Sheet

```
from deap import base, creator, tools, algorithms
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import random
```

```
class NurseSchedulingProblem:
    """This class encapsulates the Nurse Scheduling problem
    """

    def __init__(self, hardConstraintPenalty):
        """
        :param hardConstraintPenalty: the penalty factor for a hard-constraint violation
        """
        self.hardConstraintPenalty = hardConstraintPenalty

        # list of nurses:
        self.nurses = ['Debra', 'Riann', 'Velia', 'Synne', 'Anona', 'Noell', 'Fadwa', 'Zyana']

        # nurses' respective shift preferences - morning, evening, night:
        self.shiftPreference = [[1, 0, 0], [1, 1, 0], [0, 0, 1], [0, 1, 0], [0, 0, 1], [1, 1, 1], [0, 1, 1], [1, 1, 1]]

        # min and max number of nurses allowed for each shift - morning, evening, night:
        self.shiftMin = [2, 2, 1]
        self.shiftMax = [3, 4, 2]

        # max shifts per week allowed for each nurse
        self.maxShiftsPerWeek = 5

        # number of weeks we create a schedule for:
        self.weeks = 1

        # useful values:
        self.shiftPerDay = len(self.shiftMin)
        self.shiftsPerWeek = 7 * self.shiftPerDay

    def __len__(self):
        """
        :return: the number of shifts in the schedule
        """
        return len(self.nurses) * self.shiftsPerWeek * self.weeks


    def getCost(self, schedule):
        """
        Calculates the total cost of the various violations in the given schedule
        ...
        :param schedule: a list of binary values describing the given schedule
        :return: the calculated cost
        """

        if len(schedule) != self.__len__():
            raise ValueError("size of schedule list should be equal to ", self.__len__())

        # convert entire schedule into a dictionary with a separate schedule for each nurse:
        nurseShiftsDict = self.getNurseShifts(schedule)

        # count the various violations:
        consecutiveShiftViolations = self.countConsecutiveShiftViolations(nurseShiftsDict)
        shiftsPerWeekViolations = self.countShiftsPerWeekViolations(nurseShiftsDict)[1]
        nursesPerShiftViolations = self.countNursesPerShiftViolations(nurseShiftsDict)[1]
        shiftPreferenceViolations = self.countShiftPreferenceViolations(nurseShiftsDict)

        # calculate the cost of the violations:
        hardContstraintViolations = consecutiveShiftViolations + nursesPerShiftViolations + shiftsPerWeekViolations
        softContstraintViolations = shiftPreferenceViolations

        return self.hardConstraintPenalty * hardContstraintViolations + softContstraintViolations

    def getNurseShifts(self, schedule):
        """
        Converts the entire schedule into a dictionary with a separate schedule for each nurse
        :param schedule: a list of binary values describing the given schedule
        :return: a dictionary with each nurse as a key and the corresponding shifts as the value
        """
        shiftsPerNurse = self.__len__() // len(self.nurses)
        nurseShiftsDict = {}
        shiftIndex = 0

        for nurse in self.nurses:
            nurseShiftsDict[nurse] = schedule[shiftIndex:shiftIndex + shiftsPerNurse]
            shiftIndex += shiftsPerNurse

        return nurseShiftsDict
```

```
    def countConsecutiveShiftViolations(self, nurseShiftsDict):
        """
        Counts the consecutive shift violations in the schedule
        :param nurseShiftsDict: a dictionary with a separate schedule for each nurse
        :return: count of violations found
        """
        violations = 0
        # iterate over the shifts of each nurse:
        for nurseShifts in nurseShiftsDict.values():
            # look for two cosecutive '1's:
            for shift1, shift2 in zip(nurseShifts, nurseShifts[1:]):
                if shift1 == 1 and shift2 == 1:
                    violations += 1
        return violations

    def countShiftsPerWeekViolations(self, nurseShiftsDict):
        """
        Counts the max-shifts-per-week violations in the schedule
        :param nurseShiftsDict: a dictionary with a separate schedule for each nurse
        :return: count of violations found
        """
        violations = 0
        weeklyShiftsList = []
        # iterate over the shifts of each nurse:
        for nurseShifts in nurseShiftsDict.values():  # all shifts of a single nurse
            # iterate over the shifts of each weeks:
            for i in range(0, self.weeks * self.shiftsPerWeek, self.shiftsPerWeek):
                # count all the '1's over the week:
                weeklyShifts = sum(nurseShifts[i:i + self.shiftsPerWeek])
                weeklyShiftsList.append(weeklyShifts)
                if weeklyShifts > self.maxShiftsPerWeek:
                    violations += weeklyShifts - self.maxShiftsPerWeek

        return weeklyShiftsList, violations

    def countNursesPerShiftViolations(self, nurseShiftsDict):
        """
        Counts the number-of-nurses-per-shift violations in the schedule
        :param nurseShiftsDict: a dictionary with a separate schedule for each nurse
        :return: count of violations found
        """
        # sum the shifts over all nurses:
        totalPerShiftList = [sum(shift) for shift in zip(*nurseShiftsDict.values())]

        violations = 0
        # iterate over all shifts and count violations:
