Reports of experiments

Hyperparameter tunning with Grid Search:

Parameter Grid and Trial Selection

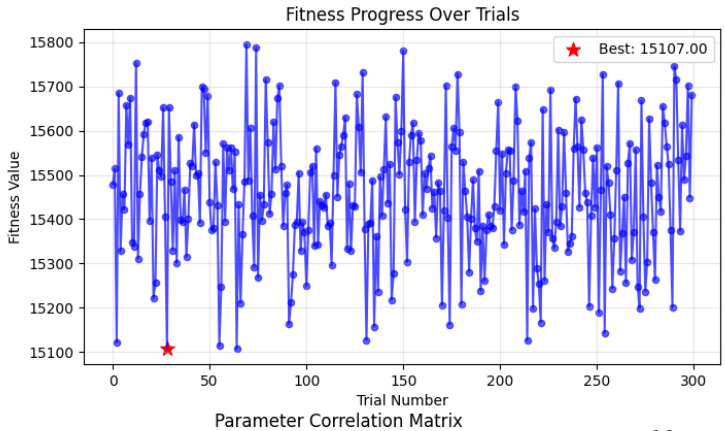
The parameter grid consisted of the following values:

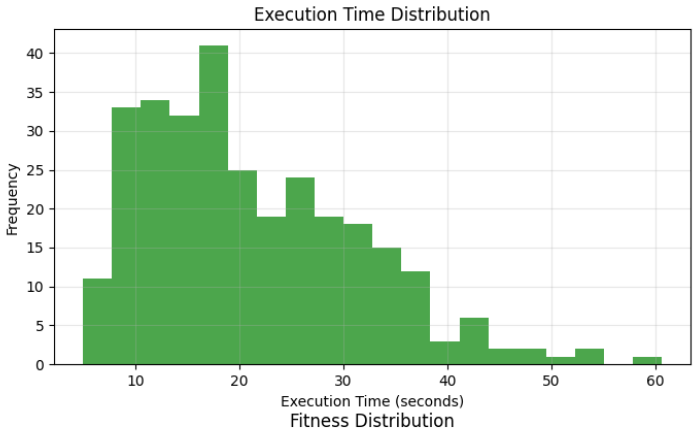
- Swarm Size: 40, 60, 80, 100, 120 (5 values)
- Max Iterations: 250, 350, 450, 550 (4 values)
- Employed Ratio: 0.35, 0.40, 0.45, 0.50, 0.55, 0.60 (6 values)
- Onlooker Ratio: 0.20, 0.25, 0.30, 0.35, 0.40 (5 values)
- Limit: 20, 25, 30, 35 (4 values)

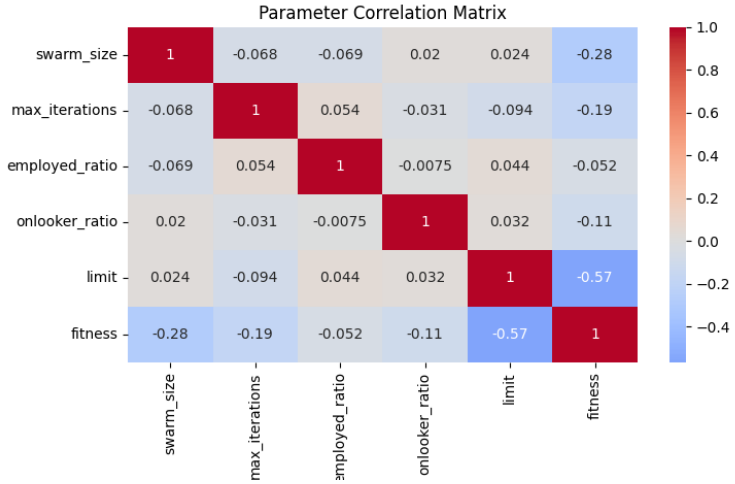
This leads to a total of possible parameter combinations in the full grid.

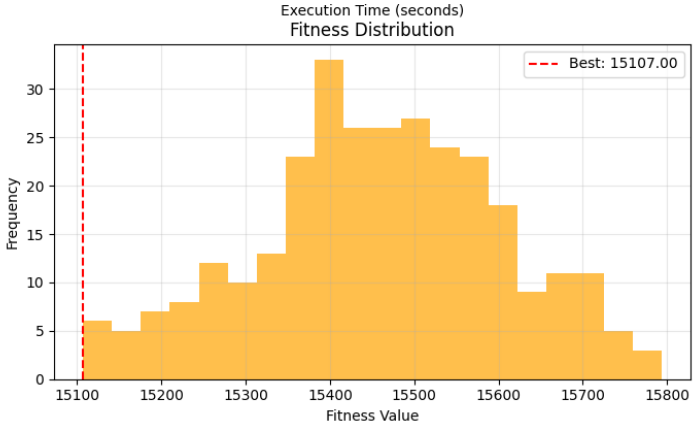
From these, 300 trials were selected for evaluation as a representative sample to effectively explore the parameter space while managing computational resources.

