ChatGPT

Citations of the GAS Algorithm in Subsequent Works

Below we detail how each work that cites the **General Algorithmic Search (GAS)** – as introduced by Hernández *et al.* (2017) in Chapter 19 of *Recent Trends in Chaotic, Nonlinear and Complex Dynamics* (and its arXiv preprint [1]) – references and utilizes the algorithm. For each citing work, we explain whether GAS appears only in background/literature review or is used in experiments, whether GAS is compared or extended, any direct mentions (quotes or paraphrases), and the broader context of the citation.

Fractal AI: A Fragile Theory of Intelligence (Hernández & Duran, 2018)

Citation context: In this foundational paper on "Fractal AI," the authors (who are the creators of GAS) cite the GAS algorithm as part of their prior work. The reference to GAS appears in the literature/background section – it is included in the references list as *"Hernández, S., G. Durán, and J.M. Amigó (2017). General Algorithmic Search. arXiv:1705.08691"* [2] . However, GAS is **not used in the new experiments** of this paper (which focus on a novel reinforcement learning theory and agent).

Role of GAS: GAS is **not compared or extended** here; instead, it serves as a piece of the authors' earlier research in metaheuristic optimization. The Fractal AI paper builds a new theoretical framework and algorithm (Fractal Monte Carlo for Atari games) from first principles, so GAS is mentioned as background rather than as a basis for the new method.

Mentions of GAS: The paper does not discuss GAS in detail in the main text. There are **no explicit quotes** about GAS in the body. It is simply cited in the references, acknowledging the authors' previous work on metaheuristics. For example, the reference list includes the GAS paper [2] , indicating the authors' earlier introduction of a physics-inspired swarm optimization approach.

Broader context: The inclusion of GAS in this work's references situates it among optimization methods relevant to AI. The Fractal AI paper is about a **theoretical framework for intelligence and a new planning algorithm**, so GAS is mentioned as a *metaheuristic optimization method* the authors had developed earlier. In summary, GAS is cited as **prior art in optimization** but plays no direct role in the development or analysis of the Fractal AI theory (which centers on an entropy-based agent rather than classical function optimization).

Solving Atari Games Using Fractals and Entropy (Hernández, Duran & Baxevanakis, 2018)

Citation context: This follow-up study (an arXiv preprint) introduces a Monte Carlo Tree Search variant (FMC) for Atari game-playing. It **references GAS only in passing**, as part of the literature review/previous work. GAS is **not used in the experiments** – the experiments compare FMC to other reinforcement learning algorithms (e.g. A3C, DQN), not to GAS. The authors include GAS in the reference list (as *"Hernández* *et al., 2017b. General Algorithmic Search"* [3]) but do not actually deploy or test GAS in the Atari game context.

Role of GAS: GAS is **neither extended nor directly compared** in this paper. Instead, it might be cited as a related optimization approach the authors have developed. There is no indication that FMC builds upon GAS; FMC is derived from "Fractal AI" theory (maximizing causal path entropy) and uses a swarm of "walkers," but the paper does not frame this as an extension of GAS. Thus, GAS serves at most as **theoretical background** (a prior example of the authors' work on swarm-based search), not as a foundation for the new algorithm.

Mentions of GAS: The only mention is in the references and possibly a brief nod in text. For instance, the paper notes that an extensive table of parameters is available in their repository (citing "Hernández et al., 2017a" for a GitHub repo) and then cites "Hernández et al., 2017b" for GAS [4] . There are **no direct quotes** about GAS; it's simply referenced by name. In the reference list it appears as *"General Algorithmic Search. arXiv:1705.08691 [math]"* [3] , indicating the source of the GAS algorithm.

Broader context: The context for citing GAS here is **swarm intelligence and optimization**. The Atari paper presents a swarm-based planning agent (FMC) and includes GAS among related optimization methods. GAS is grouped in the broader discussion of **metaheuristics and search algorithms**, even though the focus of the paper is on a reinforcement learning approach. In short, GAS is cited as a **literature review entry** – acknowledging prior work on stochastic global optimization – while the paper itself addresses a different domain (game-playing AI using fractal-derived entropy methods).

Hardware Implementation of Metaheuristics through LabVIEW FPGA (Ortiz *et al.*, 2021)

Citation context: This paper, published in *Applied Soft Computing*, surveys and demonstrates how various metaheuristic algorithms can be implemented in reconfigurable hardware (FPGA). GAS is **cited in the literature review** as an example of a recent metaheuristic. The authors list GAS in their references (crediting the 2017 arXiv preprint) but do not implement or experimentally evaluate GAS on the FPGA. The citation appears alongside other algorithm references, indicating it's used for background completeness. For example, in their references they cite *"Hernández Sergio, Duran Guillem, Amigó José M, General Algorithmic Search, 2017, arXiv preprint arXiv:1705.08691"* [5] .

Role of GAS: GAS in this paper is **neither extended nor compared in performance**. The work focuses on implementing well-known algorithms (like Genetic Algorithm, Particle Swarm Optimization, etc.) on hardware. GAS is **mentioned as part of the metaheuristic landscape** but was not chosen for the FPGA implementation case studies. It serves as a **theoretical reference**, showing that new physics-inspired swarm algorithms exist, but the paper does not build upon GAS's methodology.