        for shiftIndex, numOfNurses in enumerate(totalPerShiftList):
            dailyShiftIndex = shiftIndex % self.shiftPerDay  # -> 0, 1, or 2 for the 3 shifts per day
            if (numOfNurses > self.shiftMax[dailyShiftIndex]):
                violations += numOfNurses - self.shiftMax[dailyShiftIndex]
            elif (numOfNurses < self.shiftMin[dailyShiftIndex]):
                violations += self.shiftMin[dailyShiftIndex] - numOfNurses

        return totalPerShiftList, violations

    def countShiftPreferenceViolations(self, nurseShiftsDict):
        """
        Counts the nurse-preferences violations in the schedule
        :param nurseShiftsDict: a dictionary with a separate schedule for each nurse
        :return: count of violations found
        """
        violations = 0
        for nurseIndex, shiftPreference in enumerate(self.shiftPreference):
            # duplicate the shift-preference over the days of the period
            preference = shiftPreference * (self.shiftsPerWeek // self.shiftPerDay)
            # iterate over the shifts and compare to preferences:
            shifts = nurseShiftsDict[self.nurses[nurseIndex]]
            for pref, shift in zip(preference, shifts):
                if pref == 0 and shift == 1:
                    violations += 1

        return violations

    def printScheduleInfo(self, schedule):
        """
        Prints the schedule and violations details
        :param schedule: a list of binary values describing the given schedule
        """
        nurseShiftsDict = self.getNurseShifts(schedule)
        weeklyShiftsList, violations = self.countShiftsPerWeekViolations(nurseShiftsDict)
```

```
        totalPerShiftList, violations = self.countNursesPerShiftViolations(nurseShiftsDict)
        shiftPreferenceViolations = self.countShiftPreferenceViolations(nurseShiftsDict)


        print("\n-- Violations:")
        print("consecutive shift violations = ", self.countConsecutiveShiftViolations(nurseShiftsDict))
        print("Shifts Per Week Violations = ", violations)
        print("Nurses Per Shift Violations = ", violations)
        print("Shift Preference Violations = ", shiftPreferenceViolations)


        print("\n-- Schedule for each nurse:")
        import pandas as pd
        column_names = pd.DataFrame(
            [
                ["Monday", "morning"],
                ["Monday", "evening"],
                ["Monday", "night"],

                ["Tuesday", "morning"],
                ["Tuesday", "evening"],
                ["Tuesday", "night"],

                ["Wednesday", "morning"],
                ["Wednesday", "evening"],
                ["Wednesday", "night"],

                ["Thursday", "morning"],
                ["Thursday", "evening"],
                ["Thursday", "night"],

                ["Friday", "morning"],
                ["Friday", "evening"],
                ["Friday", "night"],

                ["Saturday", "morning"],
                ["Saturday", "evening"],
                ["Saturday", "night"],

                ["Sunday", "morning"],
                ["Sunday", "evening"],
                ["Sunday", "night"]
            ],
            columns=["Nurse", ""]
        )
        rows = []
        nurses = []
        for nurse in nurseShiftsDict:
            rows.append(nurseShiftsDict[nurse])

        columns = pd.MultiIndex.from_frame(column_names)
        for nurse in nurseShiftsDict:
            nurses.append(nurse)

        pd.set_option('display.max_columns', None)
        df = pd.DataFrame(rows, columns=columns, index=nurses)

        df.loc['Nurses Per Shift']= df.sum()
        df["weekly Shifts"] = df.sum(axis=1)

        display(df)
```

```python
def eaSimpleWithElitism(population, toolbox, cxpb, mutpb, ngen, stats=None,
             halloffame=None, verbose=__debug__):
    """This algorithm is similar to DEAP eaSimple() algorithm, with the modification that
    halloffame is used to implement an elitism mechanism. The individuals contained in the
    halloffame are directly injected into the next generation and are not subject to the
    genetic operators of selection, crossover and mutation.
    """
    logbook = tools.Logbook()
    logbook.header = ['gen', 'nevals'] + (stats.fields if stats else [])

    # Evaluate the individuals with an invalid fitness
    invalid_ind = [ind for ind in population if not ind.fitness.valid]
    fitnesses = toolbox.map(toolbox.evaluate, invalid_ind)
    for ind, fit in zip(invalid_ind, fitnesses):
        ind.fitness.values = fit

    if halloffame is None:
        raise ValueError("halloffame parameter must not be empty!")

    halloffame.update(population)
    hof_size = len(halloffame.items) if halloffame.items else 0

    record = stats.compile(population) if stats else {}
    logbook.record(gen=0, nevals=len(invalid_ind), **record)
    if verbose:
        print(logbook.stream)

    # Begin the generational process
    for gen in range(1, ngen + 1):

        # Select the next generation individuals
        offspring = toolbox.select(population, len(population) - hof_size)

        # Vary the pool of individuals
        offspring = algorithms.varAnd(offspring, toolbox, cxpb, mutpb)

        # Evaluate the individuals with an invalid fitness
        invalid_ind = [ind for ind in offspring if not ind.fitness.valid]
        fitnesses = toolbox.map(toolbox.evaluate, invalid_ind)