Result:









Best Hyperparameters

- **Swarm Size:** 80
- **Max Iterations:** 450
- **Employed Ratio:** 0.40
- **Onlooker Ratio:** 0.20
- **Limit:** 35

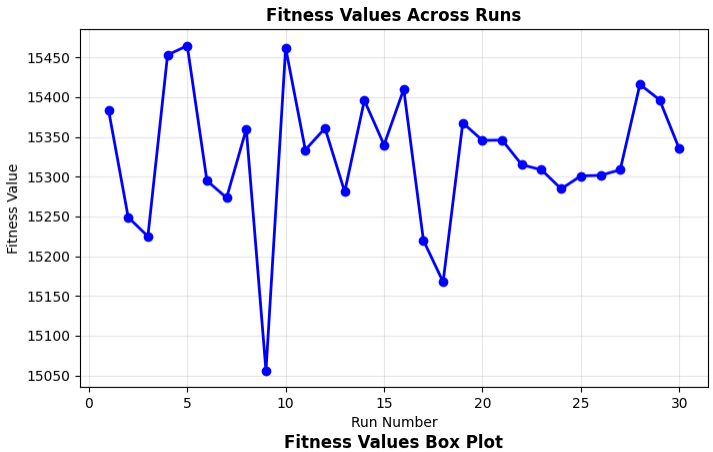
Experiments:

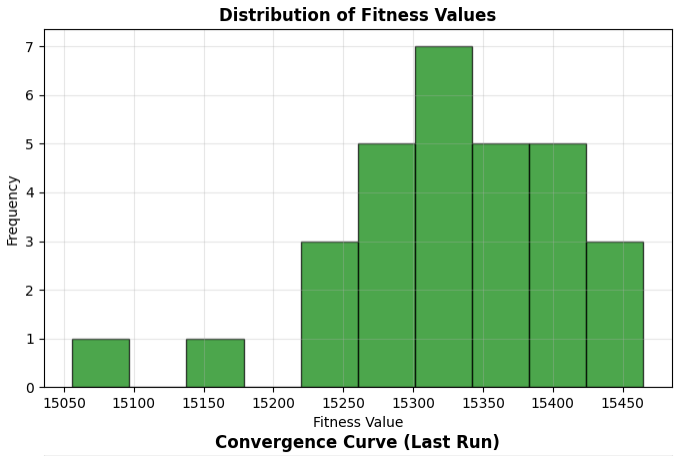
Serial Number	Best Fitness	Number of improvements	Time taken (Sec.)
1	15384.00	28	17.62
2	15249.00	44	17.08
3	15225.00	41	17.01
4	15453.05	32	16.60
5	15464.70	35	16.64
6	15295.00	36	16.63
7	15273.50	36	16.87
8	15360.00	28	17.61
9	15056.00	45	21.87
10	15462.00	24	19.99
11	15333.70	21	21.06
12	15361.05	37	19.36
13	15281.00	44	17.85
14	15396.00	33	17.79
15	15340.00	39	17.63
16	15410.00	36	17.28
17	15220.05	30	17.54
18	15167.70	28	17.21
19	15367.70	24	17.15
20	15345.70	32	17.52
21	15346.00	29	17.41
22	15315.00	36	17.18
23	15308.70	29	17.36
24	15284.70	28	17.33
25	15301.00	40	17.02
26	15301.70	45	18.71
27	15308.70	29	19.28
28	15416.00	25	20.32
29	15396.70	38	19.37
30	15335.05	34	23.51

