COMP 5660 Fall 2024 Assignment 1d

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1 Green Problem 1d - No Crowding

1.1 Parameters

Parameter	**Value**
μ	3,000
Number of Children	500
Mutation Rate	0.05
Parent Selection	k_tournament_without_replacement
Parent Selection k_kwargs	{'k': 18}
Survival Selection	k_tournament_without_replacement
Survival Selection k_kwargs	{'k': 18}
Recombination kwargs	{'method': 'uniform'}
Crowding	False

Table 1: Green 1d - No Crowding Parameters

1.2 Graphs

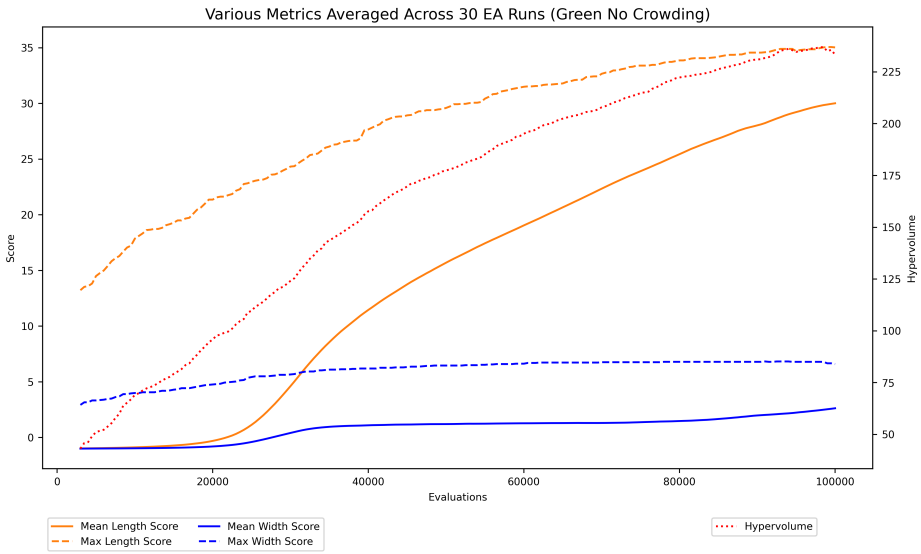

Figure 1: Evals vs Metrics Plot - No Crowding

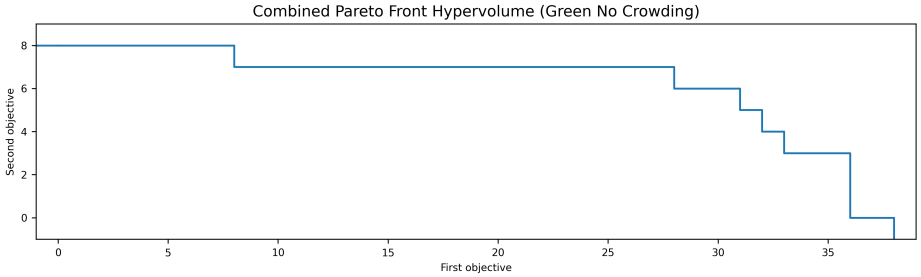

Figure 2: Combined Pareto Front - No Crowding

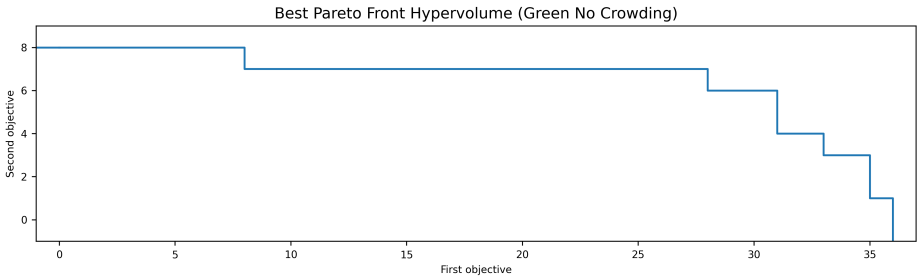

Figure 3: Best Pareto Front - No Crowding

