

GENETIC ALGORITHM RESEARCH PROJECT

Ellis Gibbons

Jacob Van Dyke

Fred Hamer



ABOUT THE SIMULATOR

Our simulator takes a population of chromosome strings combined with user-defined conditions to simulate population evolution and fitness growth.



GENETIC ALGORITHM TERMS

CHROMOSOME

Stores a string of 1s and 0s

MUTATE

Randomly changes some bits of a chromosome

ELITISM

Preserves the most fit chromosomes

SELECT

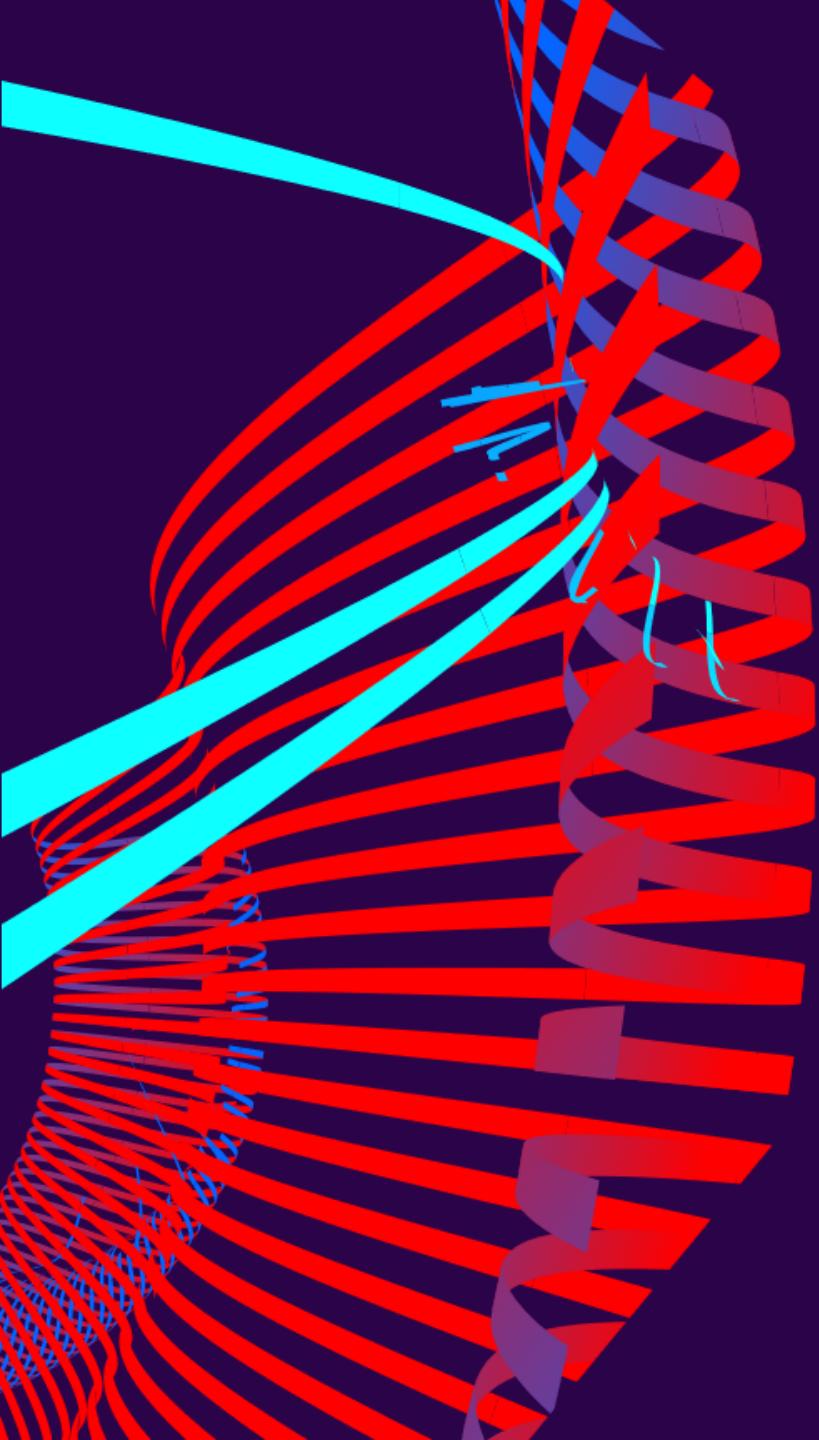
Determines which chromosomes move to the next generation