        for ind, fit in zip(invalid_ind, fitnesses):
            ind.fitness.values = fit

        # add the best back to population:
        offspring.extend(halloffame.items)

        # Update the hall of fame with the generated individuals
        halloffame.update(offspring)

        # Replace the current population by the offspring
        population[:] = offspring

        # Append the current generation statistics to the logbook
        record = stats.compile(population) if stats else {}
        logbook.record(gen=gen, nevals=len(invalid_ind), **record)
        if verbose:
            print(logbook.stream)

    return population, logbook
```

```
# problem constants:
HARD_CONSTRAINT_PENALTY = 10  # the penalty factor for a hard-constraint violation

# set the random seed:
RANDOM_SEED = 42
random.seed(RANDOM_SEED)

toolbox = base.Toolbox()

# create the nurse scheduling problem instance to be used:
nsp = NurseSchedulingProblem(HARD_CONSTRAINT_PENALTY)

# define a single objective, maximizing fitness strategy:
creator.create("FitnessMin", base.Fitness, weights=(-1.0,))

# create the Individual class based on list:
creator.create("Individual", list, fitness=creator.FitnessMin)

# create an operator that randomly returns 0 or 1:
toolbox.register("zeroOrOne", random.randint, 0, 1)

# create the individual operator to fill up an Individual instance:
toolbox.register("individualCreator", tools.initRepeat, creator.Individual, toolbox.zeroOrOne, len(nsp))

# create the population operator to generate a list of individuals:
toolbox.register("populationCreator", tools.initRepeat, list, toolbox.individualCreator)
```

```
# fitness calculation
def getCost(individual):
    return nsp.getCost(individual),  # return a tuple


toolbox.register("evaluate", getCost)

# genetic operators:
toolbox.register("select", tools.selTournament, tournsize=2)
toolbox.register("mate", tools.cxTwoPoint)
toolbox.register("mutate", tools.mutFlipBit, indpb=1.0/len(nsp))
```

```python
# Genetic Algorithm flow:
def main(POPULATION_SIZE, MAX_GENERATIONS):

    # create initial population (generation 0):
    population = toolbox.populationCreator(n=POPULATION_SIZE)

    # prepare the statistics object:
    stats = tools.Statistics(lambda ind: ind.fitness.values)
    stats.register("min", np.min)
    stats.register("avg", np.mean)

    # define the hall-of-fame object:
    hof = tools.HallOfFame(HALL_OF_FAME_SIZE)

    # perform the Genetic Algorithm flow with hof feature added:
    population, logbook = eaSimpleWithElitism(
        population,
        toolbox,
        cxpb=P_CROSSOVER,
        mutpb=P_MUTATION,
        ngen=MAX_GENERATIONS,
        stats=stats,
        halloffame=hof,
        verbose=True
    )

    # print best solution found:
    best = hof.items[0]
    print("\n-- Best Individual = ", best)
    print("-- Best Fitness = ", best.fitness.values[0])

    #print("\n-- Schedule = ")
    nsp.printScheduleInfo(best)
    print()

    # extract statistics:
    minFitnessValues, meanFitnessValues = logbook.select("min", "avg")


    # plot statistics:
    sns.set(rc = {'figure.figsize':(20,10)})
    sns.set_style("whitegrid")
    plt.plot(minFitnessValues, color='red')
    plt.plot(meanFitnessValues, color='green')
    plt.xlabel('Generation')
    plt.ylabel('Min & Average Fitness')
    plt.title('Min & Average fitness over Generations')

    legend_drawn_flag = True
    plt.legend(["minFitnessValues", "meanFitnessValues"], loc=0, frameon=legend_drawn_flag)
    plt.text(0, 6,
          f'\
            Population size: {POPULATION_SIZE}\n\
            Number of generations: {MAX_GENERATIONS}\n\
            Crossover: {P_CROSSOVER}\n\
            Mutation: {P_MUTATION}',
            fontsize=15

    )

    plt.show()
```

```python
# Genetic Algorithm constants:
P_CROSSOVER = 0.9  # probability for crossover
P_MUTATION = 0.1   # probability for mutating an individual
HALL_OF_FAME_SIZE = 30
POPULATION_SIZE = [100, 300, 700, 1600]
MAX_GENERATIONS = [70, 150, 250, 400]


# main(POPULATION_SIZE, MAX_GENERATIONS)
for i in POPULATION_SIZE:
    for j in MAX_GENERATIONS:
        main(i, j)
```

```
gen     nevals  min     avg
0       100     689     1150.19
1       60      689     997.14
2       68      635     909.21
3       62      490     831.09
4       61      490     745.77
5       60      434     684.83
6       64      414     601.27
7       62      324     541.73
8       63      324     503.12
9       66      324     468.78
10      60      279     435.89
11      65      279     400.24
12      68      268     366
13      66      187     339.51
14      67      187     309.85
15      60      187     285.31
16      59      177     259.55
17      67      176     241.45
18      62      167     216.76
19      65      167     197.97
20      68      157     185.77
21      70      147     174.56
22      67      137     166.28
23      65      127     157.03
24      59      127     148.47
25      68      117     144.19
26      67      116     140.13
27      63      116     134.87
28      68      116     130.49
29      66      106     126.2
30      61      106     123.73
31      61      106     118.43
32      64      77      114.82
33      65      66      112.22
34      58      66      109.18
35      65      66      103.75
36      61      66      97.91
37      69      66      90.9
38      60      66      81.98
