	1.0	1.0	1.0
CWOA versus MABC	1.0	1.0	1.0
CWOA versus TLBO	1.0	1.0	1.0
CWOA versus GOTLBO	1.0	1.0	1.0
CWOA versus STLBO	1.0	1.0	1.0
CWOA versus PSO	1.0	1.0	1.0
CWOA versus IJAYA	1.0	1.0	1.0
CWOA versus ISCA	1.0	1.0	1.0
CWOA versus NNA	1.0	1.0	1.0
WW versus DE	1.0	1.0	1.0

Table S144 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
WW versus EBL SHADE	1.0	1.0	1.0
WW versus ADELI	1.0	1.0	1.0
WW versus NDE	1.0	1.0	1.0
WW versus MABC	1.0	1.0	1.0
WW versus TLBO	1.0	1.0	1.0
WW versus GOTLBO	1.0	1.0	1.0
WW versus STLBO	1.0	1.0	1.0
WW versus PSO	1.0	1.0	1.0
WW versus IJAYA	1.0	1.0	1.0
WW versus ISCA	1.0	1.0	1.0
WW versus NNA	1.0	1.0	1.0
WW versus CWOA	1.0	1.0	1.0

Table S145. Adjusted p -values for tests for multiple comparisons among all methods in the single-IV case. n_1 evaluation task.

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
EBLSHADE versus CWOA	<1E-13	<1E-13	<1E-13
ADELI versus PSO	<1E-13	<1E-13	<1E-13
ADELI versus NNA	<1E-13	<1E-13	<1E-13
ADELI versus CWOA	<1E-13	<1E-13	<1E-13
STLBO versus CWOA	<1E-13	<1E-13	<1E-13
TLBO versus ISCA	1.61648E-12	1.52767E-12	1.38556E-12
EBLSHADE versus MABC	2.99050E-12	2.79332E-12	2.56328E-12
STLBO versus MABC	1.78622E-11	1.64881E-11	1.53104E-11
TLBO versus GOTLBO	2.46918E-11	2.25211E-11	2.11644E-11
EBLSHADE versus GOTLBO	5.12426E-11	4.61746E-11	4.39222E-11
ADELI versus MABC	7.56515E-11	6.73381E-11	6.48441E-11
TLBO versus WW	2.00969E-10	1.76676E-10	1.72260E-10
STLBO versus GOTLBO	2.49909E-10	2.16954E-10	2.14207E-10
TLBO versus MABC	4.53444E-10	3.88666E-10	3.88666E-10
EBLSHADE versus ISCA	5.43381E-10	4.59784E-10	4.00072E-10
ADELI versus GOTLBO	8.75044E-10	7.30806E-10	6.44263E-10
TLBO versus PSO	1.00018E-09	8.24324E-10	7.36396E-10
TLBO versus NNA	2.04728E-09	1.66482E-09	1.50734E-09
STLBO versus ISCA	2.18167E-09	1.75013E-09	1.60628E-09
ADELI versus ISCA	6.57190E-09	5.19974E-09	4.83865E-09
NDE versus CWOA	3.36109E-08	2.62239E-08	2.47465E-08
TLBO versus CWOA	5.32586E-08	4.09682E-08	3.92124E-08
EBLSHADE versus WW	5.60533E-08	4.25019E-08	4.12700E-08
STLBO versus WW	1.57318E-07	1.17556E-07	1.15828E-07
EBLSHADE versus PSO	1.72868E-07	1.27276E-07	1.27276E-07
EBLSHADE versus NNA	2.86887E-07	2.08072E-07	2.08072E-07
ADELI versus DE	3.33882E-07	2.34818E-07	2.12804E-07
ADELI versus WW	3.58848E-07	2.48433E-07	2.28717E-07
STLBO versus PSO	4.47114E-07	3.04627E-07	2.84974E-07
STLBO versus NNA	7.15762E-07	4.79796E-07	4.56200E-07
STLBO versus DE	1.19373E-06	7.73959E-07	7.60841E-07
NDE versus NNA	2.07377E-06	1.32174E-06	1.32174E-06
NDE versus PSO	4.36970E-06	2.73706E-06	2.68905E-06
EBLSHADE versus DE	4.99510E-06	3.01902E-06	3.01902E-06
DE versus CWOA	6.39569E-06	3.79524E-06	3.58440E-06
IJAYA versus CWOA	7.30359E-06	4.25374E-06	4.09322E-06
NDE versus WW	1.94193E-05	1.10967E-05	1.08833E-05
ADELI versus NDE	4.70344E-05	2.63600E-05	2.63600E-05
STLBO versus NDE	1.40958E-04	7.74492E-05	7.43513E-05
DE versus NNA	2.26316E-04	1.21862E-04	1.19375E-04
IJAYA versus NNA	2.54404E-04	1.34191E-04	1.34191E-04

Table S145 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
DE versus PSO	4.27764E-04	2.20933E-04	2.20933E-04
EBLSHADE versus NDE	4.79400E-04	2.42334E-04	2.42334E-04
IJAYA versus PSO	4.79400E-04	2.42334E-04	2.42334E-04
TLBO versus DE	1.30442E-03	6.16374E-04	6.16374E-04
DE versus WW	1.53460E-03	7.08277E-04	7.08277E-04
IJAYA versus WW	1.70903E-03	7.70003E-04	7.51222E-04
NDE versus ISCA	1.90225E-03	8.36152E-04	8.36152E-04
NDE versus GOTLBO	9.80133E-03	4.20057E-03	4.20057E-03
NDE versus MABC	4.80428E-02	2.00618E-02	2.00618E-02
TLBO versus NDE	5.02234E-02	2.04205E-02	2.04205E-02
DE versus ISCA	6.82680E-02	2.70071E-02	2.70071E-02
IJAYA versus ISCA	7.44356E-02	2.86291E-02	2.86291E-02
DE versus GOTLBO	2.55477E-01	9.54529E-02	9.54529E-02
IJAYA versus GOTLBO	2.76188E-01	1.00156E-01	9.71211E-02
MABC versus CWOA	4.52529E-01	1.59131E-01	1.59131E-01
DE versus MABC	8.94683E-01	3.04782E-01	3.04782E-01
IJAYA versus MABC	9.58593E-01	3.16020E-01	3.16020E-01
GOTLBO versus CWOA	1.0	4.72336E-01	4.72336E-01
MABC versus NNA	1.0	9.34584E-01	9.34584E-01
DE versus EBLSHADE	1.0	1.0	1.0
DE versus ADELI	1.0	1.0	1.0
DE versus NDE	1.0	1.0	1.0
DE versus TLBO	1.0	1.0	1.0
DE versus STLBO	1.0	1.0	1.0
DE versus IJAYA	1.0	1.0	1.0
EBLSHADE versus ADELI	1.0	1.0	1.0
EBLSHADE versus TLBO	1.0	1.0	1.0
EBLSHADE versus STLBO	1.0	1.0	1.0
EBLSHADE versus IJAYA	1.0	1.0	1.0
ADELI versus EBLSHADE	1.0	1.0	1.0
ADELI versus TLBO	1.0	1.0	1.0
ADELI versus STLBO	1.0	1.0	1.0
ADELI versus IJAYA	1.0	1.0	1.0
NDE versus DE	1.0	1.0	1.0
NDE versus EBLSHADE	1.0	1.0	1.0
NDE versus ADELI	1.0	1.0	1.0
NDE versus TLBO	1.0	1.0	1.0
NDE versus STLBO	1.0	1.0	1.0
NDE versus IJAYA	1.0	1.0	1.0
MABC versus DE	1.0	1.0	1.0
MABC versus EBLSHADE	1.0	1.0	1.0
MABC versus ADELI	1.0	1.0	1.0
MABC versus NDE	1.0	1.0	1.0

Table S145 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
MABC versus TLBO	1.0	1.0	1.0
MABC versus GOTLBO	1.0	1.0	1.0
MABC versus STLBO	1.0	1.0	1.0
MABC versus PSO	1.0	1.0	1.0
MABC versus IJAYA	1.0	1.0	1.0
MABC versus ISCA	1.0	1.0	1.0
MABC versus WW	1.0	1.0	1.0
TLBO versus EBL SHADE	1.0	1.0	1.0
TLBO versus ADELI	1.0	1.0	1.0
TLBO versus STLBO	1.0	1.0	1.0
TLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus DE	1.0	1.0	1.0
GOTLBO versus EBL SHADE	1.0	1.0	1.0
GOTLBO versus ADELI	1.0	1.0	1.0
GOTLBO versus NDE	1.0	1.0	1.0
GOTLBO versus MABC	1.0	1.0	1.0
GOTLBO versus TLBO	1.0	1.0	1.0
GOTLBO versus STLBO	1.0	1.0	1.0
GOTLBO versus PSO	1.0	1.0	1.0
GOTLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus ISCA	1.0	1.0	1.0
GOTLBO versus NNA	1.0	1.0	1.0
GOTLBO versus WW	1.0	1.0	1.0
STLBO versus EBL SHADE	1.0	1.0	1.0
STLBO versus ADELI	1.0	1.0	1.0
STLBO versus TLBO	1.0	1.0	1.0
STLBO versus IJAYA	1.0	1.0	1.0
PSO versus DE	1.0	1.0	1.0
PSO versus EBL SHADE	1.0	1.0	1.0
PSO versus ADELI	1.0	1.0	1.0
PSO versus NDE	1.0	1.0	1.0
PSO versus MABC	1.0	1.0	1.0
PSO versus TLBO	1.0	1.0	1.0
PSO versus GOTLBO	1.0	1.0	1.0
PSO versus STLBO	1.0	1.0	1.0
PSO versus IJAYA	1.0	1.0	1.0
PSO versus ISCA	1.0	1.0	1.0
PSO versus NNA	1.0	1.0	1.0
PSO versus CWOA	1.0	1.0	1.0
PSO versus WW	1.0	1.0	1.0
IJAYA versus DE	1.0	1.0	1.0
IJAYA versus EBL SHADE	1.0	1.0	1.0
IJAYA versus ADELI	1.0	1.0	1.0

Table S145 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
IJAYA versus NDE	1.0	1.0	1.0
IJAYA versus TLBO	1.0	1.0	1.0
IJAYA versus STLBO	1.0	1.0	1.0
ISCA versus DE	1.0	1.0	1.0
ISCA versus EBL SHADE	1.0	1.0	1.0
ISCA versus ADELI	1.0	1.0	1.0
ISCA versus NDE	1.0	1.0	1.0
ISCA versus MABC	1.0	1.0	1.0
ISCA versus TLBO	1.0	1.0	1.0
ISCA versus GOTLBO	1.0	1.0	1.0
ISCA versus STLBO	1.0	1.0	1.0
ISCA versus PSO	1.0	1.0	1.0
ISCA versus IJAYA	1.0	1.0	1.0
ISCA versus NNA	1.0	1.0	1.0
ISCA versus CWOA	1.0	1.0	1.0
ISCA versus WW	1.0	1.0	1.0
NNA versus DE	1.0	1.0	1.0
NNA versus EBL SHADE	1.0	1.0	1.0
NNA versus ADELI	1.0	1.0	1.0
NNA versus NDE	1.0	1.0	1.0
NNA versus MABC	1.0	1.0	1.0
NNA versus TLBO	1.0	1.0	1.0
NNA versus GOTLBO	1.0	1.0	1.0
NNA versus STLBO	1.0	1.0	1.0
NNA versus PSO	1.0	1.0	1.0
NNA versus IJAYA	1.0	1.0	1.0
NNA versus ISCA	1.0	1.0	1.0
NNA versus CWOA	1.0	1.0	1.0
NNA versus WW	1.0	1.0	1.0
CWOA versus DE	1.0	1.0	1.0
CWOA versus EBL SHADE	1.0	1.0	1.0
CWOA versus ADELI	1.0	1.0	1.0
CWOA versus NDE	1.0	1.0	1.0
CWOA versus MABC	1.0	1.0	1.0
CWOA versus TLBO	1.0	1.0	1.0
CWOA versus GOTLBO	1.0	1.0	1.0
CWOA versus STLBO	1.0	1.0	1.0
CWOA versus PSO	1.0	1.0	1.0
CWOA versus IJAYA	1.0	1.0	1.0
CWOA versus ISCA	1.0	1.0	1.0
CWOA versus NNA	1.0	1.0	1.0
CWOA versus WW	1.0	1.0	1.0
WW versus DE	1.0	1.0	1.0

Table S145 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
WW versus EBL SHADE	1.0	1.0	1.0
WW versus ADELI	1.0	1.0	1.0
WW versus NDE	1.0	1.0	1.0
WW versus MABC	1.0	1.0	1.0
WW versus TLBO	1.0	1.0	1.0
WW versus GOTLBO	1.0	1.0	1.0
WW versus STLBO	1.0	1.0	1.0
WW versus PSO	1.0	1.0	1.0
WW versus IJAYA	1.0	1.0	1.0
WW versus ISCA	1.0	1.0	1.0
WW versus NNA	1.0	1.0	1.0
WW versus CWOA	1.0	1.0	1.0

Table S146. Adjusted p -values for tests for multiple comparisons among all methods in the single-IV case. R_{p1} evaluation task.

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
EBLSHADE versus GOTLBO	<1E-13	<1E-13	<1E-13
EBLSHADE versus PSO	<1E-13	<1E-13	<1E-13
ADELI versus GOTLBO	<1E-13	<1E-13	<1E-13
ADELI versus PSO	<1E-13	<1E-13	<1E-13
STLBO versus GOTLBO	<1E-13	<1E-13	<1E-13
STLBO versus PSO	<1E-13	<1E-13	<1E-13
TLBO versus WW	1.43463E-12	1.34004E-12	1.22968E-12
ADELI versus MABC	1.33360E-11	1.23102E-11	1.14309E-11
STLBO versus MABC	2.69549E-11	2.45852E-11	2.31042E-11
EBLSHADE versus MABC	3.50373E-11	3.15721E-11	3.00320E-11
TLBO versus CWOA	4.11355E-10	3.66151E-10	3.52590E-10
TLBO versus NNA	8.18143E-10	7.19247E-10	7.01266E-10
TLBO versus ISCA	1.06888E-09	9.27929E-10	9.16183E-10
EBLSHADE versus WW	2.63616E-09	2.25957E-09	2.25957E-09
STLBO versus WW	3.17823E-09	2.68927E-09	2.34002E-09
TLBO versus PSO	4.31959E-09	3.60757E-09	3.18036E-09
ADELI versus WW	5.17792E-09	4.26752E-09	3.81232E-09
TLBO versus GOTLBO	1.10887E-08	9.01722E-09	8.16424E-09
NDE versus GOTLBO	8.94170E-08	7.17301E-08	6.58345E-08
ADELI versus DE	1.61452E-07	1.27742E-07	1.18871E-07
EBLSHADE versus CWOA	2.62028E-07	2.04440E-07	1.92922E-07
NDE versus PSO	2.89034E-07	2.22334E-07	2.12805E-07
STLBO versus DE	2.89034E-07	2.22334E-07	2.12805E-07
STLBO versus CWOA	3.00115E-07	2.22334E-07	2.20964E-07
TLBO versus MABC	3.10670E-07	2.25321E-07	2.25321E-07
EBLSHADE versus DE	3.58779E-07	2.56271E-07	2.28673E-07
EBLSHADE versus NNA	4.09653E-07	2.88108E-07	2.61097E-07
ADELI versus CWOA	4.28007E-07	2.96312E-07	2.72795E-07
STLBO versus NNA	4.67004E-07	3.18178E-07	2.97651E-07
EBLSHADE versus ISCA	4.87704E-07	3.26922E-07	3.10844E-07
STLBO versus ISCA	5.54974E-07	3.59818E-07	3.53720E-07
ADELI versus NNA	6.57947E-07	4.12121E-07	4.04891E-07
ADELI versus ISCA	7.78206E-07	4.78896E-07	4.78896E-07
NDE versus ISCA	1.37158E-06	8.28976E-07	8.28976E-07
NDE versus NNA	1.80779E-06	1.07275E-06	1.01315E-06
NDE versus CWOA	3.57169E-06	2.08021E-06	2.00172E-06
IJAYA versus GOTLBO	6.81498E-05	3.89427E-05	3.81938E-05
DE versus GOTLBO	1.10876E-04	6.21395E-05	6.21395E-05
IJAYA versus PSO	1.78805E-04	9.82446E-05	9.43149E-05
ADELI versus NDE	1.78805E-04	9.82446E-05	9.43149E-05
DE versus PSO	2.85820E-04	1.50762E-04	1.50762E-04

Table S146 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
STLBO versus NDE	2.85820E-04	1.50762E-04	1.50762E-04
EBLSHADE versus NDE	3.40016E-04	1.71876E-04	1.71876E-04
TLBO versus DE	5.36975E-04	2.65537E-04	2.65537E-04
IJAYA versus ISCA	6.35902E-04	3.07469E-04	3.00481E-04
NDE versus WW	7.11295E-04	3.36107E-04	3.36107E-04
IJAYA versus NNA	7.95190E-04	3.67011E-04	3.67011E-04
DE versus ISCA	9.92197E-04	4.36131E-04	4.36131E-04
DE versus NNA	1.23530E-03	5.29414E-04	5.29414E-04
IJAYA versus CWOA	1.37722E-03	5.75102E-04	5.75102E-04
DE versus CWOA	2.11615E-03	8.60411E-04	8.60411E-04
MABC versus GOTLBO	4.80428E-02	1.90060E-02	1.90060E-02
IJAYA versus WW	8.83504E-02	3.39809E-02	3.39809E-02
MABC versus PSO	9.61775E-02	3.59344E-02	3.59344E-02
TLBO versus NDE	1.00327E-01	3.63824E-02	3.59344E-02
DE versus WW	1.23672E-01	4.34891E-02	4.34891E-02
MABC versus ISCA	2.36193E-01	8.04614E-02	8.04614E-02
MABC versus NNA	2.76188E-01	9.10511E-02	9.10511E-02
MABC versus CWOA	4.04596E-01	1.28937E-01	1.28937E-01
NDE versus MABC	7.25121E-01	2.23114E-01	2.23114E-01
DE versus EBLSHADE	1.0	1.0	1.0
DE versus ADELI	1.0	1.0	1.0
DE versus NDE	1.0	1.0	1.0
DE versus MABC	1.0	1.0	1.0
DE versus TLBO	1.0	1.0	1.0
DE versus STLBO	1.0	1.0	1.0
DE versus IJAYA	1.0	1.0	1.0
EBLSHADE versus ADELI	1.0	1.0	1.0
EBLSHADE versus TLBO	1.0	1.0	1.0
EBLSHADE versus STLBO	1.0	1.0	1.0
EBLSHADE versus IJAYA	1.0	1.0	1.0
ADELI versus EBLSHADE	1.0	1.0	1.0
ADELI versus TLBO	1.0	1.0	1.0
ADELI versus STLBO	1.0	1.0	1.0
ADELI versus IJAYA	1.0	1.0	1.0
NDE versus DE	1.0	1.0	1.0
NDE versus EBLSHADE	1.0	1.0	1.0
NDE versus ADELI	1.0	1.0	1.0
NDE versus TLBO	1.0	1.0	1.0
NDE versus STLBO	1.0	1.0	1.0
NDE versus IJAYA	1.0	1.0	1.0
MABC versus DE	1.0	1.0	1.0
MABC versus EBLSHADE	1.0	1.0	1.0
MABC versus ADELI	1.0	1.0	1.0

Table S146 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
MABC versus NDE	1.0	1.0	1.0
MABC versus TLBO	1.0	1.0	1.0
MABC versus STLBO	1.0	1.0	1.0
MABC versus IJAYA	1.0	1.0	1.0
MABC versus WW	1.0	1.0	1.0
TLBO versus EBL SHADE	1.0	1.0	1.0
TLBO versus ADELI	1.0	1.0	1.0
TLBO versus STLBO	1.0	1.0	1.0
TLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus DE	1.0	1.0	1.0
GOTLBO versus EBL SHADE	1.0	1.0	1.0
GOTLBO versus ADELI	1.0	1.0	1.0
GOTLBO versus NDE	1.0	1.0	1.0
GOTLBO versus MABC	1.0	1.0	1.0
GOTLBO versus TLBO	1.0	1.0	1.0
GOTLBO versus STLBO	1.0	1.0	1.0
GOTLBO versus PSO	1.0	1.0	1.0
GOTLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus ISCA	1.0	1.0	1.0
GOTLBO versus NNA	1.0	1.0	1.0
GOTLBO versus CWOA	1.0	1.0	1.0
GOTLBO versus WW	1.0	1.0	1.0
STLBO versus EBL SHADE	1.0	1.0	1.0
STLBO versus ADELI	1.0	1.0	1.0
STLBO versus TLBO	1.0	1.0	1.0
STLBO versus IJAYA	1.0	1.0	1.0
PSO versus DE	1.0	1.0	1.0
PSO versus EBL SHADE	1.0	1.0	1.0
PSO versus ADELI	1.0	1.0	1.0
PSO versus NDE	1.0	1.0	1.0
PSO versus MABC	1.0	1.0	1.0
PSO versus TLBO	1.0	1.0	1.0
PSO versus GOTLBO	1.0	1.0	1.0
PSO versus STLBO	1.0	1.0	1.0
PSO versus IJAYA	1.0	1.0	1.0
PSO versus ISCA	1.0	1.0	1.0
PSO versus NNA	1.0	1.0	1.0
PSO versus CWOA	1.0	1.0	1.0
PSO versus WW	1.0	1.0	1.0
IJAYA versus DE	1.0	1.0	1.0
IJAYA versus EBL SHADE	1.0	1.0	1.0
IJAYA versus ADELI	1.0	1.0	1.0
IJAYA versus NDE	1.0	1.0	1.0

Table S146 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
IJAYA versus MABC	1.0	1.0	1.0
IJAYA versus TLBO	1.0	1.0	1.0
IJAYA versus STLBO	1.0	1.0	1.0
ISCA versus DE	1.0	1.0	1.0
ISCA versus EBL SHADE	1.0	1.0	1.0
ISCA versus ADELI	1.0	1.0	1.0
ISCA versus NDE	1.0	1.0	1.0
ISCA versus MABC	1.0	1.0	1.0
ISCA versus TLBO	1.0	1.0	1.0
ISCA versus GOTLBO	1.0	1.0	1.0
ISCA versus STLBO	1.0	1.0	1.0
ISCA versus PSO	1.0	1.0	1.0
ISCA versus IJAYA	1.0	1.0	1.0
ISCA versus NNA	1.0	1.0	1.0
ISCA versus CWOA	1.0	1.0	1.0
ISCA versus WW	1.0	1.0	1.0
NNA versus DE	1.0	1.0	1.0
NNA versus EBL SHADE	1.0	1.0	1.0
NNA versus ADELI	1.0	1.0	1.0
NNA versus NDE	1.0	1.0	1.0
NNA versus MABC	1.0	1.0	1.0
NNA versus TLBO	1.0	1.0	1.0
NNA versus GOTLBO	1.0	1.0	1.0
NNA versus STLBO	1.0	1.0	1.0
NNA versus PSO	1.0	1.0	1.0
NNA versus IJAYA	1.0	1.0	1.0
NNA versus ISCA	1.0	1.0	1.0
NNA versus CWOA	1.0	1.0	1.0
NNA versus WW	1.0	1.0	1.0
CWOA versus DE	1.0	1.0	1.0
CWOA versus EBL SHADE	1.0	1.0	1.0
CWOA versus ADELI	1.0	1.0	1.0
CWOA versus NDE	1.0	1.0	1.0
CWOA versus MABC	1.0	1.0	1.0
CWOA versus TLBO	1.0	1.0	1.0
CWOA versus GOTLBO	1.0	1.0	1.0
CWOA versus STLBO	1.0	1.0	1.0
CWOA versus PSO	1.0	1.0	1.0
CWOA versus IJAYA	1.0	1.0	1.0
CWOA versus ISCA	1.0	1.0	1.0
CWOA versus NNA	1.0	1.0	1.0
CWOA versus WW	1.0	1.0	1.0
WW versus DE	1.0	1.0	1.0

Table S146 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
WW versus EBL SHADE	1.0	1.0	1.0
WW versus ADELI	1.0	1.0	1.0
WW versus NDE	1.0	1.0	1.0
WW versus MABC	1.0	1.0	1.0
WW versus TLBO	1.0	1.0	1.0
WW versus GOTLBO	1.0	1.0	1.0
WW versus STLBO	1.0	1.0	1.0
WW versus PSO	1.0	1.0	1.0
WW versus IJAYA	1.0	1.0	1.0
WW versus ISCA	1.0	1.0	1.0
WW versus NNA	1.0	1.0	1.0
WW versus CWOA	1.0	1.0	1.0

Table S147. Adjusted p -values for tests for multiple comparisons among all methods in the single-IV case. I_{02} evaluation task.

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
ADELI versus PSO	<1E-13	<1E-13	<1E-13
STLBO versus PSO	<1E-13	<1E-13	<1E-13
STLBO versus GOTLBO	1.43463E-12	1.40310E-12	1.22968E-12
STLBO versus ISCA	1.43463E-12	1.40310E-12	1.22968E-12
STLBO versus MABC	1.61648E-12	1.54543E-12	1.38556E-12
ADELI versus MABC	1.85896E-12	1.75682E-12	1.59339E-12
STLBO versus NNA	2.14184E-12	2.00062E-12	1.83586E-12
ADELI versus GOTLBO	2.16205E-12	2.00062E-12	1.85318E-12
ADELI versus ISCA	2.16205E-12	2.00062E-12	1.85318E-12
EBLSHADE versus CWOA	2.18225E-12	2.00062E-12	1.87050E-12
STLBO versus WW	2.30349E-12	2.05036E-12	1.97442E-12
EBLSHADE versus WW	2.50555E-12	2.20268E-12	2.14762E-12
EBLSHADE versus NNA	2.74802E-12	2.38565E-12	2.35545E-12
EBLSHADE versus DE	9.09273E-12	7.69385E-12	6.69464E-12
ADELI versus NNA	1.17195E-11	9.78773E-12	8.62865E-12
ADELI versus WW	1.27702E-11	1.05249E-11	9.40226E-12
EBLSHADE versus GOTLBO	1.59022E-11	1.29314E-11	1.17082E-11
EBLSHADE versus ISCA	1.59022E-11	1.29314E-11	1.17082E-11
EBLSHADE versus MABC	1.89533E-11	1.49960E-11	1.39546E-11
STLBO versus CWOA	2.48535E-11	1.93912E-11	1.82987E-11
STLBO versus DE	9.52514E-11	7.22236E-11	7.01301E-11
ADELI versus CWOA	1.19539E-10	8.93259E-11	8.80123E-11
ADELI versus DE	4.11355E-10	2.93825E-10	2.78092E-10
TLBO versus PSO	3.83430E-10	2.78092E-10	2.78092E-10
ADELI versus NDE	1.03645E-09	7.28932E-10	6.60594E-10
STLBO versus NDE	5.20274E-09	3.60189E-09	3.31603E-09
TLBO versus DE	5.63195E-09	3.83716E-09	3.58960E-09
TLBO versus CWOA	2.12347E-08	1.40009E-08	1.35342E-08
EBLSHADE versus NDE	4.90997E-08	3.18339E-08	3.12943E-08
TLBO versus WW	1.73724E-07	1.10725E-07	1.10725E-07
TLBO versus NNA	1.86904E-07	1.17072E-07	1.15018E-07
EBLSHADE versus PSO	6.57947E-07	4.04891E-07	4.04891E-07
TLBO versus GOTLBO	7.84454E-07	4.74120E-07	4.74120E-07
TLBO versus ISCA	7.84454E-07	4.74120E-07	4.74120E-07
TLBO versus MABC	9.02777E-07	5.25793E-07	5.05952E-07
TLBO versus NDE	4.03987E-04	2.30850E-04	2.26410E-04
NDE versus PSO	2.90375E-03	1.62737E-03	1.62737E-03
MABC versus PSO	2.36193E-01	1.29777E-01	1.24585E-01
GOTLBO versus PSO	2.55477E-01	1.37564E-01	1.34757E-01
ISCA versus PSO	2.55477E-01	1.37564E-01	1.34757E-01
NNA versus PSO	5.43931E-01	2.80932E-01	2.80932E-01

Table S147 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
WW versus PSO	5.64095E-01	2.85147E-01	2.85147E-01
CWOA versus PSO	1.0	7.32936E-01	7.32936E-01
DE versus EBL SHADE	1.0	1.0	1.0
DE versus ADELI	1.0	1.0	1.0
DE versus NDE	1.0	1.0	1.0
DE versus MABC	1.0	1.0	1.0
DE versus TLBO	1.0	1.0	1.0
DE versus GOTLBO	1.0	1.0	1.0
DE versus STLBO	1.0	1.0	1.0
DE versus PSO	1.0	1.0	1.0
DE versus IJAYA	1.0	1.0	1.0
DE versus ISCA	1.0	1.0	1.0
DE versus NNA	1.0	1.0	1.0
DE versus CWOA	1.0	1.0	1.0
DE versus WW	1.0	1.0	1.0
EBL SHADE versus ADELI	1.0	1.0	1.0
EBL SHADE versus TLBO	1.0	1.0	1.0
EBL SHADE versus STLBO	1.0	1.0	1.0
EBL SHADE versus IJAYA	1.0	1.0	1.0
ADELI versus EBL SHADE	1.0	1.0	1.0
ADELI versus TLBO	1.0	1.0	1.0
ADELI versus STLBO	1.0	1.0	1.0
ADELI versus IJAYA	1.0	1.0	1.0
NDE versus DE	1.0	1.0	1.0
NDE versus EBL SHADE	1.0	1.0	1.0
NDE versus ADELI	1.0	1.0	1.0
NDE versus MABC	1.0	1.0	1.0
NDE versus TLBO	1.0	1.0	1.0
NDE versus GOTLBO	1.0	1.0	1.0
NDE versus STLBO	1.0	1.0	1.0
NDE versus IJAYA	1.0	1.0	1.0
NDE versus ISCA	1.0	1.0	1.0
NDE versus NNA	1.0	1.0	1.0
NDE versus CWOA	1.0	1.0	1.0
NDE versus WW	1.0	1.0	1.0
MABC versus DE	1.0	1.0	1.0
MABC versus EBL SHADE	1.0	1.0	1.0
MABC versus ADELI	1.0	1.0	1.0
MABC versus NDE	1.0	1.0	1.0
MABC versus TLBO	1.0	1.0	1.0
MABC versus GOTLBO	1.0	1.0	1.0
MABC versus STLBO	1.0	1.0	1.0
MABC versus IJAYA	1.0	1.0	1.0