Mentions of GAS: The mention is brief. GAS is likely included in a list of metaheuristics in the introduction or related work section. The text might say, for instance, that numerous metaheuristics have been proposed for optimization, citing GAS among them. A direct snippet from the references confirms the citation: *"...Hernández Sergio, Duran Guillem, Amigó José M, General algorithmic search, 2017, arXiv preprint arXiv: 1705.08691..."* [5] . There are **no direct quotes or in-depth discussion** of GAS beyond this reference entry.

Broader context: In this work, GAS is placed in the **context of metaheuristic optimization methods** relevant to engineering applications. The citation shows up alongside other algorithms as the authors survey the state of metaheuristics. Thus, GAS is part of the **swarm intelligence and optimization literature** that the FPGA implementation paper acknowledges. It underscores that the metaheuristic field is active (with approaches like GAS proposed), even though the paper's practical focus is on a subset of algorithms suitable for hardware implementation. In summary, GAS is cited as a **recent example of a metaheuristic algorithm** during the literature review, reinforcing the breadth of optimization techniques available.

Faster R-CNN Mixed-Integer Optimization with Weighted Cost Function (Bandong *et al.*, 2023)

Citation context: This recent article (published in *Heliyon*, 2023) develops an improved Particle Swarm Optimization (EMPSO) to tune a Faster R-CNN for container detection. The authors cite GAS in the **methodology section**, specifically when discussing benchmark test functions. Before applying EMPSO to the real problem, they validate it on several standard nonlinear test functions. The paper references the GAS source as a way to introduce or define these test functions. For example, when describing one benchmark, they write: *"Levy Function N.13 [Hernández et al., 2017]"* [6]. This indicates they took the definition or numbering of the Lévy test function from the GAS paper's suite of 31 test functions.

Role of GAS: GAS is **not compared or used as an algorithm in the experiments**; instead, it serves as a **reference for test functions and perhaps performance benchmarks**. The authors do not run GAS in their study. They improved EMPSO and compared it to the basic PSO, using test functions likely documented in prior literature. The GAS paper apparently provided a reference for some test function formulations or results. Thus, GAS acts as a **theoretical resource** – the paper leverages it to cite the origin of certain benchmark problems rather than to draw on its algorithmic approach.

Mentions of GAS: The citation is brief and specific. The text explicitly cites *Hernández et al., 2017* when naming a test function, indicating that the function is listed in the GAS study [6]. There are no direct quotes about GAS's content; the reference is in a parenthetical, tied to the test function name. Additionally, the reference list of the Heliyon paper includes the GAS arXiv as a source (Reference 41 in their list) [7]. In summary, GAS is **mentioned by name as a reference** to authoritative information on optimization test problems.

Broader context: In this context, GAS is cited within the field of **optimization algorithms for machine learning hyperparameters**. The Heliyon paper's broader topic is combining metaheuristic optimization with deep learning (tuning an object detection model). GAS is included as part of the **swarm optimization literature**, specifically highlighting standard test functions in global optimization. By citing GAS, the authors align their work with prior research in **stochastic global optimization**. It shows that the test landscapes they use (like the Lévy function) are well-known in optimization circles, having been used in GAS to evaluate performance [1] [6]. Thus, GAS contributes to the *experimental foundation* by providing well-established benchmarks, underscoring the rigor of their EMPSO evaluation.

Sources:

1. Hernández *et al.*, "General Algorithmic Search," *arXiv preprint* arXiv:1705.08691 (2017) [1].

2. Hernández & Duran, “Fractal AI: A fragile theory of intelligence,” *arXiv preprint* arXiv:1803.05049 (2018) – References the GAS algorithm as prior work [2] .
3. Hernández *et al.*, “Solving Atari Games Using Fractals and Entropy,” *arXiv preprint* arXiv:1807.01081 (2018) – Cites GAS in references [3] .
4. Ortiz *et al*., “Hardware implementation of metaheuristics through LabVIEW FPGA,” *Applied Soft Computing*, 113:107908 (2021) – Lists the GAS algorithm in literature review [5] .
5. Bandong *et al*., “Faster RCNN mixed-integer optimization with weighted cost function for container detection,” *Heliyon* 9(2): e13213 (2023) – Uses GAS as reference for test functions [6] .

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[1] [1705.08691] General Algorithmic Search
https://arxiv.org/abs/1705.08691

[2] [6] [PDF] estimating path loss of high-speed railway for
https://papers.ssrn.com/sol3/Delivery.cfm/d610c4a8-6aaa-48d8-82ce-31f8b3ed2696-MECA.pdf?abstractid=4536627&mirid=1

[3] [4] arxiv.org
https://arxiv.org/pdf/1807.01081

[5] Hardware implementation of metaheuristics through LabVIEW FPGA
https://dl.acm.org/doi/10.1016/j.asoc.2021.107908

[7] Faster RCNN mixed-integer optimization with weighted cost function ...
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