39      68      66      76.28
40      65      56      72.6
41      62      56      69.82
42      62      56      68.84
43      62      46      67.18
44      64      46      66.49
45      62      46      63.11
46      56      46      61.75
47      70      46      59.25
48      64      46      57.44
49      61      46      54.21
50      68      46      52.89
51      57      46      53.29
52      59      46      52.76
53      68      45      50.53
54      59      45      49.46
55      66      45      49.01
56      69      45      47.92
57      67      45      46.96
58      64      45      46.11
59      68      45      46.83
60      66      35      46.79
61      69      35      45.98
62      66      35      45.96
63      66      35      45.66
64      67      35      44.37
65      60      34      43.1
66      64      34      43.73
67      66      34      41.49
68      58      34      40.32
69      64      34      38.16
70      66      24      35.98

-- Best Individual =  [0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 1, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0
-- Best Fitness =  24.0

-- Violations:
consecutive shift violations =  0
Shifts Per Week Violations =  1
Nurses Per Shift Violations =  1
```

```
Shift Preference Violations =  14

-- Schedule for each nurse:

gen     nevals  min     avg
0       100     730     1155.74
1       68      726     1004.28
2       62      648     903.01
3       64      526     815.3
4       66      526     756.56
5       62      523     682.38
6       65      495     630.83
7       68      449     588.01
8       66      412     540.72
9       59      393     509.6
10      65      386     483.13
11      65      332     452
12      59      332     430.81
13      66      260     402.19
14      68      257     375.19
15      63      248     342.46
16      63      218     306.71
17      60      198     281.37
18      60      198     256.29
19      60      167     233.83
20      67      137     218.88
21      56      137     200.85
22      60      137     184.07
23      61      137     172.36
24      59      127     159.32
25      60      127     150.71
26      59      118     145.02
27      62      106     137.7
28      68      106     133.72
29      61      106     131.68
30      65      97      127.34
31      68      87      122.82
32      63      87      114.17
33      67      86      108.1
34      67      85      101.17
35      64      76      98.35
36      62      66      93.5
37      59      57      90.05
38      66      55      85.83
39      52      55      79.89
40      65      46      74.77
41      64      45      69.57
42      60      45      64.45
43      66      45      57.93
44      59      45      53.9
45      64      45      53.38
46      65      44      49.6
47      62      44      49.04
48      64      44      46.91
49      67      44      46.54
50      64      44      46.4
51      58      44      45.74
52      63      44      45.33
53      68      44      45.6
54      64      44      45.6
55      64      44      46.36
56      62      44      46.09
57      64      44      45.47
58      61      44      45.28
59      64      43      45.6
60      60      34      45.56
61      52      34      44.28
62      64      34      43.88
63      62      25      42.45
64      64      25      39.48
65      59      25      36.93
66      62      25      35.19
67      60      25      34.4
68      64      25      31.45
69      61      25      31.36
70      59      25      30.07
71      66      25      29.32
72      60      25      28.54
73      64      25      29.45
74      66      25      28.11
```

```
75      67      25      29.3
76      60      25      27.62
77      60      25      26.95
78      64      15      27.33
79      65      15      25.76
80      64      15      26.06
81      68      15      24.87
82      65      15      26.72
83      64      15      25.32
84      68      15      25.46
85      60      15      24.68
86      62      14      24.63
87      67      14      24.09
88      68      14      23.46
89      68      14      21.99
90      66      14      21.3
91      66      14      19.71
92      54      14      19.61
93      65      14      18.98
94      63      14      18.3
95      68      14      17.42
96      68      14      17.04
97      64      14      17.62
98      57      14      17.6
99      62      14      16.01
100     69      14      17.12
101     65      13      16.56
102     63      13      15.95
103     56      13      15.25
104     65      13      15.27
105     62      13      16.38
106     69      13      14.86
107     60      13      14.37
108     60      12      14.6
109     64      12      15.19
110     57      12      15.42
111     66      12      14.52
112     65      12      14.72
113     62      12      13.93
114     60      12      15.2
115     63      12      13.94
116     64      12      14.62
117     62      12      14.79
118     62      12      14.05
119     68      12      13.8
120     69      12      14.65
121     61      12      13.6
122     64      12      12.76
123     64      12      13.45
124     64      12      14.35
125     68      12      13.87
126     60      12      13.44
127     58      12      13.52
128     64      12      13.95
129     66      12      13.27
130     61      12      13.68
131     68      12      13.18
132     65      12      13.17
133     64      12      13.84