Table S147 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
MABC versus ISCA	1.0	1.0	1.0
MABC versus NNA	1.0	1.0	1.0
MABC versus CWOA	1.0	1.0	1.0
MABC versus WW	1.0	1.0	1.0
TLBO versus EBL SHADE	1.0	1.0	1.0
TLBO versus ADELI	1.0	1.0	1.0
TLBO versus STLBO	1.0	1.0	1.0
TLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus DE	1.0	1.0	1.0
GOTLBO versus EBL SHADE	1.0	1.0	1.0
GOTLBO versus ADELI	1.0	1.0	1.0
GOTLBO versus NDE	1.0	1.0	1.0
GOTLBO versus MABC	1.0	1.0	1.0
GOTLBO versus TLBO	1.0	1.0	1.0
GOTLBO versus STLBO	1.0	1.0	1.0
GOTLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus ISCA	1.0	1.0	1.0
GOTLBO versus NNA	1.0	1.0	1.0
GOTLBO versus CWOA	1.0	1.0	1.0
GOTLBO versus WW	1.0	1.0	1.0
STLBO versus EBL SHADE	1.0	1.0	1.0
STLBO versus ADELI	1.0	1.0	1.0
STLBO versus TLBO	1.0	1.0	1.0
STLBO versus IJAYA	1.0	1.0	1.0
PSO versus DE	1.0	1.0	1.0
PSO versus EBL SHADE	1.0	1.0	1.0
PSO versus ADELI	1.0	1.0	1.0
PSO versus NDE	1.0	1.0	1.0
PSO versus MABC	1.0	1.0	1.0
PSO versus TLBO	1.0	1.0	1.0
PSO versus GOTLBO	1.0	1.0	1.0
PSO versus STLBO	1.0	1.0	1.0
PSO versus IJAYA	1.0	1.0	1.0
PSO versus ISCA	1.0	1.0	1.0
PSO versus NNA	1.0	1.0	1.0
PSO versus CWOA	1.0	1.0	1.0
PSO versus WW	1.0	1.0	1.0
IJAYA versus DE	1.0	1.0	1.0
IJAYA versus EBL SHADE	1.0	1.0	1.0
IJAYA versus ADELI	1.0	1.0	1.0
IJAYA versus NDE	1.0	1.0	1.0
IJAYA versus MABC	1.0	1.0	1.0
IJAYA versus TLBO	1.0	1.0	1.0

Table S147 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
IJAYA versus GOTLBO	1.0	1.0	1.0
IJAYA versus STLBO	1.0	1.0	1.0
IJAYA versus PSO	1.0	1.0	1.0
IJAYA versus ISCA	1.0	1.0	1.0
IJAYA versus NNA	1.0	1.0	1.0
IJAYA versus CWOA	1.0	1.0	1.0
IJAYA versus WW	1.0	1.0	1.0
ISCA versus DE	1.0	1.0	1.0
ISCA versus EBL SHADE	1.0	1.0	1.0
ISCA versus ADELI	1.0	1.0	1.0
ISCA versus NDE	1.0	1.0	1.0
ISCA versus MABC	1.0	1.0	1.0
ISCA versus TLBO	1.0	1.0	1.0
ISCA versus GOTLBO	1.0	1.0	1.0
ISCA versus STLBO	1.0	1.0	1.0
ISCA versus IJAYA	1.0	1.0	1.0
ISCA versus NNA	1.0	1.0	1.0
ISCA versus CWOA	1.0	1.0	1.0
ISCA versus WW	1.0	1.0	1.0
NNA versus DE	1.0	1.0	1.0
NNA versus EBL SHADE	1.0	1.0	1.0
NNA versus ADELI	1.0	1.0	1.0
NNA versus NDE	1.0	1.0	1.0
NNA versus MABC	1.0	1.0	1.0
NNA versus TLBO	1.0	1.0	1.0
NNA versus GOTLBO	1.0	1.0	1.0
NNA versus STLBO	1.0	1.0	1.0
NNA versus IJAYA	1.0	1.0	1.0
NNA versus ISCA	1.0	1.0	1.0
NNA versus CWOA	1.0	1.0	1.0
NNA versus WW	1.0	1.0	1.0
CWOA versus DE	1.0	1.0	1.0
CWOA versus EBL SHADE	1.0	1.0	1.0
CWOA versus ADELI	1.0	1.0	1.0
CWOA versus NDE	1.0	1.0	1.0
CWOA versus MABC	1.0	1.0	1.0
CWOA versus TLBO	1.0	1.0	1.0
CWOA versus GOTLBO	1.0	1.0	1.0
CWOA versus STLBO	1.0	1.0	1.0
CWOA versus IJAYA	1.0	1.0	1.0
CWOA versus ISCA	1.0	1.0	1.0
CWOA versus NNA	1.0	1.0	1.0
CWOA versus WW	1.0	1.0	1.0

Table S147 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
WW versus DE	1.0	1.0	1.0
WW versus EBL SHADE	1.0	1.0	1.0
WW versus ADELI	1.0	1.0	1.0
WW versus NDE	1.0	1.0	1.0
WW versus MABC	1.0	1.0	1.0
WW versus TLBO	1.0	1.0	1.0
WW versus GOTLBO	1.0	1.0	1.0
WW versus STLBO	1.0	1.0	1.0
WW versus IJAYA	1.0	1.0	1.0
WW versus ISCA	1.0	1.0	1.0
WW versus NNA	1.0	1.0	1.0
WW versus CWOA	1.0	1.0	1.0

Table S148. Adjusted p -values for tests for multiple comparisons among all methods in the single-IV case. n_2 evaluation task.

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
EBLSHADE versus PSO	<1E-13	<1E-13	<1E-13
ADELI versus PSO	<1E-13	<1E-13	<1E-13
STLBO versus PSO	<1E-13	<1E-13	<1E-13
STLBO versus ISCA	1.73772E-12	1.68043E-12	1.48948E-12
EBLSHADE versus ISCA	2.50555E-12	2.39542E-12	2.14762E-12
ADELI versus ISCA	5.90017E-12	5.57598E-12	5.05729E-12
TLBO versus GOTLBO	3.82299E-11	3.57092E-11	3.27685E-11
TLBO versus NNA	5.54050E-11	5.11431E-11	4.74900E-11
STLBO versus GOTLBO	2.88583E-10	2.63213E-10	2.47357E-10
TLBO versus CWOA	3.57304E-10	3.21966E-10	3.06260E-10
EBLSHADE versus GOTLBO	4.11355E-10	3.66151E-10	3.52590E-10
NDE versus PSO	4.17134E-10	3.66711E-10	3.57543E-10
ADELI versus MABC	4.53444E-10	3.93649E-10	3.88666E-10
ADELI versus GOTLBO	8.18143E-10	7.01266E-10	7.01266E-10
EBLSHADE versus MABC	1.03645E-09	8.76996E-10	7.63100E-10
STLBO versus MABC	1.55916E-09	1.30216E-09	1.14795E-09
NDE versus WW	1.58351E-09	1.30509E-09	1.16588E-09
DE versus WW	2.74625E-09	2.23321E-09	2.02196E-09
IJAYA versus WW	5.20274E-09	4.17362E-09	3.83059E-09
TLBO versus PSO	7.39368E-09	5.84994E-09	5.44370E-09
TLBO versus ISCA	7.72300E-09	6.02564E-09	5.68616E-09
TLBO versus WW	1.48718E-08	1.12764E-08	1.09496E-08
NDE versus CWOA	1.82015E-08	1.36011E-08	1.34011E-08
ADELI versus DE	2.47603E-08	1.82301E-08	1.82301E-08
EBLSHADE versus DE	5.29450E-08	3.72360E-08	3.37451E-08
STLBO versus DE	7.70341E-08	5.33313E-08	4.90986E-08
STLBO versus NNA	9.71903E-08	6.62176E-08	6.19455E-08
NDE versus NNA	1.20281E-07	8.06279E-08	7.66626E-08
EBLSHADE versus NNA	1.23921E-07	8.17061E-08	7.89826E-08
MABC versus WW	1.29493E-07	8.39569E-08	8.25339E-08
ADELI versus NNA	1.98870E-07	1.26753E-07	1.26753E-07
STLBO versus CWOA	3.13904E-07	1.96621E-07	1.93172E-07
STLBO versus WW	3.76647E-07	2.31783E-07	2.31783E-07
EBLSHADE versus CWOA	3.92026E-07	2.36939E-07	2.36939E-07
EBLSHADE versus WW	4.21156E-07	2.49917E-07	2.36939E-07
ADELI versus WW	5.24150E-07	3.05274E-07	2.93755E-07
ADELI versus CWOA	6.04449E-07	3.45400E-07	3.38757E-07
TLBO versus MABC	1.01533E-05	5.69029E-06	5.69029E-06
NDE versus GOTLBO	8.70224E-05	4.78145E-05	4.59019E-05
ISCA versus WW	1.04382E-04	5.62059E-05	5.50588E-05
TLBO versus DE	2.26316E-04	1.16888E-04	1.16888E-04

Table S148 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
DE versus PSO	4.03987E-04	2.04213E-04	2.04213E-04
IJAYA versus PSO	6.35902E-04	3.14457E-04	3.14457E-04
NDE versus ISCA	3.22321E-03	1.55847E-03	1.52305E-03
GOTLBO versus WW	3.76564E-03	1.77937E-03	1.77937E-03
DE versus CWOA	5.12081E-03	2.36345E-03	2.36345E-03
MABC versus PSO	5.96060E-03	2.68554E-03	2.62004E-03
ADELI versus NDE	6.26838E-03	2.75533E-03	2.75533E-03
IJAYA versus CWOA	7.65642E-03	3.28132E-03	3.28132E-03
EBLSHADE versus NDE	1.02934E-02	4.29835E-03	4.29835E-03
STLBO versus NDE	1.31235E-02	5.33592E-03	5.33592E-03
DE versus NNA	1.74861E-02	6.91757E-03	6.91757E-03
IJAYA versus NNA	2.54443E-02	9.78628E-03	9.78628E-03
MABC versus CWOA	5.48640E-02	2.04986E-02	2.04986E-02
MABC versus NNA	1.58264E-01	5.73924E-02	5.56532E-02
NDE versus MABC	2.98420E-01	1.04939E-01	1.04939E-01
NNA versus WW	3.10137E-01	1.05651E-01	1.05651E-01
ISCA versus PSO	4.69614E-01	1.54818E-01	1.54818E-01
CWOA versus WW	7.78139E-01	2.47978E-01	2.47978E-01
DE versus GOTLBO	9.58593E-01	2.94952E-01	2.94952E-01
IJAYA versus GOTLBO	1.0	3.72867E-01	3.72867E-01
TLBO versus NDE	1.0	4.48866E-01	4.48866E-01
NDE versus DE	1.0	4.59538E-01	4.59538E-01
ISCA versus CWOA	1.0	5.84482E-01	5.84482E-01
PSO versus WW	1.0	8.50607E-01	8.50607E-01
GOTLBO versus PSO	1.0	8.85464E-01	8.85464E-01
MABC versus GOTLBO	1.0	9.99507E-01	9.99507E-01
DE versus EBLSHADE	1.0	1.0	1.0
DE versus ADELI	1.0	1.0	1.0
DE versus NDE	1.0	1.0	1.0
DE versus MABC	1.0	1.0	1.0
DE versus TLBO	1.0	1.0	1.0
DE versus STLBO	1.0	1.0	1.0
DE versus IJAYA	1.0	1.0	1.0
DE versus ISCA	1.0	1.0	1.0
EBLSHADE versus ADELI	1.0	1.0	1.0
EBLSHADE versus TLBO	1.0	1.0	1.0
EBLSHADE versus STLBO	1.0	1.0	1.0
EBLSHADE versus IJAYA	1.0	1.0	1.0
ADELI versus EBLSHADE	1.0	1.0	1.0
ADELI versus TLBO	1.0	1.0	1.0
ADELI versus STLBO	1.0	1.0	1.0
ADELI versus IJAYA	1.0	1.0	1.0
NDE versus EBLSHADE	1.0	1.0	1.0

Table S148 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
NDE versus ADELI	1.0	1.0	1.0
NDE versus TLBO	1.0	1.0	1.0
NDE versus STLBO	1.0	1.0	1.0
NDE versus IJAYA	1.0	1.0	1.0
MABC versus DE	1.0	1.0	1.0
MABC versus EBL SHADE	1.0	1.0	1.0
MABC versus ADELI	1.0	1.0	1.0
MABC versus NDE	1.0	1.0	1.0
MABC versus TLBO	1.0	1.0	1.0
MABC versus STLBO	1.0	1.0	1.0
MABC versus IJAYA	1.0	1.0	1.0
MABC versus ISCA	1.0	1.0	1.0
TLBO versus EBL SHADE	1.0	1.0	1.0
TLBO versus ADELI	1.0	1.0	1.0
TLBO versus STLBO	1.0	1.0	1.0
TLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus DE	1.0	1.0	1.0
GOTLBO versus EBL SHADE	1.0	1.0	1.0
GOTLBO versus ADELI	1.0	1.0	1.0
GOTLBO versus NDE	1.0	1.0	1.0
GOTLBO versus MABC	1.0	1.0	1.0
GOTLBO versus TLBO	1.0	1.0	1.0
GOTLBO versus STLBO	1.0	1.0	1.0
GOTLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus ISCA	1.0	1.0	1.0
GOTLBO versus NNA	1.0	1.0	1.0
GOTLBO versus CWOA	1.0	1.0	1.0
STLBO versus EBL SHADE	1.0	1.0	1.0
STLBO versus ADELI	1.0	1.0	1.0
STLBO versus TLBO	1.0	1.0	1.0
STLBO versus IJAYA	1.0	1.0	1.0
PSO versus DE	1.0	1.0	1.0
PSO versus EBL SHADE	1.0	1.0	1.0
PSO versus ADELI	1.0	1.0	1.0
PSO versus NDE	1.0	1.0	1.0
PSO versus MABC	1.0	1.0	1.0
PSO versus TLBO	1.0	1.0	1.0
PSO versus GOTLBO	1.0	1.0	1.0
PSO versus STLBO	1.0	1.0	1.0
PSO versus IJAYA	1.0	1.0	1.0
PSO versus ISCA	1.0	1.0	1.0
PSO versus NNA	1.0	1.0	1.0
PSO versus CWOA	1.0	1.0	1.0

Table S148 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
IJAYA versus DE	1.0	1.0	1.0
IJAYA versus EBL SHADE	1.0	1.0	1.0
IJAYA versus ADELI	1.0	1.0	1.0
IJAYA versus NDE	1.0	1.0	1.0
IJAYA versus MABC	1.0	1.0	1.0
IJAYA versus TLBO	1.0	1.0	1.0
IJAYA versus STLBO	1.0	1.0	1.0
IJAYA versus ISCA	1.0	1.0	1.0
ISCA versus DE	1.0	1.0	1.0
ISCA versus EBL SHADE	1.0	1.0	1.0
ISCA versus ADELI	1.0	1.0	1.0
ISCA versus NDE	1.0	1.0	1.0
ISCA versus MABC	1.0	1.0	1.0
ISCA versus TLBO	1.0	1.0	1.0
ISCA versus GOTLBO	1.0	1.0	1.0
ISCA versus STLBO	1.0	1.0	1.0
ISCA versus IJAYA	1.0	1.0	1.0
ISCA versus NNA	1.0	1.0	1.0
NNA versus DE	1.0	1.0	1.0
NNA versus EBL SHADE	1.0	1.0	1.0
NNA versus ADELI	1.0	1.0	1.0
NNA versus NDE	1.0	1.0	1.0
NNA versus MABC	1.0	1.0	1.0
NNA versus TLBO	1.0	1.0	1.0
NNA versus GOTLBO	1.0	1.0	1.0
NNA versus STLBO	1.0	1.0	1.0
NNA versus PSO	1.0	1.0	1.0
NNA versus IJAYA	1.0	1.0	1.0
NNA versus ISCA	1.0	1.0	1.0
NNA versus CWOA	1.0	1.0	1.0
CWOA versus DE	1.0	1.0	1.0
CWOA versus EBL SHADE	1.0	1.0	1.0
CWOA versus ADELI	1.0	1.0	1.0
CWOA versus NDE	1.0	1.0	1.0
CWOA versus MABC	1.0	1.0	1.0
CWOA versus TLBO	1.0	1.0	1.0
CWOA versus GOTLBO	1.0	1.0	1.0
CWOA versus STLBO	1.0	1.0	1.0
CWOA versus PSO	1.0	1.0	1.0
CWOA versus IJAYA	1.0	1.0	1.0
CWOA versus ISCA	1.0	1.0	1.0
CWOA versus NNA	1.0	1.0	1.0
WW versus DE	1.0	1.0	1.0

Table S148 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
WW versus EBL SHADE	1.0	1.0	1.0
WW versus ADELI	1.0	1.0	1.0
WW versus NDE	1.0	1.0	1.0
WW versus MABC	1.0	1.0	1.0
WW versus TLBO	1.0	1.0	1.0
WW versus GOTLBO	1.0	1.0	1.0
WW versus STLBO	1.0	1.0	1.0
WW versus PSO	1.0	1.0	1.0
WW versus IJAYA	1.0	1.0	1.0
WW versus ISCA	1.0	1.0	1.0
WW versus NNA	1.0	1.0	1.0
WW versus CWOA	1.0	1.0	1.0

Table S149. Adjusted p -values for tests for multiple comparisons among all methods in the single-IV case. R_{p2} evaluation task.

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
STLBO versus ISCA	1.29319E-12	1.29319E-12	1.29319E-12
EBLSHADE versus ISCA	1.98019E-12	1.95843E-12	1.69731E-12
TLBO versus CWOA	2.97029E-12	2.90501E-12	2.54596E-12
EBLSHADE versus GOTLBO	4.95048E-12	4.78728E-12	4.24327E-12
TLBO versus PSO	7.65810E-12	7.32148E-12	6.56408E-12
ADELI versus ISCA	1.07900E-11	1.01972E-11	9.24860E-12
STLBO versus GOTLBO	2.10951E-11	1.97042E-11	1.80815E-11
TLBO versus WW	2.46918E-11	2.27924E-11	2.11644E-11
EBLSHADE versus NNA	5.54050E-11	5.05342E-11	4.74900E-11
TLBO versus MABC	1.17478E-10	1.05859E-10	1.00695E-10
ADELI versus GOTLBO	1.73509E-10	1.54442E-10	1.48722E-10
STLBO versus NNA	2.00969E-10	1.76676E-10	1.72260E-10
ADELI versus NDE	2.13032E-10	1.84940E-10	1.82599E-10
EBLSHADE versus MABC	8.75044E-10	7.50037E-10	7.50037E-10
ADELI versus NNA	1.30252E-09	1.10213E-09	9.59000E-10
STLBO versus NDE	1.98884E-09	1.66101E-09	1.46431E-09
STLBO versus MABC	2.63616E-09	2.17266E-09	1.94091E-09
TLBO versus NNA	2.74625E-09	2.23321E-09	2.02196E-09
EBLSHADE versus WW	2.80640E-09	2.25129E-09	2.06625E-09
EBLSHADE versus NDE	7.72300E-09	6.11050E-09	5.68616E-09
STLBO versus WW	7.83965E-09	6.11665E-09	5.77205E-09
EBLSHADE versus CWOA	1.17394E-08	9.03031E-09	8.64329E-09
ADELI versus MABC	1.31489E-08	9.97004E-09	9.68105E-09
TLBO versus GOTLBO	2.67315E-08	1.99752E-08	1.96815E-08
STLBO versus CWOA	2.99616E-08	2.20597E-08	2.20597E-08
ADELI versus WW	3.51330E-08	2.54811E-08	2.54811E-08
ADELI versus CWOA	1.18085E-07	8.30485E-08	7.52627E-08
EBLSHADE versus PSO	1.23921E-07	8.57914E-08	7.89826E-08
STLBO versus PSO	2.74198E-07	1.86816E-07	1.74764E-07
TLBO versus ISCA	3.58779E-07	2.40501E-07	2.28673E-07
ADELI versus DE	6.81272E-07	4.41704E-07	4.34218E-07
ADELI versus PSO	8.81287E-07	5.61700E-07	5.61700E-07
STLBO versus DE	4.36970E-06	2.68905E-06	2.68905E-06
EBLSHADE versus DE	1.31819E-05	7.96708E-06	7.96708E-06
TLBO versus NDE	2.13413E-04	1.26641E-04	1.19605E-04
DE versus PSO	2.69673E-04	1.57062E-04	1.51136E-04
IJAYA versus PSO	1.61958E-03	9.25474E-04	9.07676E-04
DE versus CWOA	3.22321E-03	1.80641E-03	1.80641E-03
DE versus WW	1.08087E-02	5.82009E-03	5.70131E-03
IJAYA versus CWOA	1.58994E-02	8.38648E-03	8.38648E-03
DE versus MABC	2.54443E-02	1.31416E-02	1.31416E-02

Table S149 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
TLBO versus DE	4.59507E-02	2.32278E-02	2.32278E-02
IJAYA versus WW	4.80428E-02	2.37574E-02	2.37574E-02
NDE versus PSO	5.48640E-02	2.65276E-02	2.59247E-02
IJAYA versus MABC	1.04642E-01	4.94461E-02	4.94461E-02
DE versus NNA	1.34341E-01	6.20034E-02	6.20034E-02
NDE versus CWOA	3.47844E-01	1.56721E-01	1.52898E-01
DE versus GOTLBO	4.20037E-01	1.84631E-01	1.84631E-01
IJAYA versus NNA	4.69614E-01	2.01263E-01	2.01263E-01
NDE versus WW	8.34597E-01	3.48513E-01	3.48513E-01
IJAYA versus GOTLBO	1.0	5.28247E-01	5.28247E-01
DE versus ISCA	1.0	5.67461E-01	5.67461E-01
NDE versus MABC	1.0	5.88959E-01	5.88959E-01
ADELI versus TLBO	1.0	7.16260E-01	7.16260E-01
ISCA versus PSO	1.0	7.88189E-01	7.64304E-01
DE versus EBL SHADE	1.0	1.0	1.0
DE versus ADELI	1.0	1.0	1.0
DE versus NDE	1.0	1.0	1.0
DE versus TLBO	1.0	1.0	1.0
DE versus STLBO	1.0	1.0	1.0
DE versus IJAYA	1.0	1.0	1.0
EBL SHADE versus ADELI	1.0	1.0	1.0
EBL SHADE versus TLBO	1.0	1.0	1.0
EBL SHADE versus STLBO	1.0	1.0	1.0
EBL SHADE versus IJAYA	1.0	1.0	1.0
ADELI versus EBL SHADE	1.0	1.0	1.0
ADELI versus STLBO	1.0	1.0	1.0
ADELI versus IJAYA	1.0	1.0	1.0
NDE versus DE	1.0	1.0	1.0
NDE versus EBL SHADE	1.0	1.0	1.0
NDE versus ADELI	1.0	1.0	1.0
NDE versus TLBO	1.0	1.0	1.0
NDE versus GOTLBO	1.0	1.0	1.0
NDE versus STLBO	1.0	1.0	1.0
NDE versus IJAYA	1.0	1.0	1.0
NDE versus ISCA	1.0	1.0	1.0
NDE versus NNA	1.0	1.0	1.0
MABC versus DE	1.0	1.0	1.0
MABC versus EBL SHADE	1.0	1.0	1.0
MABC versus ADELI	1.0	1.0	1.0
MABC versus NDE	1.0	1.0	1.0
MABC versus TLBO	1.0	1.0	1.0
MABC versus GOTLBO	1.0	1.0	1.0
MABC versus STLBO	1.0	1.0	1.0

Table S149 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
MABC versus PSO	1.0	1.0	1.0
MABC versus IJAYA	1.0	1.0	1.0
MABC versus ISCA	1.0	1.0	1.0
MABC versus NNA	1.0	1.0	1.0
MABC versus CWOA	1.0	1.0	1.0
MABC versus WW	1.0	1.0	1.0
TLBO versus EBL SHADE	1.0	1.0	1.0
TLBO versus ADELI	1.0	1.0	1.0
TLBO versus STLBO	1.0	1.0	1.0
TLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus DE	1.0	1.0	1.0
GOTLBO versus EBL SHADE	1.0	1.0	1.0
GOTLBO versus ADELI	1.0	1.0	1.0
GOTLBO versus NDE	1.0	1.0	1.0
GOTLBO versus MABC	1.0	1.0	1.0
GOTLBO versus TLBO	1.0	1.0	1.0
GOTLBO versus STLBO	1.0	1.0	1.0
GOTLBO versus PSO	1.0	1.0	1.0
GOTLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus ISCA	1.0	1.0	1.0
GOTLBO versus NNA	1.0	1.0	1.0
GOTLBO versus CWOA	1.0	1.0	1.0
GOTLBO versus WW	1.0	1.0	1.0
STLBO versus EBL SHADE	1.0	1.0	1.0
STLBO versus ADELI	1.0	1.0	1.0
STLBO versus TLBO	1.0	1.0	1.0
STLBO versus IJAYA	1.0	1.0	1.0
PSO versus DE	1.0	1.0	1.0
PSO versus EBL SHADE	1.0	1.0	1.0
PSO versus ADELI	1.0	1.0	1.0
PSO versus NDE	1.0	1.0	1.0
PSO versus MABC	1.0	1.0	1.0
PSO versus TLBO	1.0	1.0	1.0
PSO versus GOTLBO	1.0	1.0	1.0
PSO versus STLBO	1.0	1.0	1.0
PSO versus IJAYA	1.0	1.0	1.0
PSO versus ISCA	1.0	1.0	1.0
PSO versus NNA	1.0	1.0	1.0
PSO versus CWOA	1.0	1.0	1.0
PSO versus WW	1.0	1.0	1.0
IJAYA versus DE	1.0	1.0	1.0
IJAYA versus EBL SHADE	1.0	1.0	1.0
IJAYA versus ADELI	1.0	1.0	1.0

Table S149 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
IJAYA versus NDE	1.0	1.0	1.0
IJAYA versus TLBO	1.0	1.0	1.0
IJAYA versus STLBO	1.0	1.0	1.0
IJAYA versus ISCA	1.0	1.0	1.0
ISCA versus DE	1.0	1.0	1.0
ISCA versus EBL SHADE	1.0	1.0	1.0
ISCA versus ADELI	1.0	1.0	1.0
ISCA versus NDE	1.0	1.0	1.0
ISCA versus MABC	1.0	1.0	1.0
ISCA versus TLBO	1.0	1.0	1.0
ISCA versus GOTLBO	1.0	1.0	1.0
ISCA versus STLBO	1.0	1.0	1.0
ISCA versus IJAYA	1.0	1.0	1.0
ISCA versus NNA	1.0	1.0	1.0
ISCA versus CWOA	1.0	1.0	1.0
ISCA versus WW	1.0	1.0	1.0
NNA versus DE	1.0	1.0	1.0
NNA versus EBL SHADE	1.0	1.0	1.0
NNA versus ADELI	1.0	1.0	1.0
NNA versus NDE	1.0	1.0	1.0
NNA versus MABC	1.0	1.0	1.0
NNA versus TLBO	1.0	1.0	1.0
NNA versus GOTLBO	1.0	1.0	1.0
NNA versus STLBO	1.0	1.0	1.0
NNA versus PSO	1.0	1.0	1.0
NNA versus IJAYA	1.0	1.0	1.0
NNA versus ISCA	1.0	1.0	1.0
NNA versus CWOA	1.0	1.0	1.0
NNA versus WW	1.0	1.0	1.0
CWOA versus DE	1.0	1.0	1.0
CWOA versus EBL SHADE	1.0	1.0	1.0
CWOA versus ADELI	1.0	1.0	1.0
CWOA versus NDE	1.0	1.0	1.0
CWOA versus MABC	1.0	1.0	1.0
CWOA versus TLBO	1.0	1.0	1.0
CWOA versus GOTLBO	1.0	1.0	1.0
CWOA versus STLBO	1.0	1.0	1.0
CWOA versus PSO	1.0	1.0	1.0
CWOA versus IJAYA	1.0	1.0	1.0
CWOA versus ISCA	1.0	1.0	1.0
CWOA versus NNA	1.0	1.0	1.0
CWOA versus WW	1.0	1.0	1.0
WW versus DE	1.0	1.0	1.0

Table S149 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
WW versus EBL SHADE	1.0	1.0	1.0
WW versus ADELI	1.0	1.0	1.0
WW versus NDE	1.0	1.0	1.0
WW versus MABC	1.0	1.0	1.0
WW versus TLBO	1.0	1.0	1.0
WW versus GOTLBO	1.0	1.0	1.0
WW versus STLBO	1.0	1.0	1.0
WW versus PSO	1.0	1.0	1.0
WW versus IJAYA	1.0	1.0	1.0
WW versus ISCA	1.0	1.0	1.0
WW versus NNA	1.0	1.0	1.0
WW versus CWOA	1.0	1.0	1.0

Table S150. Adjusted p -values for tests for multiple comparisons among all methods in the single-IV case. R_s evaluation task.

