**Results of Genetic algorithm**

Number of cities: 20

1. **Elite**

Genetic Algorithm

Population: 200

Evolutions: 100

Mutation Rate: 0.05

Tournament Size: 10

Elite: true

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| **Distance before algorithm** | **Distance After algorithm** | **Duration[ms]** |
| 740.18 | 402.76 | 318 |
| 746.39 | 398.58 | 267 |
| 823.54 | 391.02 | 207 |
| 822.01 | 454.57 | 310 |
| 794.58 | 425.52 | 203 |
| 811.50 | 437.82 | 187 |
| 836.09 | 393.51 | 187 |
| 823.40 | 429.14 | 180 |
| 822.59 | 424.73 | 186 |
| 728.15 | 402.76 | 184 |
| 819.13 | 398.58 | 184 |
| 796.03 | 407.89 | 186 |
| 801.17 | 416.96 | 184 |
| 762.90 | 433.01 | 182 |
| 791.41 | 391.02 | 194 |
| 779.78 | 412.85 | 185 |
| 749.61 | 443.33 | 198 |
| 795.58 | 393.51 | 184 |
| 794.36 | 393.51 | 201 |
| 805.84 | 419.86 | 186 |
| 778.54 | 427.02 | 198 |
| 812.34 | 419.86 | 184 |
| 830.98 | 391.02 | 197 |
| 813.53 | 391.02 | 184 |
| 842.46 | 430.52 | 195 |

Best route: 391.02

Best time: 180 ms (Distance Before algorithm: 823.40 Distance After algorithm: 429.14)

Average duration: 202.84 ms

Average distance after algorithm: 413.21

Nearest Neighbour algorithm

Distance: 419.92

Duration: 0.046223 ms

Genetic Algorithm

Population: 200

Evolutions: 100

Mutation Rate: 0.05

Tournament Size: 10

Elite: false

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| **Distance before algorithm** | **Distance after algorithm** | **Duration[ms]** |
| 841.20 | 416.96 | 559 |
| 733.27 | 405.26 | 421 |
| 819.35 | 393.51 | 275 |
| 827.29 | 407.89 | 568 |
| 817.13 | 442.09 | 341 |
| 638.45 | 430.52 | 221 |
| 773.76 | 393.51 | 235 |
| 807.98 | 391.02 | 250 |
| 817.92 | 391.02 | 240 |
| 819.13 | 413.31 | 250 |
| 769.04 | 391.02 | 243 |
| 834.72 | 423.81 | 252 |
| 762.82 | 393.51 | 251 |
| 837.81 | 438.55 | 250 |
| 780.06 | 403.37 | 245 |
| 850.97 | 398.58 | 253 |
| 741.51 | 391.02 | 239 |
| 781.11 | 434.05 | 247 |
| 730.57 | 391.02 | 240 |
| 757.45 | 393.51 | 253 |
| 822.74 | 403.37 | 238 |
| 801.39 | 391.02 | 267 |
| 840.92 | 436.74 | 258 |
| 799.97 | 416.96 | 225 |
| 826.03 | 393.51 | 245 |

Best route: 391.02

Best time: 221 ms (Distance Before algorithm: 638.44 Distance After algorithm: 430.52)

Average duration: 282.64 ms

Average distance after algorithm: 407.41

Nearest Neighbour algorithm

Distance: 412.80

Duration: 0.050667 ms

Genetic algorithm with elite on and off have similar results but algorithm with elite off has better average duration of algorithm.

Average distance after genetic algorithm is better than distance after nearest neighbour algorithm.

1. **Mutation Rate**

Genetic Algorithm

Population: 200

Evolutions: 100

Mutation Rate: 0.15

Tournament Size: 10

Elite: true

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| **Distance before algorithm** | **Distance after algorithm** | **Duration[ms]** |
| 723.15 | 399.74 | 296 |
| 826.51 | 422.51 | 285 |
| 797.14 | 492.39 | 217 |
| 796.95 | 484.45 | 352 |
| 803.81 | 427.11 | 202 |
| 774.70 | 460.52 | 338 |
| 825.38 | 503.90 | 411 |
| 802.85 | 452.21 | 266 |
| 777.53 | 424.21 | 414 |
| 662.80 | 452.39 | 502 |
| 769.50 | 448.68 | 403 |
| 790.56 | 417.77 | 278 |
| 826.15 | 444.26 | 389 |
| 856.36 | 426.07 | 386 |
| 810.52 | 440.82 | 261 |
| 807.14 | 430.01 | 217 |
| 804.05 | 490.54 | 205 |
| 800.93 | 422.89 | 306 |
| 768.66 | 408.85 | 424 |
| 728.31 | 464.61 | 281 |
| 842.63 | 458.32 | 226 |
| 800.26 | 463.35 | 210 |
| 820.15 | 407.46 | 217 |
| 771.28 | 488.49 | 394 |
| 802.97 | 455.08 | 307 |

Best route: 399.74

Best time: 202 ms (Distance Before algorithm: 803.81 Distance After algorithm: 427.11)

Average duration: 311.48 ms

Average distance after algorithm: 447.47

Nearest Neighbour algorithm

Distance: 441.072

Duration: 0.057778 ms

Genetic algorithm found better route(399.74 - 441.072) than nearest neighbour algorithm but it took him more time.

1. **Tournament size**

Genetic Algorithm

Population: 200

Evolutions: 100

Mutation Rate: 0.05

Tournament Size: 3

Elite: true

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| **Distance before algorithm** | **Distance after algorithm** | **Duration[ms]** |
| 820.60 | 391.03 | 217 |
| 827.99 | 430.19 | 164 |
| 839.46 | 391.98 | 192 |
| 713.78 | 398.58 | 135 |
| 686.47 | 491.50 | 251 |
| 785.63 | 397.94 | 151 |
| 826.89 | 431.66 | 147 |
| 824.49 | 412.69 | 155 |
| 769.01 | 465.84 | 193 |
| 809.48 | 397.46 | 210 |
| 771.58 | 449.46 | 180 |
| 777.44 | 441.31 | 154 |
| 810.56 | 391.03 | 154 |
| 809.48 | 391.02 | 185 |
| 752.72 | 476.65 | 153 |
| 770.45 | 391.02 | 200 |
| 787.69 | 468.79 | 158 |
| 729.61 | 423.38 | 204 |
| 780.31 | 485.83 | 162 |
| 824.32 | 409.58 | 160 |
| 785.27 | 391.02 | 146 |
| 864.51 | 392.00 | 146 |
| 786.63 | 393.51 | 148 |
| 808.40 | 480.54 | 141 |
| 750.66 | 416.18 | 151 |

Best route: 391.02

Best time: 135 ms (Distance Before algorithm: 713.78 Distance After algorithm: 398.58)

Average duration: 170.28 ms

Average distance after algorithm: 424.41

Nearest Neighbour algorithm

Distance: 446.04

Duration: 0.055555 ms

Genetic algorithm found better route(391.02 – 446.04) nearest neighbour algorithm but it took him more time.

In all results the best route was 391.02 only algorithm with mutation rate 0.15 had best route 399.74.

The best average distance after algorithm has genetic algorithm with elite off.

The best average duration of algorithm has genetic algorithm with small tournament size(3).