134     64      12      12.52
135     58      12      13.23
136     68      12      12.17
137     64      12      13.37
138     61      12      12.92
139     65      12      12.9
140     67      11      12.85
141     64      11      12.6
142     64      11      13.09
143     66      11      12.67
144     60      11      12.24
145     66      11      12.96
146     60      11      13.19
147     61      11      12.2
148     63      11      12.7
149     63      11      11.75
150     67      11      12.06

-- Best Individual =  [1, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0
-- Best Fitness =  11.0
```

```
-- Violations:
consecutive shift violations =  0
Shifts Per Week Violations =  0
Nurses Per Shift Violations =  0
Shift Preference Violations =  11

-- Schedule for each nurse:

gen     nevals  min     avg
0       100     768     1129.94
1       63      768     1020.77
2       66      661     943.35
3       67      661     868.48
4       60      620     801.49
5       60      589     747.01
6       63      572     685.38
7       67      530     643.34
8       62      448     605.56
9       67      448     571.08
10      59      423     531.07
11      66      393     501.47
12      68      348     475.14
13      66      300     438.69
14      63      300     406.38
15      58      245     381.55
16      65      245     348.25
17      66      205     319.78
18      56      205     290.4
19      57      205     268.94
20      65      169     253.03
21      64      169     234.86
22      64      169     221.46
23      66      110     205.48
24      60      110     190.21
25      64      110     173.24
26      68      110     155.04
27      66      98      139.02
28      64      88      127.04
29      55      78      116.4
30      60      68      107.81
31      61      68      98.57
32      65      68      90.37
33      66      67      84.57
34      64      58      79.17
35      66      48      73.16
36      64      48      69.7
37      58      48      68.13
38      68      48      64.51
39      58      47      62.67
40      63      47      59.33
41      60      47      56.11
42      68      47      54.82
43      60      47      53.4
44      61      47      51.76
45      63      47      50.71
46      67      47      50.58
47      66      47      50.63
48      70      37      50.15
49      70      37      50.11
50      59      37      48.93
51      66      37      46.99
52      68      37      45.51
53      64      37      42.97
54      63      37      41.69
55      58      37      39.62
56      61      37      38.93
57      59      37      38.1
58      64      37      38.36
59      58      37      38.69
60      61      37      37.77
61      64      36      37.34
62      63      36      38.44
63      60      27      38.01
64      64      27      38.3
65      64      27      37.56
66      64      26      36.86
67      67      26      35.96
68      61      26      33.89
69      65      26      32.55
70      62      26      29.46
```

71	68	26	28.22
72	64	26	27.86
73	65	26	27.43
74	68	26	27.83
75	68	26	27.65
76	68	25	27.82
77	67	25	28.85
78	63	25	28.38
79	63	25	27.18
80	62	25	26.34
81	64	25	26.54
82	54	25	26.12
83	68	25	26.91
84	60	25	26.24
85	62	25	26.43
86	62	25	25.65
87	62	25	25.77
88	60	25	26.15
89	63	25	26.54
90	64	25	26.14
91	66	25	26.64
92	70	15	27.03
93	61	15	25.61
94	60	15	26.54
95	65	15	26.13
96	62	15	25.03
97	65	15	25.74
98	64	15	22.9
99	59	15	22.54
100	66	15	20.24
101	66	15	19.55
102	64	15	20.15
103	61	15	19.5
104	68	15	20.4
105	70	15	18.87
106	62	15	19.66
107	58	15	18.81
108	67	15	18.75
109	61	15	18.23
110	65	15	20.33
111	60	15	17.59
112	66	15	18.1
113	65	15	19.66
114	66	15	17.44
115	56	15	16.98
116	69	15	19.45
117	64	15	17.97
118	62	15	16.61
119	64	15	17.55
120	65	15	16.92
121	66	15	17.09
122	61	15	17.24
123	64	14	16.79
124	64	14	16.6
125	64	14	16.83
126	66	14	16.08
127	63	14	16.37
128	64	14	15.9
129	64	14	15.82
130	60	14	16.17
131	66	14	16.18
132	66	14	15.88
133	60	14	16.38
134	66	14	16.17
135	64	14	15
136	65	14	15.74
137	67	14	16.94
138	63	14	15.84
139	64	14	16.41
140	64	14	16.33
141	64	14	14.69
142	62	14	15.63
143	65	14	16.7
144	66	14	17.18
145	64	14	16.05
146	52	14	15.61
147	66	14	16.65
148	69	14	16.56
149	60	14	15.45
150	65	14	15.57

151	63	14	15.52
152	62	14	16.11
153	66	14	15.97
154	64	14	15.35
155	69	14	16.74
156	66	14	16.76
157	66	14	15.84
158	58	14	16.81
159	62	14	16.52
160	62	14	16.13
161	65	14	17.34
162	70	14	16.75
163	68	14	16.3
164	66	14	15.42
165	62	14	16.95
166	62	14	16.99
167	63	14	15.94
168	65	14	16.46
169	58	14	15.2
170	66	14	16.28
171	62	14	16.16
172	57	14	15.48
173	58	14	16.7
174	68	14	15.02
175	63	14	15.1
176	60	14	15.75
177	66	14	15.81
178	66	14	17.45
179	58	14	15.96
180	60	14	15.21
181	62	14	15.63
182	61	14	16.57
183	64	14	16.41
184	60	14	15.59
185	63	14	16.09
186	56	14	16.69
187	62	14	15.33
188	57	14	16.52
189	65	14	17.21
190	64	14	15.75
191	63	14	16.05
192	65	14	16.83
193	68	14	16
194	59	14	15.89
195	64	14	17.13
196	54	14	15.33
197	66	14	16.95
198	57	14	15.52
199	65	14	15.86
200	68	14	16.54
201	61	14	16.96
202	65	14	16.35
203	67	14	16.45
204	57	14	15.8
205	62	14	15.14
206	67	14	15.93
207	69	14	15.74
208	68	14	15.84
209	63	14	15.71
210	67	14	16.4
211	62	14	16.3
212	64	14	15.13
213	70	14	15.92
214	67	14	15.39
215	60	14	15.1
216	61	14	15.44
217	66	14	15.72
218	61	14	15.21
219	58	14	16.32
220	56	14	15.7
221	67	14	15.31
222	64	14	15.73
223	69	14	16.32
224	62	14	16.31