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
TLBO versus PSO	<1E-13	<1E-13	<1E-13
TLBO versus NNA	1.61648E-12	1.59872E-12	1.38556E-12
ADELI versus MABC	2.97029E-12	2.90501E-12	2.54596E-12
TLBO versus ISCA	3.55627E-12	3.39995E-12	3.04823E-12
NDE versus PSO	3.83915E-12	3.62821E-12	3.29070E-12
STLBO versus MABC	5.47584E-12	5.11480E-12	4.69358E-12
TLBO versus WW	7.15294E-12	6.60272E-12	6.13110E-12
EBLSHADE versus GOTLBO	9.09273E-12	8.29337E-12	7.79377E-12
EBLSHADE versus MABC	1.59022E-11	1.41547E-11	1.36304E-11
STLBO versus GOTLBO	2.48535E-11	2.15761E-11	2.13030E-11
ADELI versus GOTLBO	4.37259E-11	3.74794E-11	3.74794E-11
EBLSHADE versus CWOA	8.82399E-11	7.46645E-11	6.49678E-11
STLBO versus CWOA	2.16164E-10	1.80533E-10	1.59154E-10
TLBO versus CWOA	2.31804E-10	1.91047E-10	1.70669E-10
ADELI versus CWOA	3.57284E-10	2.90538E-10	2.63055E-10
EBLSHADE versus WW	1.48409E-09	1.19054E-09	1.09269E-09
TLBO versus GOTLBO	2.33768E-09	1.84959E-09	1.72115E-09
EBLSHADE versus ISCA	2.47565E-09	1.93155E-09	1.82273E-09
STLBO versus WW	3.17823E-09	2.44479E-09	2.34002E-09
ADELI versus WW	4.87552E-09	3.69682E-09	3.58967E-09
STLBO versus ISCA	5.17792E-09	3.86922E-09	3.81232E-09
ADELI versus DE	5.20274E-09	3.86922E-09	3.83059E-09
ADELI versus ISCA	7.83965E-09	5.59975E-09	4.99670E-09
STLBO versus DE	9.03653E-09	6.35536E-09	5.75955E-09
EBLSHADE versus NNA	1.31489E-08	9.10308E-09	8.38061E-09
EBLSHADE versus DE	2.29314E-08	1.56236E-08	1.46156E-08
STLBO versus NNA	2.55057E-08	1.70972E-08	1.62564E-08
ADELI versus NNA	3.70334E-08	2.44176E-08	2.36037E-08
EBLSHADE versus PSO	8.87455E-08	5.75383E-08	5.65631E-08
STLBO versus PSO	1.21526E-07	7.74564E-08	7.74564E-08
ADELI versus PSO	1.45251E-07	9.09811E-08	8.93850E-08
TLBO versus MABC	3.58779E-07	2.20787E-07	2.20787E-07
DE versus PSO	7.84454E-07	4.74120E-07	4.74120E-07
NDE versus NNA	8.70224E-05	5.16397E-05	4.87708E-05
TLBO versus DE	1.17758E-04	6.85844E-05	6.59964E-05
ADELI versus NDE	1.89694E-04	1.08397E-04	1.06312E-04
MABC versus PSO	2.26316E-04	1.26836E-04	1.26836E-04
STLBO versus NDE	2.85820E-04	1.57044E-04	1.50762E-04
NDE versus ISCA	4.52878E-04	2.43857E-04	2.38881E-04
EBLSHADE versus NDE	5.68189E-04	2.99704E-04	2.99704E-04
NDE versus WW	7.11295E-04	3.67372E-04	3.67372E-04

Table S150 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
IJAYA versus PSO	4.39395E-03	2.22112E-03	2.22112E-03
NDE versus CWOA	5.96060E-03	2.94755E-03	2.94755E-03
GOTLBO versus PSO	8.04629E-03	3.89051E-03	3.80209E-03
NDE versus GOTLBO	2.31856E-02	1.09558E-02	1.09558E-02
CWOA versus PSO	3.05936E-02	1.41201E-02	1.41201E-02
WW versus PSO	1.71641E-01	7.54467E-02	7.54467E-02
DE versus NNA	1.86050E-01	7.97358E-02	7.97358E-02
TLBO versus NDE	2.27059E-01	9.48159E-02	9.48159E-02
ISCA versus PSO	2.36193E-01	9.60346E-02	9.60346E-02
NDE versus MABC	3.75247E-01	1.48450E-01	1.48450E-01
DE versus ISCA	5.43931E-01	2.09204E-01	2.09204E-01
NNA versus PSO	6.75361E-01	2.52333E-01	2.52333E-01
DE versus WW	7.25121E-01	2.62956E-01	2.54988E-01
DE versus CWOA	1.0	9.47406E-01	9.47406E-01
DE versus EBL SHADE	1.0	1.0	1.0
DE versus ADELI	1.0	1.0	1.0
DE versus NDE	1.0	1.0	1.0
DE versus MABC	1.0	1.0	1.0
DE versus TLBO	1.0	1.0	1.0
DE versus GOTLBO	1.0	1.0	1.0
DE versus STLBO	1.0	1.0	1.0
DE versus IJAYA	1.0	1.0	1.0
EBL SHADE versus ADELI	1.0	1.0	1.0
EBL SHADE versus TLBO	1.0	1.0	1.0
EBL SHADE versus STLBO	1.0	1.0	1.0
EBL SHADE versus IJAYA	1.0	1.0	1.0
ADELI versus EBL SHADE	1.0	1.0	1.0
ADELI versus TLBO	1.0	1.0	1.0
ADELI versus STLBO	1.0	1.0	1.0
ADELI versus IJAYA	1.0	1.0	1.0
NDE versus DE	1.0	1.0	1.0
NDE versus EBL SHADE	1.0	1.0	1.0
NDE versus ADELI	1.0	1.0	1.0
NDE versus TLBO	1.0	1.0	1.0
NDE versus STLBO	1.0	1.0	1.0
NDE versus IJAYA	1.0	1.0	1.0
MABC versus DE	1.0	1.0	1.0
MABC versus EBL SHADE	1.0	1.0	1.0
MABC versus ADELI	1.0	1.0	1.0
MABC versus NDE	1.0	1.0	1.0
MABC versus TLBO	1.0	1.0	1.0
MABC versus GOTLBO	1.0	1.0	1.0
MABC versus STLBO	1.0	1.0	1.0

Table S150 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
MABC versus IJAYA	1.0	1.0	1.0
MABC versus ISCA	1.0	1.0	1.0
MABC versus NNA	1.0	1.0	1.0
MABC versus CWOA	1.0	1.0	1.0
MABC versus WW	1.0	1.0	1.0
TLBO versus EBL SHADE	1.0	1.0	1.0
TLBO versus ADELI	1.0	1.0	1.0
TLBO versus STLBO	1.0	1.0	1.0
TLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus DE	1.0	1.0	1.0
GOTLBO versus EBL SHADE	1.0	1.0	1.0
GOTLBO versus ADELI	1.0	1.0	1.0
GOTLBO versus NDE	1.0	1.0	1.0
GOTLBO versus MABC	1.0	1.0	1.0
GOTLBO versus TLBO	1.0	1.0	1.0
GOTLBO versus STLBO	1.0	1.0	1.0
GOTLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus ISCA	1.0	1.0	1.0
GOTLBO versus NNA	1.0	1.0	1.0
GOTLBO versus CWOA	1.0	1.0	1.0
GOTLBO versus WW	1.0	1.0	1.0
STLBO versus EBL SHADE	1.0	1.0	1.0
STLBO versus ADELI	1.0	1.0	1.0
STLBO versus TLBO	1.0	1.0	1.0
STLBO versus IJAYA	1.0	1.0	1.0
PSO versus DE	1.0	1.0	1.0
PSO versus EBL SHADE	1.0	1.0	1.0
PSO versus ADELI	1.0	1.0	1.0
PSO versus NDE	1.0	1.0	1.0
PSO versus MABC	1.0	1.0	1.0
PSO versus TLBO	1.0	1.0	1.0
PSO versus GOTLBO	1.0	1.0	1.0
PSO versus STLBO	1.0	1.0	1.0
PSO versus IJAYA	1.0	1.0	1.0
PSO versus ISCA	1.0	1.0	1.0
PSO versus NNA	1.0	1.0	1.0
PSO versus CWOA	1.0	1.0	1.0
PSO versus WW	1.0	1.0	1.0
IJAYA versus DE	1.0	1.0	1.0
IJAYA versus EBL SHADE	1.0	1.0	1.0
IJAYA versus ADELI	1.0	1.0	1.0
IJAYA versus NDE	1.0	1.0	1.0
IJAYA versus MABC	1.0	1.0	1.0

Table S150 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
IJAYA versus TLBO	1.0	1.0	1.0
IJAYA versus GOTLBO	1.0	1.0	1.0
IJAYA versus STLBO	1.0	1.0	1.0
IJAYA versus ISCA	1.0	1.0	1.0
IJAYA versus NNA	1.0	1.0	1.0
IJAYA versus CWOA	1.0	1.0	1.0
IJAYA versus WW	1.0	1.0	1.0
ISCA versus DE	1.0	1.0	1.0
ISCA versus EBL SHADE	1.0	1.0	1.0
ISCA versus ADELI	1.0	1.0	1.0
ISCA versus NDE	1.0	1.0	1.0
ISCA versus MABC	1.0	1.0	1.0
ISCA versus TLBO	1.0	1.0	1.0
ISCA versus GOTLBO	1.0	1.0	1.0
ISCA versus STLBO	1.0	1.0	1.0
ISCA versus IJAYA	1.0	1.0	1.0
ISCA versus NNA	1.0	1.0	1.0
ISCA versus CWOA	1.0	1.0	1.0
ISCA versus WW	1.0	1.0	1.0
NNA versus DE	1.0	1.0	1.0
NNA versus EBL SHADE	1.0	1.0	1.0
NNA versus ADELI	1.0	1.0	1.0
NNA versus NDE	1.0	1.0	1.0
NNA versus MABC	1.0	1.0	1.0
NNA versus TLBO	1.0	1.0	1.0
NNA versus GOTLBO	1.0	1.0	1.0
NNA versus STLBO	1.0	1.0	1.0
NNA versus IJAYA	1.0	1.0	1.0
NNA versus ISCA	1.0	1.0	1.0
NNA versus CWOA	1.0	1.0	1.0
NNA versus WW	1.0	1.0	1.0
CWOA versus DE	1.0	1.0	1.0
CWOA versus EBL SHADE	1.0	1.0	1.0
CWOA versus ADELI	1.0	1.0	1.0
CWOA versus NDE	1.0	1.0	1.0
CWOA versus MABC	1.0	1.0	1.0
CWOA versus TLBO	1.0	1.0	1.0
CWOA versus GOTLBO	1.0	1.0	1.0
CWOA versus STLBO	1.0	1.0	1.0
CWOA versus IJAYA	1.0	1.0	1.0
CWOA versus ISCA	1.0	1.0	1.0
CWOA versus NNA	1.0	1.0	1.0
CWOA versus WW	1.0	1.0	1.0

Table S150 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
WW versus DE	1.0	1.0	1.0
WW versus EBL SHADE	1.0	1.0	1.0
WW versus ADELI	1.0	1.0	1.0
WW versus NDE	1.0	1.0	1.0
WW versus MABC	1.0	1.0	1.0
WW versus TLBO	1.0	1.0	1.0
WW versus GOTLBO	1.0	1.0	1.0
WW versus STLBO	1.0	1.0	1.0
WW versus IJAYA	1.0	1.0	1.0
WW versus ISCA	1.0	1.0	1.0
WW versus NNA	1.0	1.0	1.0
WW versus CWOA	1.0	1.0	1.0

Table S151. Adjusted p -values for tests for multiple comparisons among all methods in the single-IV case. I_{ph} evaluation task.

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
EBLSHADE versus GOTLBO	<1E-13	<1E-13	<1E-13
EBLSHADE versus PSO	<1E-13	<1E-13	<1E-13
ADELI versus GOTLBO	<1E-13	<1E-13	<1E-13
STLBO versus GOTLBO	<1E-13	<1E-13	<1E-13
STLBO versus PSO	<1E-13	<1E-13	<1E-13
EBLSHADE versus MABC	1.51545E-12	1.43219E-12	1.29896E-12
STLBO versus MABC	1.61648E-12	1.50990E-12	1.38556E-12
ADELI versus MABC	7.03171E-12	6.49081E-12	6.02718E-12
TLBO versus WW	7.79954E-12	7.11387E-12	6.68532E-12
TLBO versus ISCA	9.09273E-12	8.19345E-12	7.79377E-12
TLBO versus NNA	1.51343E-11	1.34712E-11	1.29723E-11
TLBO versus CWOA	3.43907E-11	3.02336E-11	2.94778E-11
EBLSHADE versus WW	2.18167E-09	1.89398E-09	1.87000E-09
NDE versus PSO	2.53392E-09	2.14409E-09	1.99224E-09
STLBO versus WW	2.32428E-09	1.99224E-09	1.99224E-09
TLBO versus GOTLBO	2.80640E-09	2.34381E-09	2.06625E-09
ADELI versus WW	6.97145E-09	5.74570E-09	5.13283E-09
ADELI versus PSO	1.48718E-08	1.20936E-08	1.09496E-08
TLBO versus MABC	2.29314E-08	1.83955E-08	1.68836E-08
TLBO versus PSO	2.55057E-08	2.01803E-08	1.87789E-08
NDE versus GOTLBO	4.90997E-08	3.83086E-08	3.61503E-08
EBLSHADE versus ISCA	5.89835E-08	4.53719E-08	4.34274E-08
STLBO versus ISCA	6.20553E-08	4.70529E-08	4.56890E-08
EBLSHADE versus NNA	7.97656E-08	5.96050E-08	5.87285E-08
STLBO versus NNA	8.38271E-08	6.17189E-08	6.17189E-08
ADELI versus DE	1.11709E-07	8.10200E-08	8.10200E-08
EBLSHADE versus CWOA	1.30023E-07	9.28738E-08	8.28720E-08
STLBO versus CWOA	1.36403E-07	9.59315E-08	8.69379E-08
ADELI versus ISCA	1.50038E-07	1.03872E-07	9.56286E-08
ADELI versus NNA	1.98870E-07	1.35494E-07	1.26753E-07
ADELI versus CWOA	3.13904E-07	2.10419E-07	2.00071E-07
STLBO versus DE	4.14117E-07	2.73044E-07	2.63942E-07
EBLSHADE versus DE	4.44818E-07	2.88399E-07	2.83511E-07
IJAYA versus PSO	6.81272E-07	4.34218E-07	4.34218E-07
NDE versus CWOA	4.08618E-06	2.51457E-06	2.51457E-06
NDE versus NNA	7.80316E-06	4.63045E-06	4.41426E-06
IJAYA versus GOTLBO	8.90345E-06	5.08769E-06	4.98985E-06
DE versus PSO	1.15721E-05	6.48546E-06	6.48546E-06
NDE versus ISCA	1.15721E-05	6.48546E-06	6.48546E-06
DE versus GOTLBO	1.25050E-04	6.73346E-05	6.59604E-05
ADELI versus NDE	2.39966E-04	1.26575E-04	1.26575E-04

Table S151 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
NDE versus WW	4.03987E-04	2.08653E-04	2.08653E-04
IJAYA versus CWOA	4.03987E-04	2.08653E-04	2.08653E-04
STLBO versus NDE	6.72589E-04	3.32599E-04	3.32599E-04
EBLSHADE versus NDE	7.11295E-04	3.43923E-04	3.36107E-04
IJAYA versus NNA	7.11295E-04	3.43923E-04	3.36107E-04
IJAYA versus ISCA	9.92197E-04	4.57937E-04	4.57937E-04
TLBO versus DE	1.70903E-03	7.70003E-04	7.51222E-04
DE versus CWOA	3.96494E-03	1.74283E-03	1.74283E-03
DE versus NNA	6.59115E-03	2.82478E-03	2.82478E-03
DE versus ISCA	8.88298E-03	3.70937E-03	3.70937E-03
IJAYA versus WW	1.92207E-02	7.60380E-03	7.60380E-03
NDE versus MABC	5.24960E-02	2.01908E-02	2.01908E-02
MABC versus PSO	1.13790E-01	4.25150E-02	4.25150E-02
DE versus WW	1.23672E-01	4.48482E-02	4.34891E-02
TLBO versus NDE	3.47844E-01	1.22319E-01	1.22319E-01
MABC versus GOTLBO	5.05541E-01	1.72217E-01	1.72217E-01
IJAYA versus MABC	9.58593E-01	3.16020E-01	3.16020E-01
DE versus EBLSHADE	1.0	1.0	1.0
DE versus ADELI	1.0	1.0	1.0
DE versus NDE	1.0	1.0	1.0
DE versus MABC	1.0	1.0	1.0
DE versus TLBO	1.0	1.0	1.0
DE versus STLBO	1.0	1.0	1.0
DE versus IJAYA	1.0	1.0	1.0
EBLSHADE versus ADELI	1.0	1.0	1.0
EBLSHADE versus TLBO	1.0	1.0	1.0
EBLSHADE versus STLBO	1.0	1.0	1.0
EBLSHADE versus IJAYA	1.0	1.0	1.0
ADELI versus EBLSHADE	1.0	1.0	1.0
ADELI versus TLBO	1.0	1.0	1.0
ADELI versus STLBO	1.0	1.0	1.0
ADELI versus IJAYA	1.0	1.0	1.0
NDE versus DE	1.0	1.0	1.0
NDE versus EBLSHADE	1.0	1.0	1.0
NDE versus ADELI	1.0	1.0	1.0
NDE versus TLBO	1.0	1.0	1.0
NDE versus STLBO	1.0	1.0	1.0
NDE versus IJAYA	1.0	1.0	1.0
MABC versus DE	1.0	1.0	1.0
MABC versus EBLSHADE	1.0	1.0	1.0
MABC versus ADELI	1.0	1.0	1.0
MABC versus NDE	1.0	1.0	1.0
MABC versus TLBO	1.0	1.0	1.0

Table S151 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
MABC versus STLBO	1.0	1.0	1.0
MABC versus IJAYA	1.0	1.0	1.0
MABC versus ISCA	1.0	1.0	1.0
MABC versus NNA	1.0	1.0	1.0
MABC versus CWOA	1.0	1.0	1.0
MABC versus WW	1.0	1.0	1.0
TLBO versus EBL SHADE	1.0	1.0	1.0
TLBO versus ADELI	1.0	1.0	1.0
TLBO versus STLBO	1.0	1.0	1.0
TLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus DE	1.0	1.0	1.0
GOTLBO versus EBL SHADE	1.0	1.0	1.0
GOTLBO versus ADELI	1.0	1.0	1.0
GOTLBO versus NDE	1.0	1.0	1.0
GOTLBO versus MABC	1.0	1.0	1.0
GOTLBO versus TLBO	1.0	1.0	1.0
GOTLBO versus STLBO	1.0	1.0	1.0
GOTLBO versus PSO	1.0	1.0	1.0
GOTLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus ISCA	1.0	1.0	1.0
GOTLBO versus NNA	1.0	1.0	1.0
GOTLBO versus CWOA	1.0	1.0	1.0
GOTLBO versus WW	1.0	1.0	1.0
STLBO versus EBL SHADE	1.0	1.0	1.0
STLBO versus ADELI	1.0	1.0	1.0
STLBO versus TLBO	1.0	1.0	1.0
STLBO versus IJAYA	1.0	1.0	1.0
PSO versus DE	1.0	1.0	1.0
PSO versus EBL SHADE	1.0	1.0	1.0
PSO versus ADELI	1.0	1.0	1.0
PSO versus NDE	1.0	1.0	1.0
PSO versus MABC	1.0	1.0	1.0
PSO versus TLBO	1.0	1.0	1.0
PSO versus GOTLBO	1.0	1.0	1.0
PSO versus STLBO	1.0	1.0	1.0
PSO versus IJAYA	1.0	1.0	1.0
PSO versus ISCA	1.0	1.0	1.0
PSO versus NNA	1.0	1.0	1.0
PSO versus CWOA	1.0	1.0	1.0
PSO versus WW	1.0	1.0	1.0
IJAYA versus DE	1.0	1.0	1.0
IJAYA versus EBL SHADE	1.0	1.0	1.0
IJAYA versus ADELI	1.0	1.0	1.0

Table S151 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
IJAYA versus NDE	1.0	1.0	1.0
IJAYA versus TLBO	1.0	1.0	1.0
IJAYA versus STLBO	1.0	1.0	1.0
ISCA versus DE	1.0	1.0	1.0
ISCA versus EBL SHADE	1.0	1.0	1.0
ISCA versus ADELI	1.0	1.0	1.0
ISCA versus NDE	1.0	1.0	1.0
ISCA versus MABC	1.0	1.0	1.0
ISCA versus TLBO	1.0	1.0	1.0
ISCA versus GOTLBO	1.0	1.0	1.0
ISCA versus STLBO	1.0	1.0	1.0
ISCA versus PSO	1.0	1.0	1.0
ISCA versus IJAYA	1.0	1.0	1.0
ISCA versus NNA	1.0	1.0	1.0
ISCA versus CWOA	1.0	1.0	1.0
ISCA versus WW	1.0	1.0	1.0
NNA versus DE	1.0	1.0	1.0
NNA versus EBL SHADE	1.0	1.0	1.0
NNA versus ADELI	1.0	1.0	1.0
NNA versus NDE	1.0	1.0	1.0
NNA versus MABC	1.0	1.0	1.0
NNA versus TLBO	1.0	1.0	1.0
NNA versus GOTLBO	1.0	1.0	1.0
NNA versus STLBO	1.0	1.0	1.0
NNA versus PSO	1.0	1.0	1.0
NNA versus IJAYA	1.0	1.0	1.0
NNA versus ISCA	1.0	1.0	1.0
NNA versus CWOA	1.0	1.0	1.0
NNA versus WW	1.0	1.0	1.0
CWOA versus DE	1.0	1.0	1.0
CWOA versus EBL SHADE	1.0	1.0	1.0
CWOA versus ADELI	1.0	1.0	1.0
CWOA versus NDE	1.0	1.0	1.0
CWOA versus MABC	1.0	1.0	1.0
CWOA versus TLBO	1.0	1.0	1.0
CWOA versus GOTLBO	1.0	1.0	1.0
CWOA versus STLBO	1.0	1.0	1.0
CWOA versus PSO	1.0	1.0	1.0
CWOA versus IJAYA	1.0	1.0	1.0
CWOA versus ISCA	1.0	1.0	1.0
CWOA versus NNA	1.0	1.0	1.0
CWOA versus WW	1.0	1.0	1.0
WW versus DE	1.0	1.0	1.0

Table S151 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
WW versus EBL SHADE	1.0	1.0	1.0
WW versus ADELI	1.0	1.0	1.0
WW versus NDE	1.0	1.0	1.0
WW versus MABC	1.0	1.0	1.0
WW versus TLBO	1.0	1.0	1.0
WW versus GOTLBO	1.0	1.0	1.0
WW versus STLBO	1.0	1.0	1.0
WW versus PSO	1.0	1.0	1.0
WW versus IJAYA	1.0	1.0	1.0
WW versus ISCA	1.0	1.0	1.0
WW versus NNA	1.0	1.0	1.0
WW versus CWOA	1.0	1.0	1.0

Table S152. Adjusted p -values for tests for multiple comparisons among all methods in the single-IV case. RMSPE value.

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
EBLSHADE versus ISCA	<1E-13	<1E-13	<1E-13
EBLSHADE versus NNA	<1E-13	<1E-13	<1E-13
EBLSHADE versus CWOA	<1E-13	<1E-13	<1E-13
EBLSHADE versus WW	<1E-13	<1E-13	<1E-13
ADELI versus ISCA	<1E-13	<1E-13	<1E-13
ADELI versus NNA	<1E-13	<1E-13	<1E-13
ADELI versus CWOA	<1E-13	<1E-13	<1E-13
STLBO versus ISCA	<1E-13	<1E-13	<1E-13
STLBO versus NNA	<1E-13	<1E-13	<1E-13
STLBO versus CWOA	<1E-13	<1E-13	<1E-13
TLBO versus PSO	1.37401E-12	1.22302E-12	1.17772E-12
NDE versus CWOA	1.43463E-12	1.26121E-12	1.22968E-12
NDE versus NNA	3.51585E-12	3.05223E-12	3.01359E-12
ADELI versus MABC	6.54676E-12	5.53957E-12	5.12657E-12
NDE versus ISCA	5.98099E-12	5.12657E-12	5.12657E-12
STLBO versus MABC	6.54676E-12	5.53957E-12	5.12657E-12
NDE versus WW	8.34510E-12	6.87783E-12	6.14420E-12
EBLSHADE versus MABC	4.96665E-11	4.03881E-11	3.65676E-11
EBLSHADE versus PSO	2.00969E-10	1.61217E-10	1.47967E-10
TLBO versus GOTLBO	8.75044E-10	6.92342E-10	6.44263E-10
ADELI versus PSO	1.00018E-09	7.80360E-10	7.36396E-10
STLBO versus PSO	1.00018E-09	7.80360E-10	7.36396E-10
NDE versus GOTLBO	1.22083E-09	9.25684E-10	8.98853E-10
ADELI versus DE	1.55916E-09	1.16509E-09	1.14795E-09
STLBO versus DE	1.55916E-09	1.16509E-09	1.14795E-09
EBLSHADE versus DE	9.77290E-09	7.08804E-09	7.08804E-09
ADELI versus WW	1.85769E-08	1.32692E-08	1.18402E-08
STLBO versus WW	1.85769E-08	1.32692E-08	1.18402E-08
TLBO versus MABC	2.29314E-08	1.58756E-08	1.46156E-08
TLBO versus ISCA	3.51330E-08	2.39368E-08	2.23925E-08
TLBO versus NNA	4.80531E-08	3.22114E-08	3.06272E-08
IJAYA versus WW	4.90997E-08	3.23734E-08	3.12943E-08
EBLSHADE versus GOTLBO	6.86488E-08	4.45086E-08	4.37542E-08
TLBO versus CWOA	8.80796E-08	5.61386E-08	5.61386E-08
ADELI versus GOTLBO	2.08311E-07	1.30480E-07	1.28191E-07
STLBO versus GOTLBO	2.08311E-07	1.30480E-07	1.28191E-07
TLBO versus WW	4.67004E-07	2.82255E-07	2.82255E-07
IJAYA versus CWOA	6.81272E-07	4.04272E-07	3.81812E-07
IJAYA versus NNA	1.57507E-06	9.17350E-07	8.82733E-07
NDE versus PSO	1.68754E-06	9.64306E-07	9.45762E-07
TLBO versus DE	2.37760E-06	1.33250E-06	1.33250E-06

Table S152 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
IJAYA versus ISCA	2.37760E-06	1.33250E-06	1.33250E-06
IJAYA versus GOTLBO	1.25050E-04	6.32121E-05	6.32121E-05
DE versus WW	2.26316E-04	1.11914E-04	1.11914E-04
DE versus CWOA	1.70903E-03	8.26344E-04	8.07564E-04
NDE versus MABC	2.23150E-03	1.05444E-03	1.05444E-03
DE versus NNA	3.22321E-03	1.48763E-03	1.48763E-03
DE versus ISCA	4.39395E-03	1.97969E-03	1.93141E-03
MABC versus WW	7.28445E-03	3.12191E-03	3.12191E-03
IJAYA versus PSO	2.11160E-02	8.81767E-03	8.81767E-03
MABC versus CWOA	4.01728E-02	1.63340E-02	1.63340E-02
NDE versus DE	5.02234E-02	1.98686E-02	1.98686E-02
MABC versus NNA	6.82680E-02	2.62569E-02	2.62569E-02
DE versus GOTLBO	8.11168E-02	3.03074E-02	3.03074E-02
MABC versus ISCA	8.83504E-02	3.20392E-02	3.10683E-02
ADELI versus NDE	9.21871E-02	3.24174E-02	3.24174E-02
STLBO versus NDE	9.21871E-02	3.24174E-02	3.24174E-02
EBLSHADE versus NDE	2.36193E-01	7.78659E-02	7.78659E-02
MABC versus GOTLBO	9.58593E-01	3.05486E-01	3.05486E-01
PSO versus WW	1.0	3.15856E-01	3.15856E-01
IJAYA versus MABC	1.0	6.25076E-01	6.25076E-01
DE versus PSO	1.0	7.69767E-01	7.69767E-01
TLBO versus NDE	1.0	8.59568E-01	8.59568E-01
PSO versus CWOA	1.0	8.59568E-01	8.59568E-01
DE versus EBL SHADE	1.0	1.0	1.0
DE versus ADELI	1.0	1.0	1.0
DE versus NDE	1.0	1.0	1.0
DE versus MABC	1.0	1.0	1.0
DE versus TLBO	1.0	1.0	1.0
DE versus STLBO	1.0	1.0	1.0
DE versus IJAYA	1.0	1.0	1.0
EBLSHADE versus ADELI	1.0	1.0	1.0
EBLSHADE versus TLBO	1.0	1.0	1.0
EBLSHADE versus STLBO	1.0	1.0	1.0
EBLSHADE versus IJAYA	1.0	1.0	1.0
ADELI versus EBL SHADE	1.0	1.0	1.0
ADELI versus TLBO	1.0	1.0	1.0
ADELI versus STLBO	1.0	1.0	1.0
ADELI versus IJAYA	1.0	1.0	1.0
NDE versus EBL SHADE	1.0	1.0	1.0
NDE versus ADELI	1.0	1.0	1.0
NDE versus TLBO	1.0	1.0	1.0
NDE versus STLBO	1.0	1.0	1.0
NDE versus IJAYA	1.0	1.0	1.0

Table S152 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
MABC versus DE	1.0	1.0	1.0
MABC versus EBL SHADE	1.0	1.0	1.0
MABC versus ADELI	1.0	1.0	1.0
MABC versus NDE	1.0	1.0	1.0
MABC versus TLBO	1.0	1.0	1.0
MABC versus STLBO	1.0	1.0	1.0
MABC versus PSO	1.0	1.0	1.0
MABC versus IJAYA	1.0	1.0	1.0
TLBO versus EBL SHADE	1.0	1.0	1.0
TLBO versus ADELI	1.0	1.0	1.0
TLBO versus STLBO	1.0	1.0	1.0
TLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus DE	1.0	1.0	1.0
GOTLBO versus EBL SHADE	1.0	1.0	1.0
GOTLBO versus ADELI	1.0	1.0	1.0
GOTLBO versus NDE	1.0	1.0	1.0
GOTLBO versus MABC	1.0	1.0	1.0
GOTLBO versus TLBO	1.0	1.0	1.0
GOTLBO versus STLBO	1.0	1.0	1.0
GOTLBO versus PSO	1.0	1.0	1.0
GOTLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus ISCA	1.0	1.0	1.0
GOTLBO versus NNA	1.0	1.0	1.0
GOTLBO versus CWOA	1.0	1.0	1.0
GOTLBO versus WW	1.0	1.0	1.0
STLBO versus EBL SHADE	1.0	1.0	1.0
STLBO versus ADELI	1.0	1.0	1.0
STLBO versus TLBO	1.0	1.0	1.0
STLBO versus IJAYA	1.0	1.0	1.0
PSO versus DE	1.0	1.0	1.0
PSO versus EBL SHADE	1.0	1.0	1.0
PSO versus ADELI	1.0	1.0	1.0
PSO versus NDE	1.0	1.0	1.0
PSO versus MABC	1.0	1.0	1.0
PSO versus TLBO	1.0	1.0	1.0
PSO versus GOTLBO	1.0	1.0	1.0
PSO versus STLBO	1.0	1.0	1.0
PSO versus IJAYA	1.0	1.0	1.0
PSO versus ISCA	1.0	1.0	1.0
PSO versus NNA	1.0	1.0	1.0
IJAYA versus DE	1.0	1.0	1.0
IJAYA versus EBL SHADE	1.0	1.0	1.0
IJAYA versus ADELI	1.0	1.0	1.0

Table S152 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
IJAYA versus NDE	1.0	1.0	1.0
IJAYA versus TLBO	1.0	1.0	1.0
IJAYA versus STLBO	1.0	1.0	1.0
ISCA versus DE	1.0	1.0	1.0
ISCA versus EBL SHADE	1.0	1.0	1.0
ISCA versus ADELI	1.0	1.0	1.0
ISCA versus NDE	1.0	1.0	1.0
ISCA versus MABC	1.0	1.0	1.0
ISCA versus TLBO	1.0	1.0	1.0
ISCA versus GOTLBO	1.0	1.0	1.0
ISCA versus STLBO	1.0	1.0	1.0
ISCA versus PSO	1.0	1.0	1.0
ISCA versus IJAYA	1.0	1.0	1.0
ISCA versus NNA	1.0	1.0	1.0
ISCA versus CWOA	1.0	1.0	1.0
ISCA versus WW	1.0	1.0	1.0
NNA versus DE	1.0	1.0	1.0
NNA versus EBL SHADE	1.0	1.0	1.0
NNA versus ADELI	1.0	1.0	1.0
NNA versus NDE	1.0	1.0	1.0
NNA versus MABC	1.0	1.0	1.0
NNA versus TLBO	1.0	1.0	1.0
NNA versus GOTLBO	1.0	1.0	1.0
NNA versus STLBO	1.0	1.0	1.0
NNA versus PSO	1.0	1.0	1.0
NNA versus IJAYA	1.0	1.0	1.0
NNA versus ISCA	1.0	1.0	1.0
NNA versus CWOA	1.0	1.0	1.0
NNA versus WW	1.0	1.0	1.0
CWOA versus DE	1.0	1.0	1.0
CWOA versus EBL SHADE	1.0	1.0	1.0
CWOA versus ADELI	1.0	1.0	1.0
CWOA versus NDE	1.0	1.0	1.0
CWOA versus MABC	1.0	1.0	1.0
CWOA versus TLBO	1.0	1.0	1.0
CWOA versus GOTLBO	1.0	1.0	1.0
CWOA versus STLBO	1.0	1.0	1.0
CWOA versus PSO	1.0	1.0	1.0
CWOA versus IJAYA	1.0	1.0	1.0
CWOA versus ISCA	1.0	1.0	1.0
CWOA versus NNA	1.0	1.0	1.0
CWOA versus WW	1.0	1.0	1.0
WW versus DE	1.0	1.0	1.0

Table S152 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
WW versus EBL SHADE	1.0	1.0	1.0
WW versus ADELI	1.0	1.0	1.0
WW versus NDE	1.0	1.0	1.0
WW versus MABC	1.0	1.0	1.0
WW versus TLBO	1.0	1.0	1.0
WW versus GOTLBO	1.0	1.0	1.0
WW versus STLBO	1.0	1.0	1.0
WW versus PSO	1.0	1.0	1.0
WW versus IJAYA	1.0	1.0	1.0
WW versus ISCA	1.0	1.0	1.0
WW versus NNA	1.0	1.0	1.0
WW versus CWOA	1.0	1.0	1.0

Table S153. Adjusted p -values for tests for multiple comparisons among all methods in the single-IV case. Comp parameter.

