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Faculty of Applied Informatics
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LLM-designed Evolutionary Algorithms

Competition results

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Competition details

https://ailab.fai.utb.cz/first-competition-on-llm-designed-ea/

General overview

- **Objective**: Launch a novel competition focused on the use of large language models (LLMs) to design evolutionary algorithms (EAs) tackling numerical global optimization tasks.
- **Event**: First edition hosted at GECCO 2025.
- **Benchmark**: Challenges participants with the GNBG [1] suite of 24 box-constrained numerical functions (provided in *Python*, *MATLAB*, and *C++*).
- **Runs**: Each function is independently evaluated in 31 repeated runs, ensuring statistical signifikance.

[1] A. H. Gandomi, D. Yazdani, M. N. Omidvar, and K. Deb, "GNBG-Generated Test Suite for Box-Constrained Numerical Global Optimization," arXiv preprint arXiv:2312.07034, 2023

Competition rules

- **LLM integration**
  - Participants must use an LLM during EA design (e.g., GPT-4 Turbo with specified temperature & prompts).
- **Consistency in parameters**
  - While tuning is allowed, any algorithm parameters must be constant across all functions.
- **Benchmark integrity**
  - No modifications to the GNBG benchmark are permitted; it must be treated as a black-box function.
- **Submission requirements**
  - Must include:
    - Algorithm title
    - LLM details and prompts
    - Source code for verification
    - ZIP of results in specified format (f_x_value.txt and f_x_params.txt)

Evaluation criteria

- **Performance metric**:
  - Compute the me**an best-found value** over 31 runs for each function.
  - Normalize scores between 0 (worst) and 1 (best) per function, proportionally.
- **Overall scoring**:
  - Aggregate scores across all 24 functions.
  - **Maximum total score = 24**, achieved by being the best on every function.
  - Precision differences down to **1e-8 absolute error** are considered in scoring.

Competition entries

Entries

Algorithm title	LLM specification
Adaptive Ensemble Evolutionary Algorithm (AEEA)	Claude 3.5 Sonnet, temperature = 0.7, max_tokens = 4096
LLM-SHADE	claude-sonnet-4-20250514, tempeurture=1.0, max_tokens=4096
Ensembled Seed	Claude, GPT4o, Google Gemini
LLM_based_GA_with_Adaptive_Strategies	GitHub Copilot / Claude AI Assistant
Vortex Search: A New Nature-Inspired Metaheuristic	DeepSeek
LLM-Driven Evolution of Metaheuristic Components V2	deepseek-coder-v2 with 236B and random temperature for each run
Ensembled HeuristicAlgorithm (Tem: UNAL-CROM)	DEEPSEEK, CLAUDE
LLM-Enhanced Genetic Algorithm	deepseek/deepseek-r1:free Temperature: 0.1 Max Tokens: 500
AdaptiveIslandDE	Gemini 2.0 flash "temperature": 1.2, "top_p": 0.98, "top_k": 80, "max_output_tokens": 8192
MSHO-LLM: LLM-Assisted Multi-Stage Hybrid Optimizer	Gemini-2.0-flash, temperature=0.0
EASE-ing into Global Optimization	GPT-4o - gpt-4o-2024-08-06 (default temp)
Adaptive Multi-Memory SHADE with Progress-guided Search Efficiency (AMMS-PGSE)	gpt-4o-mini(temperature=0.3),Claude-3.5-Sonnet(temperature=0.3)
AdaSwarmD	GPT-4o
Adaptive Evolutionary Algorithm with Local Search	gpt-4o-mini-2024-07-18, temperature: 1
HybridFireflyDE	GPT 4o, temperature=0.8
Entropy-Driven Quantum-Inspired Optimization	mistrall:small, magistral, openai deepresearch, o3

Competition results

Ranking

Rank	Points	Algorithm title	Author
1	19.60	Adaptive Ensemble Evolutionary Algorithm (AEEA)	Đôn Trần Quí
2	19.41	MSHO-LLM: LLM-Assisted Multi-Stage Hybrid Optimizer	Đoàn Duy Tùng
3	19.34	LLM-SHADE	Acvine Curie
4	19.25	Ensembled HeuristicAlgorithm (Tem: UNAL-CROM)	Note: Same result files
4	19.25	Ensembled Seed	
6	19.22	AdaSwarmD	
7	18.86	Adaptive Multi-Memory SHADE with Progress-guided Search Efficiency (AMMS-PGSE)	
8	18.71	LLM-Driven Evolution of Metaheuristic Components V2	
9	18.59	AdaptiveIslandDE	
10	18.42	LLM_based_GA_with_Adaptive_Strategies	
11	17.85	EASE-ing into Global Optimization	
12	17.69	HybridFireflyDE	
13	17.49	Adaptive Evolutionary Algorithm with Local Search	
14	17.23	Vortex Search: A New Nature-Inspired Metaheuristic	
15	12.44	LLM-Enhanced Genetic Algorithm	
16	11.83	Entropy-Driven Quantum-Inspired Optimization	

Concluding remarks

- **Congratulations to the winners and thank you all for participating.**

- **Stay tuned for**:
  - Post-competition analysis of the entries,
  - Next renditions of the competition.

- **Complete results** and codes of the best 3 algorithms can be found at the competition github repo.

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Enjoy the rest of the conference!

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