225	60	14	15.36
226	65	14	18.16
227	62	14	16.39
228	60	14	15.73
229	63	14	15.91
230	64	14	15.31

```
231     59      14      16.37
232     61      14      15.62
233     65      14      15.5
234     63      14      15.8
235     70      14      15.29
236     57      14      15.93
237     62      14      16.45
238     70      14      15.54
239     64      14      15.96
240     66      14      15.67
241     68      13      14.99
242     64      13      15.54
243     58      13      16.91
244     67      13      16.29
245     63      13      15.6
246     60      13      15.36
247     63      13      15.91
248     63      13      16.47
249     66      13      16.03
250     67      13      16.17

-- Best Individual =  [0, 1, 0, 0, 0, 0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0
-- Best Fitness =  13.0

-- Violations:
consecutive shift violations =  0
Shifts Per Week Violations =  0
Nurses Per Shift Violations =  0
Shift Preference Violations =  13

-- Schedule for each nurse:

gen     nevals  min     avg
0       100     730     1130.59
1       65      708     997.64
2       67      674     897.07
3       68      627     828.05
4       68      562     755.08
5       65      547     695.39
6       63      494     647.19
7       66      448     592.64
8       67      442     552.76
9       64      409     509.39
10      68      373     487.3
11      64      368     460.52
12      62      331     433.21
13      66      298     405.82
14      65      289     375.26
15      64      211     347.81
16      65      211     327.58
17      66      211     298.3
18      66      163     273.79
19      66      142     247.26
20      64      142     223.42
21      66      142     201.5
22      69      125     178.06
23      62      113     160.53
24      66      102     143.3
25      57      91      132.1
26      63      91      122.57
27      64      91      116.52
28      60      72      108.41
29      62      72      99.7
30      64      72      93.23
31      61      72      87.27
32      63      71      82.49
33      62      64      79.74
34      64      64      76.83
35      63      62      73.89
36      60      53      73.09
37      61      52      71.6
38      61      52      69.32
39      66      52      67.21
40      64      52      64.07
41      68      52      61.39
42      70      52      59.21
43      61      51      58.03
44      68      51      56.72
45      63      51      55.75
46      63      51      54.87
```

47	66	42	54.41
48	60	42	54.23
49	55	42	53.68
50	66	42	54.41
51	64	42	53.32
52	58	41	53.01
53	63	41	52.12
54	64	41	50.68
55	66	32	48.08
56	62	32	43.81
57	60	22	43.72
58	59	21	40.8
59	63	21	38.57
60	66	21	37.29
61	59	21	35.02
62	57	21	32.73
63	61	21	30.74
64	64	21	30.17
65	58	21	28.26
66	64	21	27.39
67	68	21	27.65
68	63	21	27.8
69	60	21	27.6
70	64	21	25.99
71	68	21	27.58
72	57	21	26.18
73	67	21	25.95
74	64	21	26.68
75	62	21	26.03
76	62	21	25.72
77	65	21	25.98
78	66	21	26.94
79	64	21	25.43
80	59	21	26.68
81	65	20	25.24
82	64	20	24.68
83	63	20	23.82
84	66	20	24.22
85	67	20	24.1
86	68	20	24.55
87	61	20	26.83
88	62	20	24.31
89	67	20	22.78
90	65	20	22.89
91	68	20	22.04
92	65	20	22.66
93	64	19	20.97
94	65	19	21.59
95	61	19	20.42
96	67	19	20.92
97	64	19	20.41
98	66	19	21.05
99	60	19	21.44
100	66	19	20.7
101	63	19	20.36
102	60	19	19.64
103	62	19	19.56
104	64	19	19.63
105	66	19	19.62
106	59	19	19.31
107	66	19	21.04
108	67	19	20.11
109	65	19	20.36
110	66	19	20.15
111	63	19	19.92
112	65	19	19.84
113	68	19	20.21
114	64	19	20.43
115	66	19	19.12
116	60	19	19.81
117	60	19	19.91
118	66	19	19.66
119	65	19	19.31
120	62	19	19.94
121	67	19	19.64
122	67	19	20.24
123	66	19	19.5
124	62	19	19.11
125	66	19	20.35
126	65	19	20.22

127	65	19	19.94
128	62	19	19.79
129	64	19	20.53
130	60	19	20.13
131	59	19	20.54
132	64	19	19.22
133	64	19	19.54
134	60	19	20.22
135	61	19	20.06
136	66	19	19.2
137	65	19	20.24
138	61	19	19.83
139	64	19	20.32
140	62	19	20.29
141	68	19	20.23
142	70	10	19.72
143	65	10	19.92
144	68	10	20.18
145	64	10	19.76
146	66	10	19.71
147	65	10	19.91
148	66	10	18.86
149	64	10	19.54
150	70	10	18.44
151	61	10	18.68
152	66	10	18.8
153	66	10	18.19
154	62	10	17.77
155	66	10	17.88
156	57	10	16
157	65	9	15.75
158	64	9	14.67
159	67	9	13.88
160	62	9	12.54
161	67	9	13.9
162	57	9	11.58
163	66	9	11.77
164	62	9	11.92
165	60	9	10.73
166	62	9	10.41
167	62	9	10.27
168	58	9	10.04
169	64	9	9.88
170	61	9	10.26
171	68	9	10.41
172	66	9	10.07
173	64	9	9.31
174	64	9	9.62
175	62	9	10.53
176	66	9	9.7
177	62	9	10
178	63	9	10.82
179	59	9	11.31
180	68	9	10.13
181	66	9	10.63
182	67	9	11.05
183	65	9	9.42
184	66	9	10.63
185	62	9	10.42
186	62	9	9.76
187	59	8	9.91
188	68	8	10.16
189	64	8	10.16
190	62	8	10.03
191	62	8	10.64
192	67	8	9.58
193	66	8	11.45
194	60	8	10.55
195	60	8	10.31
196	67	8	10.74
197	64	8	10.07
198	64	8	9.75
199	70	8	9.74
200	67	8	9.53
201	61	7	9.47
202	67	7	9.19
203	68	7	9.67
204	62	7	9.76
205	68	7	9.58
206	63	7	9.03

207	62	7	9.18
208	68	7	9.57
209	64	7	9.53
210	66	7	8.41
211	60	7	9
212	66	7	7.87
213	63	7	8.47
214	64	7	8.61
215	64	7	7.66
216	62	7	7.79
217	63	7	7.96
218	66	7	8.8
219	64	7	7.7
220	64	7	7.92
221	67	7	8.4
222	66	7	8.53
223	68	7	8.11
224	70	7	8.07
225	60	7	8.36
226	61	7	7.93
227	60	7	7.65
228	64	7	8.23
229	58	7	7.92
230	64	7	8.32
231	66	7	8.12
232	61	7	7.7
233	60	7	7.91
234	64	7	7.93
235	59	7	8.03
236	65	7	8.74
237	65	7	9.11
238	65	7	9.38
239	59	7	7.52
240	60	7	8.51
241	61	7	8.22
242	60	7	8.71
