

A vertical column of ten blue chevrons pointing upwards is positioned on the left side of the slide.

Melhorias no PSO com foco em diversidade direcional e hibridizações

Helder Mateus dos Reis Matos

Inteligência de enxames

Inspiração da biologia - revoada de pássaros



Inteligência de enxames

Inspiração da biologia - cardume de peixes



Inteligência de enxames

Inspiração da biologia - colônia de formigas



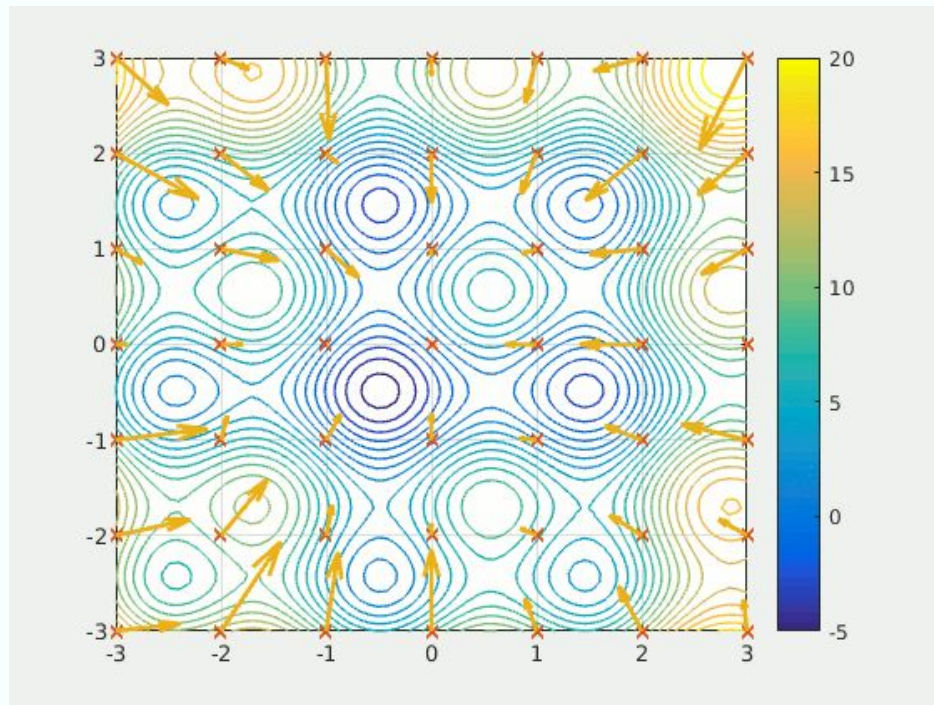
Particle Swarm Optimization (PSO)

Partículas dispostas em um espaço de busca



- Kennedy & Eberhart, 1995.
- Inspirado em **revoadas**.
- Não-determinístico.
- Baseado em **populações**.
- Equação de atualização da **velocidade**:

$$V_i^{t+1} = \underbrace{V_i^t}_{\text{Inertia}} + \underbrace{\varphi_1 \cdot r_1 (P_i - X_i^t)}_{\text{Cognitive Component}} + \underbrace{\varphi_2 \cdot r_2 (P_g - X_i^t)}_{\text{Social Component}}$$



Particle Swarm Optimization (PSO)

Histórico e variações



Evolution of Particle Swarm Optimization Techniques

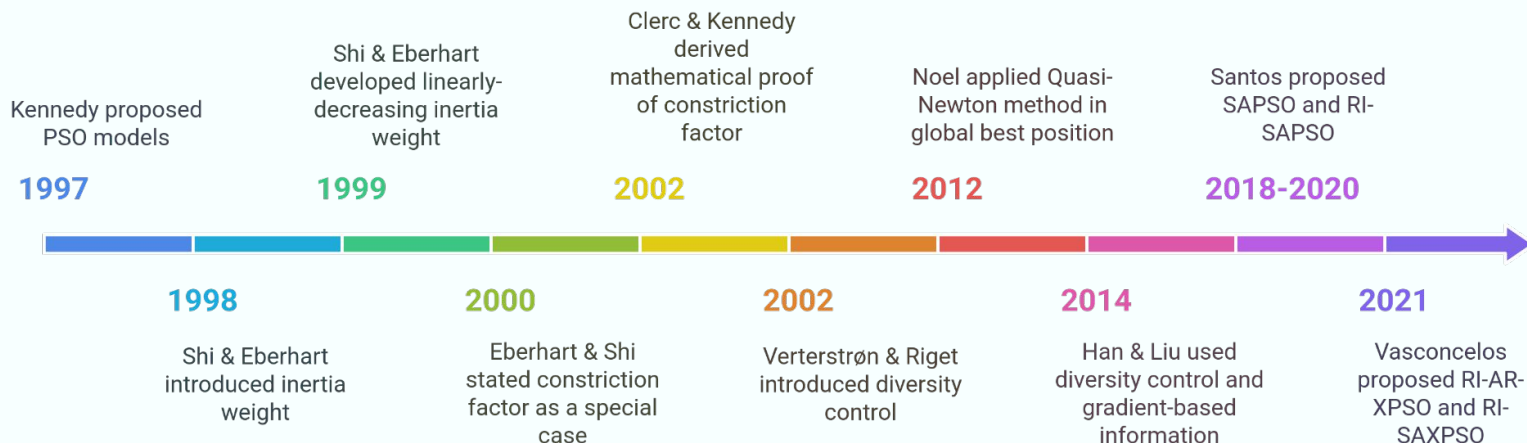
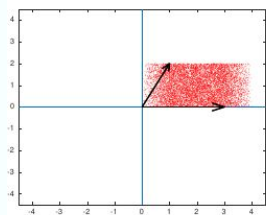
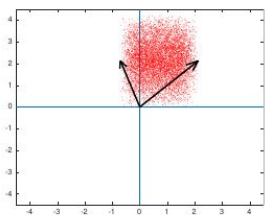