CROSSOVER

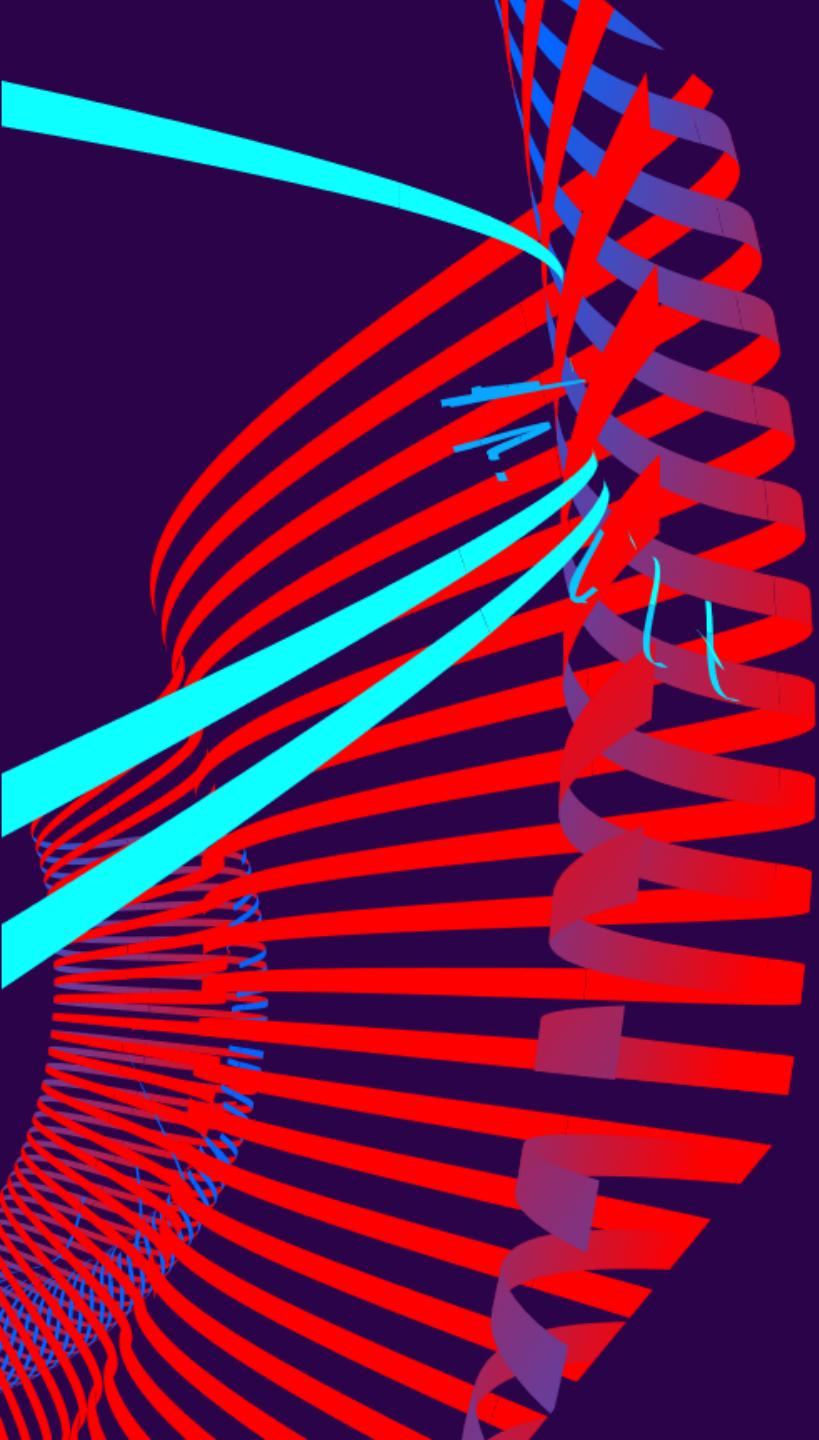
Combines data from two chromosomes into a new one

DIVERSITY

Finds the average amount of differences between two chromosomes

A complex 3D rendering of abstract geometric shapes, primarily red and blue ribbons and cubes, arranged in a spiral-like pattern against a dark background.