243	69	7	7.6
244	66	7	9.14
245	66	7	8.62
246	64	7	7.92
247	64	7	8.5
248	65	7	8.63
249	58	7	8.72
250	57	7	7.5
251	66	7	8.23
252	64	7	8.74
253	66	7	8.14
254	62	7	8.45
255	61	7	8.22
256	62	7	8.02
257	61	7	8.71
258	62	7	8.33
259	68	7	8.2
260	60	7	8.51
261	63	7	8.44
262	62	7	7.82
263	60	7	7.3
264	67	7	8.43
265	68	7	8.2
266	63	7	9.12
267	68	7	7.82
268	68	7	8.66
269	68	7	8.46
270	62	7	8.29
271	58	7	8.41
272	68	7	7.3
273	69	7	8.84
274	68	7	8.42
275	57	7	8.42
276	64	7	8.4
277	62	7	8.32
278	63	7	8.57
279	68	7	9.22
280	57	7	9.04
281	64	7	9.77
282	57	7	8.3
283	57	7	8.03
284	67	7	9.11
285	68	7	8.13
286	64	7	8.12

287	60	7	7.61
288	63	7	8.41
289	61	7	8.33
290	62	7	8.82
291	68	7	8.32
292	67	7	9.13
293	63	7	7.92
294	62	7	7.7
295	66	7	8.64
296	65	7	8.01
297	58	7	8.32
298	68	7	8.02
299	64	7	8.01
300	64	7	7.93
301	66	7	7.8
302	62	7	8
303	64	7	8.31
304	65	7	7.7
305	61	7	8.73
306	67	7	8.66
307	62	7	7.6
308	60	7	7.92
309	57	7	8.13
310	64	7	8.82
311	64	7	7.81
312	66	7	9.13
313	60	7	8.33
314	63	7	9.03
315	58	7	8.11
316	67	7	8.12
317	60	7	7.72
318	60	7	8.24
319	67	7	8.13
320	67	7	8.93
321	58	7	8.71
322	68	7	8.53
323	66	7	8.83
324	61	7	7.91
325	66	7	9.35
326	65	7	8.3
327	67	7	8.31
328	60	7	7.81
329	62	7	8.12
330	62	7	7.81
331	66	7	8.73
332	64	7	8.19
333	66	7	7.31
334	59	7	8.41
335	60	7	7.81
336	62	7	7.75
337	66	7	8.57
338	62	7	8.34
339	68	7	8.09
340	57	7	8.13
341	66	7	7.8
342	64	7	9.06
343	63	7	7.7
344	64	7	9.03
345	64	7	8.61
346	66	7	7.91
347	65	7	8.13
348	65	7	9.54
349	66	7	7.61
350	64	7	8.63
351	65	7	8.54
352	68	7	7.81
353	65	7	8.13
354	67	7	8.95
355	68	7	8.97
356	66	7	8.63
357	64	7	7.83
358	58	7	7.95
359	62	7	7.83
360	68	7	8
361	66	7	7.9
362	58	7	8.94
363	65	7	8.93
364	66	7	8.54
365	66	7	8
366	64	7	7.72

```
367     60      7       7.62
368     66      7       8.24
369     61      7       8.25
370     68      7       8.62
371     62      7       8.32
372     64      7       8.01
373     59      7       8.84
374     63      7       8.42
375     66      7       9.12
376     58      7       8.42
377     62      7       8.23
378     59      7       10.67
379     64      7       8.91
380     66      7       8.89
381     61      7       7.72
382     64      7       8.34
383     62      7       8.21
384     61      7       8.33
385     66      7       8.33
386     66      7       7.92
387     55      7       8.21
388     67      7       8
389     64      7       8.32
390     68      7       8.21
391     66      7       9.05
392     65      7       8.12
393     65      7       8.73
394     60      7       8.53
395     68      7       9.58
396     66      7       9.04
397     66      7       8.92
398     68      7       8.81
399     60      7       8.01
400     64      7       8.2

-- Best Individual =  [0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0, 1, 0, 0, 0
-- Best Fitness =  7.0

-- Violations:
consecutive shift violations =  0
Shifts Per Week Violations =  0
Nurses Per Shift Violations =  0
Shift Preference Violations =  7

-- Schedule for each nurse:

gen     nevals  min     avg
0       300     660     1142.68
1       254     567     1013.79
2       238     527     912.77
3       237     527     823.927
4       237     497     746.04
5       244     357     673.72
6       255     357     604.053
7       249     299     548
8       246     299     489.41
9       250     188     434.03
10      242     188     387.487
11      245     179     345.92
12      233     157     310.86
13      253     156     281.59
14      251     145     253.367
15      254     145     226.7
16      243     126     205.537
17      250     123     185.67
18      236     106     169.943
19      247     87      159.71
20      249     75      148.623
21      244     75      135.16
22      254     75      124.04
23      249     64      111.35
24      242     57      100.233
25      249     55      90.5333
26      246     46      82.17
27      243     46      75.0367
28      247     34      68.13
29      240     34      61.04
30      248     34      56.6467
31      250     34      51.5467
32      247     25      49.3733
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33      251     24      47.15
34      247     24      42.3033
35      245     23      40.5767
36      247     16      37.8367
37      257     15      35.44
38      243     14      32.44
39      250     14      28.5267
40      236     14      26.4567
41      246     13      24.0967
42      247     13      22.1867
43      246     13      19.89
44      248     13      17.5433
45      236     13      16.4867
46      250     13      15.0033
47      244     13      15.1333
48      255     13      14.77
49      241     13      14.3933
50      242     13      13.87
51      245     12      14.25
52      237     12      14.73
53      248     12      13.72
54      246     12      14.3467
55      253     12      14.27
56      249     12      13.8267
57      243     12      14.9067
58      245     12      14.08
59      246     12      14.1567
60      255     12      14.8767
61      249     12      14.68
62      241     12      13.33
63      244     12      13.8133
64      249     12      13.5667
65      244     11      13.57
66      243     11      13.45
67      248     11      13.4567
68      237     11      13.3033
69      238     11      13.8667
70      241     11      13.7533

-- Best Individual =  [1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0
-- Best Fitness =  11.0