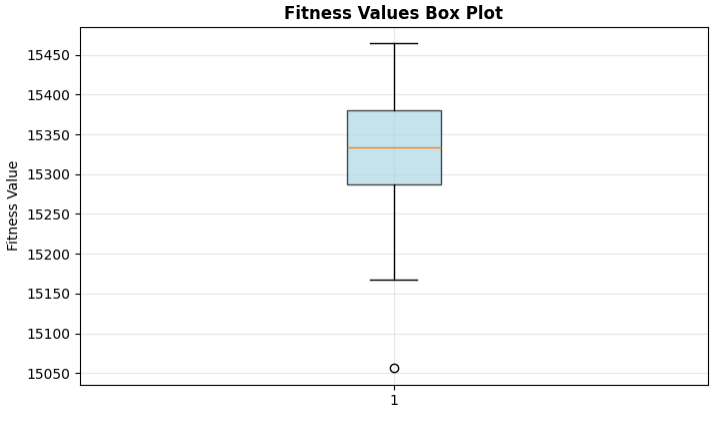
Summary Statistics

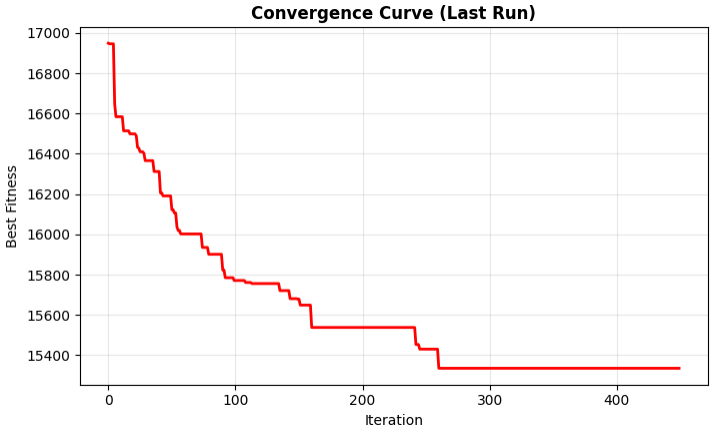
- Total Runs Requested: 30
- Successful Runs: 30
- Success Rate: 100%
- Best Fitness: 15,056.0
- Worst Fitness: 15,464.7
- Mean Fitness: 15,325.29
- Median Fitness: 15,334.38
- Standard Deviation of Fitness: 86.07
- Mean Execution Time (per run): 18.20 seconds
- Total Execution Time: 545.87 seconds

Result:









Hyperparameter tunning with Bayesian Search:

Parameter Grid and Trial Selection

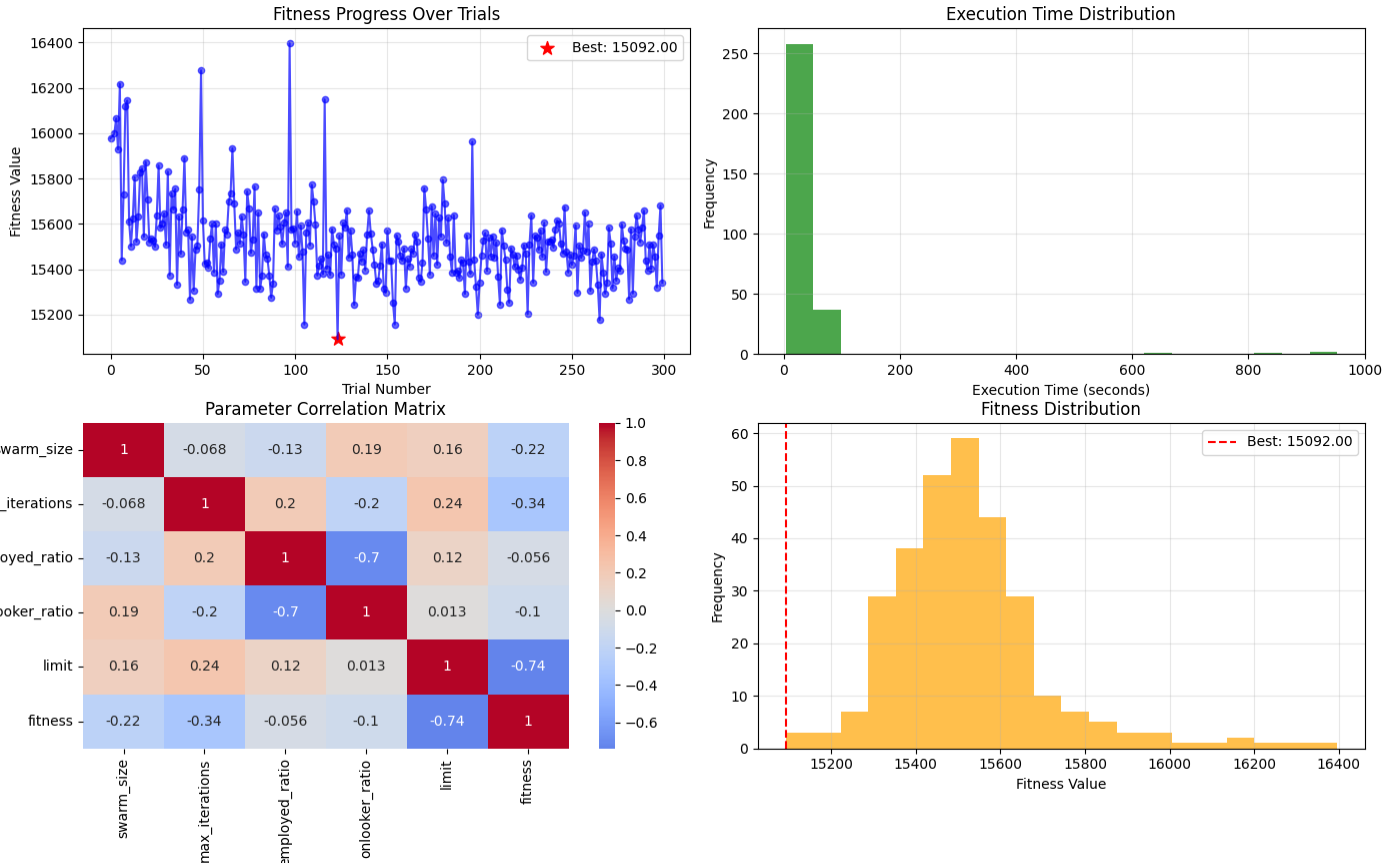
The parameter grid consisted of the following values:

- Swarm Size: 40, 60, 80, 100, 120 (5 values)
- Max Iterations: 250, 350, 450, 550 (4 values)
- Employed Ratio: 0.35, 0.40, 0.45, 0.50, 0.55, 0.60 (6 values)
- Onlooker Ratio: 0.20, 0.25, 0.30, 0.35, 0.40 (5 values)
- Limit: 20, 25, 30, 35 (4 values)

This leads to a total of possible parameter combinations in the full grid.

From these, 300 trials were selected for evaluation as a representative sample to effectively explore the parameter space while managing computational resources.

Result:



Best Hyperparameters

- **Employed Ratio:** 0.50
- **Onlooker Ratio:** 0.35
- **Swarm Size:** 110
- **Max Iterations:** 350
- **Limit:** 25

Experiments:

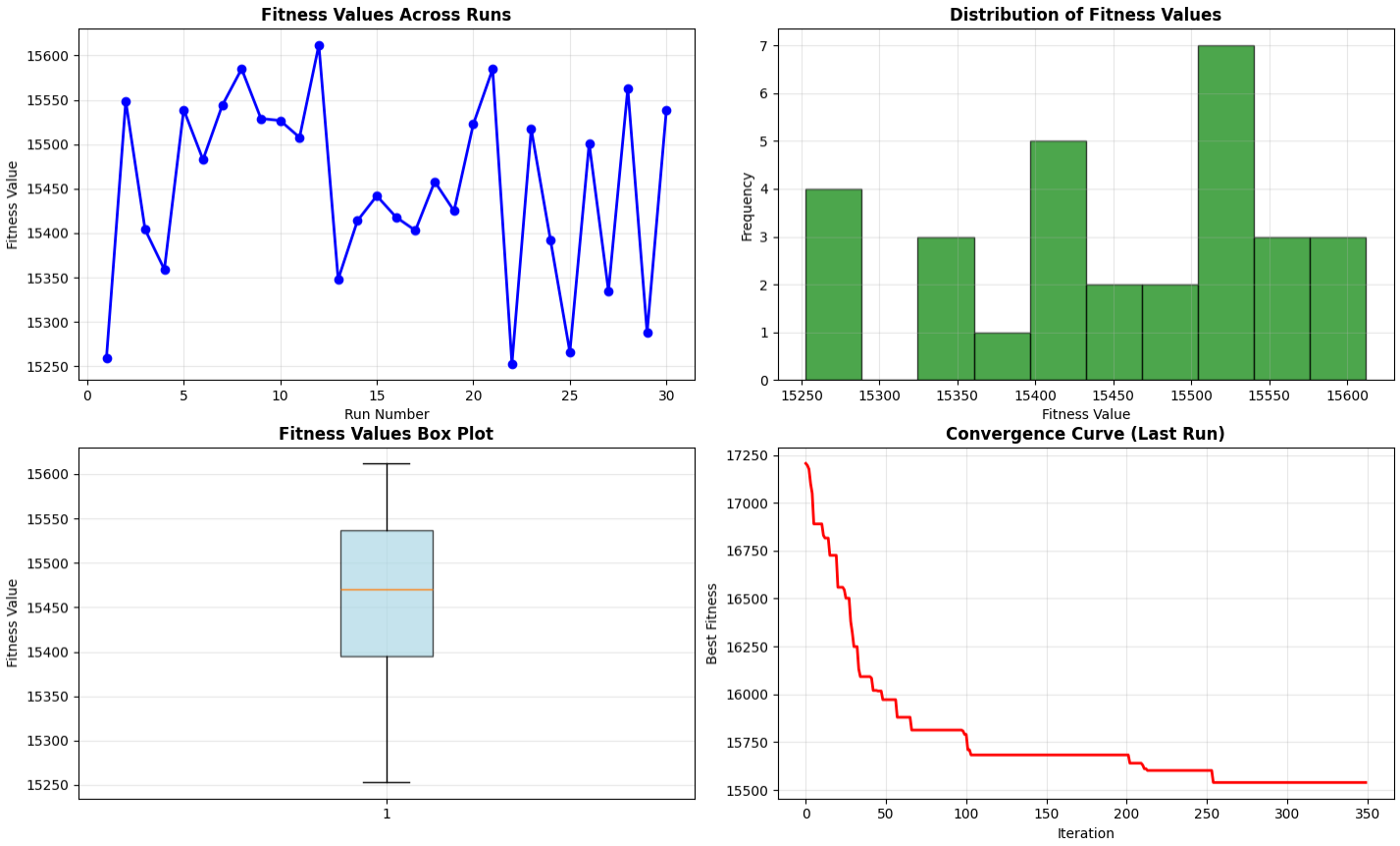
Serial Number	Best Fitness	Number of improvements	Time taken (Sec.)
1	15259.70	29	24.02
2	15548.50	32	23.95
3	15404.05	29	23.45
4	15359.05	21	23.42
5	15539.00	21	23.34
6	15482.75	32	23.34
7	15544.00	26	23.39
8	15585.00	23	23.56
9	15529.00	25	23.40
10	15526.75	30	24.08
11	15507.75	27	24.93
12	15612.00	12	23.79
13	15348.00	34	23.82
14	15414.05	30	23.80
15	15442.00	30	23.66
16	15418.00	23	23.65
17	15403.00	31	23.72
18	15458.00	24	23.93
19	15425.05	27	24.02
20	15522.70	28	23.79
21	15584.70	24	24.28
22	15252.75	22	24.37
23	15517.00	20	24.13
24	15391.75	39	23.84
25	15266.00	33	24.38
26	15501.00	25	23.94
27	15335.00	35	23.98
28	15563.00	34	24.23