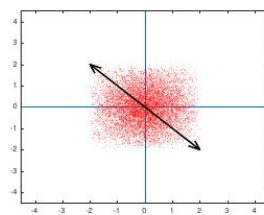
Figure 9 – Search distribution of all possible next positions given by searching vectors $(\vec{p} - \vec{x})$ and $(\vec{g} - \vec{x})$. The particle sample is at the origin $\vec{x} = [0, 0]$ and a total of 10^4 samples make part of the search distribution.



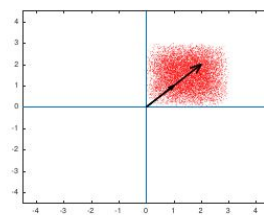
(a)



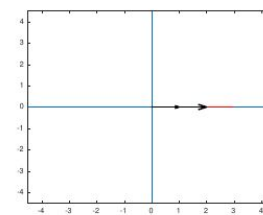
(b)



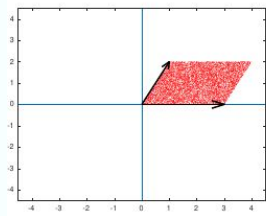
(c)



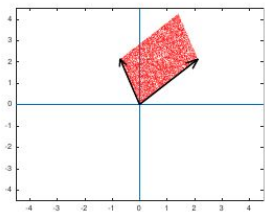
(d)



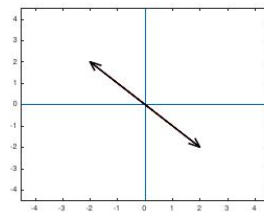
(e)



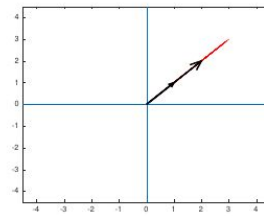
(f)



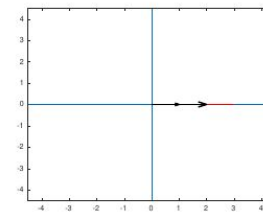
(g)



(h)



(i)



(j)

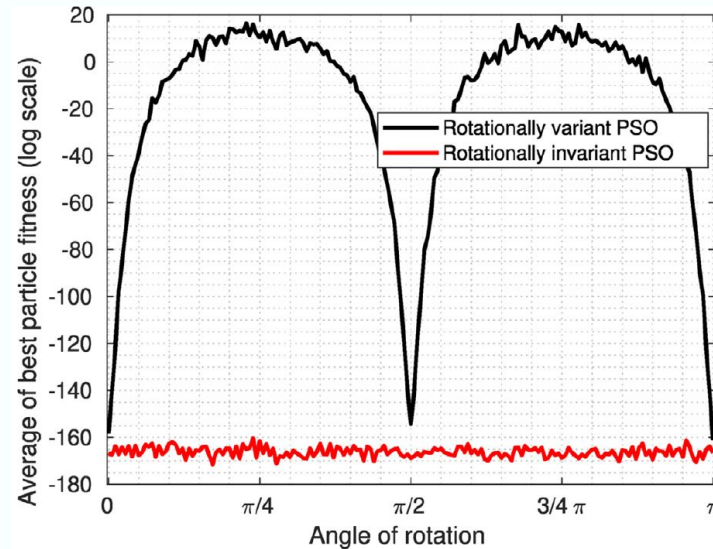


Fig. 2. Performance of both PSO versions as the system is rotated on a 2-dimensional eccentric ellipse function. The swarm size was set as $n = 20$, the maximum number of iterations was $T = 1000$, the inertia weight was $w = 0.7298$, and the acceleration coefficients were both $c_1 = c_2 = 1.4961$. For both versions of PSO, the number of executions was set as $E = 20$.