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
EBLSHADE versus WW	9.13562E-05	9.13562E-05	9.13562E-05
EBLSHADE versus CWOA	1.78593E-04	1.76630E-04	1.53079E-04
EBLSHADE versus PSO	2.03794E-04	1.99315E-04	1.74680E-04
EBLSHADE versus NNA	3.51080E-03	3.39506E-03	3.00926E-03
EBLSHADE versus GOTLBO	4.42051E-03	4.22620E-03	3.78901E-03
ADELI versus WW	4.42051E-03	4.22620E-03	3.78901E-03
STLBO versus WW	6.21372E-03	5.80403E-03	5.32605E-03
TLBO versus WW	6.95110E-03	6.41640E-03	5.95809E-03
ADELI versus CWOA	7.77070E-03	7.08756E-03	6.66060E-03
EBLSHADE versus ISCA	8.68102E-03	7.82246E-03	7.44088E-03
ADELI versus PSO	8.68102E-03	7.82246E-03	7.44088E-03
STLBO versus CWOA	1.08120E-02	9.50506E-03	9.26744E-03
TLBO versus PSO	1.34296E-02	1.13635E-02	1.03320E-02
TLBO versus CWOA	1.20540E-02	1.04645E-02	1.03320E-02
STLBO versus PSO	1.20540E-02	1.04645E-02	1.03320E-02
EBLSHADE versus MABC	6.90283E-02	5.76500E-02	5.08231E-02
ADELI versus NNA	9.20449E-02	7.48497E-02	6.77693E-02
ADELI versus GOTLBO	1.11137E-01	8.91541E-02	8.18263E-02
STLBO versus NNA	1.21998E-01	9.65262E-02	8.98230E-02
TLBO versus NNA	1.33831E-01	1.04418E-01	9.85352E-02
STLBO versus GOTLBO	1.46714E-01	1.12857E-01	1.08020E-01
TLBO versus GOTLBO	1.60730E-01	1.21872E-01	1.18339E-01
ADELI versus ISCA	1.92520E-01	1.43861E-01	1.41746E-01
STLBO versus ISCA	2.51119E-01	1.84890E-01	1.84890E-01
TLBO versus ISCA	2.74012E-01	1.98734E-01	1.98734E-01
EBLSHADE versus DE	3.54582E-01	2.53273E-01	2.25997E-01
ADELI versus MABC	1.0	7.11524E-01	6.44819E-01
NDE versus WW	1.0	8.02025E-01	7.50281E-01
STLBO versus MABC	1.0	8.50346E-01	8.08525E-01
TLBO versus MABC	1.0	8.85738E-01	8.70725E-01
EBLSHADE versus NDE	1.0	9.20945E-01	9.04788E-01
DE versus EBL SHADE	1.0	1.0	1.0
DE versus ADELI	1.0	1.0	1.0
DE versus NDE	1.0	1.0	1.0
DE versus MABC	1.0	1.0	1.0
DE versus TLBO	1.0	1.0	1.0
DE versus GOTLBO	1.0	1.0	1.0
DE versus STLBO	1.0	1.0	1.0
DE versus PSO	1.0	1.0	1.0
DE versus IJAYA	1.0	1.0	1.0
DE versus ISCA	1.0	1.0	1.0

Table S153 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
DE versus NNA	1.0	1.0	1.0
DE versus CWOA	1.0	1.0	1.0
DE versus WW	1.0	1.0	1.0
EBLSHADE versus ADELI	1.0	1.0	1.0
EBLSHADE versus TLBO	1.0	1.0	1.0
EBLSHADE versus STLBO	1.0	1.0	1.0
EBLSHADE versus IJAYA	1.0	1.0	1.0
ADELI versus DE	1.0	1.0	1.0
ADELI versus EBL SHADE	1.0	1.0	1.0
ADELI versus NDE	1.0	1.0	1.0
ADELI versus TLBO	1.0	1.0	1.0
ADELI versus STLBO	1.0	1.0	1.0
ADELI versus IJAYA	1.0	1.0	1.0
NDE versus DE	1.0	1.0	1.0
NDE versus EBL SHADE	1.0	1.0	1.0
NDE versus ADELI	1.0	1.0	1.0
NDE versus MABC	1.0	1.0	1.0
NDE versus TLBO	1.0	1.0	1.0
NDE versus GOTLBO	1.0	1.0	1.0
NDE versus STLBO	1.0	1.0	1.0
NDE versus PSO	1.0	1.0	1.0
NDE versus IJAYA	1.0	1.0	1.0
NDE versus ISCA	1.0	1.0	1.0
NDE versus NNA	1.0	1.0	1.0
NDE versus CWOA	1.0	1.0	1.0
MABC versus DE	1.0	1.0	1.0
MABC versus EBL SHADE	1.0	1.0	1.0
MABC versus ADELI	1.0	1.0	1.0
MABC versus NDE	1.0	1.0	1.0
MABC versus TLBO	1.0	1.0	1.0
MABC versus GOTLBO	1.0	1.0	1.0
MABC versus STLBO	1.0	1.0	1.0
MABC versus PSO	1.0	1.0	1.0
MABC versus IJAYA	1.0	1.0	1.0
MABC versus ISCA	1.0	1.0	1.0
MABC versus NNA	1.0	1.0	1.0
MABC versus CWOA	1.0	1.0	1.0
MABC versus WW	1.0	1.0	1.0
TLBO versus DE	1.0	1.0	1.0
TLBO versus EBL SHADE	1.0	1.0	1.0
TLBO versus ADELI	1.0	1.0	1.0
TLBO versus NDE	1.0	1.0	1.0
TLBO versus STLBO	1.0	1.0	1.0

Table S153 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
TLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus DE	1.0	1.0	1.0
GOTLBO versus EBL SHADE	1.0	1.0	1.0
GOTLBO versus ADELI	1.0	1.0	1.0
GOTLBO versus NDE	1.0	1.0	1.0
GOTLBO versus MABC	1.0	1.0	1.0
GOTLBO versus TLBO	1.0	1.0	1.0
GOTLBO versus STLBO	1.0	1.0	1.0
GOTLBO versus PSO	1.0	1.0	1.0
GOTLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus ISCA	1.0	1.0	1.0
GOTLBO versus NNA	1.0	1.0	1.0
GOTLBO versus CWOA	1.0	1.0	1.0
GOTLBO versus WW	1.0	1.0	1.0
STLBO versus DE	1.0	1.0	1.0
STLBO versus EBL SHADE	1.0	1.0	1.0
STLBO versus ADELI	1.0	1.0	1.0
STLBO versus NDE	1.0	1.0	1.0
STLBO versus TLBO	1.0	1.0	1.0
STLBO versus IJAYA	1.0	1.0	1.0
PSO versus DE	1.0	1.0	1.0
PSO versus EBL SHADE	1.0	1.0	1.0
PSO versus ADELI	1.0	1.0	1.0
PSO versus NDE	1.0	1.0	1.0
PSO versus MABC	1.0	1.0	1.0
PSO versus TLBO	1.0	1.0	1.0
PSO versus GOTLBO	1.0	1.0	1.0
PSO versus STLBO	1.0	1.0	1.0
PSO versus IJAYA	1.0	1.0	1.0
PSO versus ISCA	1.0	1.0	1.0
PSO versus NNA	1.0	1.0	1.0
PSO versus CWOA	1.0	1.0	1.0
PSO versus WW	1.0	1.0	1.0
IJAYA versus DE	1.0	1.0	1.0
IJAYA versus EBL SHADE	1.0	1.0	1.0
IJAYA versus ADELI	1.0	1.0	1.0
IJAYA versus NDE	1.0	1.0	1.0
IJAYA versus MABC	1.0	1.0	1.0
IJAYA versus TLBO	1.0	1.0	1.0
IJAYA versus GOTLBO	1.0	1.0	1.0
IJAYA versus STLBO	1.0	1.0	1.0
IJAYA versus PSO	1.0	1.0	1.0
IJAYA versus ISCA	1.0	1.0	1.0

Table S153 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
IJAYA versus NNA	1.0	1.0	1.0
IJAYA versus CWOA	1.0	1.0	1.0
IJAYA versus WW	1.0	1.0	1.0
ISCA versus DE	1.0	1.0	1.0
ISCA versus EBL SHADE	1.0	1.0	1.0
ISCA versus ADELI	1.0	1.0	1.0
ISCA versus NDE	1.0	1.0	1.0
ISCA versus MABC	1.0	1.0	1.0
ISCA versus TLBO	1.0	1.0	1.0
ISCA versus GOTLBO	1.0	1.0	1.0
ISCA versus STLBO	1.0	1.0	1.0
ISCA versus PSO	1.0	1.0	1.0
ISCA versus IJAYA	1.0	1.0	1.0
ISCA versus NNA	1.0	1.0	1.0
ISCA versus CWOA	1.0	1.0	1.0
ISCA versus WW	1.0	1.0	1.0
NNA versus DE	1.0	1.0	1.0
NNA versus EBL SHADE	1.0	1.0	1.0
NNA versus ADELI	1.0	1.0	1.0
NNA versus NDE	1.0	1.0	1.0
NNA versus MABC	1.0	1.0	1.0
NNA versus TLBO	1.0	1.0	1.0
NNA versus GOTLBO	1.0	1.0	1.0
NNA versus STLBO	1.0	1.0	1.0
NNA versus PSO	1.0	1.0	1.0
NNA versus IJAYA	1.0	1.0	1.0
NNA versus ISCA	1.0	1.0	1.0
NNA versus CWOA	1.0	1.0	1.0
NNA versus WW	1.0	1.0	1.0
CWOA versus DE	1.0	1.0	1.0
CWOA versus EBL SHADE	1.0	1.0	1.0
CWOA versus ADELI	1.0	1.0	1.0
CWOA versus NDE	1.0	1.0	1.0
CWOA versus MABC	1.0	1.0	1.0
CWOA versus TLBO	1.0	1.0	1.0
CWOA versus GOTLBO	1.0	1.0	1.0
CWOA versus STLBO	1.0	1.0	1.0
CWOA versus PSO	1.0	1.0	1.0
CWOA versus IJAYA	1.0	1.0	1.0
CWOA versus ISCA	1.0	1.0	1.0
CWOA versus NNA	1.0	1.0	1.0
CWOA versus WW	1.0	1.0	1.0
WW versus DE	1.0	1.0	1.0

Table S153 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
WW versus EBL SHADE	1.0	1.0	1.0
WW versus ADELI	1.0	1.0	1.0
WW versus NDE	1.0	1.0	1.0
WW versus MABC	1.0	1.0	1.0
WW versus TLBO	1.0	1.0	1.0
WW versus GOTLBO	1.0	1.0	1.0
WW versus STLBO	1.0	1.0	1.0
WW versus PSO	1.0	1.0	1.0
WW versus IJAYA	1.0	1.0	1.0
WW versus ISCA	1.0	1.0	1.0
WW versus NNA	1.0	1.0	1.0
WW versus CWOA	1.0	1.0	1.0

Table S154. The results of the compared algorithms in the IV-set case.

Algorithm, metric	I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	Parameter			I_{ph} (A)	RMSPE
						$T = 260$ K				
true value	1.50000E-05	6.37044E+00	1.00000E+04	8.96101E-06	2.92308E+00	1.41753E+04	1.00000E+01	9.60000E-04	5.55000E+02	
DE										
MEAN	4.69057E-05	6.30708E+00	2.97192E+04	8.65745E-06	2.71501E+00	1.40692E+04	6.56303E+01	1.16043E-03	1.89083E-01	
MEDIAN	2.62622E-06	4.91376E+00	2.07122E+03	8.39149E-06	2.74341E+00	1.38837E+04	5.31154E+01	1.10392E-03	1.36102E-01	
STD	1.40807E-04	4.83826E+00	1.19197E+05	1.87434E-06	4.85664E-01	1.10024E+03	6.97079E+01	2.23934E-04	9.49094E-02	
IQR	1.90272E-05	3.82747E+00	6.99210E+03	2.07603E-06	8.01925E-01	1.32071E+03	8.70225E+01	2.75091E-04	1.61708E-01	
EBSHADE										
MEAN	2.01388E-05	5.49038E+00	7.76643E+03	8.16611E-06	2.67787E+00	1.37765E+04	6.74898E+01	1.08004E-03	1.19451E-01	
MEDIAN	9.90953E-06	6.12537E+00	6.31620E+03	8.95342E-06	2.88690E+00	1.41506E+04	2.55399E+01	9.97449E-04	1.00133E-01	
STD	4.86370E-05	2.63941E+00	1.04179E+04	1.11268E-06	3.26014E-01	5.46121E+02	6.89751E+01	1.75238E-04	4.15560E-02	
IQR	1.48880E-05	3.38745E+00	8.60682E+03	1.57957E-06	5.17435E-01	8.15200E+02	1.16329E+02	1.68848E-04	1.82019E-02	
ADELI										
MEAN	1.48003E-05	6.35177E+00	9.74887E+03	8.96080E-06	2.92295E+00	1.41751E+04	1.03086E+01	9.60447E-04	9.95037E-02	
MEDIAN	1.49998E-05	6.37041E+00	1.00019E+04	8.96101E-06	2.92307E+00	1.41753E+04	1.00025E+01	9.59996E-04	9.95037E-02	
STD	5.31369E-07	5.01535E-02	6.44912E+02	5.75513E-10	3.56841E-04	4.83078E-01	8.28714E-01	1.22281E-06	1.83374E-08	
IQR	4.36500E-12	3.89500E-07	7.23000E-03	0.00000E+00	2.50000E-09	0.00000E+00	3.90000E-07	6.00000E-13	0.00000E+00	
NDE										
MEAN	6.14289E-05	8.48588E+00	5.08184E+04	7.64602E-06	2.41768E+00	1.40726E+04	1.30758E+02	5.01164E-03	2.74711E-01	
MEDIAN	3.52725E-06	5.19947E+00	2.31607E+03	8.93042E-06	2.90231E+00	1.41535E+04	4.71911E+01	1.08179E-03	1.16520E-01	
STD	1.83406E-04	8.33816E+00	1.97124E+05	5.06371E-06	1.06971E+00	3.43420E+03	1.43461E+02	9.54832E-03	2.62947E-01	
IQR	6.55127E-06	2.28483E+00	3.15183E+03	5.42428E-06	1.52579E+00	1.85976E+03	1.87806E+02	1.05710E-03	2.96819E-01	
MABC										
MEAN	8.43696E-05	1.14305E+01	1.51025E+04	6.88795E-06	2.05296E+00	1.30822E+04	1.87992E+02	8.73693E-03	3.29820E-01	
MEDIAN	1.39100E-06	9.93725E+00	3.91349E+02	6.47851E-06	1.84359E+00	1.27895E+04	1.13315E+02	1.53906E-03	3.53569E-01	
STD	1.72156E-04	8.22054E+00	6.94018E+04	2.38962E-06	6.31622E-01	1.22683E+03	1.71735E+02	1.52181E-02	1.09211E-01	
IQR	1.18894E-04	1.18583E+01	6.83317E+02	1.03384E-06	3.99133E-01	4.64595E+02	3.59388E+02	6.93289E-03	1.17934E-01	
TLBO										
MEAN	1.41354E-05	6.25434E+00	3.61536E+04	8.95928E-06	2.92201E+00	1.41739E+04	1.21722E+01	9.63674E-04	9.95042E-02	
MEDIAN	1.49998E-05	6.37041E+00	1.00019E+04	8.96101E-06	2.92307E+00	1.41753E+04	1.00025E+01	9.59996E-04	9.95037E-02	
STD	3.64271E-06	4.06928E-01	1.31353E+05	5.98003E-09	3.64405E-03	4.82182E+00	7.40580E+00	1.24785E-05	2.20001E-06	
IQR	2.49391E-06	2.38776E-01	2.80094E+03	2.66597E-09	1.73634E-03	2.37254E+00	3.15653E+00	4.50969E-06	2.02140E-07	

Table S154 (continued)

Algorithm, metric	I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	Parameter			I_{ph} (A)	RMSPE
						R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)		
GOTLBO										
MEAN	1.38343E-04	1.00611E+01	4.98093E+04	1.17919E-05	3.11751E+00	1.73665E+04	1.16759E+02	1.62579E-02	4.77176E-01	
MEDIAN	5.37507E-06	7.28573E+00	4.15155E+02	9.57098E-06	2.85578E+00	1.36144E+04	1.29627E+01	2.67967E-03	3.90311E-01	
STD	2.62287E-04	8.16600E+00	1.34161E+05	9.12450E-06	1.71413E+00	9.85001E+03	1.61999E+02	2.76955E-02	2.65655E-01	
IQR	1.44051E-04	9.29239E+00	5.05273E+03	1.47588E-05	2.33102E+00	8.67457E+03	2.23950E+02	1.26027E-02	3.34857E-01	
STLBO										
MEAN	1.49795E-05	6.36854E+00	9.97536E+03	8.96098E-06	2.92306E+00	1.41753E+04	1.00339E+01	9.60039E-04	9.95037E-02	
MEDIAN	1.49998E-05	6.37041E+00	1.00019E+04	8.96101E-06	2.92307E+00	1.41753E+04	1.00025E+01	9.59996E-04	9.95037E-02	
STD	1.44843E-07	1.33906E-02	1.89741E+02	1.76253E-10	1.03160E-04	1.40774E-01	2.24315E-01	3.09387E-07	1.68034E-09	
IQR	1.45000E-13	1.35000E-08	2.20000E-04	0.00000E+00	0.00000E+00	0.00000E+00	2.00000E-07	3.00000E-13	0.00000E+00	
PSO										
MEAN	4.96545E-04	1.91264E+01	4.50294E+05	6.73083E-06	3.11462E+00	1.44364E+04	2.73896E+02	4.28324E-02	3.72144E-01	
MEDIAN	3.93736E-04	3.00000E+01	6.26289E+02	6.46051E-06	1.83190E+00	1.27767E+04	4.06458E+02	5.33325E-02	3.85700E-01	
STD	4.91736E-04	1.25858E+01	5.01487E+05	7.61651E-06	5.71557E+00	9.27566E+03	2.51077E+02	3.94865E-02	2.22745E-01	
IQR	1.00000E-03	2.45495E+01	9.99990E+05	7.18939E-06	2.05427E+00	2.47101E+03	4.96305E+02	6.45831E-02	1.50075E-01	
IJAYA										
MEAN	9.42349E-06	5.29024E+00	4.56409E+04	8.85416E-06	2.89893E+00	1.41009E+04	2.95165E+01	1.03031E-03	1.03602E-01	
MEDIAN	4.06721E-06	4.99484E+00	2.15019E+03	8.96174E-06	2.92351E+00	1.41640E+04	2.09875E+01	1.03297E-03	9.97036E-02	
STD	9.97079E-06	1.37877E+00	1.50209E+05	6.34878E-07	1.40577E-01	3.50896E+02	3.18446E+01	6.87619E-05	1.39971E-02	
IQR	1.70485E-05	2.48413E+00	1.00581E+04	1.15569E-07	5.21455E-02	8.11628E+01	4.12794E+01	9.07897E-05	1.38672E-03	
ISCA										
MEAN	2.14398E-04	1.13257E+01	4.95872E+04	1.32313E-05	4.09783E+00	1.71151E+04	4.73098E+01	1.38167E-02	8.18085E-01	
MEDIAN	4.64450E-05	8.71622E+00	8.29500E+02	1.14849E-05	4.22265E+00	1.40675E+04	6.47950E+00	3.14781E-03	7.88469E-01	
STD	2.85623E-04	7.27020E+00	1.37358E+05	1.04956E-05	2.02014E+00	1.02917E+04	9.73633E+01	2.06994E-02	3.51104E-01	
IQR	3.31054E-04	1.15029E+01	2.90738E+04	1.70564E-05	3.35400E+00	1.04869E+04	2.36857E+01	1.53414E-02	5.49263E-01	
NNA										
MEAN	6.97328E-05	1.11960E+01	3.53652E+04	3.24448E-05	6.99158E+00	1.39565E+04	1.20903E+02	2.02108E-02	7.63030E-01	
MEDIAN	4.83914E-07	5.40878E+00	2.85860E+02	7.14148E-06	4.64963E+00	8.24641E+03	8.38115E+00	7.48303E-03	7.72851E-01	
STD	1.73519E-04	1.02970E+01	1.47089E+05	8.29188E-05	7.83605E+00	1.43488E+04	2.04252E+02	2.29392E-02	3.27747E-01	
IQR	3.03647E-05	1.84023E+01	4.76218E+03	2.75607E-05	5.16022E+00	8.11209E+03	1.42647E+02	2.78367E-02	4.84035E-01	
CWOA										
MEAN	4.49032E-04	1.44168E+01	1.85295E+05	2.74796E-04	9.56700E+00	2.60700E+04	1.87729E+02	2.08770E-02	5.30129E-01	
MEDIAN	4.09507E-05	8.93518E+00	5.11516E+02	1.47994E-05	5.62832E+00	1.43077E+04	2.18000E+01	5.06958E-03	4.31416E-01	

Table S154 (continued)

Algorithm, metric	Parameter								
	I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
STD	4.90289E-04	1.06173E+01	3.68325E+05	1.40060E-03	9.90648E+00	1.93858E+04	2.42860E+02	3.19845E-02	2.44593E-01
IQR	9.99991E-04	2.02686E+01	3.31672E+04	2.48264E-05	1.35909E+01	3.90139E+04	3.84579E+02	1.75534E-02	3.97857E-01
WW									
MEAN	2.20155E-04	1.11588E+01	4.54647E+04	1.39193E-05	3.35375E+00	1.85707E+04	1.43130E+02	1.81508E-02	4.63896E-01
MEDIAN	1.26821E-05	7.49752E+00	3.58915E+02	7.11711E-06	1.90408E+00	1.19046E+04	4.99410E+01	4.23071E-03	4.19885E-01
STD	3.27795E-04	8.79605E+00	1.95860E+05	2.06209E-05	3.08596E+00	1.40779E+04	1.64633E+02	2.56551E-02	2.32534E-01
IQR	4.03710E-04	1.07669E+01	1.11765E+03	1.81979E-05	3.84336E+00	8.32636E+03	2.54327E+02	2.11628E-02	3.14131E-01
T = 270 K									
true value	1.50000E-05	6.13450E+00	1.00000E+04	1.73488E-05	2.85185E+00	8.35610E+03	2.00000E+01	9.70000E-04	5.55000E+02
DE									
MEAN	3.97827E-05	6.46318E+00	1.47957E+04	1.60419E-05	2.40776E+00	8.07538E+03	7.98556E+01	1.14786E-03	2.22913E-01
MEDIAN	5.77314E-06	5.29869E+00	2.38569E+03	1.56412E-05	2.38705E+00	7.93938E+03	4.24117E+01	1.09825E-03	1.94071E-01
STD	1.11777E-04	4.47231E+00	6.33642E+04	4.08053E-06	5.99120E-01	9.05848E+02	8.63818E+01	1.81649E-04	9.77005E-02
IQR	2.76233E-05	4.99615E+00	5.31820E+03	5.17515E-06	8.98643E-01	1.07949E+03	1.04027E+02	2.48342E-04	1.54062E-01
EBSHADE									
MEAN	1.20138E-05	4.98071E+00	3.38125E+04	1.57012E-05	2.47307E+00	8.03848E+03	1.04170E+02	1.73934E-03	1.36977E-01
MEDIAN	1.01808E-05	5.66058E+00	7.25031E+03	1.71043E-05	2.73316E+00	8.29864E+03	6.89136E+01	9.73795E-04	1.01068E-01
STD	1.60470E-05	1.92840E+00	1.12391E+05	2.60446E-06	4.99355E-01	4.76023E+02	1.05545E+02	4.74130E-03	7.59595E-02
IQR	1.46272E-05	2.85879E+00	8.20152E+03	4.16504E-06	8.06062E-01	7.87928E+02	1.38323E+02	1.21335E-04	4.13082E-02
ADELI									
MEAN	1.50038E-05	6.13482E+00	1.00067E+04	1.73488E-05	2.85185E+00	8.35610E+03	1.99953E+01	9.69990E-04	9.95037E-02
MEDIAN	1.50041E-05	6.13485E+00	1.00072E+04	1.73488E-05	2.85185E+00	8.35610E+03	1.99947E+01	9.69989E-04	9.95037E-02
STD	2.58165E-09	2.27269E-04	3.34077E+00	5.03827E-12	2.93864E-06	2.37866E-03	4.38562E-03	4.30177E-09	2.80056E-12
IQR	1.15000E-13	9.50000E-09	1.65000E-04	0.00000E+00	0.00000E+00	0.00000E+00	1.45000E-07	2.00000E-13	0.00000E+00
NDE									
MEAN	3.60465E-05	7.52609E+00	4.39246E+04	1.72948E-05	2.78308E+00	8.80209E+03	1.01459E+02	4.81775E-03	3.23871E-01
MEDIAN	7.62416E-06	5.53708E+00	4.46543E+03	1.73249E-05	2.84084E+00	8.34608E+03	4.09988E+01	9.94233E-04	9.95174E-02
STD	1.37707E-04	6.43194E+00	1.86180E+05	1.10173E-05	1.24892E+00	3.93863E+03	1.23126E+02	1.04508E-02	3.19557E-01
IQR	1.01408E-05	1.26505E+00	6.36841E+03	3.40922E-07	3.80923E-01	3.04136E+02	7.78842E+01	1.56030E-03	4.32743E-01
MABC									
MEAN	8.35160E-05	1.13300E+01	1.90230E+03	1.52458E-05	1.83437E+00	8.14462E+03	1.71108E+02	6.46840E-03	4.09273E-01
MEDIAN	2.71136E-06	6.75135E+00	4.44996E+02	1.28359E-05	1.49147E+00	7.32573E+03	1.10384E+02	1.51852E-03	4.53471E-01
STD	1.77793E-04	8.72640E+00	6.86129E+03	8.14470E-06	8.54012E-01	2.87251E+03	1.63207E+02	1.15945E-02	1.19907E-01

Table S154 (continued)

Algorithm, metric	Parameter								
	I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
IQR	3.74323E-05	1.16597E+01	4.56164E+02	3.63794E-06	8.02846E-01	7.22304E+02	2.89850E+02	1.58740E-03	1.09724E-01
TLBO									
MEAN	3.42920E-05	6.14136E+00	1.03102E+04	1.72507E-05	2.82232E+00	8.33313E+03	2.88516E+01	2.91144E-03	1.06683E-01
MEDIAN	1.50041E-05	6.13485E+00	1.00072E+04	1.73488E-05	2.85185E+00	8.35610E+03	1.99947E+01	9.69989E-04	9.95037E-02
STD	1.37902E-04	1.08243E-01	5.07984E+03	6.99104E-07	2.10329E-01	1.63655E+02	6.26792E+01	1.38641E-02	5.12710E-02
IQR	1.65000E-13	1.45000E-08	2.10000E-04	0.00000E+00	0.00000E+00	0.00000E+00	2.80000E-07	3.00000E-13	0.00000E+00
GOTLBO									
MEAN	2.21297E-04	1.02327E+01	5.82929E+04	2.63430E-05	3.18704E+00	1.50645E+04	1.82996E+02	1.79608E-02	5.37131E-01
MEDIAN	4.36767E-05	7.24878E+00	6.00680E+02	1.74105E-05	2.17765E+00	7.65899E+03	3.58986E+01	3.30988E-03	4.68831E-01
STD	3.29794E-04	7.75064E+00	1.71753E+05	2.14681E-05	2.49472E+00	1.31466E+04	2.04525E+02	2.51704E-02	2.56434E-01
IQR	3.04017E-04	1.37737E+01	1.12995E+04	3.81661E-05	4.72482E+00	1.19406E+04	3.96259E+02	2.55133E-02	3.08822E-01
STLBO									
MEAN	1.50041E-05	6.13485E+00	1.00072E+04	1.73488E-05	2.85185E+00	8.35610E+03	1.99947E+01	9.69989E-04	9.95037E-02
MEDIAN	1.50041E-05	6.13485E+00	1.00072E+04	1.73488E-05	2.85185E+00	8.35610E+03	1.99947E+01	9.69989E-04	9.95037E-02
STD	7.11701E-14	6.30226E-09	9.65869E-05	1.02655E-20	4.48508E-16	9.18545E-12	1.22443E-07	1.29342E-13	0.00000E+00
IQR	1.00000E-13	9.00000E-09	1.25000E-04	0.00000E+00	0.00000E+00	0.00000E+00	1.85000E-07	1.50000E-13	0.00000E+00
PSO									
MEAN	5.42121E-04	1.73060E+01	4.04042E+05	2.21554E-04	1.81735E+00	1.15906E+04	3.66525E+02	5.55091E-02	4.57577E-01
MEDIAN	7.65571E-04	1.03874E+01	5.01498E+01	1.23559E-05	1.34967E+00	7.18728E+03	4.67262E+02	5.94252E-02	4.65652E-01
STD	4.73026E-04	1.25113E+01	4.90627E+05	1.39832E-03	1.84670E+00	1.42994E+04	2.48536E+02	4.03759E-02	1.56622E-01
IQR	1.00000E-03	2.44417E+01	9.99990E+05	7.56079E-06	1.03118E+00	8.23241E+02	3.67990E+02	9.82999E-02	8.89681E-02
IJAYA									
MEAN	1.34436E-05	5.56862E+00	7.06023E+04	1.72620E-05	2.85474E+00	8.33257E+03	2.57141E+01	1.01548E-03	1.04705E-01
MEDIAN	8.14670E-06	5.43119E+00	3.84502E+03	1.73289E-05	2.85875E+00	8.35131E+03	5.99943E+00	9.95066E-04	9.97465E-02
STD	1.27047E-05	1.41515E+00	1.75091E+05	8.14931E-07	1.31050E-01	1.78679E+02	3.22800E+01	9.14166E-05	2.34925E-02
IQR	2.05442E-05	2.30946E+00	2.69783E+04	2.64758E-07	8.27546E-02	7.15931E+01	4.59218E+01	6.75688E-05	6.59079E-04
ISCA									
MEAN	2.28542E-04	8.84677E+00	5.20611E+04	3.69271E-05	5.46702E+00	1.50917E+04	6.69038E+01	1.61026E-02	7.96817E-01
MEDIAN	6.51884E-05	7.58798E+00	1.83515E+03	3.69600E-05	5.95693E+00	1.01392E+04	2.54027E+01	5.61353E-03	7.96935E-01
STD	2.94528E-04	5.73257E+00	1.37975E+05	2.35718E-05	2.67474E+00	1.14491E+04	1.03287E+02	2.05783E-02	3.65124E-01
IQR	3.44632E-04	5.30328E+00	2.35572E+04	4.36206E-05	4.77947E+00	1.34149E+04	9.05064E+01	2.15636E-02	6.73399E-01
NNA									
MEAN	1.33163E-04	1.18191E+01	1.34310E+05	3.42653E-05	7.99323E+00	8.49075E+03	1.34474E+02	2.18238E-02	6.45683E-01