29	15288.00	32	24.21
30	15539.00	31	24.49

Summary Statistics

- Total Runs Requested: 30
- Successful Runs: 30
- Success Rate: 100%
- Best Fitness: 15,252.75
- Worst Fitness: 15,612.00
- Mean Fitness: 15,452.22
- Median Fitness: 15,470.38
- Standard Deviation of Fitness: 102.70
- Mean Execution Time (per run): 23.90 seconds
- Total Execution Time: 717.02 seconds

Result:



Sensitivity Analysis:

Satellite Capacity	Secondary Capacity (compartment)	Best Fitness	Mean Fitness	Std Fitness	Mean Time
19500	800	15088.00	15372.15	156.04	16.87s
19500	900	15258.05	15341.24	59.74	16.52s
19500	1000	15336.00	15491.03	86.92	16.52s
19500	1100	15335.00	15361.20	31.07	16.27s
19500	1200	15233.00	15450.10	119.35	16.61s
20000	800	15269.00	15345.10	70.70	16.31s
20000	900	15288.00	15367.75	73.50	16.39s
20000	1000	15153.05	15306.51	98.09	16.28s
20000	1100	15197.70	15302.19	63.75	16.52s
20000	1200	15024.70	15277.62	172.65	16.47s
21000	800	15186.05	15266.71	74.63	16.29s
21000	900	15145.70	15298.74	91.84	16.86s
21000	1000	15160.70	15323.09	89.20	16.83s
21000	1100	15250.00	15287.80	40.84	17.68s
21000	1200	15126.00	15296.95	99.53	18.25s
22000	800	14987.00	15164.68	141.09	19.93s
22000	900	15231.00	15277.92	56.31	18.21s
22000	1000	15171.00	15266.05	55.77	18.53s
22000	1100	14990.00	15209.92	121.89	18.34s
22000	1200	15164.00	15229.04	86.12	19.34s
23000	800	15177.00	15291.30	90.35	19.08s
23000	900	15147.70	15244.77	100.29	18.96s
23000	1000	15174.00	15233.55	74.76	18.75s
23000	1100	15163.70	15254.68	85.12	18.75s
23000	1200	15205.70	15299.35	65.76	18.62s