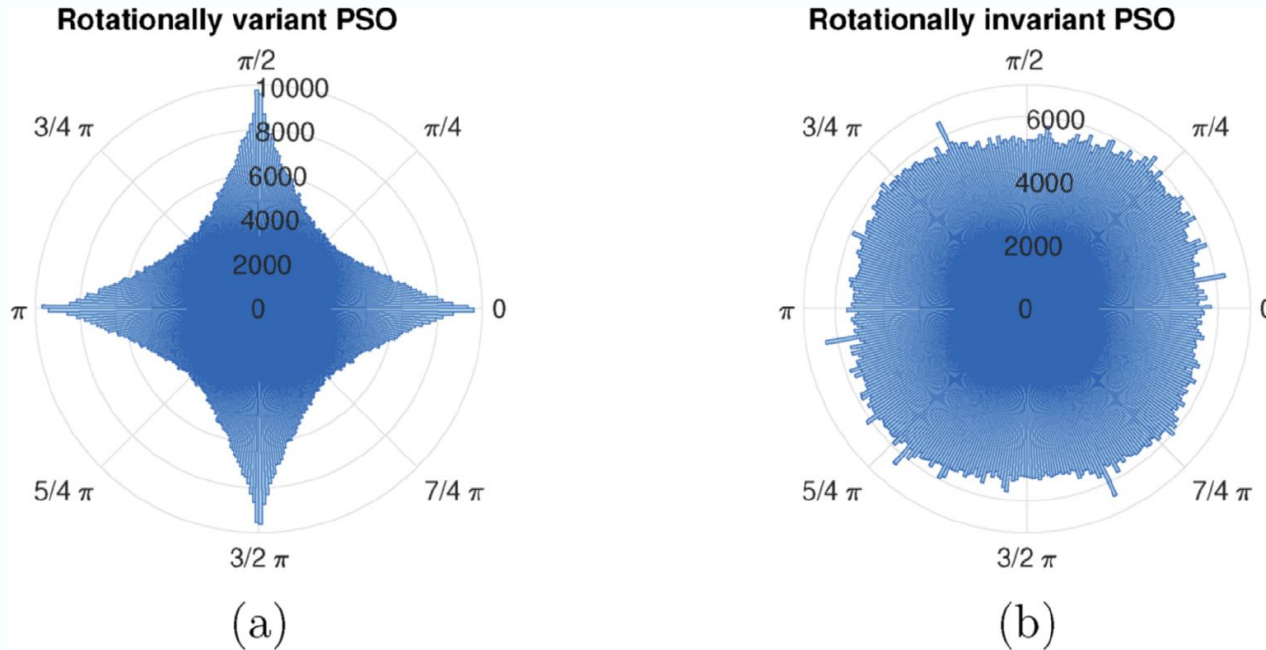


Fig. 3. A rotationally variant and invariant PSO versions applied on Sphere function with $d = 2$.