Table S154 (continued)

Algorithm,		Parameter								
metric		I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
MEDIAN		1.80058E-06	9.75274E+00	3.66720E+02	9.51081E-06	5.34996E+00	3.74761E+03	4.70315E+00	7.83039E-03	6.02627E-01
STD		2.67511E-04	8.74011E+00	2.82548E+05	7.36358E-05	8.15039E+00	1.25501E+04	2.14004E+02	2.78684E-02	3.64232E-01
IQR		1.21611E-04	1.40399E+01	7.06111E+04	3.55724E-05	8.30687E+00	5.76668E+03	2.43160E+02	2.34230E-02	4.50381E-01
CWOA										
MEAN		3.93696E-04	1.55911E+01	1.09481E+05	6.65485E-04	9.65336E+00	2.68805E+04	1.94785E+02	2.85699E-02	6.35434E-01
MEDIAN		4.35791E-07	1.54541E+01	2.42849E+02	5.98460E-05	6.62586E+00	1.70441E+04	1.40753E+01	1.75843E-02	6.05750E-01
STD		4.77009E-04	1.16298E+01	2.88059E+05	2.36125E-03	9.53654E+00	2.20374E+04	2.58012E+02	3.27865E-02	2.98087E-01
IQR		1.00000E-03	2.47268E+01	1.68690E+03	5.32964E-05	6.52389E+00	4.28198E+04	3.88437E+02	4.24920E-02	3.42745E-01
WW										
MEAN		2.16269E-04	9.40052E+00	5.15084E+03	2.29466E-05	3.64496E+00	1.32663E+04	1.65863E+02	2.69972E-02	7.00965E-01
MEDIAN		9.75714E-06	7.18348E+00	1.81856E+02	1.20356E-05	3.41832E+00	6.57734E+03	1.20930E+02	1.17396E-02	7.09785E-01
STD		3.51729E-04	7.77397E+00	1.77662E+04	2.79248E-05	2.69874E+00	1.44664E+04	1.70058E+02	3.05017E-02	2.85715E-01
IQR		2.91627E-04	9.53794E+00	9.84394E+02	3.08470E-05	3.24640E+00	6.24479E+03	1.93044E+02	4.65641E-02	5.01708E-01
T = 280 K										
true value		1.50000E-05	5.91541E+00	1.00000E+04	3.20396E-05	2.78571E+00	5.11528E+03	3.00000E+01	9.80000E-04	5.55000E+02
DE										
MEAN		4.03971E-05	6.47375E+00	3.43403E+04	3.19652E-05	2.43732E+00	5.16621E+03	7.48714E+01	1.16245E-03	2.69919E-01
MEDIAN		1.05665E-05	5.55661E+00	2.33187E+03	3.00393E-05	2.24036E+00	4.86298E+03	3.35295E+01	1.11319E-03	2.40187E-01
STD		7.82385E-05	3.76377E+00	1.02886E+05	1.19898E-05	9.93911E-01	1.35207E+03	8.65413E+01	2.04066E-04	1.41998E-01
IQR		3.80577E-05	4.53467E+00	7.58220E+03	1.19566E-05	1.26054E+00	9.83531E+02	1.22586E+02	2.28513E-04	2.65492E-01
EBLSHADE										
MEAN		1.18545E-05	5.14036E+00	8.00183E+03	3.04040E-05	2.56009E+00	4.98407E+03	7.10561E+01	1.03308E-03	1.22161E-01
MEDIAN		1.50050E-05	5.91584E+00	9.18706E+03	3.20374E-05	2.78327E+00	5.11486E+03	2.99905E+01	9.80532E-04	9.95039E-02
STD		1.20503E-05	1.57676E+00	1.06627E+04	3.89328E-06	4.69538E-01	2.80340E+02	7.51483E+01	1.06631E-04	5.98735E-02
IQR		1.34067E-05	2.02795E+00	7.81235E+03	2.27881E-06	2.81145E-01	2.05100E+02	7.09991E+01	6.26323E-05	5.74356E-03
ADELI										
MEAN		1.50050E-05	5.91584E+00	1.00056E+04	3.20396E-05	2.78572E+00	5.11528E+03	2.99905E+01	9.79994E-04	9.95037E-02
MEDIAN		1.50050E-05	5.91584E+00	1.00056E+04	3.20396E-05	2.78572E+00	5.11528E+03	2.99905E+01	9.79994E-04	9.95037E-02
STD		4.68791E-14	4.08594E-09	5.84150E-05	4.15390E-15	1.96039E-10	1.96039E-07	9.17494E-08	7.99019E-14	0.00000E+00
IQR		6.50000E-14	6.00000E-09	8.50000E-05	0.00000E+00	0.00000E+00	0.00000E+00	1.25000E-07	1.50000E-13	0.00000E+00
NDE										
MEAN		2.77117E-05	8.69583E+00	5.56285E+04	5.33777E-05	3.87503E+00	1.31572E+04	8.64157E+01	3.21307E-03	4.11828E-01
MEDIAN		1.05499E-05	5.72903E+00	4.33185E+03	3.20377E-05	2.78288E+00	5.11362E+03	3.69645E+01	1.01834E-03	1.01189E-01

Table S154 (continued)

Algorithm,		Parameter								
metric		I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
STD		8.06873E-05	7.83219E+00	1.96568E+05	3.96424E-05	2.47164E+00	1.51291E+04	9.27014E+01	6.11367E-03	3.61927E-01
IQR		1.36463E-05	2.84525E+00	8.39135E+03	5.06552E-05	1.58487E+00	9.24994E+03	8.21456E+01	1.12110E-03	6.09675E-01
MABC										
MEAN		1.05079E-04	9.48064E+00	1.00918E+04	3.74310E-05	2.17608E+00	7.21156E+03	2.01627E+02	9.75615E-03	4.43772E-01
MEDIAN		8.08438E-06	5.85840E+00	4.74797E+02	2.57093E-05	1.36866E+00	4.37556E+03	1.47165E+02	1.52239E-03	5.30317E-01
STD		2.37915E-04	7.78150E+00	4.30445E+04	2.39975E-05	1.76970E+00	7.87100E+03	1.93659E+02	1.67765E-02	1.98345E-01
IQR		3.18799E-05	1.00038E+01	1.25100E+03	1.56437E-05	2.30682E+00	1.44114E+03	3.72880E+02	5.68043E-03	3.13886E-01
TLBO										
MEAN		1.57491E-05	5.96851E+00	5.39360E+04	3.20421E-05	2.78672E+00	5.11587E+03	2.89571E+01	9.79193E-04	9.95041E-02
MEDIAN		1.50050E-05	5.91584E+00	1.00056E+04	3.20396E-05	2.78572E+00	5.11528E+03	2.99905E+01	9.79994E-04	9.95037E-02
STD		2.73367E-06	2.03931E-01	1.90143E+05	1.22930E-08	4.46177E-03	2.55500E+00	4.17713E+00	3.26380E-06	1.12462E-06
IQR		1.35000E-13	1.10000E-08	1.70000E-04	1.00000E-14	0.00000E+00	0.00000E+00	2.45000E-07	2.00000E-13	0.00000E+00
GOTLBO										
MEAN		1.33014E-04	9.91098E+00	1.75797E+04	6.13097E-05	4.42251E+00	1.28409E+04	1.39907E+02	1.96162E-02	7.08323E-01
MEDIAN		2.95516E-06	6.77589E+00	3.38128E+02	6.45502E-05	3.81116E+00	7.51306E+03	2.34557E+01	2.75168E-03	6.79184E-01
STD		2.77360E-04	7.83704E+00	5.05155E+04	3.90846E-05	3.18270E+00	1.30797E+04	1.77222E+02	2.83219E-02	2.64995E-01
IQR		7.16887E-05	1.22921E+01	1.49611E+03	7.08709E-05	5.29957E+00	1.13359E+04	2.57643E+02	2.71988E-02	3.56115E-01
STLBO										
MEAN		1.50050E-05	5.91584E+00	1.00056E+04	3.20396E-05	2.78572E+00	5.11528E+03	2.99905E+01	9.79994E-04	9.95037E-02
MEDIAN		1.50050E-05	5.91584E+00	1.00056E+04	3.20396E-05	2.78572E+00	5.11528E+03	2.99905E+01	9.79994E-04	9.95037E-02
STD		6.79313E-14	5.71795E-09	8.35703E-05	4.28403E-15	1.96039E-10	2.37635E-07	1.24334E-07	1.13863E-13	0.00000E+00
IQR		1.10000E-13	9.00000E-09	1.35000E-04	4.99999E-15	0.00000E+00	0.00000E+00	2.25000E-07	2.00000E-13	0.00000E+00
PSO										
MEAN		4.90580E-04	1.76613E+01	4.91086E+05	4.20596E-05	2.29212E+00	9.41958E+03	2.84719E+02	3.41257E-02	4.34537E-01
MEDIAN		3.74885E-04	1.53835E+01	2.13639E+04	2.38043E-05	8.18861E-01	4.11017E+03	3.23952E+02	2.60703E-03	5.18227E-01
STD		4.72548E-04	1.22030E+01	5.03958E+05	7.40977E-05	4.49178E+00	1.49906E+04	2.64010E+02	3.85989E-02	2.10950E-01
IQR		1.00000E-03	2.37458E+01	9.99990E+05	7.19490E-06	1.32207E+00	4.12745E+02	5.18089E+02	6.16710E-02	2.58364E-01
IJAYA										
MEAN		1.19277E-05	5.45879E+00	1.63419E+04	3.23995E-05	2.84490E+00	5.15540E+03	2.64533E+01	1.00538E-03	1.00681E-01
MEDIAN		9.05189E-06	5.39475E+00	4.01672E+03	3.23243E-05	2.84374E+00	5.14506E+03	2.20458E+01	1.00048E-03	9.96693E-02
STD		8.87445E-06	9.19306E-01	3.71416E+04	9.63524E-07	1.17815E-01	8.07806E+01	2.35787E+01	2.82317E-05	2.17705E-03
IQR		1.17422E-05	1.28966E+00	4.70664E+03	7.86839E-07	1.18051E-01	8.54310E+01	4.03945E+01	3.36021E-05	9.82662E-04
ISCA										

Table S154 (continued)

Algorithm, metric	Parameter								
	I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
MEAN	1.83766E-04	9.86647E+00	4.69925E+04	7.03646E-05	6.07375E+00	1.25942E+04	5.42215E+01	1.47866E-02	8.75664E-01
MEDIAN	5.47205E-05	8.41675E+00	7.75965E+02	6.50218E-05	6.57588E+00	8.94831E+03	8.57698E+00	4.47212E-03	8.50597E-01
STD	2.51264E-04	6.52144E+00	9.88665E+04	5.30048E-05	3.61334E+00	1.15304E+04	9.58071E+01	2.33692E-02	3.68388E-01
IQR	2.53087E-04	8.90420E+00	2.90583E+04	9.40261E-05	6.41914E+00	1.18267E+04	5.34118E+01	1.22838E-02	4.41164E-01
NNA									
MEAN	8.78895E-05	1.14990E+01	2.67358E+04	9.98624E-05	9.76851E+00	7.62042E+03	8.55876E+01	1.72191E-02	6.43180E-01
MEDIAN	8.59411E-07	6.50432E+00	3.25105E+02	1.66778E-05	4.73042E+00	3.19642E+03	1.17920E+01	7.07644E-03	3.43187E-01
STD	2.21259E-04	1.01545E+01	9.73571E+04	1.79068E-04	9.59993E+00	1.23248E+04	1.37935E+02	2.05363E-02	4.44218E-01
IQR	2.08350E-05	1.55855E+01	1.79409E+03	1.03583E-04	1.19909E+01	2.63282E+03	9.10212E+01	1.87243E-02	7.10095E-01
CWOA									
MEAN	3.85449E-04	1.39379E+01	2.70838E+05	8.46368E-04	9.62326E+00	1.74583E+04	2.02366E+02	2.14748E-02	5.27628E-01
MEDIAN	2.19171E-06	8.88450E+00	1.00137E+03	3.09983E-05	5.84803E+00	4.23165E+03	1.00462E+02	4.83641E-03	4.81295E-01
STD	4.74388E-04	1.12526E+01	4.19853E+05	2.68209E-03	9.67793E+00	2.13337E+04	2.37390E+02	3.15758E-02	3.13645E-01
IQR	1.00000E-03	2.48353E+01	4.37554E+05	1.03505E-04	1.37793E+01	4.70393E+04	3.85010E+02	2.62552E-02	3.94971E-01
WW									
MEAN	1.44647E-04	8.49699E+00	2.25207E+04	8.06690E-05	5.87753E+00	1.55260E+04	1.21233E+02	2.13644E-02	7.02521E-01
MEDIAN	2.07544E-05	5.55207E+00	3.49887E+02	2.88009E-05	3.97374E+00	4.18031E+03	3.14306E+01	1.25676E-02	6.55868E-01
STD	2.67028E-04	7.05764E+00	1.39847E+05	1.26299E-04	6.35493E+00	1.97252E+04	1.69308E+02	2.68815E-02	3.07217E-01
IQR	1.14146E-04	6.32558E+00	1.55561E+03	9.78762E-05	7.21343E+00	1.76767E+04	1.56014E+02	2.90273E-02	4.14570E-01
T = 290 K									
true value	1.50000E-05	5.71143E+00	1.00000E+04	5.67193E-05	2.72414E+00	3.23917E+03	4.00000E+01	9.90000E-04	5.55000E+02
DE									
MEAN	3.46159E-05	6.09216E+00	2.19158E+04	6.71648E-05	2.50783E+00	4.83207E+03	8.12931E+01	1.90810E-03	3.32500E-01
MEDIAN	6.48195E-06	5.11255E+00	1.13697E+03	5.54289E-05	1.99172E+00	3.10085E+03	3.25107E+01	1.15795E-03	3.30132E-01
STD	7.76808E-05	3.80964E+00	9.53276E+04	3.25963E-05	1.60899E+00	7.24854E+03	1.03942E+02	5.16092E-03	1.65294E-01
IQR	1.83053E-05	3.87415E+00	2.30838E+03	2.73442E-05	1.84917E+00	9.81403E+02	1.28220E+02	1.95082E-04	2.54569E-01
EBSHADE									
MEAN	1.30826E-05	4.85036E+00	1.48021E+04	5.33603E-05	2.40127E+00	3.10172E+03	8.61806E+01	1.05495E-03	1.38395E-01
MEDIAN	1.39459E-05	5.62019E+00	5.60258E+03	5.66979E-05	2.71612E+00	3.23758E+03	4.22780E+01	9.99182E-04	9.97064E-02
STD	2.41108E-05	2.18769E+00	4.26434E+04	6.94163E-06	5.83161E-01	2.39924E+02	8.03303E+01	8.83941E-05	9.92945E-02
IQR	1.44295E-05	2.39489E+00	8.52726E+03	6.87811E-06	5.03367E-01	2.53025E+02	7.17242E+01	1.17236E-04	1.23223E-02
ADELI									
MEAN	1.50007E-05	5.71149E+00	1.00012E+04	5.67193E-05	2.72414E+00	3.23917E+03	3.99991E+01	9.89998E-04	9.95037E-02

Table S154 (continued)

Algorithm,		Parameter								
metric		I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
MEDIAN		1.50007E-05	5.71149E+00	1.00012E+04	5.67193E-05	2.72414E+00	3.23917E+03	3.99991E+01	9.89998E-04	9.95037E-02
STD		3.39977E-14	2.89381E-09	3.79566E-05	4.40143E-15	3.25396E-10	3.21491E-12	7.17403E-08	5.82759E-14	0.00000E+00
IQR		4.50000E-14	4.50000E-09	5.00000E-05	5.00000E-15	0.00000E+00	0.00000E+00	1.10000E-07	1.00000E-13	0.00000E+00
NDE										
MEAN		1.58693E-05	5.93582E+00	3.26967E+04	9.19756E-05	4.06791E+00	9.83853E+03	8.59774E+01	4.75296E-03	3.98666E-01
MEDIAN		1.02402E-05	5.51328E+00	7.23087E+03	5.67175E-05	2.72357E+00	3.23868E+03	4.09017E+01	1.00029E-03	1.02070E-01
STD		5.46032E-05	4.99782E+00	1.43416E+05	8.80024E-05	3.93737E+00	1.44569E+04	1.06084E+02	1.20467E-02	3.66697E-01
IQR		1.44796E-05	1.81800E+00	9.63269E+03	4.18079E-05	9.82699E-01	2.05120E+03	3.58207E+01	1.54216E-03	5.76480E-01
MABC										
MEAN		7.01581E-05	1.07377E+01	7.75671E+03	7.08918E-05	2.18311E+00	4.67703E+03	1.36832E+02	3.57349E-03	4.84575E-01
MEDIAN		1.15925E-05	7.28004E+00	6.40583E+02	5.04565E-05	1.19481E+00	2.71026E+03	3.48521E+01	1.18108E-03	5.20898E-01
STD		1.56622E-04	8.52624E+00	2.91632E+04	5.91263E-05	2.99809E+00	6.50252E+03	1.59505E+02	7.09046E-03	2.25041E-01
IQR		7.31985E-05	1.12969E+01	9.98146E+02	3.85287E-05	2.23323E+00	1.51067E+03	2.31349E+02	1.38120E-03	3.80873E-01
TLBO										
MEAN		1.54137E-05	5.73941E+00	2.55179E+04	5.67237E-05	2.72523E+00	3.23963E+03	3.93612E+01	9.89632E-04	9.95041E-02
MEDIAN		1.50007E-05	5.71149E+00	1.00012E+04	5.67193E-05	2.72414E+00	3.23917E+03	3.99991E+01	9.89998E-04	9.95037E-02
STD		2.18704E-06	1.57524E-01	1.00694E+05	1.88543E-08	6.14267E-03	2.47913E+00	3.69459E+00	2.23989E-06	1.70469E-06
IQR		5.50000E-14	5.00000E-09	6.00000E-05	1.00000E-14	1.00000E-09	0.00000E+00	1.45000E-07	1.00000E-13	0.00000E+00
GOTLBO										
MEAN		1.66251E-04	1.09387E+01	1.30215E+04	1.26431E-04	5.70596E+00	1.15678E+04	1.21993E+02	1.80467E-02	7.97421E-01
MEDIAN		2.96412E-05	6.50236E+00	5.39677E+02	1.20935E-04	4.70210E+00	5.70257E+03	2.35265E+01	4.30726E-03	8.63220E-01
STD		2.69063E-04	8.93296E+00	3.44522E+04	8.21815E-05	4.62093E+00	1.38655E+04	1.78454E+02	2.60908E-02	2.69993E-01
IQR		2.53190E-04	1.52243E+01	2.25961E+03	1.49658E-04	8.61052E+00	8.73759E+03	1.66739E+02	2.42244E-02	3.11135E-01
STLBO										
MEAN		1.50007E-05	5.71149E+00	1.00012E+04	5.67193E-05	2.72414E+00	3.23917E+03	3.99991E+01	9.89998E-04	9.95037E-02
MEDIAN		1.50007E-05	5.71149E+00	1.00012E+04	5.67193E-05	2.72414E+00	3.23917E+03	3.99991E+01	9.89998E-04	9.95037E-02
STD		4.68347E-14	3.89338E-09	5.26118E-05	4.40143E-15	3.47540E-10	3.21491E-12	1.00269E-07	6.72718E-14	0.00000E+00
IQR		7.50000E-14	6.00000E-09	7.00000E-05	5.00000E-15	0.00000E+00	0.00000E+00	1.60000E-07	1.00000E-13	0.00000E+00
PSO										
MEAN		5.51686E-04	1.67256E+01	3.70327E+05	1.20269E-04	2.71825E+00	9.83965E+03	3.16996E+02	4.33233E-02	5.35518E-01
MEDIAN		8.26755E-04	1.04606E+01	4.46531E+02	5.06697E-05	5.00000E-01	2.43531E+03	3.96603E+02	5.98563E-02	6.60803E-01
STD		4.75206E-04	1.18695E+01	4.85199E+05	1.72785E-04	6.04477E+00	1.75085E+04	2.61133E+02	3.89563E-02	2.63606E-01
IQR		1.00000E-03	2.42036E+01	9.99990E+05	3.47754E-06	1.65118E+00	5.89695E+02	5.39438E+02	6.62238E-02	4.55138E-01

Table S154 (continued)

Algorithm, metric	I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	Parameter R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
IJAYA									
MEAN	1.53256E-05	5.57217E+00	6.45141E+04	5.78551E-05	2.84898E+00	3.29560E+03	2.54323E+01	1.00624E-03	1.02239E-01
MEDIAN	1.19927E-05	5.55220E+00	5.46455E+03	5.71774E-05	2.84170E+00	3.28778E+03	1.58175E+01	1.00069E-03	9.99281E-02
STD	1.08122E-05	9.61495E-01	1.75253E+05	3.24031E-06	1.70219E-01	1.13570E+02	2.69828E+01	2.23760E-05	5.77843E-03
IQR	1.39318E-05	1.27108E+00	7.32249E+03	1.37186E-06	2.20054E-01	8.11578E+01	4.67049E+01	2.48365E-05	1.37587E-03
ISCA									
MEAN	1.88352E-04	1.02924E+01	5.06431E+04	1.51169E-04	7.41483E+00	1.25388E+04	5.27692E+01	1.03213E-02	9.01972E-01
MEDIAN	9.07772E-05	9.01795E+00	2.04181E+03	1.52257E-04	7.14392E+00	5.45077E+03	1.10823E+01	2.17614E-03	9.71728E-01
STD	2.59465E-04	6.07831E+00	1.49793E+05	1.04137E-04	4.94714E+00	1.27191E+04	9.37927E+01	1.70780E-02	3.59380E-01
IQR	2.09978E-04	1.01167E+01	1.25254E+04	1.60292E-04	8.67436E+00	1.91588E+04	5.99782E+01	1.11238E-02	5.64833E-01
NNA									
MEAN	8.20655E-05	1.46746E+01	2.39911E+04	2.05795E-04	1.19841E+01	5.04294E+03	8.92972E+01	1.94127E-02	5.96072E-01
MEDIAN	9.63328E-07	1.23790E+01	2.05760E+02	5.51447E-05	1.04436E+01	1.31096E+03	1.16984E+01	5.67027E-03	3.90102E-01
STD	1.58362E-04	9.20329E+00	9.42769E+04	4.20445E-04	9.72885E+00	1.16526E+04	1.57603E+02	2.55543E-02	4.30474E-01
IQR	6.82542E-05	1.60415E+01	7.11520E+02	2.19951E-04	1.54278E+01	2.16621E+03	1.03763E+02	2.87548E-02	6.38341E-01
CWOA									
MEAN	4.45003E-04	1.31055E+01	2.52782E+05	8.63963E-04	1.48260E+01	2.25333E+04	1.74406E+02	2.75758E-02	5.47280E-01
MEDIAN	5.34909E-05	1.05113E+01	7.43261E+02	1.77091E-04	1.26578E+01	9.92153E+03	1.46206E+01	7.43876E-03	5.61402E-01
STD	4.83552E-04	9.70182E+00	4.11586E+05	2.34060E-03	1.02865E+01	2.31948E+04	2.28218E+02	3.62627E-02	3.43019E-01
IQR	9.99961E-04	1.59179E+01	4.78801E+05	5.36351E-04	1.90108E+01	4.94168E+04	3.41167E+02	3.38596E-02	6.10151E-01
WW									
MEAN	2.37351E-04	1.10534E+01	4.47609E+04	1.77288E-04	7.87023E+00	1.66819E+04	1.10611E+02	2.44292E-02	8.00307E-01
MEDIAN	1.99805E-05	7.52472E+00	4.43570E+02	6.75913E-05	5.60803E+00	2.81063E+03	5.08511E+01	5.88068E-03	8.05164E-01
STD	3.53358E-04	8.94998E+00	1.95926E+05	2.50230E-04	7.65259E+00	2.11348E+04	1.52380E+02	2.93859E-02	3.39355E-01
IQR	3.83407E-04	1.19207E+01	1.79089E+03	1.94079E-04	1.09393E+01	4.81191E+04	1.45186E+02	4.89611E-02	5.48539E-01
T = 300 K									
true value	1.50000E-05	5.52105E+00	1.00000E+04	9.66582E-05	2.66667E+00	2.11460E+03	5.00000E+01	1.00000E-03	5.55000E+02
DE									
MEAN	3.51965E-05	5.50271E+00	2.99166E+04	1.53375E-04	3.42276E+00	6.24026E+03	9.19256E+01	1.27377E-03	3.23885E-01
MEDIAN	3.10794E-06	4.27872E+00	1.70806E+03	1.17255E-04	2.31232E+00	2.20501E+03	2.69548E+01	1.09209E-03	2.73994E-01
STD	9.18538E-05	4.00276E+00	8.48576E+04	7.64279E-05	2.61184E+00	8.85376E+03	1.23941E+02	9.61325E-04	1.87727E-01
IQR	2.23260E-05	4.14692E+00	4.98422E+03	1.15996E-04	4.64682E+00	3.55642E+03	1.26080E+02	1.64768E-04	2.86723E-01
EBLSHADE									

Table S154 (continued)

Algorithm,		Parameter								
metric		I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
MEAN		2.89803E-05	5.58048E+00	3.60037E+04	9.67198E-05	2.42509E+00	2.16960E+03	8.19111E+01	1.06391E-03	1.51261E-01
MEDIAN		1.50047E-05	5.52143E+00	1.00057E+04	9.66584E-05	2.66669E+00	2.11460E+03	4.99906E+01	9.99993E-04	9.95037E-02
STD		8.05950E-05	3.25435E+00	1.49287E+05	2.30722E-05	8.56891E-01	1.07032E+03	7.94635E+01	2.06469E-04	1.45148E-01
IQR		4.55628E-06	3.63684E-01	5.79534E+03	4.92001E-06	4.10559E-01	2.30690E+02	1.30276E+01	1.85992E-05	1.26108E-02
ADELI										
MEAN		1.50047E-05	5.52143E+00	1.00057E+04	9.66584E-05	2.66669E+00	2.11460E+03	4.99906E+01	9.99993E-04	9.95037E-02
MEDIAN		1.50047E-05	5.52143E+00	1.00057E+04	9.66584E-05	2.66669E+00	2.11460E+03	4.99906E+01	9.99993E-04	9.95037E-02
STD		3.96781E-14	3.12523E-09	4.23079E-05	3.25395E-15	4.15390E-10	1.83709E-12	8.87300E-08	5.32106E-14	1.40159E-17
IQR		6.50000E-14	5.00000E-09	6.00000E-05	0.00000E+00	0.00000E+00	0.00000E+00	1.35000E-07	9.99999E-14	0.00000E+00
NDE										
MEAN		4.82497E-05	6.59966E+00	4.46612E+04	1.47570E-04	4.58182E+00	6.25574E+03	8.39660E+01	2.54601E-03	3.48055E-01
MEDIAN		1.50047E-05	5.52143E+00	9.88441E+03	9.66584E-05	2.66669E+00	2.11460E+03	4.99907E+01	1.00148E-03	9.95052E-02
STD		1.30992E-04	5.27294E+00	1.84293E+05	1.33767E-04	4.80092E+00	1.07478E+04	9.34517E+01	3.89367E-03	4.56456E-01
IQR		8.76603E-06	3.54898E-01	6.23858E+03	1.32674E-06	2.86598E-01	8.04543E+00	1.25602E+01	6.81420E-04	4.22018E-01
MABC										
MEAN		6.94090E-05	8.71378E+00	1.84343E+03	1.44709E-04	2.46263E+00	5.11243E+03	1.84834E+02	8.41390E-03	6.14680E-01
MEDIAN		3.57725E-06	5.74748E+00	5.18707E+02	1.11707E-04	8.93544E-01	1.86541E+03	9.36889E+01	1.50237E-03	6.98864E-01
STD		1.50035E-04	6.92668E+00	4.64035E+03	1.00540E-04	3.26196E+00	8.10759E+03	1.82721E+02	1.61845E-02	2.76627E-01
IQR		6.92923E-05	8.77817E+00	1.04964E+03	6.81027E-05	2.67293E+00	1.68079E+03	3.20176E+02	3.24728E-03	3.73436E-01
TLBO										
MEAN		1.53432E-05	5.54448E+00	2.14158E+04	9.66637E-05	2.66825E+00	2.11506E+03	4.93823E+01	9.99700E-04	9.95042E-02
MEDIAN		1.50047E-05	5.52143E+00	1.00057E+04	9.66584E-05	2.66669E+00	2.11460E+03	4.99906E+01	9.99993E-04	9.95037E-02
STD		1.86055E-06	1.26401E-01	7.99545E+04	3.13636E-08	8.70698E-03	2.57147E+00	3.34853E+00	1.59853E-06	2.66395E-06
IQR		6.50000E-14	5.50000E-09	7.00000E-05	0.00000E+00	1.00000E-09	0.00000E+00	1.55000E-07	9.99999E-14	0.00000E+00
GOTLBO										
MEAN		2.03177E-04	1.12720E+01	3.11353E+04	2.20241E-04	5.42039E+00	9.19891E+03	1.62162E+02	1.67984E-02	8.09807E-01
MEDIAN		8.74259E-05	1.09652E+01	5.27834E+02	2.15163E-04	3.17672E+00	4.08508E+03	5.68037E+01	2.44336E-03	8.48772E-01
STD		2.83682E-04	6.76314E+00	1.02605E+05	1.50741E-04	5.71032E+00	1.26659E+04	1.93759E+02	2.67072E-02	2.25369E-01
IQR		2.64320E-04	9.80581E+00	4.18183E+03	1.92999E-04	8.66259E+00	7.68620E+03	2.88298E+02	1.39422E-02	1.97709E-01
STLBO										
MEAN		1.50047E-05	5.52143E+00	1.00057E+04	9.66584E-05	2.66669E+00	2.11460E+03	4.99906E+01	9.99993E-04	9.95037E-02
MEDIAN		1.50047E-05	5.52143E+00	1.00057E+04	9.66584E-05	2.66669E+00	2.11460E+03	4.99906E+01	9.99993E-04	9.95037E-02
STD		3.80041E-14	3.01967E-09	3.80351E-05	5.27666E-15	5.01762E-10	1.83709E-12	9.57435E-08	5.02542E-14	1.40159E-17

Table S154 (continued)

