**AI\_Assignment**

***Comparisons:***

Egg Holder function presents a more challenging optimization landscape, requiring a larger population and more generations for both DE and PSO to effectively converge to the optimal solution.

However, for the Holder Table function, DE and PSO converge relatively quickly to the optimal solution across different parameter settings, indicating its robustness in handling different optimization landscapes.

Solutions from Wikipedia Page:

* Egg\_Holder Function: -19.20854
* Table\_Holder Function: -959.6407

The results I have obtained are as follows:

***Differential Evolution:***

**Egg Holder Function:**

Population Size: 20, Generations: 50

Best Fitness: -786.5259747253419

Best Solution: [-456.88582566 -382.62226708]

Population Size: 20, Generations: 100

Best Fitness: -959.6406627208511

Best Solution: [512. 404.23180515]

Population Size: 20, Generations: 200

Best Fitness: -959.6406627208511

Best Solution: [512. 404.23180538]

Population Size: 50, Generations: 50

Best Fitness: -959.6391269377186

Best Solution: [512. 404.23258322]

Population Size: 50, Generations: 100

Best Fitness: -959.6406627208509

Best Solution: [512. 404.2318051]

Population Size: 50, Generations: 200

Best Fitness: -959.6406627208509

Best Solution: [512. 404.23180507]

Population Size: 100, Generations: 50

Best Fitness: -959.6406612094593

Best Solution: [512. 404.2318084]

Population Size: 100, Generations: 100

Best Fitness: -959.6406627208509

Best Solution: [512. 404.23180503]

Population Size: 100, Generations: 200

Best Fitness: -959.6406627208509

Best Solution: [512. 404.23180502]

Population Size: 200, Generations: 50

Best Fitness: -959.6406626548375

Best Solution: [512. 404.23180258]

Population Size: 200, Generations: 100

Best Fitness: -959.640662720851

Best Solution: [512. 404.23180517]

Population Size: 200, Generations: 200

Best Fitness: -959.640662720851

Best Solution: [512. 404.23180506]

**Holder Table Function:**

Population Size: 20, Generations: 50

Best Fitness: -19.200136899555297

Best Solution: [-8.08409632 9.6642454 ]

Population Size: 20, Generations: 100

Best Fitness: -19.205168545889062

Best Solution: [-8.03660973 9.6648084 ]

Population Size: 20, Generations: 200

Best Fitness: -18.020716634347007

Best Solution: [ 8.05100873 -10. ]

Population Size: 50, Generations: 50

Best Fitness: -19.208484418763987

Best Solution: [-8.0549151 9.66464049]

Population Size: 50, Generations: 100

Best Fitness: -19.20850256788674

Best Solution: [-8.05502348 -9.66459001]

Population Size: 50, Generations: 200

Best Fitness: -19.20850256788675

Best Solution: [-8.05502347 9.66459002]

Population Size: 100, Generations: 50

Best Fitness: -19.207003440997585

Best Solution: [8.0555145 9.66475826]

Population Size: 100, Generations: 100

Best Fitness: -19.20850256788633

Best Solution: [-8.05502348 9.66459004]

Population Size: 100, Generations: 200

Best Fitness: -19.20850256788675

Best Solution: [-8.05502348 -9.66459002]

Population Size: 200, Generations: 50

Best Fitness: -19.20847188020709

Best Solution: [ 8.05509934 -9.66469745]

Population Size: 200, Generations: 100

Best Fitness: -19.20850187026506

Best Solution: [-8.05503548 9.66456016]

Population Size: 200, Generations: 200

Best Fitness: -19.208502567886743

Best Solution: [-8.05502348 -9.66459002]

***Particle Swarm Optimization:***

**Egg Holder Function:**

Population Size: 20, Generations: 50

Best Fitness: -817.5593088596854

Best Solution: [-466.35200088 386.33583749]

Population Size: 20, Generations: 100

Best Fitness: -951.5545039316727

Best Solution: [512. 404.09472387]

Population Size: 20, Generations: 200

Best Fitness: -950.802010287062

Best Solution: [512. 404.22767984]

Population Size: 50, Generations: 50

Best Fitness: -898.1466739076876

Best Solution: [512. 403.9954789]

Population Size: 50, Generations: 100

Best Fitness: -907.9438170818336

Best Solution: [512. 404.25099425]

Population Size: 50, Generations: 200

Best Fitness: -866.6435497248423

Best Solution: [-465.4325351 385.92939103]

Population Size: 100, Generations: 50

Best Fitness: -870.6977008597408

Best Solution: [512. 404.05405568]

Population Size: 100, Generations: 100

Best Fitness: -874.0994670340672

Best Solution: [-466.14953467 385.63689235]

Population Size: 100, Generations: 200

Best Fitness: -956.5143954104784

Best Solution: [512. 404.23476985]

Population Size: 200, Generations: 50

Best Fitness: -909.2846136517309

Best Solution: [512. 404.17385153]

Population Size: 200, Generations: 100

Best Fitness: -941.793044253306

Best Solution: [512. 404.21090969]

Population Size: 200, Generations: 200

Best Fitness: -956.2686848078879

Best Solution: [512. 404.22998598]

**Holder Table Function:**

Population Size: 20, Generations: 50

Best Fitness: -19.0450176782135

Best Solution: [-8.0412488 9.68986214]

Population Size: 20, Generations: 100

Best Fitness: -19.042001463859428

Best Solution: [8.05657664 9.62575748]

Population Size: 20, Generations: 200

Best Fitness: -19.185087649504247

Best Solution: [8.06102006 9.66432405]

Population Size: 50, Generations: 50

Best Fitness: -18.816874692104292

Best Solution: [ 8.04150224 -9.66483403]

Population Size: 50, Generations: 100

Best Fitness: -19.174986029412622

Best Solution: [-8.05364302 9.66623985]

Population Size: 50, Generations: 200

Best Fitness: -18.015782954415467

Best Solution: [-8.05096151 10. ]

Population Size: 100, Generations: 50

Best Fitness: -19.03936306430184

Best Solution: [-8.05457294 9.66259548]

Population Size: 100, Generations: 100

Best Fitness: -19.117557282717083

Best Solution: [-8.05804774 9.66694725]

Population Size: 100, Generations: 200

Best Fitness: -19.168307603297663

Best Solution: [-8.05705133 -9.66360077]

Population Size: 200, Generations: 50

Best Fitness: -19.03444901735268

Best Solution: [8.05612833 9.66312763]

Population Size: 200, Generations: 100

Best Fitness: -19.134158091251624

Best Solution: [ 8.05726164 -9.66573008]

Population Size: 200, Generations: 200

Best Fitness: -19.17485481037479

Best Solution: [ 8.05434603 -9.66510011]