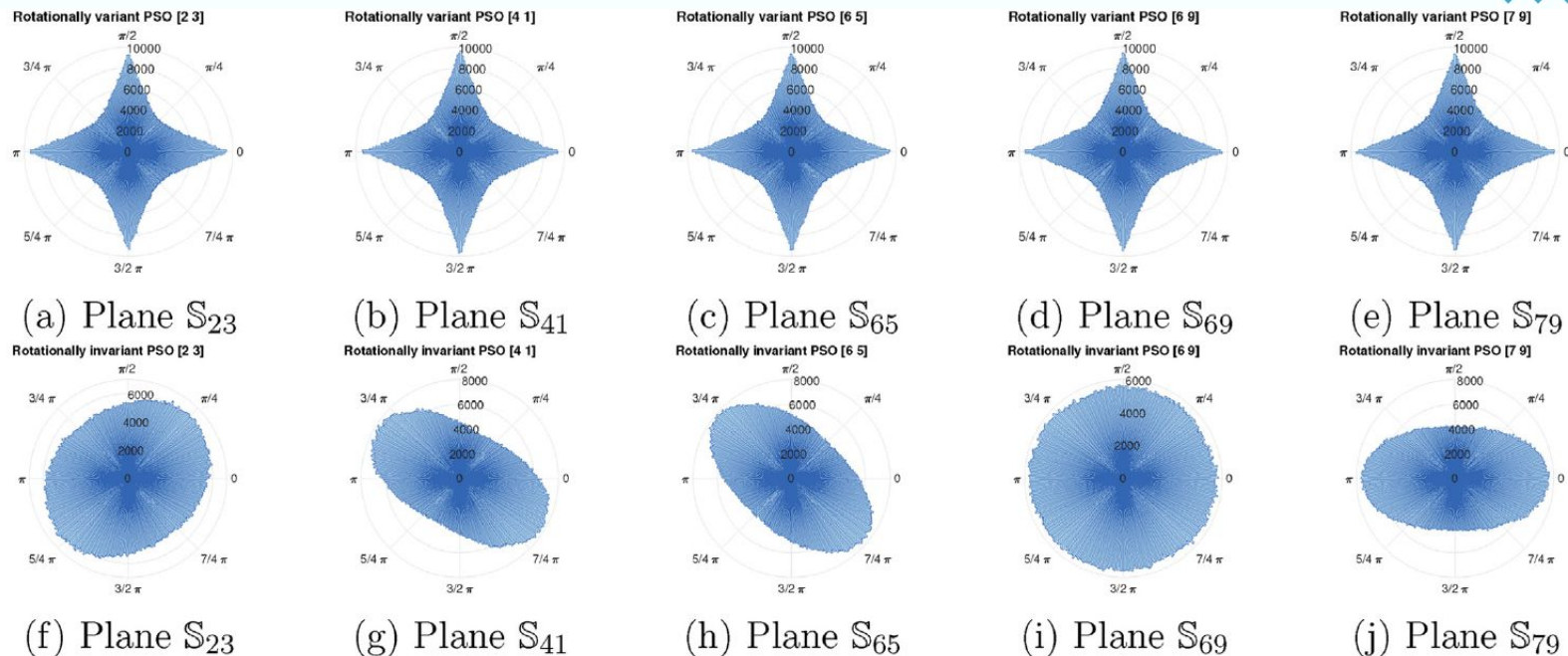


Fig. 4. A rotationally variant and invariant PSO versions applied on Sphere function with $d = 10$. Five random planes were chosen arbitrarily: S_{23} , S_{41} , S_{65} , S_{69} , and S_{79} .

Propostas de tese

Principal [P] e “satélites” [S]



- **[P] PSO rotacionalmente variante livre de bias direcional.**
- [S] Hibridização entre as versões variante e invariante.
- [S] Evitar a exploração de regiões já visitadas.
- [S] Hibridizar PSO com métodos determinísticos.
- [S] Paralelismo de métodos determinísticos na melhor partícula.

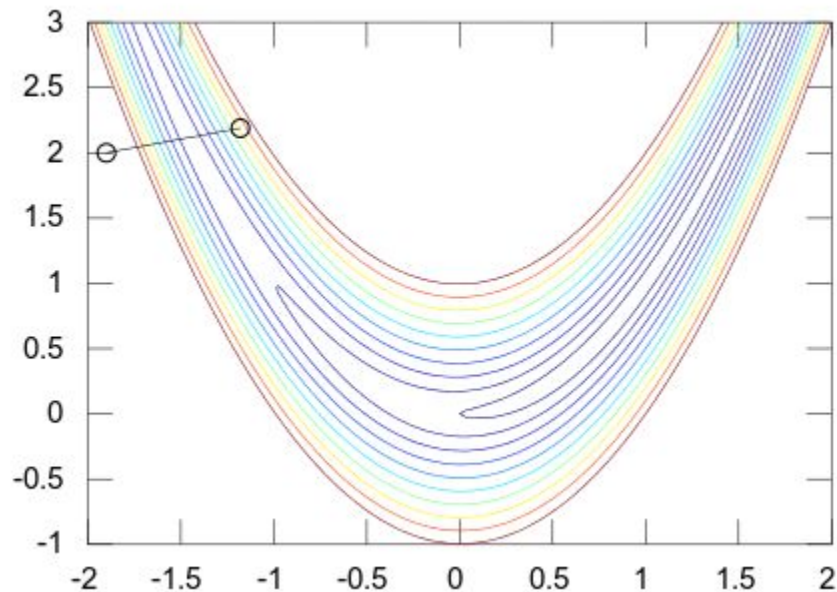


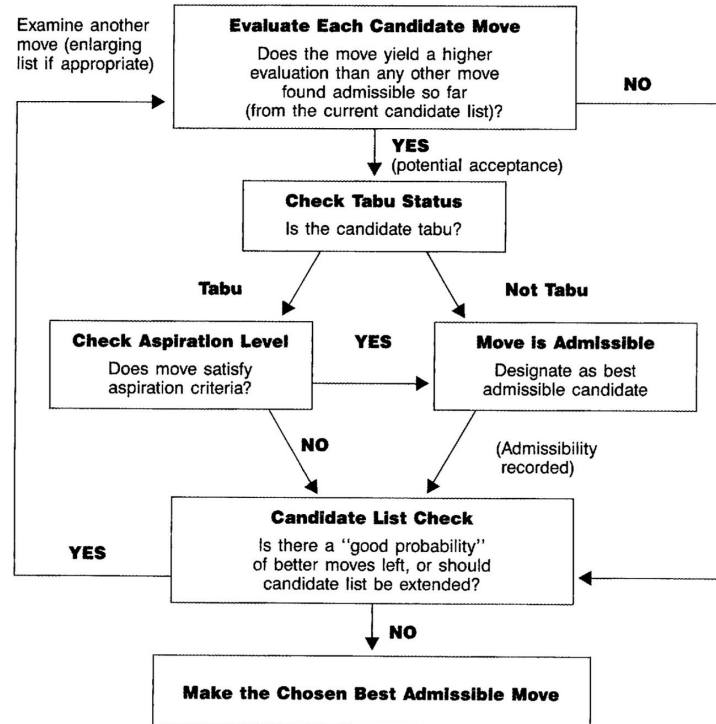
Matrix Rotation by 90 degrees clock-wise