Algorithm, metric	Parameter								
	I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
IQR	5.00000E-14	4.00000E-09	5.00000E-05	0.00000E+00	1.00000E-09	0.00000E+00	1.40000E-07	9.99999E-14	0.00000E+00
PSO									
MEAN	4.99841E-04	1.65583E+01	5.86175E+05	1.33541E-04	3.66979E+00	1.00155E+04	2.63100E+02	3.70550E-02	6.66922E-01
MEDIAN	3.46468E-04	1.04476E+01	1.00000E+06	1.09294E-04	5.00000E-01	1.53484E+03	1.10413E+02	1.50444E-03	8.08031E-01
STD	4.85677E-04	1.28935E+01	4.94943E+05	1.33073E-04	8.00745E+00	1.86978E+04	2.55971E+02	4.24542E-02	2.29116E-01
IQR	1.00000E-03	2.57803E+01	9.99581E+05	2.45142E-05	1.96857E+00	2.79560E+02	5.37096E+02	7.10609E-02	2.75491E-01
IJAYA									
MEAN	1.39583E-05	5.16215E+00	3.40167E+04	9.90186E-05	2.82302E+00	2.17471E+03	4.11632E+01	1.02105E-03	1.07285E-01
MEDIAN	9.64908E-06	5.07492E+00	5.00575E+03	9.86551E-05	2.85924E+00	2.16722E+03	2.82659E+01	1.01070E-03	1.00395E-01
STD	1.09228E-05	1.12643E+00	1.02314E+05	1.22530E-05	4.63833E-01	1.69646E+02	4.28823E+01	3.55346E-05	3.84984E-02
IQR	1.75392E-05	1.67109E+00	1.60320E+04	3.63271E-06	3.50526E-01	9.28388E+01	5.43289E+01	3.53854E-05	3.02838E-03
ISCA									
MEAN	2.68071E-04	8.26372E+00	1.05802E+05	2.98667E-04	9.83589E+00	1.19223E+04	8.74530E+01	1.63487E-02	8.78696E-01
MEDIAN	1.26977E-04	6.57343E+00	7.89350E+03	2.72764E-04	8.46807E+00	4.29228E+03	1.66668E+01	2.28548E-03	9.12351E-01
STD	3.00015E-04	4.87900E+00	2.28831E+05	2.21605E-04	7.24243E+00	1.38656E+04	1.37925E+02	2.52095E-02	2.94374E-01
IQR	5.20150E-04	6.25902E+00	1.00183E+05	3.56002E-04	1.09203E+01	1.64469E+04	9.09044E+01	1.40251E-02	3.10670E-01
NNA									
MEAN	7.29041E-05	1.03187E+01	5.23172E+04	2.47645E-04	1.36773E+01	5.69996E+03	8.82562E+01	1.95798E-02	7.48232E-01
MEDIAN	5.69582E-07	6.86258E+00	3.42842E+02	7.70737E-05	1.18282E+01	9.76485E+02	1.34118E+01	9.03104E-03	7.48111E-01
STD	2.01509E-04	8.74179E+00	1.68414E+05	4.06486E-04	9.47471E+00	1.18583E+04	1.46120E+02	2.25199E-02	3.21327E-01
IQR	7.21391E-06	1.30264E+01	2.28832E+03	3.11029E-04	1.43017E+01	2.82092E+03	9.48686E+01	2.68469E-02	6.18640E-01
CWOA									
MEAN	2.90205E-04	1.41316E+01	1.35669E+05	7.80121E-04	1.37397E+01	1.92959E+04	1.81484E+02	2.36425E-02	6.60415E-01
MEDIAN	2.29921E-06	1.22522E+01	5.67376E+02	2.73938E-04	1.30797E+01	3.57410E+03	2.24290E+01	4.45749E-03	7.43557E-01
STD	4.29717E-04	1.07750E+01	2.92205E+05	1.96319E-03	9.94002E+00	2.30073E+04	2.37135E+02	3.34828E-02	2.92262E-01
IQR	7.75671E-04	2.25030E+01	7.84951E+04	6.06509E-04	1.95166E+01	4.96717E+04	3.90461E+02	3.08310E-02	4.81705E-01
WW									
MEAN	2.51084E-04	1.31224E+01	1.01786E+05	3.12718E-04	1.02195E+01	1.81410E+04	1.04869E+02	1.87520E-02	8.27972E-01
MEDIAN	1.65052E-05	1.10316E+01	1.68236E+02	2.79606E-04	8.37853E+00	2.85763E+03	1.91177E+01	5.50126E-03	8.61913E-01
STD	3.51687E-04	9.35477E+00	2.81086E+05	2.51901E-04	8.42864E+00	2.16979E+04	1.68479E+02	2.62596E-02	2.42413E-01
IQR	4.60577E-04	1.61504E+01	5.09554E+03	3.74895E-04	1.34022E+01	4.86799E+04	1.15701E+02	2.44940E-02	2.70548E-01
T = 310 K									
true value	1.50000E-05	5.34295E+00	1.00000E+04	1.59152E-04	2.61290E+00	1.41896E+03	6.00000E+01	1.01000E-03	5.55000E+02

Table S154 (continued)

Algorithm, metric	I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	Parameter			I_{ph} (A)	RMSPE
						R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)		
DE										
MEAN	5.27913E-05	5.83741E+00	1.08362E+04	2.97902E-04	4.24758E+00	1.14657E+04	8.02052E+01	1.17553E-03	4.17188E-01	
MEDIAN	5.92881E-06	4.57997E+00	2.53709E+03	3.09783E-04	4.52646E+00	3.21489E+03	3.66747E+01	1.13575E-03	4.03099E-01	
STD	1.46997E-04	3.93926E+00	2.64949E+04	1.21598E-04	2.45028E+00	1.66551E+04	9.46525E+01	1.63952E-04	2.10138E-01	
IQR	3.59199E-05	3.71012E+00	5.06135E+03	2.14065E-04	3.92978E+00	9.16739E+03	1.14195E+02	1.80142E-04	3.29481E-01	
EBSHADE										
MEAN	2.03670E-05	4.78862E+00	5.79370E+03	1.87413E-04	2.54298E+00	3.70210E+03	1.17724E+02	1.21428E-03	1.94172E-01	
MEDIAN	9.67504E-06	4.87001E+00	3.29031E+03	1.59151E-04	2.59268E+00	1.41864E+03	7.68485E+01	1.03836E-03	1.03575E-01	
STD	4.21304E-05	2.60373E+00	5.98290E+03	8.13721E-05	1.48032E+00	8.53903E+03	9.62114E+01	8.94416E-04	1.90825E-01	
IQR	1.47762E-05	2.51336E+00	8.27975E+03	2.33299E-05	1.18970E+00	2.20816E+02	9.47566E+01	1.17037E-04	1.05460E-01	
ADELI										
MEAN	1.50078E-05	5.34355E+00	1.00089E+04	1.59151E-04	2.61295E+00	1.41897E+03	5.99840E+01	1.00999E-03	9.95037E-02	
MEDIAN	1.50078E-05	5.34355E+00	1.00089E+04	1.59151E-04	2.61295E+00	1.41897E+03	5.99840E+01	1.00999E-03	9.95037E-02	
STD	2.18820E-14	1.64496E-09	2.04786E-05	0.00000E+00	4.76095E-10	4.59272E-13	6.10734E-08	8.75992E-19	1.40159E-17	
IQR	3.00000E-14	2.00000E-09	3.00000E-05	0.00000E+00	1.00000E-09	0.00000E+00	9.00000E-08	0.00000E+00	0.00000E+00	
NDE										
MEAN	5.03624E-05	6.97618E+00	4.98906E+04	2.36249E-04	4.72704E+00	3.49302E+03	1.04350E+02	4.71088E-03	3.21355E-01	
MEDIAN	1.50078E-05	5.34355E+00	6.77703E+03	1.59151E-04	2.61295E+00	1.41837E+03	5.99865E+01	1.01904E-03	9.95390E-02	
STD	1.46708E-04	5.28828E+00	1.94859E+05	2.56322E-04	5.52670E+00	8.78848E+03	9.93430E+01	1.01918E-02	3.58313E-01	
IQR	8.95872E-06	1.69619E+00	7.28780E+03	1.22426E-06	3.05234E-01	6.68075E+01	5.56161E+01	1.02304E-04	4.31138E-01	
MABC										
MEAN	5.44973E-05	7.78116E+00	3.55852E+03	2.38094E-04	2.67344E+00	3.25170E+03	1.57267E+02	5.89561E-03	6.36940E-01	
MEDIAN	1.76571E-06	4.58855E+00	6.35767E+02	1.95533E-04	7.67802E-01	1.11911E+03	9.53646E+01	1.30397E-03	6.69238E-01	
STD	1.25503E-04	7.57886E+00	1.57680E+04	1.38735E-04	3.14519E+00	5.76172E+03	1.58093E+02	1.85983E-02	3.37739E-01	
IQR	3.32981E-05	7.30264E+00	1.12514E+03	1.43949E-04	3.54424E+00	1.17214E+03	2.42287E+02	9.32032E-04	7.07899E-01	
TLBO										
MEAN	1.56416E-05	5.38308E+00	2.86965E+04	1.59244E-04	2.62248E+00	1.42101E+03	5.84375E+01	1.00961E-03	9.95057E-02	
MEDIAN	1.50078E-05	5.34355E+00	1.00089E+04	1.59151E-04	2.61295E+00	1.41897E+03	5.99840E+01	1.00999E-03	9.95037E-02	
STD	3.34333E-06	2.06338E-01	1.25351E+05	6.16257E-07	5.73996E-02	1.22468E+01	8.56092E+00	1.89663E-06	1.07609E-05	
IQR	4.00000E-14	3.00000E-09	3.00000E-05	0.00000E+00	1.00000E-09	0.00000E+00	8.00000E-08	0.00000E+00	0.00000E+00	
GOTLBO										
MEAN	1.27436E-04	1.07688E+01	4.32346E+04	4.76334E-04	1.03070E+01	5.24197E+03	8.92025E+01	1.16586E-02	7.65122E-01	
MEDIAN	2.25272E-06	8.84283E+00	6.69111E+02	3.91107E-04	9.52303E+00	1.93955E+03	1.45832E+01	1.87400E-03	8.73647E-01	

Table S154 (continued)

Algorithm,		Parameter								
metric		I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
STD		2.48715E-04	8.37863E+00	1.69878E+05	2.86765E-04	7.88097E+00	6.54736E+03	1.40132E+02	2.46066E-02	3.38118E-01
IQR		1.19829E-04	1.20362E+01	2.05705E+03	3.96603E-04	1.10699E+01	6.20911E+03	1.16335E+02	3.99547E-03	5.43553E-01
STLBO										
MEAN		1.50078E-05	5.34355E+00	1.00089E+04	1.59151E-04	2.61295E+00	1.41897E+03	5.99840E+01	1.00999E-03	9.95037E-02
MEDIAN		1.50078E-05	5.34355E+00	1.00089E+04	1.59151E-04	2.61295E+00	1.41897E+03	5.99840E+01	1.00999E-03	9.95037E-02
STD		3.22466E-14	2.57925E-09	2.97295E-05	0.00000E+00	6.00653E-10	3.00327E-07	9.20937E-08	8.75992E-19	1.40159E-17
IQR		4.00000E-14	3.00000E-09	4.00000E-05	0.00000E+00	1.00000E-09	0.00000E+00	1.15000E-07	0.00000E+00	0.00000E+00
PSO										
MEAN		3.58817E-04	1.30453E+01	4.69617E+05	4.51996E-04	6.61931E+00	5.84557E+03	2.97136E+02	4.17000E-02	6.90010E-01
MEDIAN		4.39423E-05	6.48566E+00	1.48109E+03	2.16223E-04	5.00000E-01	1.00695E+03	4.82017E+02	3.19353E-02	7.09783E-01
STD		4.50034E-04	1.19260E+01	4.99383E+05	1.39382E-03	1.11489E+01	1.47241E+04	2.61643E+02	4.06614E-02	3.52375E-01
IQR		1.00000E-03	2.58827E+01	9.99990E+05	7.59159E-05	5.24631E+00	4.28276E+02	5.26325E+02	6.49896E-02	7.72248E-01
IJAYA										
MEAN		1.72494E-05	5.15134E+00	5.28239E+04	1.76356E-04	3.13596E+00	1.60237E+03	3.65969E+01	1.03768E-03	1.15207E-01
MEDIAN		1.24809E-05	5.11996E+00	5.11879E+03	1.67617E-04	3.15428E+00	1.53277E+03	9.21597E+00	1.01903E-03	1.01439E-01
STD		1.99954E-05	1.46947E+00	1.58179E+05	3.23727E-05	8.90283E-01	3.22490E+02	6.22089E+01	7.01828E-05	5.84609E-02
IQR		1.94096E-05	1.79802E+00	9.23729E+03	1.87428E-05	5.93770E-01	1.77576E+02	3.57547E+01	3.49426E-05	5.82171E-03
ISCA										
MEAN		2.24319E-04	1.06260E+01	7.24301E+04	7.45896E-04	1.61161E+01	6.79780E+03	7.35759E+01	8.06081E-03	9.53550E-01
MEDIAN		1.44675E-04	8.77503E+00	3.99817E+03	5.45807E-04	1.61995E+01	2.07570E+03	1.29011E+01	2.15152E-03	9.80318E-01
STD		2.46235E-04	6.61245E+00	1.85597E+05	5.42216E-04	8.76032E+00	1.06816E+04	9.79728E+01	1.59653E-02	2.47794E-01
IQR		3.20991E-04	9.05965E+00	3.63221E+04	7.41526E-04	1.51740E+01	4.33502E+03	1.49216E+02	2.13848E-03	2.71945E-01
NNA										
MEAN		3.53673E-05	1.14526E+01	4.67456E+04	2.48647E-04	1.62427E+01	3.65305E+03	8.87110E+01	1.53823E-02	8.63015E-01
MEDIAN		2.63231E-07	8.97624E+00	3.43780E+02	1.01777E-05	1.46241E+01	5.46250E+02	4.19670E+00	3.84468E-03	7.07078E-01
STD		9.43393E-05	9.00525E+00	1.44633E+05	3.57340E-04	8.88477E+00	8.28385E+03	1.50249E+02	2.12076E-02	2.76059E-01
IQR		7.00772E-06	1.66556E+01	2.66049E+03	3.98779E-04	1.60798E+01	1.45594E+03	1.18683E+02	1.67959E-02	3.64503E-01
CWOA										
MEAN		4.42549E-04	1.23600E+01	1.60225E+05	1.29127E-03	1.48703E+01	1.63984E+04	2.39430E+02	3.45453E-02	8.23218E-01
MEDIAN		5.71073E-05	8.00318E+00	5.11507E+02	4.00117E-04	1.27622E+01	1.02316E+03	1.50944E+02	1.24945E-02	7.45968E-01
STD		4.85517E-04	9.95508E+00	3.36239E+05	2.45881E-03	1.15410E+01	2.22917E+04	2.25625E+02	3.83360E-02	2.24000E-01
IQR		9.99995E-04	1.23539E+01	3.88232E+04	1.27213E-03	2.44326E+01	4.97047E+04	4.73841E+02	6.15521E-02	2.83878E-01
WW										

Table S154 (continued)

Algorithm,		Parameter								
metric		I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
MEAN		3.04057E-04	1.61944E+01	5.14322E+04	1.09441E-03	1.49717E+01	2.38136E+04	1.32634E+02	1.65234E-02	8.98584E-01
MEDIAN		5.43077E-05	1.38977E+01	3.52454E+02	7.85762E-04	1.34910E+01	5.76096E+03	2.62317E+01	3.69576E-03	8.90367E-01
STD		3.82272E-04	9.56841E+00	1.99483E+05	1.18760E-03	9.78946E+00	2.39948E+04	1.80861E+02	2.29666E-02	1.71250E-01
IQR		6.59899E-04	1.71357E+01	2.73118E+03	1.03855E-03	1.85467E+01	4.91248E+04	2.37493E+02	2.52921E-02	2.73300E-01
T = 320 K										
true value		1.50000E-05	5.17598E+00	1.00000E+04	2.54008E-04	2.56250E+00	9.76205E+02	7.00000E+01	1.02000E-03	5.55000E+02
DE										
MEAN		7.26330E-05	6.85495E+00	9.71347E+03	5.11873E-04	6.80687E+00	7.12817E+03	7.77148E+01	1.25039E-03	5.51930E-01
MEDIAN		9.30567E-06	5.37535E+00	2.34236E+03	3.87326E-04	4.22513E+00	9.36575E+02	2.32693E+01	1.17770E-03	5.19937E-01
STD		1.41165E-04	5.09206E+00	2.98843E+04	4.40747E-04	7.98824E+00	1.31061E+04	9.92735E+01	2.95753E-04	2.79318E-01
IQR		9.23265E-05	8.22767E+00	4.53959E+03	4.05243E-04	5.71293E+00	4.23276E+03	1.18074E+02	1.76734E-04	4.25355E-01
EBSHADE										
MEAN		1.71503E-05	5.83730E+00	9.28327E+03	2.85733E-04	4.98708E+00	2.72951E+03	1.01506E+02	1.30518E-03	2.45268E-01
MEDIAN		5.31441E-06	4.74271E+00	5.98265E+03	2.53282E-04	2.56252E+00	9.64449E+02	6.99971E+01	1.04226E-03	1.05279E-01
STD		3.45535E-05	6.33275E+00	1.42950E+04	1.86435E-04	7.07115E+00	8.27988E+03	9.65207E+01	1.30672E-03	2.72333E-01
IQR		1.48147E-05	2.70705E+00	8.15662E+03	1.00118E-04	2.76648E+00	4.62456E+02	1.21334E+02	9.29293E-05	1.19986E-01
ADELI										
MEAN		1.48621E-05	5.61478E+00	2.25242E+04	2.51868E-04	3.07064E+00	9.56061E+02	7.47471E+01	1.02337E-03	1.17985E-01
MEDIAN		1.50011E-05	5.17607E+00	1.00009E+04	2.54009E-04	2.56252E+00	9.76210E+02	6.99971E+01	1.02000E-03	9.95037E-02
STD		4.41223E-06	3.52838E+00	8.99649E+04	4.07513E-05	3.84228E+00	1.37779E+02	5.04158E+01	2.90272E-05	1.27118E-01
IQR		3.00000E-14	3.00000E-09	3.00000E-05	1.00000E-13	1.00000E-09	1.00000E-07	1.05000E-07	0.00000E+00	0.00000E+00
NDE										
MEAN		4.13673E-05	1.07901E+01	6.78533E+04	2.04782E-04	9.69368E+00	1.17286E+03	6.22102E+01	3.46622E-03	4.73581E-01
MEDIAN		4.58545E-06	5.31060E+00	3.67429E+03	2.48647E-04	2.74733E+00	8.76418E+02	4.95192E+01	1.06238E-03	1.06973E-01
STD		1.60569E-04	1.02441E+01	2.26567E+05	2.68835E-04	9.99184E+00	3.05491E+03	6.52108E+01	9.22788E-03	4.41768E-01
IQR		1.67557E-05	1.13360E+01	9.91554E+03	2.54257E-04	1.68951E+01	7.37479E+02	9.97529E+01	4.05764E-04	9.07812E-01
MABC										
MEAN		9.68675E-05	1.23065E+01	5.44548E+04	2.34224E-04	9.28653E+00	1.45762E+03	1.01078E+02	2.26295E-03	6.93816E-01
MEDIAN		6.95611E-06	8.90569E+00	1.30332E+03	1.19179E-06	5.63072E+00	3.49592E+02	4.22161E+01	1.30592E-03	8.31866E-01
STD		2.07006E-04	9.80658E+00	1.89291E+05	4.77514E-04	8.76429E+00	6.96057E+03	1.36443E+02	2.65048E-03	3.58807E-01
IQR		9.95496E-05	1.38549E+01	5.93767E+03	2.43577E-04	1.36571E+01	4.60622E+02	1.30006E+02	1.01208E-03	7.77650E-01
TLBO										
MEAN		1.39576E-05	5.64122E+00	1.11698E+04	2.38568E-04	3.36379E+00	9.32734E+02	7.13598E+01	1.21300E-03	1.52502E-01

Table S154 (continued)

Algorithm,		Parameter								
metric		I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
MEDIAN		1.50011E-05	5.17607E+00	1.00009E+04	2.54009E-04	2.56252E+00	9.76210E+02	6.99971E+01	1.02000E-03	9.95037E-02
STD		4.61632E-06	2.97800E+00	1.43867E+04	6.03222E-05	4.02652E+00	1.53019E+02	3.71213E+01	8.92368E-04	2.13885E-01
IQR		5.00000E-14	3.00000E-09	5.00000E-05	1.00000E-13	1.00000E-09	3.00000E-07	1.60000E-07	0.00000E+00	0.00000E+00
GOTLBO										
MEAN		1.33014E-04	1.11720E+01	9.61439E+04	4.86648E-04	1.13031E+01	2.34334E+03	7.61548E+01	1.97709E-03	7.31274E-01
MEDIAN		1.43191E-05	8.41820E+00	5.69572E+03	1.00515E-05	7.80442E+00	4.17426E+02	5.16922E+00	1.37460E-03	8.05013E-01
STD		2.04914E-04	8.48535E+00	1.99332E+05	1.43244E-03	8.32415E+00	5.50450E+03	1.30764E+02	1.41306E-03	3.09462E-01
IQR		2.26827E-04	1.17431E+01	7.07113E+04	5.69483E-04	1.39522E+01	5.75727E+02	6.56241E+01	8.65017E-04	4.17941E-01
STLBO										
MEAN		1.47069E-05	5.66281E+00	9.81358E+03	2.49028E-04	3.10051E+00	9.58697E+02	6.90416E+01	1.02752E-03	1.17304E-01
MEDIAN		1.50011E-05	5.17607E+00	1.00009E+04	2.54009E-04	2.56252E+00	9.76210E+02	6.99971E+01	1.02000E-03	9.95037E-02
STD		2.10056E-06	3.47605E+00	1.33786E+03	3.55683E-05	3.84200E+00	1.25065E+02	6.82386E+00	5.37231E-05	1.27123E-01
IQR		5.00000E-14	4.00000E-09	4.00000E-05	1.00000E-13	1.00000E-09	2.00000E-07	1.65000E-07	0.00000E+00	0.00000E+00
PSO										
MEAN		4.28573E-04	1.30514E+01	4.71916E+05	9.60042E-04	1.61376E+01	7.21107E+03	1.66622E+02	3.06821E-02	6.92880E-01
MEDIAN		7.20290E-05	6.97497E+00	1.15796E+04	1.01463E-10	1.89715E+01	5.47520E+02	1.00000E-01	1.19046E-03	9.26404E-01
STD		4.75991E-04	1.18202E+01	5.02611E+05	2.69650E-03	1.43659E+01	1.72395E+04	2.31369E+02	4.12168E-02	4.05119E-01
IQR		1.00000E-03	2.70695E+01	9.99990E+05	2.78904E-04	2.95000E+01	7.48530E+02	4.52731E+02	6.71751E-02	8.68329E-01
IJAYA										
MEAN		3.91128E-05	5.61085E+00	4.68665E+04	3.90409E-04	6.29427E+00	2.01458E+03	3.98225E+01	1.13848E-03	3.18674E-01
MEDIAN		4.47984E-06	4.22549E+00	3.88912E+03	3.32444E-04	4.72130E+00	1.13989E+03	1.23042E+01	1.05966E-03	1.88337E-01
STD		8.74753E-05	4.06095E+00	1.49984E+05	2.47406E-04	5.68530E+00	2.38276E+03	7.24754E+01	2.18656E-04	2.86962E-01
IQR		2.04562E-05	3.30507E+00	1.76595E+04	3.35026E-04	4.20486E+00	1.21482E+03	3.93728E+01	1.36508E-04	2.40580E-01
ISCA										
MEAN		2.40725E-04	1.14031E+01	1.01573E+05	8.05252E-04	1.28256E+01	2.55507E+03	6.48675E+01	4.68183E-03	8.40888E-01
MEDIAN		4.92732E-05	8.72217E+00	4.41892E+03	2.25511E-04	1.24327E+01	4.97558E+02	6.77838E+00	1.53815E-03	8.39373E-01
STD		3.21900E-04	7.43918E+00	2.01809E+05	1.61867E-03	7.66339E+00	7.86467E+03	1.03697E+02	1.05459E-02	2.42200E-01
IQR		3.80371E-04	1.09995E+01	9.82014E+04	9.42977E-04	1.23849E+01	9.51094E+02	8.07893E+01	1.00389E-03	2.70310E-01
NNA										
MEAN		6.69980E-05	1.57615E+01	3.49472E+04	4.15971E-04	1.82391E+01	9.56393E+02	7.28741E+01	6.16946E-03	9.84641E-01
MEDIAN		2.29885E-07	1.51050E+01	3.17890E+02	1.86967E-07	1.90479E+01	3.31800E+02	1.09340E+01	2.45555E-03	1.00726E+00
STD		1.38456E-04	8.78396E+00	1.20768E+05	1.10718E-03	8.39411E+00	3.22574E+03	1.15489E+02	7.97423E-03	1.49736E-01
IQR		6.39691E-05	1.52349E+01	7.94627E+02	7.53367E-05	1.28133E+01	3.08576E+02	8.80296E+01	5.50315E-03	1.01562E-02

Table S154 (continued)

Algorithm, metric	I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	Parameter R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
CWOA									
MEAN	2.85745E-04	1.19415E+01	2.36128E+05	1.70647E-03	1.61498E+01	4.55409E+03	1.67886E+02	1.63148E-02	8.05619E-01
MEDIAN	2.10437E-07	7.25140E+00	3.33189E+03	7.36514E-09	1.63437E+01	4.57514E+02	3.94865E+01	3.86311E-03	1.00102E+00
STD	4.25718E-04	1.04561E+01	4.08767E+05	3.63302E-03	1.07295E+01	1.30381E+04	2.04233E+02	2.52596E-02	3.83244E-01
IQR	6.98652E-04	1.72536E+01	1.38863E+05	3.24691E-04	1.93018E+01	4.59135E+02	3.38072E+02	1.85643E-02	2.98172E-01
WW									
MEAN	3.31199E-04	1.20148E+01	1.09691E+05	9.46532E-04	1.88406E+01	1.13513E+04	1.65089E+02	7.69268E-03	8.85889E-01
MEDIAN	7.55199E-05	8.16182E+00	5.92042E+03	1.03281E-04	1.76841E+01	4.54399E+02	3.17310E+01	1.99298E-03	9.38947E-01
STD	4.04170E-04	9.61501E+00	2.70733E+05	1.96931E-03	1.07836E+01	2.05170E+04	2.01020E+02	1.60335E-02	1.95426E-01
IQR	7.43216E-04	1.88668E+01	5.37071E+04	9.34889E-04	2.16190E+01	3.18900E+03	3.04741E+02	5.46747E-03	2.07929E-01
T = 330 K									
true value	1.50000E-05	5.01914E+00	1.00000E+04	3.94074E-04	2.51515E+00	6.86999E+02	8.00000E+01	1.03000E-03	5.55000E+02
DE									
MEAN	1.45306E-05	3.89436E+00	2.47670E+04	5.78041E-04	5.44376E+00	4.27040E+03	6.52316E+01	1.10383E-03	2.22987E-01
MEDIAN	1.73918E-06	3.39358E+00	2.56468E+03	4.54094E-04	4.29295E+00	7.60487E+02	4.38098E+01	1.08083E-03	1.82846E-01
STD	4.59785E-05	2.23582E+00	8.59814E+04	3.89995E-04	4.19410E+00	8.03184E+03	6.86059E+01	7.72389E-05	1.14500E-01
IQR	1.43496E-05	2.83764E+00	3.01045E+03	6.55659E-04	5.61193E+00	2.83648E+03	9.94062E+01	9.05259E-05	1.56753E-01
EBSHADE									
MEAN	1.75078E-05	4.96861E+00	4.17918E+04	3.86868E-04	2.48324E+00	9.25031E+02	8.41984E+01	1.03766E-03	1.07256E-01
MEDIAN	1.49977E-05	5.01897E+00	9.99808E+03	3.94074E-04	2.51510E+00	6.86993E+02	8.00063E+01	1.03000E-03	9.95440E-02
STD	1.49573E-05	1.04815E+00	1.59351E+05	1.19518E-04	1.42077E+00	1.93935E+03	5.14499E+01	2.22986E-05	1.68043E-02
IQR	7.59136E-06	6.29958E-01	5.22619E+03	4.44594E-05	7.97547E-01	1.44843E+02	1.87124E+01	7.79881E-06	5.89057E-03
ADELI									
MEAN	1.49977E-05	5.01897E+00	9.99808E+03	3.94074E-04	2.51510E+00	6.86993E+02	8.00063E+01	1.03000E-03	9.95037E-02
MEDIAN	1.49977E-05	5.01897E+00	9.99808E+03	3.94074E-04	2.51510E+00	6.86993E+02	8.00063E+01	1.03000E-03	9.95037E-02
STD	2.58472E-14	1.79433E-09	2.14585E-05	5.01762E-14	1.22266E-09	1.68616E-07	8.63717E-08	8.75992E-19	4.20476E-17
IQR	4.50000E-14	3.00000E-09	3.40000E-05	1.00000E-13	2.00000E-09	2.50000E-07	1.35000E-07	0.00000E+00	0.00000E+00
NDE									
MEAN	6.11227E-05	5.76490E+00	1.42779E+04	3.85317E-04	6.79009E+00	5.42006E+02	1.06737E+02	1.35544E-03	4.04987E-01
MEDIAN	1.50078E-05	5.01917E+00	9.99808E+03	3.94074E-04	2.63162E+00	6.86981E+02	8.00063E+01	1.03000E-03	9.95166E-02
STD	1.85101E-04	3.64751E+00	1.70935E+04	4.45975E-04	8.48920E+00	2.64055E+02	7.60261E+01	7.79399E-04	4.47829E-01
IQR	1.10713E-05	8.15665E-01	8.37131E+03	9.34878E-05	1.51087E+00	3.87830E+02	3.92110E+01	2.92655E-04	7.97824E-01
MABC									

Table S154 (continued)