LIVE DEMONSTRATION

A vertical column of abstract 3D shapes on the left side of the slide. The shapes are primarily red and blue, consisting of curved and straight lines, some with a grid pattern, creating a sense of depth and perspective.

DESIGN PRINCIPLES

OO DESIGN PRINCIPLE #2: STRUCTURE DESIGN AROUND DATA

CHROMOSOME

MUTATOR

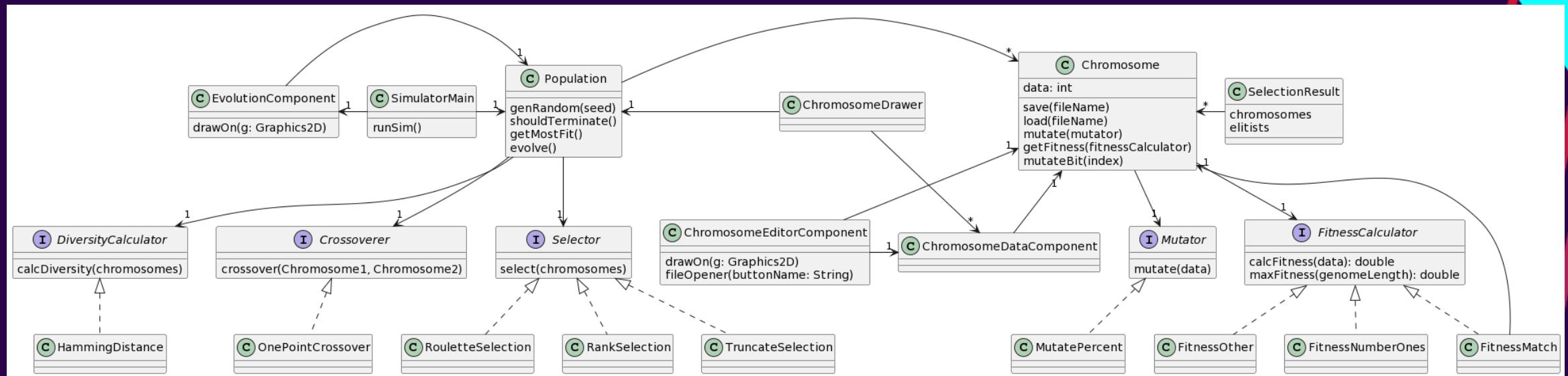
POPULATION

CROSSOVER

SELECTOR

FITNESS
CALCULATOR

OO PRINCIPLE #3: FUNCTIONALITY SHOULD BE DISTRIBUTED EFFICIENTLY



OO PRINCIPLE #5: DON'T DUPLICATE CODE

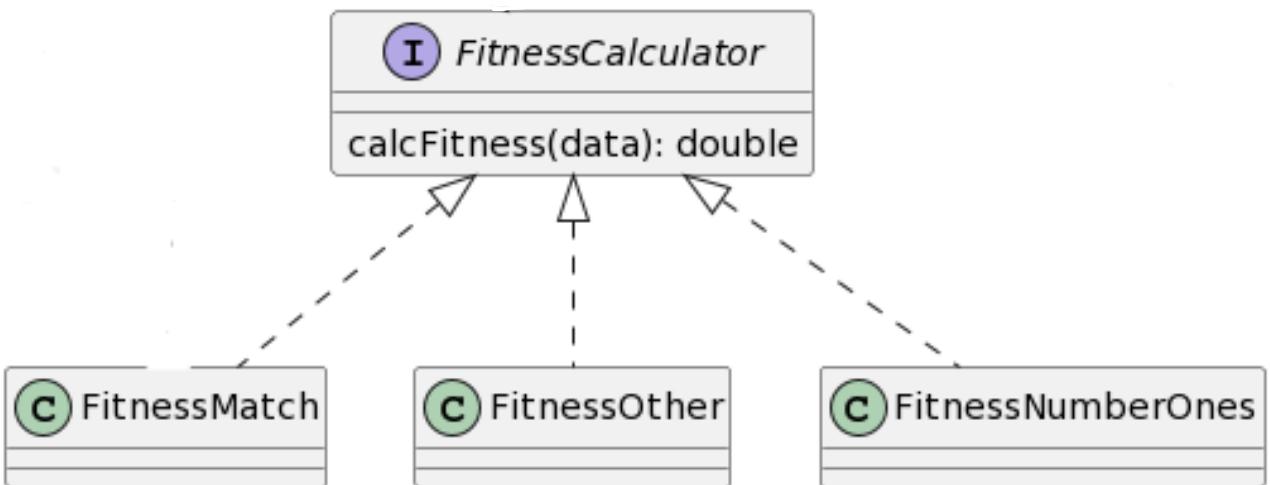
I FitnessCalculator
calcFitness(data): double

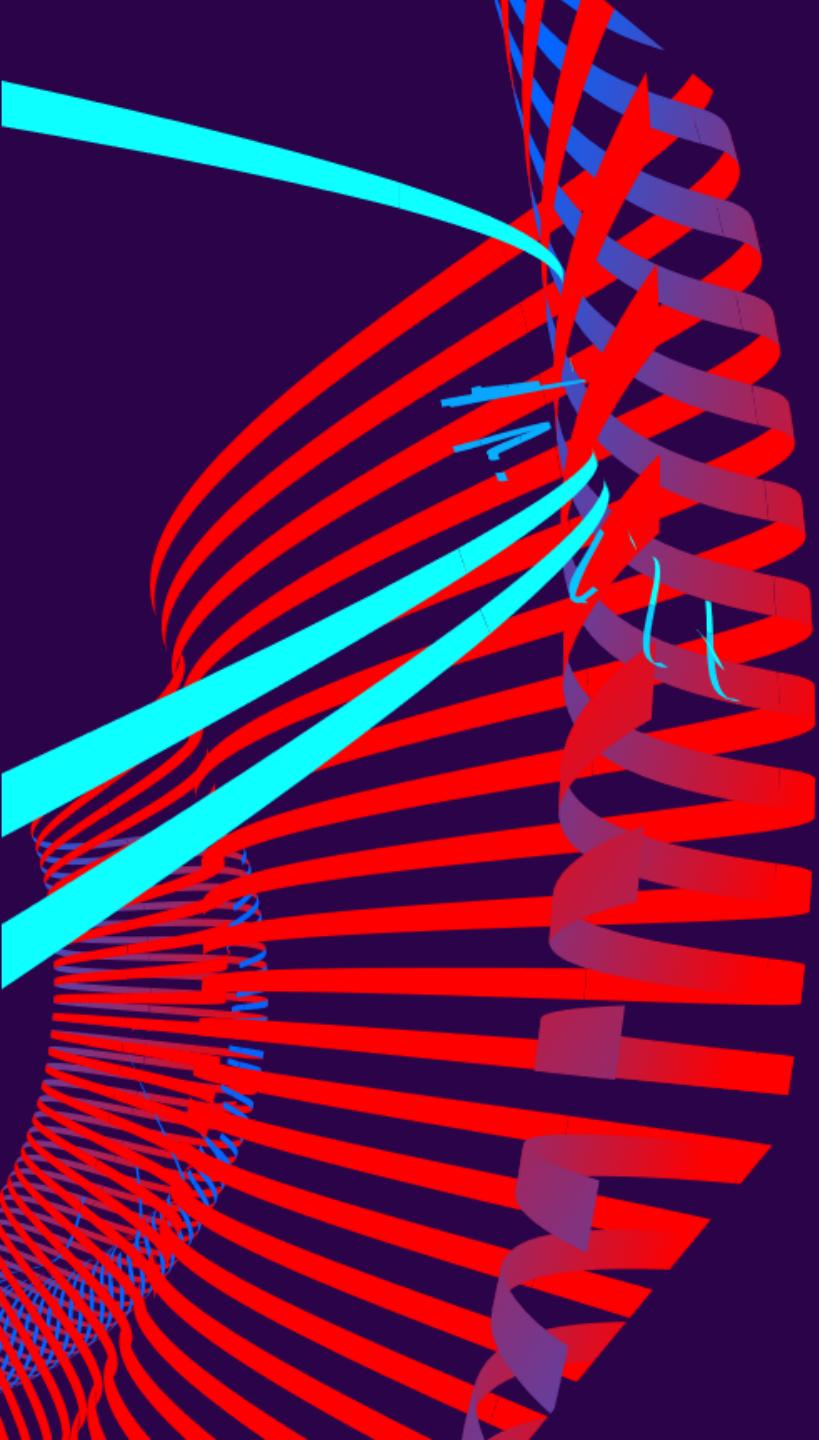
I Mutator
mutate(data)