1	2	3
4	5	6
7	8	9

Técnicas de IA

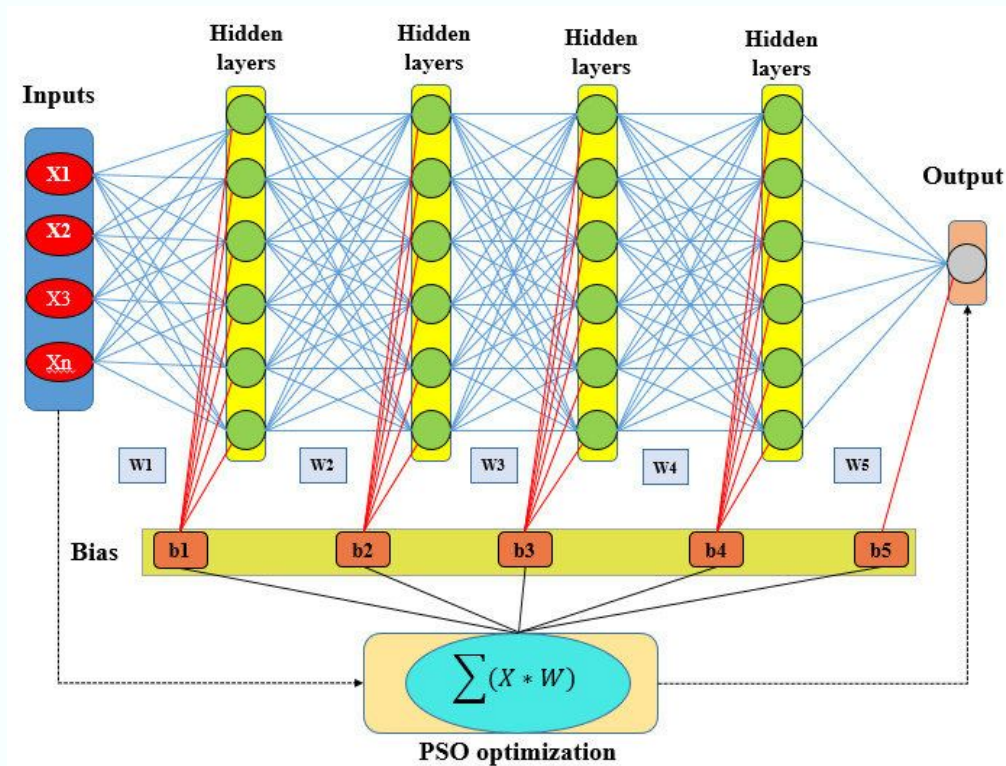
Incorporação de métodos determinísticos





Técnicas de IA

Treinamento de redes neurais



Structural Health Monitoring

Impact Factor: **5.7**

5-Year Impact Factor: **6.8**



Available access | Research article

First published online July 4, 2016

A global expectation-maximization based on memetic swarm optimization for structural damage detection

[Adam Santos](#) ✉, [Moisés Silva](#), [...], and [João C. W. A. Costa](#) ⁺³ [View all authors and affiliations](#)

[Volume 15, Issue 5](#) | <https://doi.org/10.1177/1475921716654433>

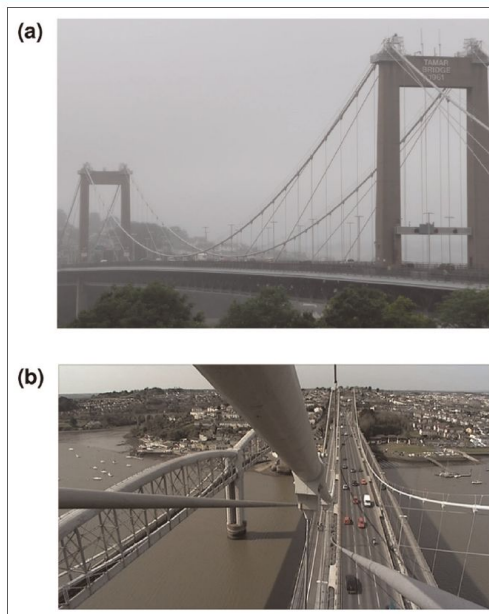


Figure 3. The Tamar Suspension Bridge viewed from River Tamar margins (a) and cantilever perspective (b).

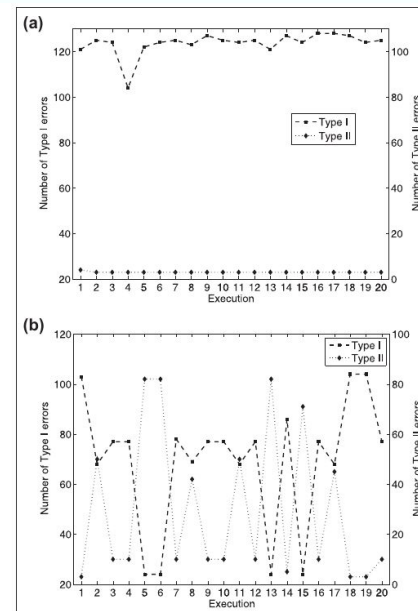


Figure 6. Z-24 Bridge: damage classification performance of the GEM-PSO (a) and EM-GMM (b) approaches with MSD as a function of the number of executions.