Algorithm,		Parameter								
metric		I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
MEAN		5.39823E-05	5.67309E+00	2.17155E+04	7.60613E-04	5.39419E+00	3.76996E+03	9.74361E+01	1.15927E-03	3.77969E-01
MEDIAN		1.73048E-06	3.38347E+00	1.97362E+03	3.78054E-04	1.49757E+00	4.52821E+02	6.05965E+01	1.12335E-03	1.90273E-01
STD		1.01742E-04	4.61636E+00	5.53297E+04	1.02115E-03	7.17947E+00	1.03683E+04	1.04887E+02	1.42125E-04	3.37441E-01
IQR		6.00519E-05	6.12117E+00	5.11232E+03	6.35138E-04	7.10702E+00	3.85734E+02	1.20090E+02	1.54021E-04	4.74666E-01
TLBO										
MEAN		1.62028E-05	5.08992E+00	6.21055E+04	3.95709E-04	2.56797E+00	6.94133E+02	7.65114E+01	1.02926E-03	9.95078E-02
MEDIAN		1.49977E-05	5.01897E+00	9.99808E+03	3.94074E-04	2.51510E+00	6.86993E+02	8.00063E+01	1.03000E-03	9.95037E-02
STD		4.33790E-06	2.53111E-01	2.09274E+05	8.23971E-06	2.29696E-01	3.14381E+01	1.34179E+01	2.58832E-06	1.53698E-05
IQR		3.00000E-14	2.00000E-09	2.45000E-05	1.00000E-13	2.00000E-09	3.00000E-07	1.25000E-07	0.00000E+00	0.00000E+00
GOTLBO										
MEAN		9.37257E-05	7.10471E+00	6.70223E+04	5.29326E-04	1.07708E+01	3.56947E+03	4.72598E+01	1.15025E-03	4.60479E-01
MEDIAN		2.04085E-05	6.15577E+00	5.91727E+03	6.32428E-05	6.99296E+00	3.81620E+02	8.22560E+00	1.12897E-03	4.61259E-01
STD		1.76969E-04	5.58795E+00	1.69100E+05	8.20384E-04	9.11626E+00	8.85932E+03	7.57204E+01	1.35393E-04	2.91012E-01
IQR		1.08575E-04	6.47745E+00	3.28656E+04	7.59814E-04	1.40217E+01	5.37263E+02	5.89234E+01	1.67432E-04	5.24704E-01
STLBO										
MEAN		1.49977E-05	5.01897E+00	9.99808E+03	3.94074E-04	2.51510E+00	6.86993E+02	8.00063E+01	1.03000E-03	9.95037E-02
MEDIAN		1.49977E-05	5.01897E+00	9.99808E+03	3.94074E-04	2.51510E+00	6.86993E+02	8.00063E+01	1.03000E-03	9.95037E-02
STD		2.26499E-14	1.70052E-09	1.95374E-05	5.40152E-14	1.05867E-09	1.62432E-07	7.70108E-08	8.75992E-19	4.20476E-17
IQR		3.50000E-14	2.00000E-09	2.90000E-05	1.00000E-13	1.50000E-09	3.00000E-07	1.00000E-07	0.00000E+00	0.00000E+00
PSO										
MEAN		4.60127E-04	1.70258E+01	5.69538E+05	1.51389E-03	1.51710E+01	1.00330E+04	9.78458E+01	1.05787E-02	6.21580E-01
MEDIAN		3.85429E-05	2.73182E+01	1.00000E+06	5.04845E-04	8.31005E+00	4.55418E+02	1.00000E-01	1.12840E-03	8.35733E-01
STD		4.95539E-04	1.31314E+01	4.99142E+05	2.97363E-03	1.43395E+01	1.99360E+04	1.64276E+02	2.22018E-02	4.47494E-01
IQR		1.00000E-03	2.71327E+01	9.97390E+05	8.84969E-04	2.95000E+01	5.25256E+02	9.00247E+01	1.25410E-04	7.55484E-01
IJAYA										
MEAN		1.38133E-05	4.48901E+00	5.04708E+04	5.76225E-04	5.16229E+00	2.29083E+03	3.79302E+01	1.05043E-03	1.07312E-01
MEDIAN		9.12089E-06	4.51095E+00	4.70321E+03	4.99642E-04	4.81956E+00	9.89840E+02	5.08097E+00	1.03456E-03	1.02820E-01
STD		1.32242E-05	1.29283E+00	1.35368E+05	2.06684E-04	2.56985E+00	5.49333E+03	5.92073E+01	3.46902E-05	1.19947E-02
IQR		2.86775E-05	2.64207E+00	4.06013E+04	2.28061E-04	2.56737E+00	8.19351E+02	4.41926E+01	5.33229E-05	8.22927E-03
ISCA										
MEAN		2.26209E-04	1.14464E+01	5.94864E+04	1.38330E-03	1.33611E+01	1.69970E+03	5.82906E+01	1.22280E-03	6.39507E-01
MEDIAN		1.13127E-04	9.35167E+00	8.68900E+03	3.61387E-04	1.35306E+01	2.64162E+02	5.04152E+00	1.20421E-03	6.14736E-01
STD		2.43224E-04	6.56184E+00	1.36856E+05	2.32389E-03	8.45890E+00	4.50884E+03	8.83865E+01	1.23423E-04	2.76647E-01

Table S154 (continued)

Algorithm, metric	Parameter								
	I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
IQR	3.68853E-04	1.25112E+01	5.22940E+04	1.40752E-03	1.30999E+01	3.31939E+02	1.03615E+02	1.85733E-04	3.45443E-01
NNA									
MEAN	1.63359E-04	1.20815E+01	3.09979E+04	5.55116E-04	1.65569E+01	1.52684E+03	3.60443E+01	2.93885E-03	9.88136E-01
MEDIAN	1.04304E-05	1.00021E+01	3.04719E+03	6.77431E-07	1.81328E+01	2.81254E+02	1.58449E+00	1.51113E-03	1.05385E+00
STD	2.62048E-04	9.07136E+00	7.59872E+04	1.53947E-03	8.81570E+00	7.09037E+03	7.03684E+01	4.21691E-03	3.19298E-01
IQR	1.97503E-04	1.71852E+01	1.50456E+04	9.03172E-05	1.64293E+01	3.01169E+02	4.01732E+01	1.19544E-03	5.90619E-01
CWOA									
MEAN	2.46426E-04	1.19620E+01	1.57158E+05	2.52922E-03	1.67977E+01	8.38181E+03	1.17385E+02	1.08732E-02	8.99587E-01
MEDIAN	8.04574E-07	5.93122E+00	4.02858E+02	6.82975E-08	1.67288E+01	3.87396E+02	1.61285E+01	1.81969E-03	1.18886E+00
STD	4.07629E-04	1.08393E+01	3.62591E+05	4.02230E-03	1.02405E+01	1.73997E+04	1.63622E+02	2.08707E-02	5.50075E-01
IQR	2.59201E-04	1.96042E+01	3.76037E+03	3.37860E-03	1.82677E+01	5.99772E+02	2.25262E+02	8.06087E-03	1.12231E+00
WW									
MEAN	3.95696E-04	1.52501E+01	1.17694E+05	1.68950E-03	1.58443E+01	9.56900E+03	5.49070E+01	2.52344E-03	9.20130E-01
MEDIAN	2.68794E-04	1.44738E+01	5.51686E+03	2.00828E-04	1.33873E+01	2.59880E+02	9.46265E+00	1.28744E-03	9.28054E-01
STD	3.66344E-04	8.90406E+00	2.97119E+05	2.99688E-03	1.16357E+01	1.91461E+04	9.96093E+01	5.61169E-03	2.45900E-01
IQR	7.20546E-04	1.60080E+01	1.84651E+04	1.61225E-03	2.55228E+01	8.84961E+02	5.02754E+01	3.15797E-04	2.74302E-01
T = 340 K									
true value	1.50000E-05	4.87151E+00	1.00000E+04	5.95785E-04	2.47059E+00	4.93568E+02	9.00000E+01	1.04000E-03	5.55000E+02
DE									
MEAN	8.79836E-06	3.65610E+00	4.32122E+04	8.49896E-04	4.92352E+00	3.60831E+03	1.00566E+02	1.08551E-03	1.35532E-01
MEDIAN	2.84057E-06	3.55733E+00	3.59710E+03	7.54123E-04	3.33097E+00	5.94661E+02	9.01178E+01	1.06011E-03	1.17021E-01
STD	1.06895E-05	1.42220E+00	1.43409E+05	4.03068E-04	4.08878E+00	7.72464E+03	8.11411E+01	5.68810E-05	3.75107E-02
IQR	1.56516E-05	2.59431E+00	8.96510E+03	5.98051E-04	6.34835E+00	7.61002E+02	1.52281E+02	8.46358E-05	4.51257E-02
EBSHADE									
MEAN	1.56192E-05	4.83515E+00	3.91746E+04	6.65425E-04	3.09205E+00	1.15850E+03	8.34612E+01	1.04287E-03	1.01161E-01
MEDIAN	1.49976E-05	4.87135E+00	9.99775E+03	5.95786E-04	2.47050E+00	4.93562E+02	9.00067E+01	1.04000E-03	9.95037E-02
STD	6.60123E-06	5.81929E-01	1.46878E+05	2.33913E-04	2.04792E+00	2.77162E+03	4.25142E+01	1.41186E-05	4.90941E-03
IQR	3.00000E-14	2.00000E-09	3.10000E-05	3.05100E-10	3.67700E-06	1.03980E-03	1.81758E-03	0.00000E+00	3.28653E-05
ADELI									
MEAN	1.49976E-05	4.87135E+00	9.99775E+03	5.95786E-04	2.47050E+00	4.93562E+02	9.00067E+01	1.04000E-03	9.95037E-02
MEDIAN	1.49976E-05	4.87135E+00	9.99775E+03	5.95786E-04	2.47050E+00	4.93562E+02	9.00067E+01	1.04000E-03	9.95037E-02
STD	1.75790E-14	1.20033E-09	1.44102E-05	1.58770E-13	1.88638E-09	2.36046E-07	7.01952E-08	4.37996E-19	2.80318E-17
IQR	3.00000E-14	2.00000E-09	2.00000E-05	2.00000E-13	2.50000E-09	3.50000E-07	9.50000E-08	0.00000E+00	0.00000E+00

Table S154 (continued)

Algorithm, metric	I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	Parameter			I_{ph} (A)	RMSPE
						R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)		
NDE										
MEAN	5.19566E-05	6.32741E+00	1.01777E+05	7.49865E-04	6.14737E+00	3.19477E+03	9.81832E+01	1.44226E-03	4.34404E-01	
MEDIAN	1.49976E-05	4.87135E+00	9.44930E+03	5.94386E-04	2.49628E+00	4.86725E+02	9.19468E+01	1.04114E-03	9.95162E-02	
STD	1.13956E-04	3.87363E+00	2.62762E+05	1.08270E-03	6.81281E+00	1.09933E+04	6.38884E+01	1.68412E-03	5.32427E-01	
IQR	1.62475E-05	1.06716E+00	5.52351E+03	5.72239E-05	3.63839E+00	2.55027E+02	3.17248E+01	1.34534E-04	7.99543E-01	
MABC										
MEAN	3.05581E-05	4.98028E+00	1.49162E+04	8.47970E-04	5.32265E+00	1.73528E+03	7.46422E+01	1.13665E-03	3.43734E-01	
MEDIAN	8.92925E-06	4.37730E+00	2.39072E+03	6.82367E-04	2.24432E+00	4.00197E+02	4.31606E+01	1.10525E-03	1.92311E-01	
STD	7.52263E-05	2.99108E+00	5.44402E+04	8.74395E-04	6.76070E+00	4.91942E+03	7.94419E+01	1.22484E-04	2.88013E-01	
IQR	2.23641E-05	2.59100E+00	2.86691E+03	7.54359E-04	5.55762E+00	9.20921E+02	1.24436E+02	1.28490E-04	3.67714E-01	
TLBO										
MEAN	1.53838E-05	4.89280E+00	1.25704E+04	6.15385E-04	2.64219E+00	6.40423E+02	8.70706E+01	1.03980E-03	9.95045E-02	
MEDIAN	1.49976E-05	4.87135E+00	9.99775E+03	5.95786E-04	2.47050E+00	4.93562E+02	9.00067E+01	1.04000E-03	9.95037E-02	
STD	2.68729E-06	1.57238E-01	1.84404E+04	1.16517E-04	9.77835E-01	9.97852E+02	1.74971E+01	1.61384E-06	4.14976E-06	
IQR	3.50000E-14	2.50000E-09	2.85000E-05	2.50000E-13	3.00000E-09	4.00000E-07	1.35000E-07	0.00000E+00	0.00000E+00	
GOTLBO										
MEAN	7.05291E-05	6.29116E+00	6.24839E+04	1.21424E-03	1.05849E+01	1.63539E+03	5.38159E+01	1.14769E-03	4.18351E-01	
MEDIAN	1.10034E-05	4.66909E+00	5.15583E+03	1.66807E-04	1.03613E+01	2.55793E+02	1.07162E+01	1.11812E-03	3.34591E-01	
STD	1.20510E-04	4.33286E+00	1.66931E+05	2.15218E-03	7.87951E+00	4.68805E+03	8.00930E+01	1.49792E-04	2.63800E-01	
IQR	9.38915E-05	6.34208E+00	1.31582E+04	1.05895E-03	1.27241E+01	2.87702E+02	7.69059E+01	1.25037E-04	4.79425E-01	
STLBO										
MEAN	1.49976E-05	4.87135E+00	9.99775E+03	5.95786E-04	2.47050E+00	4.93562E+02	9.00067E+01	1.04000E-03	9.95037E-02	
MEDIAN	1.49976E-05	4.87135E+00	9.99775E+03	5.95786E-04	2.47050E+00	4.93562E+02	9.00067E+01	1.04000E-03	9.95037E-02	
STD	2.36013E-14	1.58745E-09	1.95492E-05	1.84008E-13	2.30617E-09	2.92226E-07	9.85905E-08	4.37996E-19	2.80318E-17	
IQR	3.00000E-14	2.00000E-09	2.80000E-05	2.00000E-13	3.00000E-09	3.50000E-07	1.60000E-07	0.00000E+00	0.00000E+00	
PSO										
MEAN	2.21654E-04	7.60539E+00	6.08521E+05	2.63718E-03	1.83391E+01	8.99448E+03	1.20009E+02	8.55564E-03	3.69785E-01	
MEDIAN	4.95093E-07	2.72447E+00	1.00000E+06	1.00000E-10	3.00000E+01	2.84474E+02	5.91392E+00	1.06647E-03	1.37158E-01	
STD	4.12710E-04	1.00243E+01	4.92238E+05	4.19354E-03	1.41426E+01	1.91723E+04	1.47369E+02	2.37014E-02	4.72023E-01	
IQR	5.71259E-05	3.98140E+00	9.98330E+05	3.14477E-03	2.95000E+01	4.15526E+02	2.85662E+02	1.83505E-04	7.52508E-02	
IJAYA										
MEAN	1.54049E-05	4.63641E+00	5.41300E+04	8.56276E-04	5.61286E+00	1.57011E+03	3.83416E+01	1.05076E-03	1.06501E-01	
MEDIAN	1.25971E-05	4.70015E+00	6.57438E+03	7.77851E-04	5.26519E+00	8.15414E+02	9.49987E+00	1.04056E-03	1.01111E-01	

Table S154 (continued)

Algorithm,		Parameter								
metric		I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
STD		1.20534E-05	1.01749E+00	1.20224E+05	2.73197E-04	2.51098E+00	2.81445E+03	4.94703E+01	2.19246E-05	1.32839E-02
IQR		2.32307E-05	1.92994E+00	2.01415E+04	2.51877E-04	3.19813E+00	4.57840E+02	6.33788E+01	3.31586E-05	7.69143E-03
ISCA										
MEAN		2.55178E-04	1.16722E+01	6.74738E+04	1.70713E-03	1.36118E+01	1.13345E+03	2.73746E+01	1.19290E-03	6.60133E-01
MEDIAN		2.14839E-04	1.18740E+01	1.28698E+04	2.07337E-04	1.32083E+01	1.60565E+02	3.69136E+00	1.15263E-03	6.57795E-01
STD		2.28558E-04	5.81717E+00	1.81817E+05	2.46664E-03	8.85857E+00	3.92061E+03	5.34016E+01	1.62653E-04	2.62856E-01
IQR		3.65748E-04	9.65155E+00	3.88236E+04	2.85296E-03	1.51416E+01	2.29861E+02	2.17020E+01	1.37760E-04	3.71118E-01
NNA										
MEAN		1.96823E-04	1.25891E+01	3.25799E+04	1.24805E-03	1.50060E+01	8.16217E+02	2.41474E+01	1.56126E-03	1.02250E+00
MEDIAN		2.77596E-05	1.03837E+01	1.53188E+03	1.28826E-06	1.46694E+01	1.03892E+02	1.15011E+00	1.25925E-03	1.00020E+00
STD		2.85104E-04	9.20725E+00	1.34996E+05	2.47821E-03	9.64705E+00	2.69099E+03	5.58393E+01	9.32773E-04	4.15987E-01
IQR		3.10832E-04	1.69993E+01	7.93101E+03	5.60656E-04	1.77378E+01	2.84312E+02	1.43782E+01	5.05524E-04	8.02560E-01
CWOA										
MEAN		2.35026E-04	9.96170E+00	1.19886E+05	2.12417E-03	1.51872E+01	4.68752E+03	1.09268E+02	1.63127E-02	9.94650E-01
MEDIAN		2.98697E-07	5.01116E+00	1.19836E+03	1.77957E-07	1.55980E+01	2.90983E+02	1.69384E+01	1.44070E-03	1.10043E+00
STD		3.84494E-04	9.69983E+00	3.22577E+05	3.65337E-03	9.89640E+00	1.34771E+04	1.47383E+02	2.88413E-02	6.49101E-01
IQR		2.84441E-04	1.39057E+01	5.93316E+03	3.66564E-03	1.72990E+01	3.30445E+02	2.38480E+02	9.50611E-03	1.40045E+00
WW										
MEAN		2.48175E-04	1.06628E+01	1.96112E+05	1.58121E-03	1.20454E+01	3.56004E+03	3.25340E+01	2.31363E-03	7.41655E-01
MEDIAN		4.99052E-05	7.05898E+00	4.60904E+03	1.29376E-04	6.28470E+00	2.23731E+02	6.46792E+00	1.18070E-03	8.16433E-01
STD		3.37471E-04	8.26648E+00	3.79195E+05	2.87210E-03	1.11226E+01	1.17953E+04	5.64323E+01	7.62385E-03	4.03780E-01
IQR		4.75198E-04	1.34104E+01	6.21178E+04	1.35656E-03	1.99688E+01	2.49973E+02	2.49406E+01	2.18951E-04	6.19593E-01
T = 350 K										
true value		1.50000E-05	4.73233E+00	1.00000E+04	8.79718E-04	2.42857E+00	3.61363E+02	1.00000E+02	1.05000E-03	5.55000E+02
DE										
MEAN		8.69397E-06	3.43654E+00	2.58081E+04	1.14107E-03	6.15066E+00	1.49222E+03	9.12705E+01	1.09968E-03	1.22682E-01
MEDIAN		5.41709E-07	2.70681E+00	2.17421E+03	9.53584E-04	4.58884E+00	3.40978E+02	8.89378E+01	1.10859E-03	1.17118E-01
STD		1.31687E-05	1.42887E+00	9.42210E+04	7.70324E-04	5.19901E+00	2.84500E+03	7.64629E+01	4.34113E-05	2.12294E-02
IQR		1.53139E-05	2.52440E+00	3.81052E+03	8.76618E-04	6.50400E+00	5.64781E+02	1.40120E+02	8.01679E-05	2.92000E-02
EBSL SHADE										
MEAN		1.76605E-05	4.88026E+00	3.82528E+04	8.62261E-04	2.66469E+00	4.13813E+02	8.96591E+01	1.04911E-03	1.00169E-01
MEDIAN		1.50032E-05	4.73254E+00	1.00036E+04	8.79718E-04	2.42874E+00	3.61374E+02	9.99915E+01	1.05000E-03	9.95037E-02
STD		6.78709E-06	3.72693E-01	1.43101E+05	2.07871E-04	1.03168E+00	3.40682E+02	2.82531E+01	3.18981E-06	1.90530E-03

Table S154 (continued)

Algorithm, metric	Parameter								
	I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
IQR	3.00000E-14	2.00000E-09	2.00000E-05	1.35000E-12	5.00000E-09	9.50000E-07	1.75000E-07	0.00000E+00	0.00000E+00
ADELI									
MEAN	1.50032E-05	4.73254E+00	1.00036E+04	8.79718E-04	2.42874E+00	3.61374E+02	9.99915E+01	1.05000E-03	9.95037E-02
MEDIAN	1.50032E-05	4.73254E+00	1.00036E+04	8.79718E-04	2.42874E+00	3.61374E+02	9.99915E+01	1.05000E-03	9.95037E-02
STD	1.76302E-14	1.29645E-09	1.54869E-05	8.07922E-13	4.86000E-09	5.93461E-07	1.07962E-07	6.56994E-19	4.20476E-17
IQR	3.00000E-14	2.00000E-09	2.00000E-05	1.25000E-12	7.50000E-09	9.00000E-07	1.55000E-07	0.00000E+00	0.00000E+00
NDE									
MEAN	2.14512E-05	4.81662E+00	1.04285E+04	1.14885E-03	6.32159E+00	1.36983E+03	7.88813E+01	1.10430E-03	2.34604E-01
MEDIAN	1.50032E-05	4.73254E+00	1.00036E+04	8.79718E-04	2.42932E+00	3.61374E+02	9.99893E+01	1.05000E-03	9.95046E-02
STD	3.70972E-05	1.67544E+00	6.54716E+03	1.22991E-03	6.91420E+00	3.79787E+03	3.39401E+01	1.54948E-04	3.51097E-01
IQR	4.48012E-06	3.07542E-01	3.79454E+03	3.58447E-04	4.86176E+00	2.12881E+02	4.00536E+01	4.36090E-06	2.15188E-05
MABC									
MEAN	2.30593E-05	4.20685E+00	5.03637E+04	9.30677E-04	7.43217E+00	9.34217E+02	6.84413E+01	1.15569E-03	2.03232E-01
MEDIAN	3.56101E-06	3.58582E+00	3.21006E+03	4.51102E-04	3.12914E+00	2.41633E+02	2.99907E+01	1.07626E-03	1.16524E-01
STD	5.84140E-05	2.65468E+00	1.56967E+05	1.44826E-03	8.28260E+00	2.76505E+03	7.66201E+01	4.11432E-04	2.55094E-01
IQR	2.23295E-05	3.10343E+00	1.00377E+04	1.06199E-03	9.60657E+00	1.87791E+02	1.19346E+02	9.81028E-05	4.82567E-02
TLBO									
MEAN	1.56730E-05	4.76234E+00	1.08441E+04	1.03596E-03	3.20617E+00	3.32055E+03	9.26285E+01	1.04986E-03	9.95092E-02
MEDIAN	1.50032E-05	4.73254E+00	1.00036E+04	8.79718E-04	2.42874E+00	3.61374E+02	9.99915E+01	1.05000E-03	9.95037E-02
STD	3.25043E-06	2.51594E-01	2.68810E+03	3.74343E-04	1.95642E+00	9.48578E+03	2.73570E+01	3.85660E-06	2.34852E-05
IQR	6.50000E-14	4.50000E-09	5.00000E-05	2.55000E-12	1.40000E-08	1.95000E-06	3.90000E-07	1.00000E-12	5.79900E-08
GOTLBO									
MEAN	8.54154E-05	6.75483E+00	7.62391E+04	9.60102E-04	1.30100E+01	8.50839E+02	3.61071E+01	1.12442E-03	3.83567E-01
MEDIAN	1.65454E-05	5.07993E+00	7.12981E+03	5.27489E-05	1.21436E+01	1.72948E+02	4.66429E+00	1.10108E-03	3.10471E-01
STD	1.20562E-04	4.04633E+00	2.03734E+05	1.92009E-03	9.04385E+00	2.68740E+03	5.87908E+01	1.02163E-04	2.63264E-01
IQR	1.53143E-04	6.63110E+00	3.53413E+04	1.08914E-03	1.34751E+01	1.86087E+02	4.67860E+01	6.56280E-05	4.41560E-01
STLBO									
MEAN	1.50032E-05	4.73254E+00	1.00036E+04	8.79718E-04	2.42874E+00	3.61374E+02	9.99915E+01	1.05000E-03	9.95037E-02
MEDIAN	1.50032E-05	4.73254E+00	1.00036E+04	8.79718E-04	2.42874E+00	3.61374E+02	9.99915E+01	1.05000E-03	9.95037E-02
STD	2.22781E-14	1.63515E-09	2.00841E-05	1.16780E-12	6.68085E-09	8.41544E-07	1.40198E-07	2.37635E-13	4.20476E-17
IQR	3.00000E-14	2.50000E-09	3.00000E-05	1.65000E-12	1.00000E-08	1.25000E-06	2.00000E-07	0.00000E+00	0.00000E+00
PSO									
MEAN	7.25675E-05	5.02539E+00	5.11025E+05	3.33443E-03	1.95109E+01	1.39492E+04	1.45821E+02	1.28303E-02	4.38373E-01

Table S154 (continued)

Algorithm,		Parameter								
metric		I_{01} (A)	n_1	R_{p1} (Ω)	I_{02} (A)	n_2	R_{p2} (Ω)	R_s (Ω)	I_{ph} (A)	RMSPE
MEDIAN		3.23114E-06	3.46955E+00	5.06623E+05	2.10611E-04	3.00000E+01	1.24223E+02	1.35643E+02	1.04811E-03	1.28175E-01
STD		2.41560E-04	6.45878E+00	5.03626E+05	4.30218E-03	1.29049E+01	2.24223E+04	1.40544E+02	2.67301E-02	6.33459E-01
IQR		9.41973E-06	2.62292E+00	9.98589E+05	1.00000E-02	2.78744E+01	4.99897E+04	2.34377E+02	1.68255E-04	3.61187E-02
IJAYA										
MEAN		1.43859E-05	4.46263E+00	3.48681E+04	1.30829E-03	7.82133E+00	1.91100E+03	3.77466E+01	1.06194E-03	1.05522E-01
MEDIAN		1.24540E-05	4.57213E+00	5.25571E+03	1.14765E-03	7.56814E+00	6.10271E+02	7.61560E+00	1.05579E-03	1.01940E-01
STD		1.05876E-05	9.28048E-01	1.24185E+05	5.39619E-04	4.34077E+00	5.55987E+03	5.83388E+01	2.29665E-05	8.17914E-03
IQR		1.75718E-05	1.44702E+00	1.39039E+04	8.14092E-04	6.11684E+00	6.08394E+02	4.41557E+01	3.08393E-05	7.09278E-03
ISCA										
MEAN		1.50131E-04	8.89807E+00	1.05563E+05	1.66180E-03	1.26885E+01	1.02562E+03	1.85482E+01	1.16642E-03	6.40744E-01
MEDIAN		1.02769E-04	8.64490E+00	8.75361E+03	2.95090E-04	1.20682E+01	1.60420E+02	3.87085E+00	1.13401E-03	6.56746E-01
STD		1.46524E-04	4.20787E+00	2.05815E+05	2.57694E-03	7.86932E+00	2.84644E+03	2.83567E+01	1.02773E-04	2.73669E-01
IQR		2.03003E-04	6.41871E+00	9.58805E+04	2.42769E-03	1.25917E+01	2.60129E+02	1.85336E+01	1.35898E-04	4.19912E-01
NNA										
MEAN		1.26054E-04	9.98644E+00	3.29076E+04	7.01347E-04	1.53889E+01	3.75533E+02	2.62488E+01	1.82813E-03	8.34411E-01
MEDIAN		2.01088E-05	7.29681E+00	2.34230E+03	1.62772E-06	1.44230E+01	1.02973E+02	1.74503E+00	1.16825E-03	7.94328E-01
STD		1.96453E-04	7.54130E+00	1.04300E+05	2.00796E-03	8.35224E+00	1.19007E+03	5.34795E+01	3.35504E-03	4.65190E-01
IQR		2.19288E-04	1.02398E+01	1.93101E+04	7.10653E-05	1.34784E+01	1.88704E+02	2.92703E+01	3.06791E-04	5.98379E-01
CWOA										
MEAN		3.07406E-04	1.16799E+01	8.55418E+04	2.30518E-03	1.55286E+01	3.57714E+03	8.52064E+01	1.13903E-02	9.48378E-01
MEDIAN		2.08594E-05	5.76655E+00	1.40068E+03	1.47191E-05	1.56516E+01	2.52279E+02	8.12653E+00	1.26817E-03	9.98901E-01
STD		4.19368E-04	1.02479E+01	2.70365E+05	3.71354E-03	1.05186E+01	1.18680E+04	1.22897E+02	2.46765E-02	7.48635E-01
IQR		6.88717E-04	1.71049E+01	4.39332E+03	2.28832E-03	2.06732E+01	3.39655E+02	1.50975E+02	5.18315E-03	1.65244E+00
WW										
MEAN		2.75714E-04	1.09139E+01	2.74259E+05	4.00199E-03	1.03581E+01	5.08693E+03	5.04411E+01	1.38793E-03	8.71434E-01
MEDIAN		9.77243E-05	8.34191E+00	7.01043E+03	1.64437E-03	7.66904E+00	1.07109E+02	1.62179E+01	1.18914E-03	8.46548E-01
STD		3.45977E-04	7.80210E+00	4.31976E+05	4.22991E-03	1.00880E+01	1.49616E+04	6.79048E+01	9.43810E-04	4.00295E-01
IQR		4.33127E-04	1.11635E+01	6.58580E+05	9.77137E-03	1.61542E+01	1.93634E+02	9.05761E+01	2.32756E-04	6.04344E-01

Table S155. Adjusted p -values for multiple comparisons $1 \times N$ tests in IV-set case (DE is the control algorithm).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
NNA	Friedman	2.29810E-08	2.29810E-08	2.29810E-08	2.29810E-08
	Friedman Aligned	8.47789E-11	1.56515E-10	1.55951E-10	1.56515E-10
	Quade	3.76631E-01	1.0	1.0	6.58260E-01
CWOA	Friedman	1.05597E-07	1.94949E-07	1.94949E-07	1.94949E-07
	Friedman Aligned	1.54745E-10	4.76139E-10	4.58363E-10	4.76139E-10
	Quade	3.76631E-01	7.78425E-01	7.78425E-01	5.52832E-01
PSO	Friedman	2.13595E-07	5.42203E-07	5.42203E-07	5.42202E-07
	Friedman Aligned	2.39185E-10	8.83146E-10	8.83146E-10	8.83146E-10
	Quade	3.76631E-01	4.64129E-01	4.64129E-01	3.76631E-01
ISCA	Friedman	1.19223E-06	3.66839E-06	3.66839E-06	3.66838E-06
	Friedman Aligned	1.54745E-10	4.76139E-10	4.58363E-10	4.76139E-10
	Quade	4.25757E-01	1.0	1.0	8.18550E-01
WW	Friedman	6.91165E-06	2.39250E-05	2.39250E-05	2.39247E-05
	Friedman Aligned	8.47789E-11	1.56515E-10	1.55951E-10	1.56515E-10
	Quade	4.84274E-01	1.0	1.0	8.98952E-01
GOTLBO	Friedman	1.16713E-02	4.32304E-02	4.32304E-02	4.24216E-02
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	8.25712E-01	1.0	1.0	9.98420E-01
MABC	Friedman	1.64623E-01	6.46181E-01	6.46181E-01	4.92358E-01
	Friedman Aligned	2.85170E-09	1.07487E-08	1.07487E-08	1.07487E-08
	Quade	8.53843E-01	1.0	1.0	9.99289E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S155 (continued)

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
ADELI	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S156. Adjusted p -values for multiple comparisons $1 \times N$ tests in IV-set case (EBLSHADE is the control algorithm).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
WW	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	1.30617E-03	4.52317E-03	4.52317E-03	4.51409E-03
MABC	Friedman	2.68452E-13	4.95604E-13	4.95604E-13	4.95604E-13
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	1.18584E-02	4.48199E-02	4.48199E-02	4.39681E-02
GOTLBO	Friedman	1.68209E-10	4.26991E-10	4.26991E-10	4.26991E-10
	Friedman Aligned	5.52549E-11	2.04018E-10	2.04018E-10	2.04018E-10
	Quade	9.21013E-03	3.40914E-02	3.40914E-02	3.35872E-02
DE	Friedman	6.52150E-10	2.00661E-09	1.86258E-09	2.00661E-09
	Friedman Aligned	1.86733E-09	6.46383E-09	6.46383E-09	6.46383E-09
	Quade	3.78658E-02	1.40848E-01	1.40848E-01	1.32837E-01
ISCA	Friedman	6.52150E-10	2.00661E-09	1.86258E-09	2.00661E-09
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	7.54340E-04	2.32165E-03	2.32165E-03	2.31923E-03
PSO	Friedman	1.13825E-09	4.20278E-09	4.20278E-09	4.20278E-09
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	1.64554E-04	1.64567E-04	1.64567E-04	1.64554E-04
CWOA	Friedman	1.53596E-09	5.78937E-09	5.78937E-09	5.78937E-09
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	2.55177E-04	4.71146E-04	4.71146E-04	4.71045E-04
NNA	Friedman	3.01406E-09	1.11288E-08	1.11288E-08	1.11288E-08
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	3.45157E-04	8.76285E-04	8.76285E-04	8.75936E-04

Table S156 (continued)

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
IJAYA	Friedman	4.00976E-06	1.38799E-05	1.38799E-05	1.38799E-05
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	1.52655E-01	5.41737E-01	5.41737E-01	4.36390E-01
NDE	Friedman	1.44050E-01	4.51073E-01	4.51073E-01	3.80347E-01
	Friedman Aligned	4.74587E-01	1.0	1.0	8.61961E-01
	Quade	6.69739E-01	1.0	1.0	9.66920E-01
ADELI	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S157. Adjusted p -values for multiple comparisons $1 \times N$ tests in IV-set case (ADELI is the control algorithm).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
MABC	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	5.85354E-04	2.20663E-03	2.20663E-03	2.20455E-03
PSO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	2.06564E-06	2.06565E-06	2.06565E-06	2.06564E-06
ISCA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	1.68471E-05	5.18374E-05	5.18374E-05	5.18362E-05
NNA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	6.17579E-06	1.56771E-05	1.56771E-05	1.56769E-05
CWOA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	3.96937E-06	7.32807E-06	7.32807E-06	7.32805E-06
WW	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	3.45304E-05	1.19530E-04	1.19530E-04	1.19523E-04
IJAYA	Friedman	3.39792E-13	1.28075E-12	1.28075E-12	1.28075E-12
	Friedman Aligned	5.86654E-11	2.16611E-10	2.16611E-10	2.16611E-10
	Quade	1.88316E-02	6.53767E-02	6.53767E-02	6.36893E-02
DE	Friedman	3.97017E-11	1.46591E-10	1.46591E-10	1.46591E-10
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	2.72842E-03	1.00795E-02	1.00795E-02	1.00372E-02

Table S157 (continued)

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
GOTLBO	Friedman	7.91529E-10	2.73991E-09	2.73991E-09	2.73991E-09
	Friedman Aligned	7.86484E-11	2.72244E-10	2.72244E-10	2.72244E-10
	Quade	4.08003E-04	1.50664E-03	1.50664E-03	1.50565E-03
NDE	Friedman	2.43840E-05	7.50278E-05	7.50278E-05	7.50257E-05
	Friedman Aligned	4.29787E-02	1.32910E-01	1.32910E-01	1.26431E-01
	Quade	1.90667E-01	6.00708E-01	6.00708E-01	4.78428E-01
EBLSHADE	Friedman	8.35516E-03	2.12229E-02	2.12229E-02	2.10732E-02
	Friedman Aligned	2.36221E-01	6.11673E-01	6.11673E-01	4.95434E-01
	Quade	4.32702E-01	1.0	8.37312E-01	7.62830E-01
STLBO	Friedman	3.89796E-01	7.32328E-01	5.00736E-01	5.98252E-01
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	8.19430E-01	1.0	8.37312E-01	9.57572E-01
TLBO	Friedman	5.00736E-01	7.32328E-01	5.00736E-01	5.98252E-01
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	8.37312E-01	1.0	8.37312E-01	9.57572E-01

Table S158. Adjusted p -values for multiple comparisons $1 \times N$ tests in IV-set case (NDE is the control algorithm).