I Selector
select(chromosomes)

I Crossoverer
crossover(Chromosome1, Chromosome2)

FITNESS FUNCTION



A vertical abstract sculpture composed of numerous thin, curved ribbons in shades of red, orange, and purple, arranged in a spiral-like pattern against a dark background.

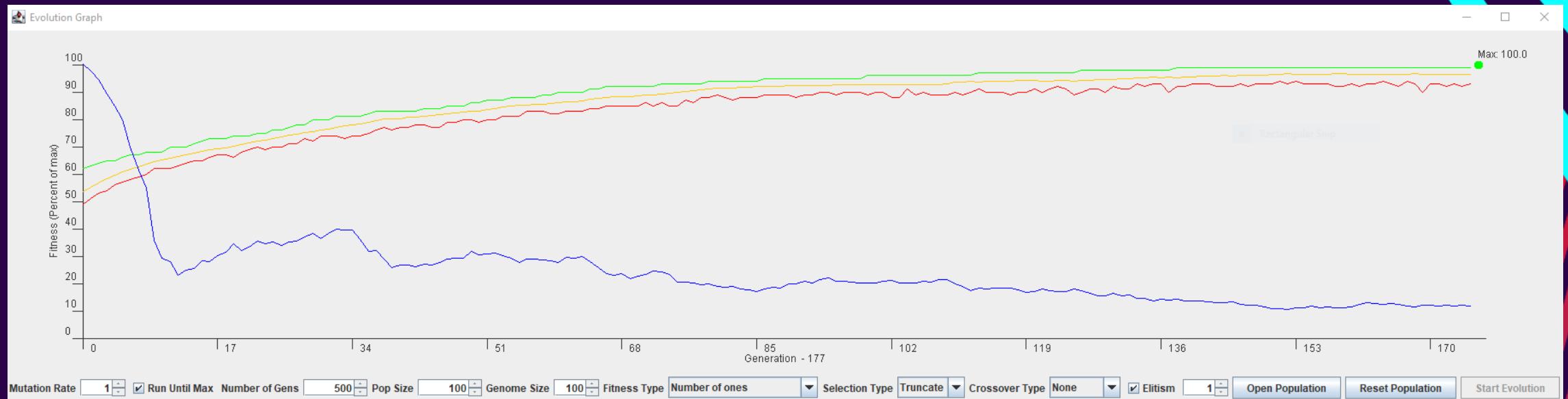
EXPERIMENTS

MUTATION

GENETIC ALGORITHM

11

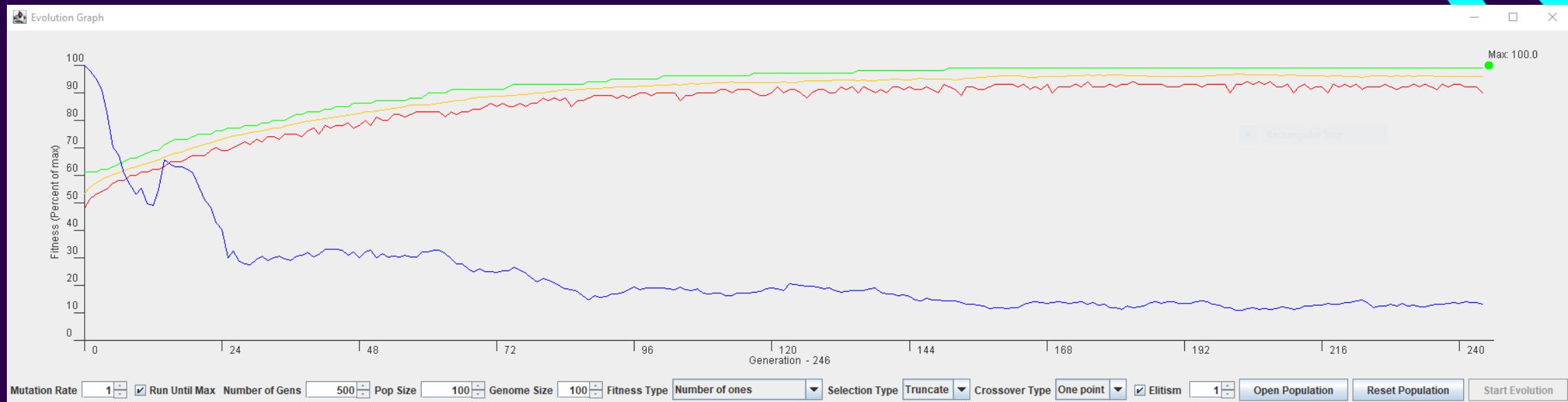
NOVEMBER 9, 2023



run #	1	2	3	4	5	6	7	8	9	10