Article


Using Improved Particle Swarm Optimization Algorithm for Location Problem of Drone Logistics Hub

Li Zheng, Gang Xu , Wenbin Chen

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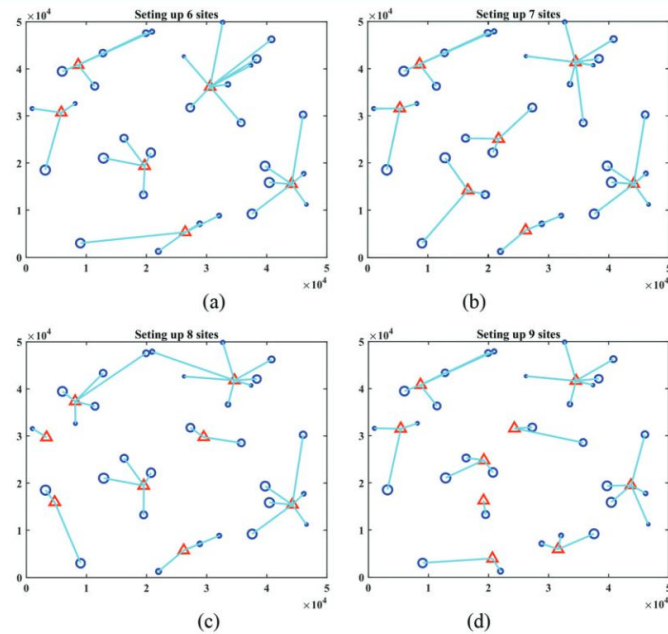


Figure 7: Distribution of drone logistics hub and village under DHPSO. (a–d) respectively represent the location distribution of the number of UAV logistics hubs at 6, 7, 8 and 9

Aplicações

Otimização de hiperparâmetros





Biomedical Signal Processing and Control

Volume 100, Part C, February 2025, 107126



Optimized attention-based lightweight CNN using particle swarm optimization for brain tumor classification

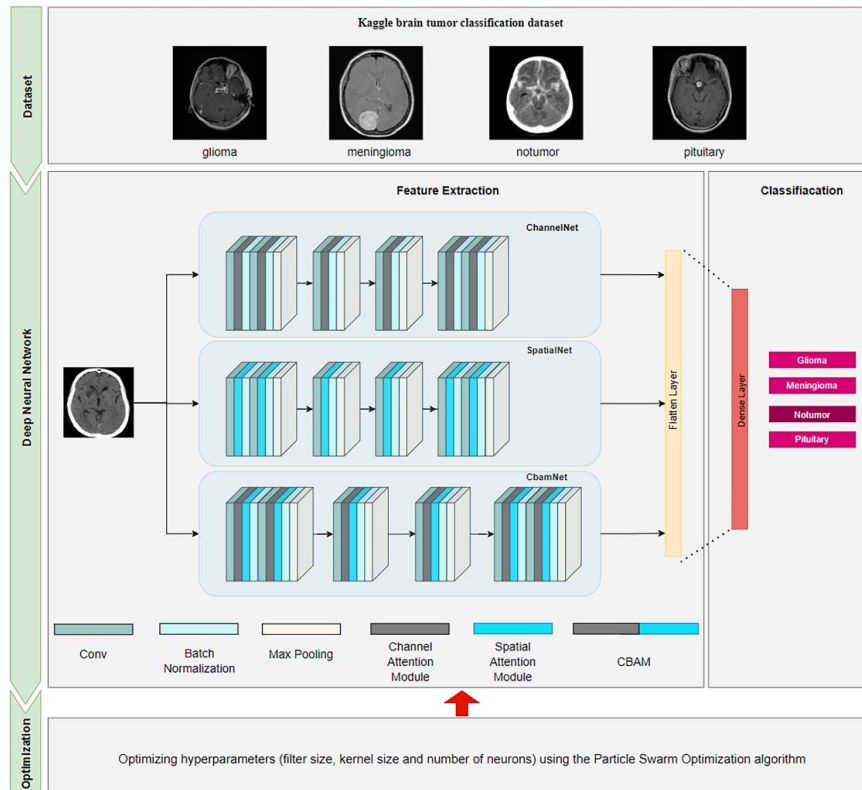
Okan Guder , Yasemin Cetin-Kaya 

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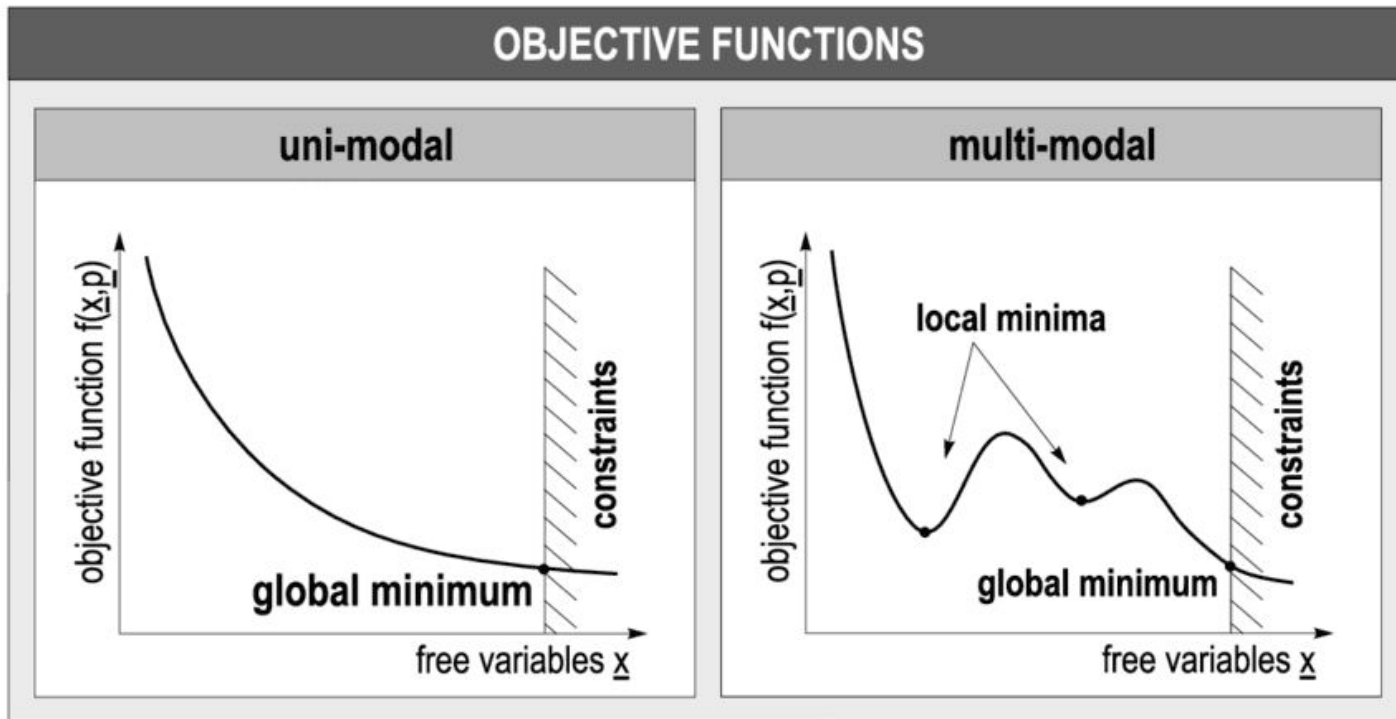
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Funções objetivo

Otimização unimodal e multimodal

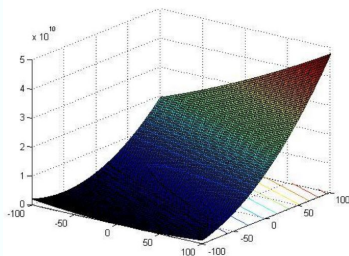


Benchmarks

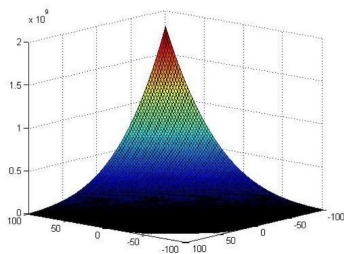
IEEE Congress on Evolutionary Computation (CEC)



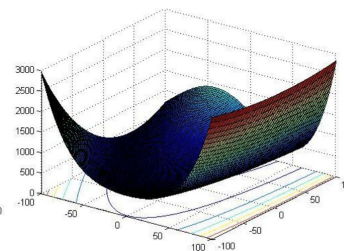
$$F_1(\mathbf{x}) = f_1(\mathbf{M}(\mathbf{x} - \mathbf{o}_1)) + F_1^*$$



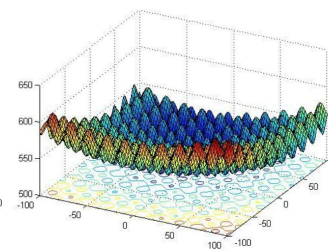
$$F_3(\mathbf{x}) = f_3(\mathbf{M}(\mathbf{x} - \mathbf{o}_3)) + F_3^*$$



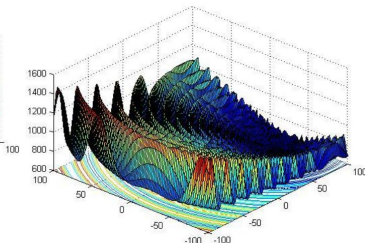
$$F_4(\mathbf{x}) = f_4(\mathbf{M}(\frac{2.048(\mathbf{x} - \mathbf{o}_4)}{100})) + F_4^*$$



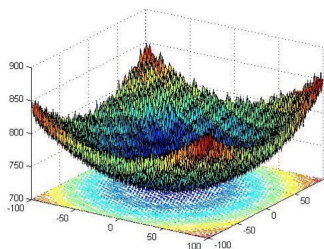
$$F_5(\mathbf{x}) = f_5(\mathbf{M}(\mathbf{x} - \mathbf{o}_5)) + F_5^*$$



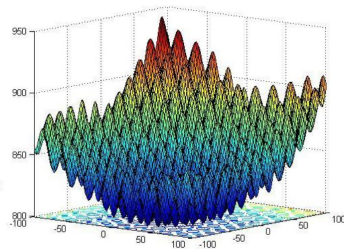
$$F_6(\mathbf{x}) = f_{20}(\mathbf{M}(\frac{0.5(\mathbf{x} - \mathbf{o}_6)}{100})) + F_6^*$$



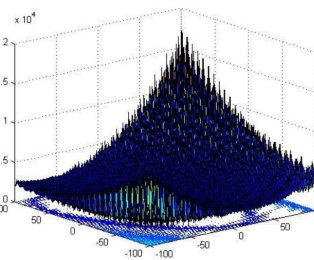
$$F_7(\mathbf{x}) = f_7(\mathbf{M}(\frac{600(\mathbf{x} - \mathbf{o}_7)}{100})) + F_7^*$$



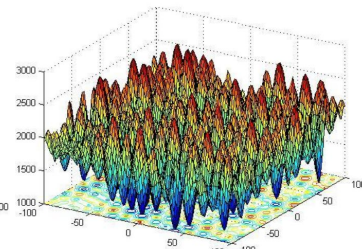
$$F_8(\mathbf{x}) = f_8(\frac{5.12(\mathbf{x} - \mathbf{o}_8)}{100}) + F_8^*$$



$$F_9(\mathbf{x}) = f_9(\mathbf{M}(\frac{5.12(\mathbf{x} - \mathbf{o}_9)}{100})) + F_9^*$$

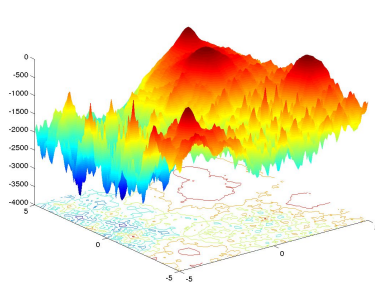
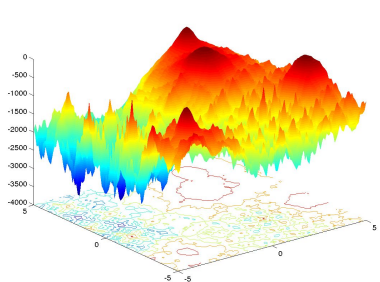
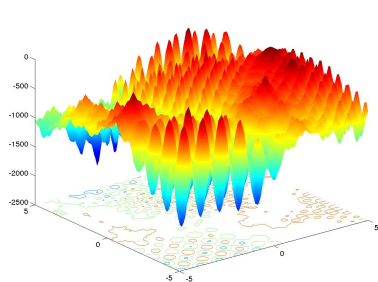
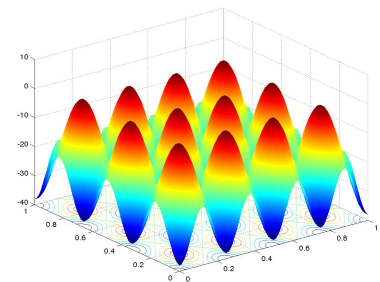
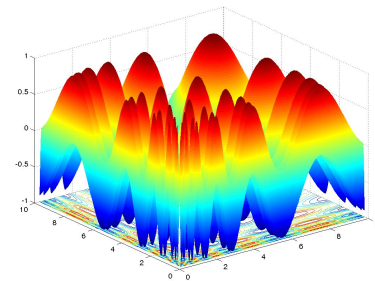
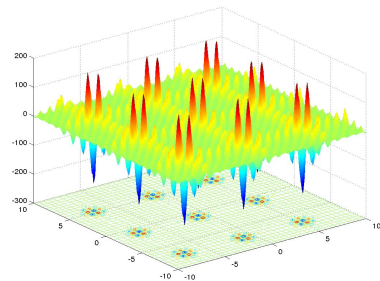
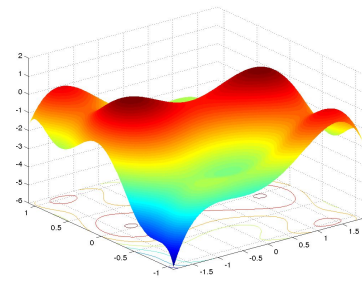
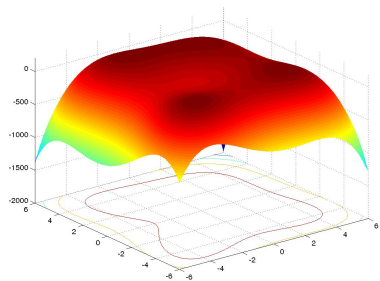


$$F_{10}(\mathbf{x}) = f_{10}(\frac{1000(\mathbf{x} - \mathbf{o}_{10})}{100}) + F_{10}^*$$



Benchmarks

Genetic and Evolutionary Computation Conference (GECCO)



A vertical column of ten blue chevrons pointing upwards is positioned on the left side of the slide.

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