1.3 Comparison of Solutions Across the Best Pareto Front

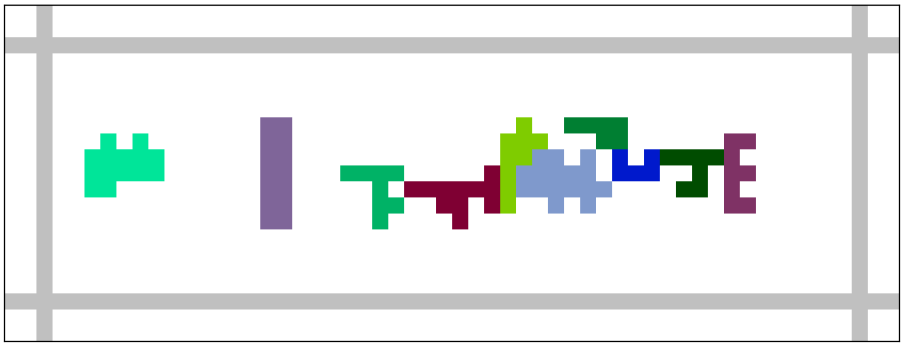

Figure 4: Best width solution - No Crowding

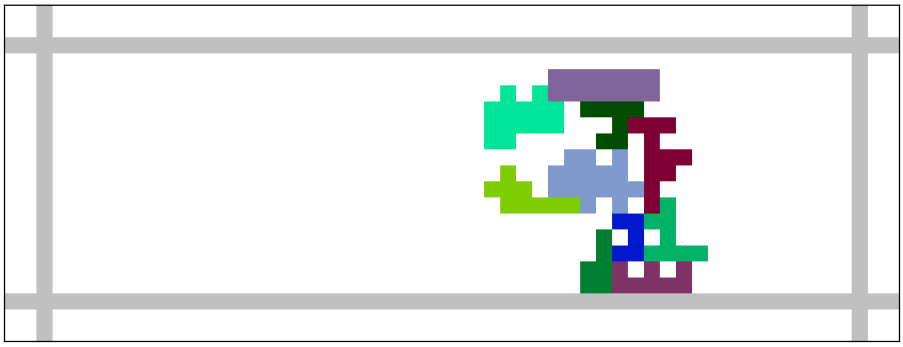

Figure 5: Best length solution - No Crowding

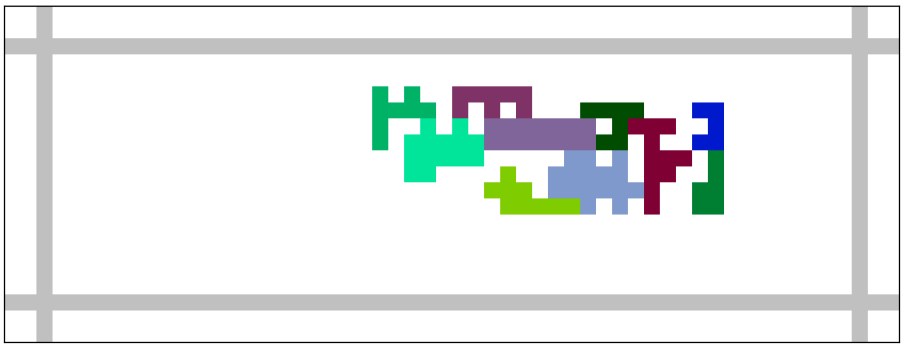

Figure 6: Solution from middle of front - No Crowding

The best length solution has a very high objective score for length, but it has a poor performance on the width objective. Similarly, the best width solution has a high objective score for the width, but a low objective score for the length. The solution taken from the middle of the pareto front combines the strengths of both these solutions and has a strong objective score for both the width and length.

2 Green Problem 1d - With Crowding

2.1 Parameters

Parameter	Value
μ	3,000
Number of Children	500
Mutation Rate	0.05
Parent Selection	k_tournament_without_replacement
Parent Selection k_kwargs	{'k': 13}
Survival Selection	k_tournament_without_replacement
Survival Selection k_kwargs	{'k': 13}
Recombination kwargs	{'method': 'uniform'}
Crowding	True

Table 2: Green 1d - With Crowding Parameters

2.2 Graphs

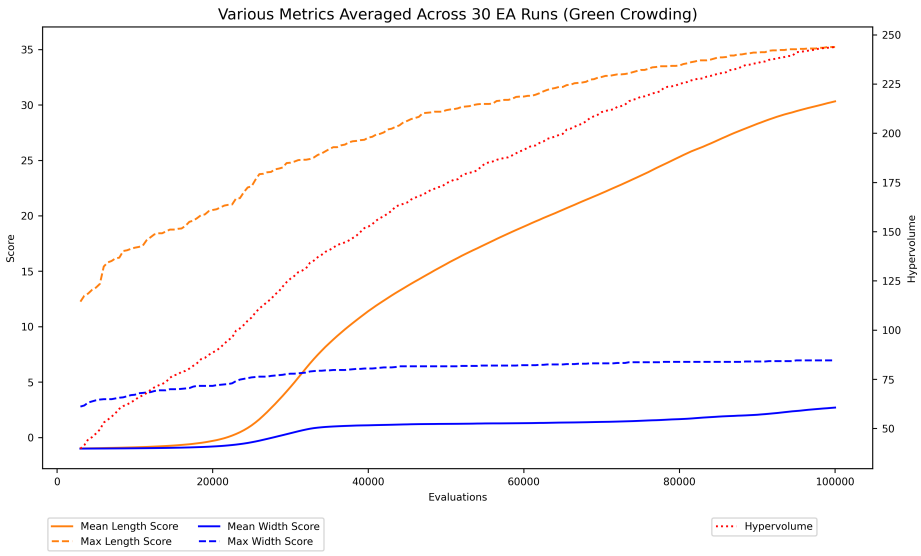

Figure 7: Evals vs Metrics Plot - With Crowding

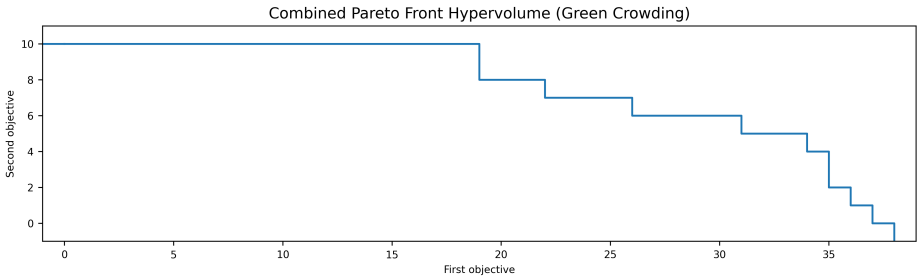

Figure 8: Combined Pareto Front - With Crowding

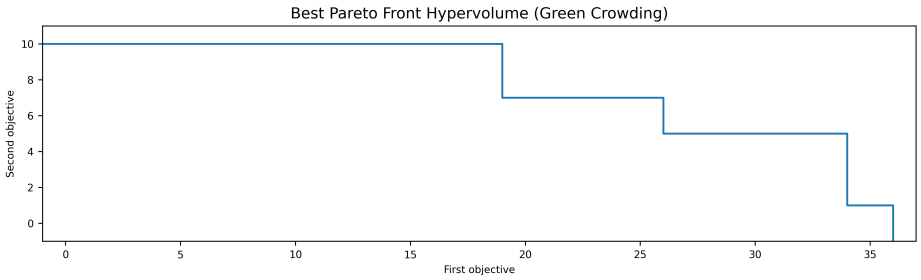

Figure 9: Best Pareto Front - With Crowding

2.3 Comparison of Solutions Across the Best Pareto Front

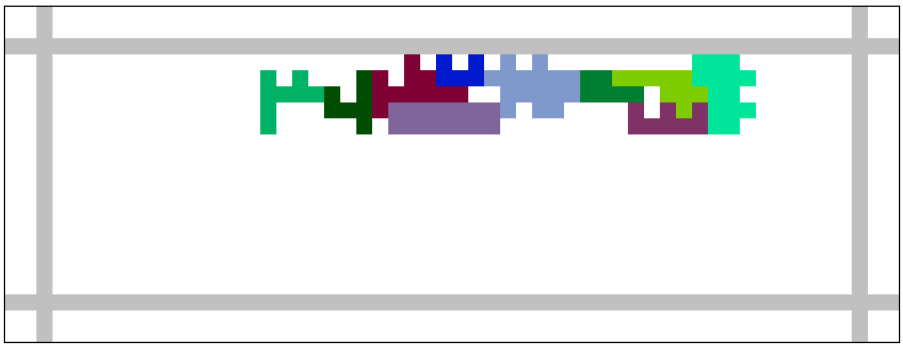

Figure 10: Best width solution - With Crowding

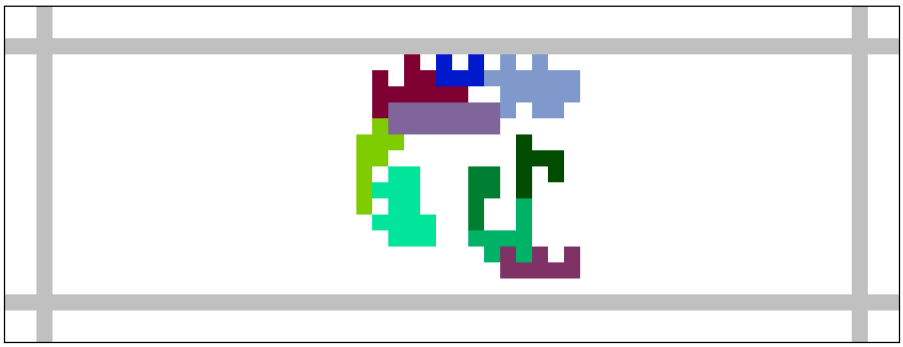

Figure 11: Best length solution - With Crowding

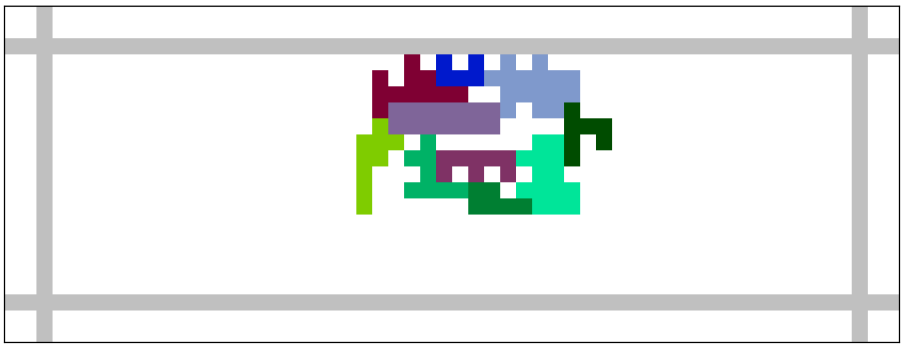

Figure 12: Solution from middle of front - With Crowding

The best length solution has a very high objective score for length, but it has a mediocre performance on the width objective. Similarly, the best width solution has a high objective score for the width, but a low objective score for the length. The solution taken from the middle of the pareto front combines the strengths of both these solutions and has a strong objective score for the width and length.

2.4 Statistical Analysis

Parameter	**No Crowding**	**Crowding**
Mean	233.33	243.83
Stdv	24.03	22.35
Number of Samples	30	
p-value	0.08498171046530352	
α-value	0.05	

Table 3: Comparison of Results for Data Sets 1a and 1b

Given that the p-value (0.08498) is greater than the α-value (0.05), we fail to reject the null hypothesis. This means that, based on this test, there is not enough evidence to suggest a statistically significant difference between the "No Crowding" and "Crowding" parameters.