|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Algorithm | Optimal values for variables | | | | Best Subjects | | | | Optimal cost |
|  |  |  |  |  |  |  |  |  |  |
| **H5N1** | 0.78058 | 0.38635 | 40.43444 | 198.42283 | -0.00019 | -0.00060 | -77.53741 | -41.57717 | 5892.58762 |
| AOA [1] | 0.83037 | 0.41621 | 42.75127 | 169.34540 | N/A | N/A | N/A | N/A | 6048.78440 |
| HPSO [2] | 0.81250 | 0.43750 | 42.09845 | 176.63660 | N/A | N/A | N/A | N/A | 6059.71433 |
| CDE [3] | 0.81250 | 0.43750 | 42.09841 | 176.63769 | N/A | N/A | N/A | N/A | 6059.73400 |
| WOA [4] | 0.81250 | 0.43750 | 42.09827 | 176.63900 | N/A | N/A | N/A | N/A | 6059.74100 |
| Coello 2002[5] | 0.81250 | 0.43750 | 42.09740 | 176.65405 | -0.00002 | -0.03589 | -27.88608 | -63.34595 | 6059.94634 |
| Coello 2000[6] | 0.87500 | 0.50000 | 42.09390 | 177.08050 | -0.00009 | -0.03592 | -2156.83649 | -62.91951 | 6069.32670 |
| GeneAS [7] | 0.93750 | 0.50000 | 48.32900 | 112.67900 | -0.00475 | -0.03894 | -3652.87684 | -127.32100 | 6410.38110 |
| HS [8] | 1.12500 | 0.62500 | 58.29015 | 43.69268 | 0.00000 | -0.06891 | -2.01500 | -196.30700 | 7197.73000 |
| Kannan [9] | 1.12500 | 0.62500 | 58.29100 | 43.69000 | 0.00002 | -0.06890 | -21.22010 | -196.31000 | 7198.04280 |
| Branch-bound [10] | 1.12500 | 0.62500 | 48.97000 | 106.72000 | 0.17900 | 0.15780 | 3.00000 | 133.28400 | 7982.50000 |

[1] L. Abualigah, A. Diabat, S. Mirjalili, M. Abd Elaziz, and A. H. Gandomi, “The arithmetic optimization algorithm,” *Comput. Methods Appl. Mech. Eng.*, vol. 376, p. 113609, 2021, doi: 10.1016/j.cma.2020.113609.

[2] Q. He and L. Wang, “A hybrid particle swarm optimization with a feasibility-based rule for constrained optimization,” *Appl. Math. Comput.*, vol. 186, no. 2, pp. 1407–1422, Mar. 2007, doi: 10.1016/j.amc.2006.07.134.

[3] F. Huang, L. Wang, and Q. He, “An effective co-evolutionary differential evolution for constrained optimization,” *Appl. Math. Comput.*, vol. 186, no. 1, pp. 340–356, Mar. 2007, doi: 10.1016/j.amc.2006.07.105.

[4] S. Mirjalili and A. Lewis, “The whale optimization algorithm,” *Adv. Eng. Softw.*, vol. 95, pp. 51–67, 2016, doi: 10.1016/j.advengsoft.2017.07.002.

[5] C. A. Coello Coello and E. Mezura Montes, “Constraint-handling in genetic algorithms through the use of dominance-based tournament selection,” *Adv. Eng. Inform.*, vol. 16, no. 3, pp. 193–203, Jul. 2002, doi: 10.1016/S1474-0346(02)00011-3.

[6] C. A. Coello Coello, “CONSTRAINT-HANDLING USING AN EVOLUTIONARY MULTIOBJECTIVE OPTIMIZATION TECHNIQUE,” *Civ. Eng. Environ. Syst.*, vol. 17, no. 4, pp. 319–346, Oct. 2000, doi: 10.1080/02630250008970288.

[7] K. Deb, “GeneAS: A Robust Optimal Design Technique for Mechanical Component Design,” in *Evolutionary Algorithms in Engineering Applications*, D. Dasgupta and Z. Michalewicz, Eds., Berlin, Heidelberg: Springer Berlin Heidelberg, 1997, pp. 497–514. doi: 10.1007/978-3-662-03423-1\_27.

[8] M. Mahdavi, M. Fesanghary, and E. Damangir, “An improved harmony search algorithm for solving optimization problems,” *Appl. Math. Comput.*, vol. 188, no. 2, pp. 1567–1579, May 2007, doi: 10.1016/j.amc.2006.11.033.

[9] B. K. Kannan and S. N. Kramer, “An Augmented Lagrange Multiplier Based Method for Mixed Integer Discrete Continuous Optimization and Its Applications to Mechanical Design,” *J. Mech. Des.*, vol. 116, no. 2, pp. 405–411, Jun. 1994, doi: 10.1115/1.2919393.

[10] E. Sandgren, “Nonlinear Integer and Discrete Programming in Mechanical Design Optimization,” *J. Mech. Des.*, vol. 112, no. 2, pp. 223–229, Jun. 1990, doi: 10.1115/1.2912596.