gens	177	221	357	223	178	273	207	303	154	249

Avg = 234.2

MUTATION AND CROSSOVER



run #	1	2	3	4	5	6	7	8	9	10
gens	222	242	187	315	252	179	242	236	245	246

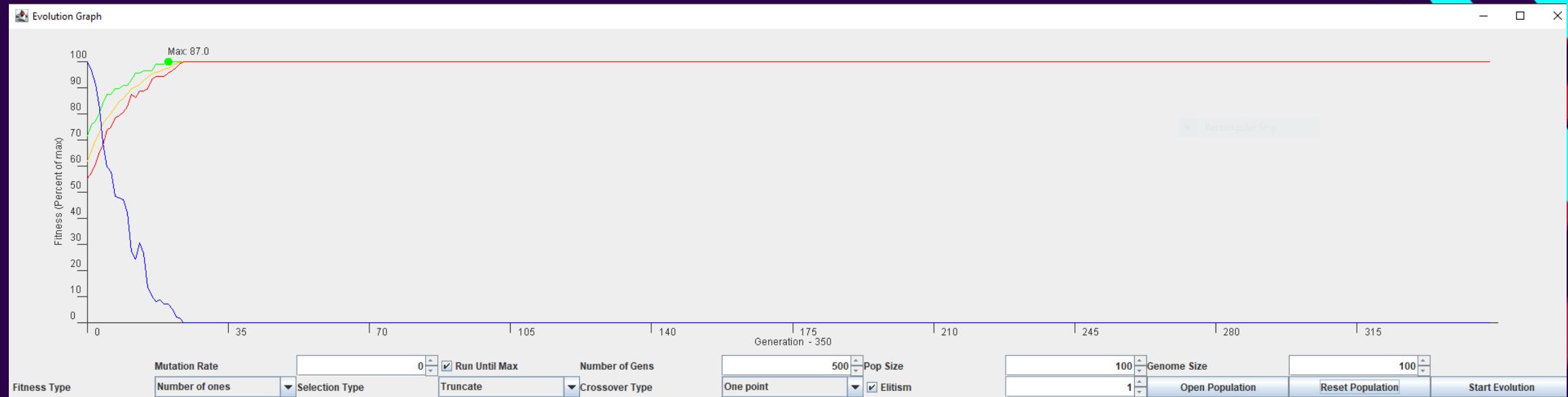
Avg = 236.6