Algorithm	Test	Finner	post-hoc procedure		
			Holm	Hochberg	Holland
NNA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	5.41163E-11	1.87326E-10	1.87326E-10	1.87326E-10
	Quade	3.10829E-03	7.89971E-03	7.89971E-03	7.87141E-03
GOTLBO	Friedman	3.00204E-13	5.54223E-13	5.54223E-13	5.54223E-13
	Friedman Aligned	4.81828E-11	1.77906E-10	1.44500E-10	1.77906E-10
	Quade	4.64595E-02	1.73741E-01	1.73741E-01	1.61093E-01
MABC	Friedman	4.61314E-10	1.17103E-09	1.17103E-09	1.17103E-09
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	5.59004E-02	2.13496E-01	2.13496E-01	1.94925E-01
WW	Friedman	6.25900E-10	1.92585E-09	1.92585E-09	1.92585E-09
	Friedman Aligned	4.81828E-11	1.77906E-10	1.44500E-10	1.77906E-10
	Quade	9.17697E-03	3.18566E-02	3.18566E-02	3.14092E-02
ISCA	Friedman	2.74325E-09	9.49587E-09	9.49587E-09	9.49587E-09
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	5.89940E-03	1.81892E-02	1.81892E-02	1.80410E-02
PSO	Friedman	9.70417E-09	3.58308E-08	3.58308E-08	3.58308E-08
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	1.85637E-03	1.85796E-03	1.85796E-03	1.85637E-03
CWOA	Friedman	1.66888E-08	6.29039E-08	6.29039E-08	6.29039E-08
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	2.51164E-03	4.64181E-03	4.64181E-03	4.63194E-03
DE	Friedman	2.78979E-06	1.03008E-05	1.03008E-05	1.03007E-05
	Friedman Aligned	4.81828E-11	1.77906E-10	1.44500E-10	1.77906E-10
	Quade	1.39964E-01	5.31682E-01	5.31682E-01	4.26920E-01

Table S158 (continued)

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
IJAYA	Friedman	2.78592E-03	9.64770E-03	9.64770E-03	9.61054E-03
	Friedman Aligned	6.97744E-12	2.41527E-11	2.41527E-11	2.41527E-11
	Quade	3.98964E-01	1.0	1.0	8.28345E-01
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S159. Adjusted p -values for multiple comparisons $1 \times N$ tests in IV-set case (MABC is the control algorithm).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
NNA	Friedman	1.84192E-04	1.84208E-04	1.84208E-04	1.84192E-04
	Friedman Aligned	2.16462E-08	7.49292E-08	7.49292E-08	7.49292E-08
	Quade	7.49843E-01	1.0	1.0	9.37539E-01
CWOA	Friedman	4.68826E-04	8.65696E-04	8.65696E-04	8.65353E-04
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	7.49843E-01	1.0	1.0	8.86660E-01
PSO	Friedman	6.95410E-04	1.76574E-03	1.76574E-03	1.76433E-03
	Friedman Aligned	9.16590E-11	2.82028E-10	2.82028E-10	2.82028E-10
	Quade	7.49843E-01	1.0	1.0	7.49843E-01
ISCA	Friedman	2.17168E-03	6.68712E-03	6.68712E-03	6.66704E-03
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	7.49843E-01	1.0	1.0	9.84244E-01
WW	Friedman	6.72782E-03	2.33370E-02	2.33370E-02	2.30964E-02
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	7.90139E-01	1.0	1.0	9.95504E-01
GOTLBO	Friedman	4.97246E-01	1.0	1.0	9.21057E-01
	Friedman Aligned	2.83114E-07	1.04534E-06	1.04534E-06	1.04534E-06
	Quade	9.92459E-01	1.0	1.0	1.00000E+00
DE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S159 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
ADELI	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S160. Adjusted p -values for multiple comparisons $1 \times N$ tests in IV-set case (TLBO is the control algorithm).

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
GOTLBO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	7.88357E-11	2.72893E-10	2.72893E-10	2.72893E-10
	Quade	9.04101E-04	3.33903E-03	3.33903E-03	3.33416E-03
PSO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	6.15979E-06	6.15981E-06	6.15981E-06	6.15979E-06
ISCA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	4.38663E-05	1.34975E-04	1.34975E-04	1.34967E-04
NNA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	1.69424E-05	4.30078E-05	4.30078E-05	4.30070E-05
CWOA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	1.12542E-05	2.07771E-05	2.07771E-05	2.07769E-05
DE	Friedman	9.58345E-13	3.53850E-12	3.53850E-12	3.53850E-12
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	5.39136E-03	1.99273E-02	1.99273E-02	1.97625E-02
IJAYA	Friedman	4.01779E-11	1.51440E-10	1.51440E-10	1.51440E-10
	Friedman Aligned	6.08664E-11	2.24738E-10	2.24738E-10	2.24738E-10
	Quade	3.27993E-02	1.14117E-01	1.14117E-01	1.09026E-01
MABC	Friedman	3.86006E-09	1.42525E-08	1.42525E-08	1.42525E-08
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	1.26435E-03	4.76701E-03	4.76701E-03	4.75728E-03

Table S160 (continued)

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
WW	Friedman	1.00418E-08	3.47602E-08	3.47602E-08	3.47602E-08
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	8.64072E-05	2.99110E-04	2.99110E-04	2.99070E-04
NDE	Friedman	4.04427E-04	1.24445E-03	1.24445E-03	1.24387E-03
	Friedman Aligned	4.22263E-02	1.30571E-01	1.30571E-01	1.24316E-01
	Quade	2.72841E-01	8.69448E-01	8.69448E-01	6.24816E-01
EBLSHADE	Friedman	5.10673E-02	1.30152E-01	1.30152E-01	1.24587E-01
	Friedman Aligned	2.33358E-01	6.04098E-01	6.04098E-01	4.90618E-01
	Quade	5.61708E-01	1.0	1.0	8.76795E-01
STLBO	Friedman	8.41920E-01	1.0	1.0	9.66810E-01
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	9.65693E-01	1.0	1.0	9.98023E-01
ADELI	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	9.96305E-01	1.0	1.0	9.99968E-01
	Quade	1.0	1.0	1.0	1.0

Table S161. Adjusted p -values for multiple comparisons $1 \times N$ tests in IV-set case (GOTLBO is the control algorithm).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
NNA	Friedman	1.52876E-02	1.53966E-02	1.53966E-02	1.52876E-02
	Friedman Aligned	<1E-13	1.64313E-13	1.64313E-13	1.64313E-13
	Quade	8.40301E-01	1.0	1.0	9.71745E-01
CWOA	Friedman	2.63386E-02	4.91760E-02	4.91760E-02	4.80826E-02
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	8.40301E-01	1.0	1.0	9.40882E-01
PSO	Friedman	3.19246E-02	8.20536E-02	8.20536E-02	7.90607E-02
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	8.40301E-01	1.0	1.0	8.40301E-01
ISCA	Friedman	6.74279E-02	2.12506E-01	2.12506E-01	1.93294E-01
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	8.40301E-01	1.0	1.0	9.94931E-01
WW	Friedman	1.38347E-01	5.00951E-01	5.00951E-01	4.02758E-01
	Friedman Aligned	1.15463E-13	3.99680E-13	3.99680E-13	3.99680E-13
	Quade	8.62992E-01	1.0	1.0	9.98972E-01
DE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S161 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
NDE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S162. Adjusted p -values for multiple comparisons $1 \times N$ tests in IV-set case (STLBO is the control algorithm).

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
GOTLBO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	1.35278E-10	5.09895E-10	5.09895E-10	5.09895E-10
	Quade	1.11445E-03	4.11614E-03	4.11614E-03	4.10873E-03
PSO	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	8.22938E-06	8.22941E-06	8.22941E-06	8.22938E-06
NNA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	2.21284E-05	5.61727E-05	5.61727E-05	5.61713E-05
CWOA	Friedman	<1E-13	<1E-13	<1E-13	<1E-13
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	1.48311E-05	2.73807E-05	2.73807E-05	2.73803E-05
DE	Friedman	2.32081E-13	8.03357E-13	8.03357E-13	8.03357E-13
	Friedman Aligned	1.74950E-09	6.45968E-09	6.45968E-09	6.45968E-09
	Quade	6.44257E-03	2.38175E-02	2.38175E-02	2.35824E-02
IJAYA	Friedman	2.17645E-10	8.03613E-10	8.03613E-10	8.03613E-10
	Friedman Aligned	3.63299E-09	1.25757E-08	1.25757E-08	1.25757E-08
	Quade	3.78757E-02	1.31885E-01	1.31885E-01	1.25109E-01
MABC	Friedman	1.75608E-09	6.61909E-09	6.61909E-09	6.61909E-09
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	1.54776E-03	5.83595E-03	5.83595E-03	5.82137E-03
WW	Friedman	7.44635E-09	2.74942E-08	2.74942E-08	2.74942E-08
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	1.10078E-04	3.81053E-04	3.81053E-04	3.80989E-04

Table S162 (continued)

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
ISCA	Friedman	1.32325E-08	4.58048E-08	4.58048E-08	4.58048E-08
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	5.64886E-05	1.73815E-04	1.73815E-04	1.73801E-04
NDE	Friedman	9.57698E-04	2.94709E-03	2.94709E-03	2.94383E-03
	Friedman Aligned	2.69373E-03	8.29097E-03	8.29097E-03	8.26522E-03
	Quade	2.98714E-01	9.55486E-01	9.55486E-01	6.64392E-01
EBLSHADE	Friedman	8.62842E-02	2.20533E-01	2.20533E-01	2.04719E-01
	Friedman Aligned	3.10807E-02	7.90881E-02	7.90881E-02	7.70214E-02
	Quade	5.99120E-01	1.0	1.0	9.01765E-01
ADELI	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	3.64522E-01	6.83937E-01	3.45600E-01	5.66995E-01
	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	3.64522E-01	6.83937E-01	3.45600E-01	5.66995E-01
	Quade	1.0	1.0	1.0	1.0

Table S163. Adjusted p -values for multiple comparisons $1 \times N$ tests in IV-set case (PSO is the control algorithm).

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
NNA	Friedman	9.99983E-01	1.0	1.0	9.99983E-01
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	9.99995E-01	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S163 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
GOTLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S164. Adjusted p -values for multiple comparisons $1 \times N$ tests in IV-set case (IJAYA is the control algorithm).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
NNA	Friedman	2.30926E-13	2.30926E-13	2.30926E-13	2.30926E-13
	Friedman Aligned	1.12499E-10	3.46150E-10	3.31155E-10	3.46150E-10
	Quade	8.09700E-02	2.12264E-01	2.12264E-01	1.92925E-01
CWOA	Friedman	1.65112E-12	3.04823E-12	3.04823E-12	3.04823E-12
	Friedman Aligned	1.89312E-10	6.98998E-10	6.38521E-10	6.98998E-10
	Quade	7.67278E-02	1.46479E-01	1.46479E-01	1.37035E-01
PSO	Friedman	4.53770E-12	1.15188E-11	1.15188E-11	1.15188E-11
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	7.25355E-02	7.50831E-02	7.50831E-02	7.25355E-02
ISCA	Friedman	4.61124E-11	1.41884E-10	1.41884E-10	1.41884E-10
	Friedman Aligned	1.89312E-10	6.98998E-10	6.38521E-10	6.98998E-10
	Quade	1.18124E-01	3.79398E-01	3.79398E-01	3.20761E-01
WW	Friedman	4.92686E-10	1.70545E-09	1.70545E-09	1.70545E-09
	Friedman Aligned	1.12499E-10	3.46150E-10	3.31155E-10	3.46150E-10
	Quade	1.50884E-01	5.48728E-01	5.48728E-01	4.32304E-01
GOTLBO	Friedman	1.73282E-05	6.39812E-05	6.39812E-05	6.39794E-05
	Friedman Aligned	<1E-13	<1E-13	<1E-13	<1E-13
	Quade	4.00601E-01	1.0	1.0	8.48902E-01
MABC	Friedman	1.41255E-03	5.32597E-03	5.32597E-03	5.31383E-03
	Friedman Aligned	2.50170E-13	6.35048E-13	6.35048E-13	6.35048E-13
	Quade	4.31768E-01	1.0	1.0	8.81218E-01
DE	Friedman	1.45627E-01	5.53869E-01	5.53869E-01	4.40731E-01
	Friedman Aligned	6.44412E-02	2.40977E-01	2.40977E-01	2.18038E-01
	Quade	6.85516E-01	1.0	1.0	9.86037E-01

Table S164 (continued)

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S165. Adjusted p -values for multiple comparisons $1 \times N$ tests in IV-set case (ISCA is the control algorithm).

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	9.96127E-01	1.0	1.0	9.99999E-01
	Friedman Aligned	7.63492E-05	7.63519E-05	7.63519E-05	7.63492E-05
	Quade	9.99856E-01	1.0	1.0	9.99856E-01
NNA	Friedman	9.96127E-01	1.0	1.0	9.96127E-01
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	9.99856E-01	1.0	1.0	1.00000E+00
CWOA	Friedman	9.96127E-01	1.0	1.0	9.99961E-01
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	9.99856E-01	1.0	1.0	9.99998E-01
DE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S165 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
TLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S166. Adjusted p -values for multiple comparisons $1 \times N$ tests in IV-set case (NNA is the control algorithm).

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
DE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S166 (continued)

Algorithm	Test	post-hoc procedure			
		Finner	Holm	Hochberg	Holland
PSO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	4.32987E-13	4.32987E-13	4.32987E-13	4.32987E-13
	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.32960E-02	2.46857E-02	2.46857E-02	2.44083E-02
	Quade	1.0	1.0	1.0	1.0
CWOA	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.65948E-02	4.23968E-02	4.23968E-02	4.15892E-02
	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	9.98955E-01	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S167. Adjusted p -values for multiple comparisons $1 \times N$ tests in IV-set case (CWOA is the control algorithm).

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
NNA	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
MABC	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S167 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
STLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
PSO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	3.02243E-05	3.02247E-05	3.02247E-05	3.02243E-05
	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
ISCA	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	9.99995E-01	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
WW	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S168. Adjusted p -values for multiple comparisons $1 \times N$ tests in IV-set case (WW is the control algorithm).

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
NNA	Friedman	9.28732E-01	1.0	1.0	9.28732E-01
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	9.97795E-01	1.0	1.0	9.99987E-01
PSO	Friedman	9.31953E-01	1.0	1.0	9.98494E-01
	Friedman Aligned	1.31051E-12	1.31051E-12	1.31051E-12	1.31051E-12
	Quade	9.97795E-01	1.0	1.0	9.97795E-01
CWOA	Friedman	9.31953E-01	1.0	1.0	9.92999E-01
	Friedman Aligned	2.65438E-02	6.80793E-02	6.80793E-02	6.60112E-02
	Quade	9.97795E-01	1.0	1.0	9.99875E-01
ISCA	Friedman	9.79287E-01	1.0	1.0	9.99993E-01
	Friedman Aligned	2.18559E-02	4.07276E-02	4.07276E-02	3.99759E-02
	Quade	9.97795E-01	1.0	1.0	1.0
DE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
EBLSHADE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
ADELI	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
NDE	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S168 (continued)

Algorithm	Test	Finner	Holm	post-hoc procedure	
				Hochberg	Holland
MABC	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
TLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
GOTLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
STLBO	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0
IJAYA	Friedman	1.0	1.0	1.0	1.0
	Friedman Aligned	1.0	1.0	1.0	1.0
	Quade	1.0	1.0	1.0	1.0

Table S169. Adjusted p -values for tests for multiple comparisons among all methods in the IV-set case.

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
EBLSHADE versus WW	<1E-13	<1E-13	<1E-13
ADELI versus MABC	<1E-13	<1E-13	<1E-13
ADELI versus PSO	<1E-13	<1E-13	<1E-13
ADELI versus ISCA	<1E-13	<1E-13	<1E-13
ADELI versus NNA	<1E-13	<1E-13	<1E-13
ADELI versus CWOA	<1E-13	<1E-13	<1E-13
ADELI versus WW	<1E-13	<1E-13	<1E-13
NDE versus NNA	<1E-13	<1E-13	<1E-13
TLBO versus GOTLBO	<1E-13	<1E-13	<1E-13
TLBO versus PSO	<1E-13	<1E-13	<1E-13
TLBO versus ISCA	<1E-13	<1E-13	<1E-13
TLBO versus NNA	<1E-13	<1E-13	<1E-13
TLBO versus CWOA	<1E-13	<1E-13	<1E-13
STLBO versus GOTLBO	<1E-13	<1E-13	<1E-13
STLBO versus PSO	<1E-13	<1E-13	<1E-13
STLBO versus NNA	<1E-13	<1E-13	<1E-13
STLBO versus CWOA	<1E-13	<1E-13	<1E-13
IJAYA versus NNA	1.61648E-12	1.31450E-12	1.19016E-12
EBLSHADE versus MABC	3.75833E-12	3.01492E-12	2.76712E-12
NDE versus GOTLBO	4.20286E-12	3.32534E-12	3.09441E-12
STLBO versus DE	8.12284E-12	6.33760E-12	5.98055E-12
IJAYA versus CWOA	2.31157E-11	1.75273E-11	1.70193E-11
TLBO versus DE	4.02505E-11	3.00773E-11	2.96350E-11
IJAYA versus PSO	9.52918E-11	7.01599E-11	7.01599E-11
IJAYA versus ISCA	1.29115E-09	9.36436E-10	9.36436E-10
ADELI versus DE	2.22329E-09	1.56363E-09	1.41704E-09
EBLSHADE versus GOTLBO	3.53238E-09	2.44550E-09	2.25141E-09
NDE versus MABC	9.68759E-09	6.49388E-09	6.17451E-09
IJAYA versus WW	1.72440E-08	1.13697E-08	1.09907E-08
NDE versus WW	1.75252E-08	1.13697E-08	1.11699E-08
EBLSHADE versus DE	1.82602E-08	1.16384E-08	1.16384E-08
EBLSHADE versus ISCA	1.88327E-08	1.17963E-08	1.16384E-08
EBLSHADE versus PSO	4.78066E-08	2.94194E-08	2.94194E-08
ADELI versus GOTLBO	4.98663E-08	3.01390E-08	3.01390E-08
EBLSHADE versus CWOA	7.52618E-08	4.46609E-08	4.21797E-08
STLBO versus MABC	8.60481E-08	5.01159E-08	4.82248E-08
NDE versus ISCA	9.60138E-08	5.48650E-08	5.38099E-08
DE versus NNA	1.60867E-07	9.01562E-08	9.01562E-08
EBLSHADE versus NNA	1.68788E-07	9.27404E-08	9.01562E-08
TLBO versus MABC	2.16163E-07	1.16396E-07	1.14020E-07
NDE versus PSO	4.07575E-07	2.14985E-07	2.14985E-07

Table S169 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
STLBO versus WW	4.16995E-07	2.15371E-07	2.15371E-07
TLBO versus WW	6.32636E-07	3.19794E-07	3.19794E-07
NDE versus CWOA	8.17751E-07	4.04382E-07	4.04382E-07
STLBO versus ISCA	8.33647E-07	4.04382E-07	4.04382E-07
DE versus CWOA	1.47836E-06	6.98567E-07	6.98567E-07
DE versus PSO	4.48549E-06	2.07023E-06	2.07023E-06
DE versus ISCA	3.33823E-05	1.50404E-05	1.46735E-05
NDE versus DE	1.56228E-04	6.86718E-05	6.86718E-05
DE versus WW	2.41908E-04	1.03675E-04	1.03675E-04
IJAYA versus GOTLBO	7.27786E-04	2.95913E-04	2.95913E-04
MABC versus NNA	1.28945E-03	5.10114E-04	5.10114E-04
ADELI versus NDE	1.70688E-03	6.56493E-04	6.56493E-04
MABC versus CWOA	6.56486E-03	2.45281E-03	2.45281E-03
MABC versus PSO	1.46075E-02	5.29723E-03	5.13671E-03
TLBO versus NDE	2.83112E-02	9.95560E-03	9.95560E-03
MABC versus ISCA	6.08528E-02	2.07301E-02	2.07301E-02
STLBO versus NDE	6.70463E-02	2.21032E-02	2.21032E-02
IJAYA versus MABC	6.92376E-02	2.21032E-02	2.21032E-02
GOTLBO versus NNA	1.07776E-01	3.31618E-02	3.31618E-02
MABC versus WW	2.35963E-01	6.74180E-02	6.74180E-02
GOTLBO versus CWOA	3.72918E-01	1.02450E-01	1.02450E-01
DE versus GOTLBO	4.91746E-01	1.29691E-01	1.29691E-01
ADELI versus EBL SHADE	6.43762E-01	1.62709E-01	1.62709E-01
GOTLBO versus PSO	6.78807E-01	1.64107E-01	1.64107E-01
GOTLBO versus ISCA	1.0	4.46263E-01	4.46263E-01
TLBO versus EBL SHADE	1.0	8.67680E-01	8.67680E-01
DE versus EBL SHADE	1.0	1.0	1.0
DE versus ADELI	1.0	1.0	1.0
DE versus NDE	1.0	1.0	1.0
DE versus MABC	1.0	1.0	1.0
DE versus TLBO	1.0	1.0	1.0
DE versus STLBO	1.0	1.0	1.0
DE versus IJAYA	1.0	1.0	1.0
EBL SHADE versus ADELI	1.0	1.0	1.0
EBL SHADE versus NDE	1.0	1.0	1.0
EBL SHADE versus TLBO	1.0	1.0	1.0
EBL SHADE versus STLBO	1.0	1.0	1.0
EBL SHADE versus IJAYA	1.0	1.0	1.0
ADELI versus TLBO	1.0	1.0	1.0
ADELI versus STLBO	1.0	1.0	1.0
ADELI versus IJAYA	1.0	1.0	1.0
NDE versus EBL SHADE	1.0	1.0	1.0
NDE versus ADELI	1.0	1.0	1.0

Table S169 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
NDE versus TLBO	1.0	1.0	1.0
NDE versus STLBO	1.0	1.0	1.0
NDE versus IJAYA	1.0	1.0	1.0
MABC versus DE	1.0	1.0	1.0
MABC versus EBL SHADE	1.0	1.0	1.0
MABC versus ADELI	1.0	1.0	1.0
MABC versus NDE	1.0	1.0	1.0
MABC versus TLBO	1.0	1.0	1.0
MABC versus GOTLBO	1.0	1.0	1.0
MABC versus STLBO	1.0	1.0	1.0
MABC versus IJAYA	1.0	1.0	1.0
TLBO versus ADELI	1.0	1.0	1.0
TLBO versus STLBO	1.0	1.0	1.0
TLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus DE	1.0	1.0	1.0
GOTLBO versus EBL SHADE	1.0	1.0	1.0
GOTLBO versus ADELI	1.0	1.0	1.0
GOTLBO versus NDE	1.0	1.0	1.0
GOTLBO versus MABC	1.0	1.0	1.0
GOTLBO versus TLBO	1.0	1.0	1.0
GOTLBO versus STLBO	1.0	1.0	1.0
GOTLBO versus IJAYA	1.0	1.0	1.0
GOTLBO versus WW	1.0	1.0	1.0
STLBO versus EBL SHADE	1.0	1.0	1.0
STLBO versus ADELI	1.0	1.0	1.0
STLBO versus TLBO	1.0	1.0	1.0
STLBO versus IJAYA	1.0	1.0	1.0
PSO versus DE	1.0	1.0	1.0
PSO versus EBL SHADE	1.0	1.0	1.0
PSO versus ADELI	1.0	1.0	1.0
PSO versus NDE	1.0	1.0	1.0
PSO versus MABC	1.0	1.0	1.0
PSO versus TLBO	1.0	1.0	1.0
PSO versus GOTLBO	1.0	1.0	1.0
PSO versus STLBO	1.0	1.0	1.0
PSO versus IJAYA	1.0	1.0	1.0
PSO versus ISCA	1.0	1.0	1.0
PSO versus NNA	1.0	1.0	1.0
PSO versus CWOA	1.0	1.0	1.0
PSO versus WW	1.0	1.0	1.0
IJAYA versus DE	1.0	1.0	1.0
IJAYA versus EBL SHADE	1.0	1.0	1.0
IJAYA versus ADELI	1.0	1.0	1.0

Table S169 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
IJAYA versus NDE	1.0	1.0	1.0
IJAYA versus TLBO	1.0	1.0	1.0
IJAYA versus STLBO	1.0	1.0	1.0
ISCA versus DE	1.0	1.0	1.0
ISCA versus EBL SHADE	1.0	1.0	1.0
ISCA versus ADELI	1.0	1.0	1.0
ISCA versus NDE	1.0	1.0	1.0
ISCA versus MABC	1.0	1.0	1.0
ISCA versus TLBO	1.0	1.0	1.0
ISCA versus GOTLBO	1.0	1.0	1.0
ISCA versus STLBO	1.0	1.0	1.0
ISCA versus PSO	1.0	1.0	1.0
ISCA versus IJAYA	1.0	1.0	1.0
ISCA versus NNA	1.0	1.0	1.0
ISCA versus CWOA	1.0	1.0	1.0
ISCA versus WW	1.0	1.0	1.0
NNA versus DE	1.0	1.0	1.0
NNA versus EBL SHADE	1.0	1.0	1.0
NNA versus ADELI	1.0	1.0	1.0
NNA versus NDE	1.0	1.0	1.0
NNA versus MABC	1.0	1.0	1.0
NNA versus TLBO	1.0	1.0	1.0
NNA versus GOTLBO	1.0	1.0	1.0
NNA versus STLBO	1.0	1.0	1.0
NNA versus PSO	1.0	1.0	1.0
NNA versus IJAYA	1.0	1.0	1.0
NNA versus ISCA	1.0	1.0	1.0
NNA versus CWOA	1.0	1.0	1.0
NNA versus WW	1.0	1.0	1.0
CWOA versus DE	1.0	1.0	1.0
CWOA versus EBL SHADE	1.0	1.0	1.0
CWOA versus ADELI	1.0	1.0	1.0
CWOA versus NDE	1.0	1.0	1.0
CWOA versus MABC	1.0	1.0	1.0
CWOA versus TLBO	1.0	1.0	1.0
CWOA versus GOTLBO	1.0	1.0	1.0
CWOA versus STLBO	1.0	1.0	1.0
CWOA versus PSO	1.0	1.0	1.0
CWOA versus IJAYA	1.0	1.0	1.0
CWOA versus ISCA	1.0	1.0	1.0
CWOA versus NNA	1.0	1.0	1.0
CWOA versus WW	1.0	1.0	1.0
WW versus DE	1.0	1.0	1.0

Table S169 (continued)

Hypothesis	post-hoc procedure		
	Nemenyi	Holm	Shaffer
WW versus EBL SHADE	1.0	1.0	1.0
WW versus ADELI	1.0	1.0	1.0
WW versus NDE	1.0	1.0	1.0
WW versus MABC	1.0	1.0	1.0
WW versus TLBO	1.0	1.0	1.0
WW versus GOTLBO	1.0	1.0	1.0
WW versus STLBO	1.0	1.0	1.0
WW versus PSO	1.0	1.0	1.0
WW versus IJAYA	1.0	1.0	1.0
WW versus ISCA	1.0	1.0	1.0
WW versus NNA	1.0	1.0	1.0
WW versus CWOA	1.0	1.0	1.0

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: