# Project Food Sense

Mid-Semester Presentation

# Problem Statement

- To use Nature Inspired Algorithms to determine the quality of food items using various gas sensors and camera

# Nature Inspired Optimized Algorithms - MFO

- Inspired from navigation method of Moths
- Concept of Moths and Flames
- Moths - Candidate Solutions
- Flames  - Best possible moths obtained so far
- Exploration v/s Exploitation

# MFO

- Fitness measure : distance of moth from corresponding flame
- Moth position updation: using logarithmic spiral
- Adaptive decrease of no of flames: for convergence
- Convergence

# Nature Inspired Optimization Algorithms - GSA

- Inspired from the Laws of Gravity
- Mass of Search Agent (M)
- Fitness of search agent (F)
- Randomization in Force calculation, position updation

# GSA

- Mass updation of agents : proportional to fitness
- Role of G Updation in convergence
- Convergence

# GSA + MFO Hybrid

- Assign mass concept to Moths in MFO
- Communication between moths because of both MFO and GSA
- Increase the mass of the fitter moth - GSA
- Moths spiral around fit flames - MFO

# Hybrid Algorithm (Contd.)

- Moth motion is guided by not just by flames but by masses of other moths
- Ideally, faster convergence

# Hybrid Algorithm Flow

- MFO locomotion
- Parameter updation
- GSA locomotion

# Mass Fitness Relationship

- GSA - Measure of Fitness is Mass
- MFO - Measure of Fitness is distance to fittest moth
- GSA works on the premise that fitter agent attracts others towards itself

# Mass Fitness Relationship

- Hybrid algorithm, exploits this behaviour
- Hybrid - Measure of Fitness is distance to fittest moth
- Fittest moth has highest mass

# Problems Faced - G Updation

- Stagnation of algorithm for values in the order of G0
- Reason for stagnation - Slow decay of G
- $1/t$ vs $1/t^2$ vs $b^t$ where $b<1$ and $t$ = iteration no
- Slow decay of G: results in deviation of Moths from optimum value
- Updated decay of G to facilitate faster convergence without stagnation
- As iterations progress, decrease the GSA motion

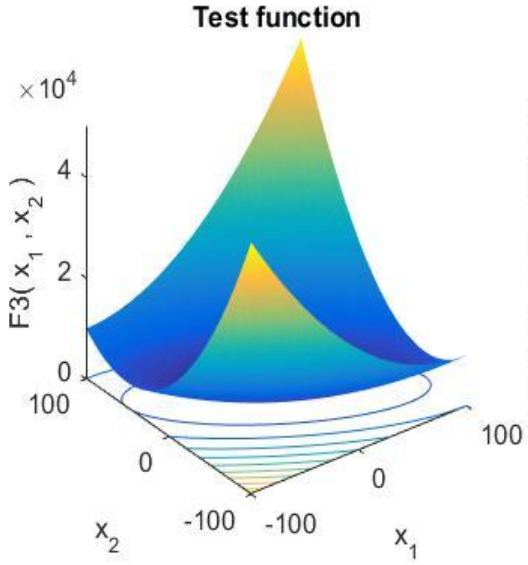
# Problems Faced - Mass Updation

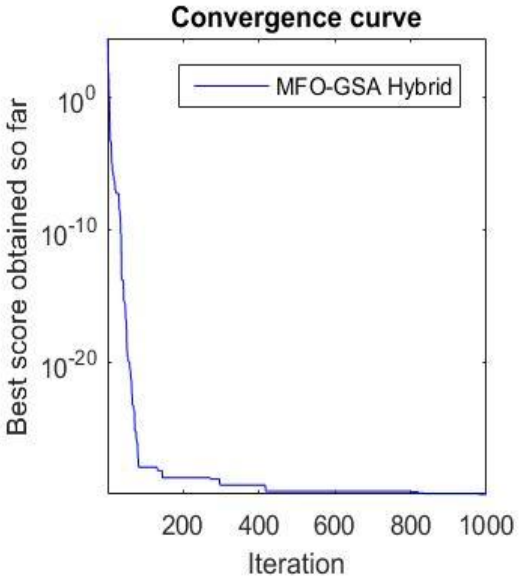
- Mass Updation according to previous mass
- Mass(i) = Mass(i) + Fitness(i) / Sum(Fitness(i))
- Effective increase in mass of moth was negligible in this case
- Replaced with Mass(i) = 1 / fitness(i)

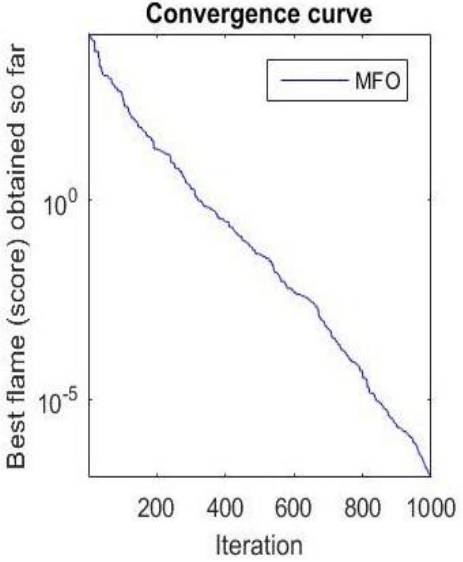
# Role of Randomization

- Decreases effect of previous values on future values
- Significantly important contributor to performance
- Example

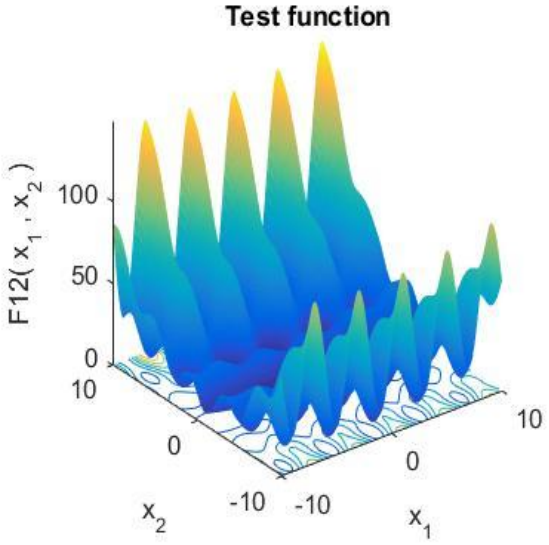
# Results

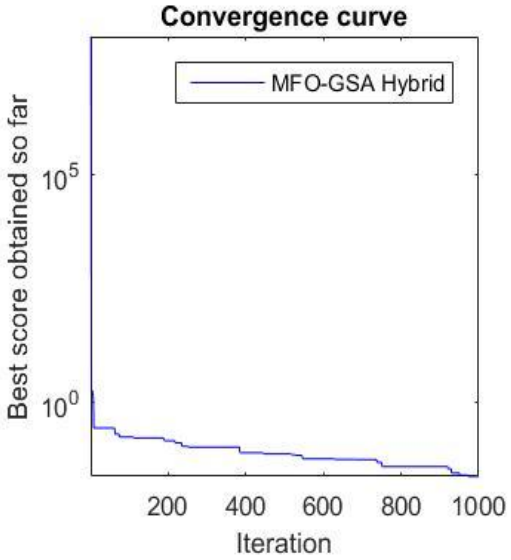

Test function
×10^4
4
2
0
F3( x1 , x2 )
100
0
-100
x2
-100
0
100
x1

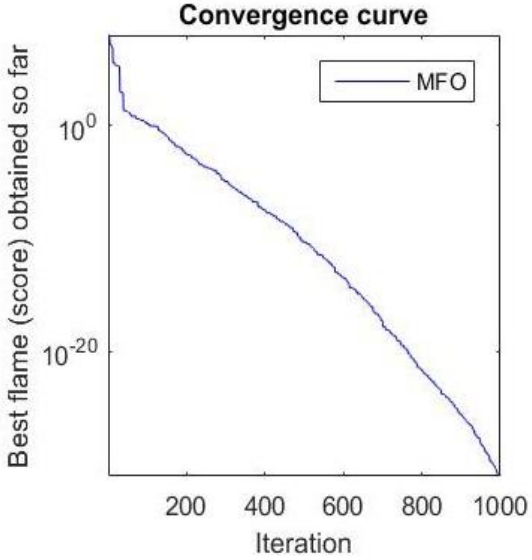

Convergence curve
MFO-GSA Hybrid
Best score obtained so far
10^0
10^-10
10^-20
200
400
600
800
1000
Iteration


Convergence curve
MFO
Best flame (score) obtained so far
10^0
10^-5
200
400
600
800
1000
Iteration

# Results (Contd.)



# Results (Contd.)