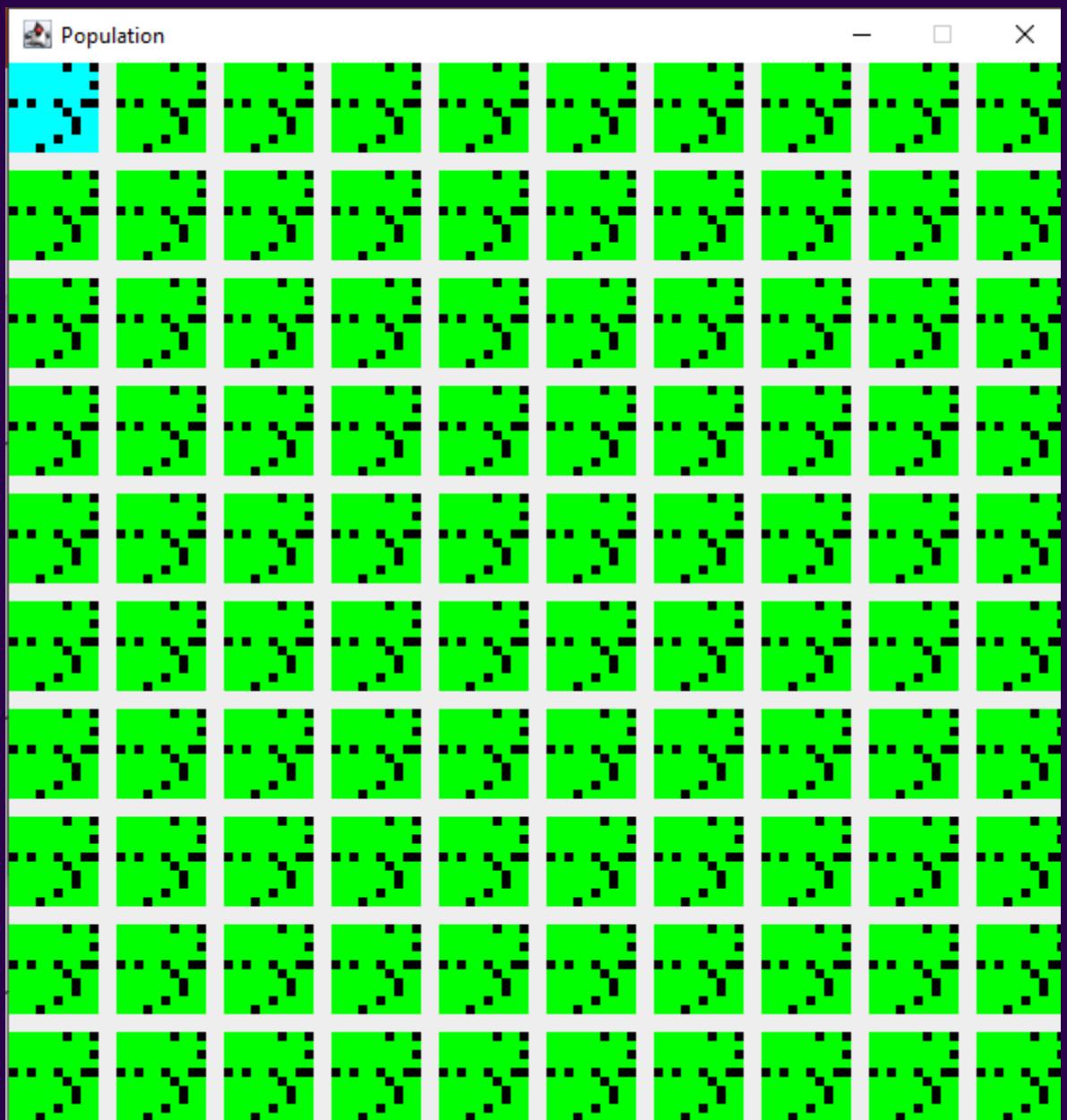
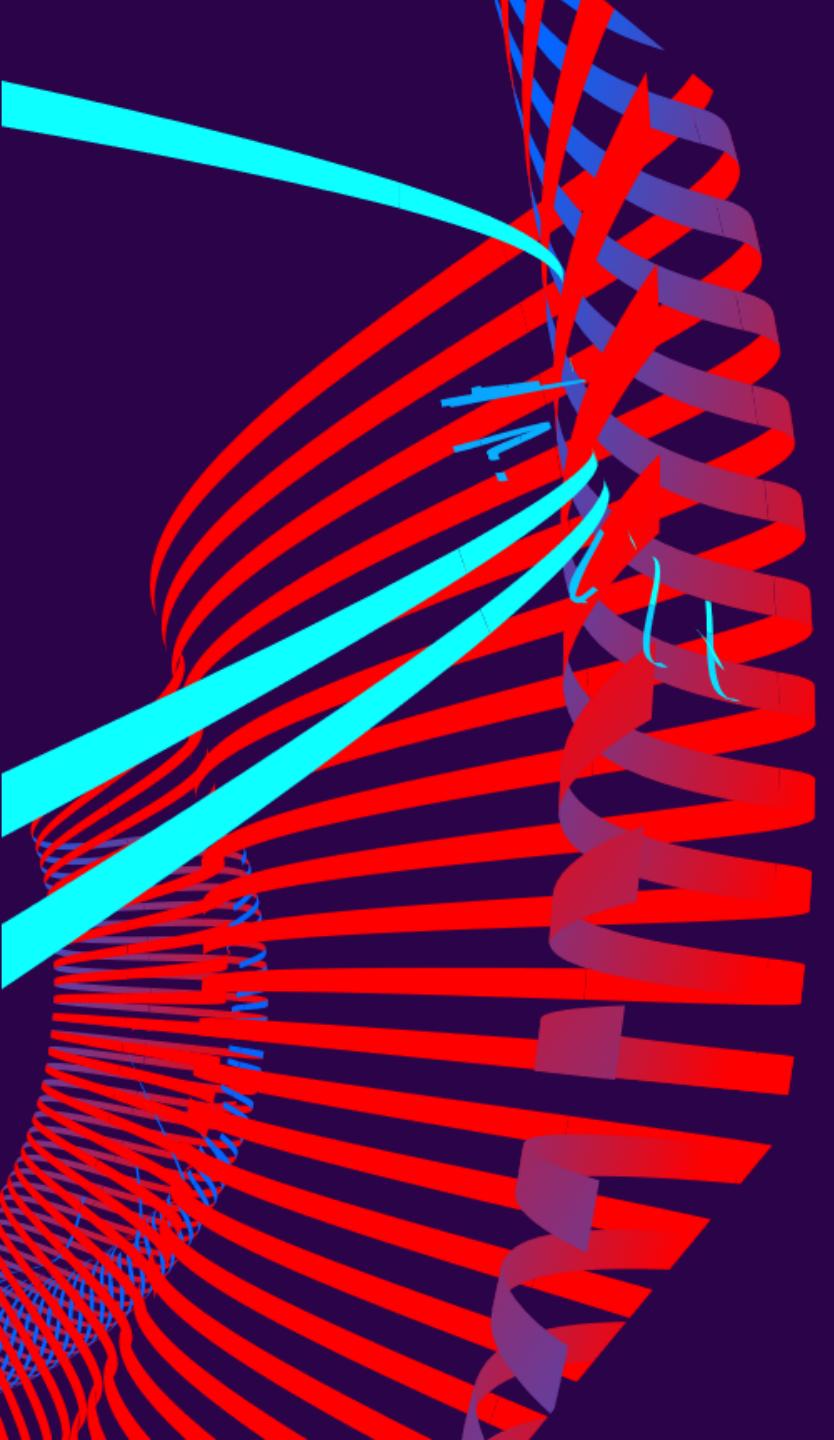
CROSSOVER

GENETIC ALGORITHM

13

NOVEMBER 9, 2023





ROULETTE



run #	1	2	3	4	5	6	7	8	9	10
gens	471	327	379	559	1131	518	501	424	647	320

Avg = 527.7