-- Violations:
consecutive shift violations =  0
Shifts Per Week Violations =  0
Nurses Per Shift Violations =  0
Shift Preference Violations =  11

-- Schedule for each nurse:

gen     nevals  min     avg
0       300     564     1152.34
1       245     564     1015.53
2       245     564     899.977
3       238     521     793.367
4       244     424     711.74
5       242     405     638.55
6       259     365     578.24
7       251     292     530.45
8       246     284     477.473
9       245     259     427.58
10      247     241     384.153
11      236     224     344.333
12      254     197     311.15
13      246     156     276.407
14      231     145     248.47
15      258     137     225.597
16      240     95      204.183
17      253     75      184.117
18      241     75      164.98
19      254     75      144.057
20      250     60      129.34
21      258     60      115.14
22      252     60      104.48
23      252     60      94.2833
24      243     60      85.9033
25      225     54      81.32
26      253     50      73.4967
27      245     44      67.6533
28      255     40      63.51
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29	235	40	60.67
30	244	30	56.8033
31	245	30	52.85
32	253	30	48.2267
33	241	30	45.0333
34	245	30	42.0633
35	242	20	39.2333
36	247	20	36.0067
37	245	10	33.51
38	236	10	31.6933
39	254	10	29.2133
40	245	10	26.4333
41	249	10	24.08
42	249	10	22.11
43	258	10	20.15
44	234	10	18.93
45	244	10	17.33
46	249	10	16.92
47	246	10	14.6933
48	246	9	13.5033
49	245	9	12.5533
50	249	9	11.5
51	246	9	11.07
52	253	9	11.6633
53	244	9	11.1933
54	246	9	11.4233
55	246	9	11.17
56	233	9	11.0033
57	237	9	10.77
58	235	9	12.5033
59	252	9	10.6
60	246	9	10.21
61	246	9	10.2233
62	249	8	10.1733
63	249	8	9.94667
64	247	8	10.5467
65	250	8	10.1133
66	238	8	10.8133
67	244	8	10.11
68	252	8	10.34
69	242	8	10.5933
70	257	8	10.3333
71	245	8	10.0567
72	243	8	9.84333
73	258	8	9.73333
74	256	8	9.12667
75	246	8	9.72
76	239	8	9.01667
77	252	7	9.19333
78	241	7	9.45667
79	251	7	9.25
80	243	7	8.94333
81	252	7	8.98
82	246	7	9.29333
83	247	7	9.23333
84	236	7	9.01
85	241	7	8.88
86	248	7	9.61
87	245	7	9.12667
88	240	7	9.15
89	253	7	8.48
90	237	7	9.37
91	246	7	8.84
92	232	7	8.23667
93	238	7	8.68667
94	242	7	8.77333
95	233	7	8.16
96	248	7	8.39667
97	232	7	8.71
98	251	7	8.40333
99	248	7	8.27667
100	240	7	8.63
101	241	7	8.55667
102	255	7	8.36
103	238	7	8.01667
104	249	7	7.79333
105	248	7	8.83667
106	246	7	8.46667
107	242	7	8.26333
108	248	7	8.37

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109     255     7       8.77667
110     250     7       8.15667
111     249     7       8.42667
112     246     7       8.36
113     242     7       8.01
114     241     7       8.56333
115     245     7       8.66667
116     255     7       8.28667
117     251     7       8.3
118     248     7       8.60333
119     248     7       8.13
120     243     7       8.72333
121     257     7       8.19
122     236     7       8.10667
123     245     7       9.18333
124     244     7       8.44667
125     247     7       8.01667
126     245     7       8.58333
127     257     7       8.92667
128     230     7       8.32333
129     247     7       8.59333
130     248     7       8.72333
131     248     7       8.7
132     249     7       8.85
133     234     7       8.88
134     250     7       8.36333
135     253     7       7.90667
136     241     7       8.56333
137     253     7       9.45667
138     238     7       8.19333
139     236     7       8.42
140     239     7       8.64333
141     248     7       8.73667
142     251     7       8.62667
143     240     7       8.82333
144     248     7       8.5
145     232     7       7.73333
146     236     7       7.96
147     250     7       8.39333
148     244     7       9.01333
149     246     7       8.08333
150     243     7       9.05667

-- Best Individual =  [0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 1
-- Best Fitness =  7.0

-- Violations:
consecutive shift violations =  0
Shifts Per Week Violations =  0
Nurses Per Shift Violations =  0
Shift Preference Violations =  7

-- Schedule for each nurse:

gen     nevals  min     avg
0       300     715     1136.1
1       247     669     1037.56
2       248     557     946.533
3       250     557     853.477
4       235     489     766.123
5       250     433     683.253
6       248     431     607.9
7       237     331     559.473
8       241     331     509.193
9       248     287     469.317
10      250     285     432.3
11      247     256     393.01
12      248     249     358.39
13      249     210     331.473
14      254     197     302.11
15      247     178     278.847
16      251     177     256.933
17      251     134     234.593
18      236     134     214.677
19      256     115     201.703
20      254     93      186.177
21      250     83      173.187
22      244     83      165.047
23      235     83      153.16
24      245     82      142.513
```

25	246	73	132.36
26	239	72	119.657
27	245	72	110.91
28	251	68	102.01
29	250	53	94.54
30	255	53	87.3633
31	250	51	79.7833
32	251	51	73.6967
33	239	51	68.4767
34	237	41	62.08
35	246	41	57.65
36	232	40	55.1733
37	248	40	52.7533
38	243	31	50.4267
39	234	31	48.5567
40	247	30	45.9267
41	247	30	42.43
42	230	21	40.4133
43	251	21	37.54
44	248	21	35.64
45	250	21	33.9867
46	243	21	32.3567
47	239	21	30.7933
48	249	21	29.2733
49	248	12	26.83
50	240	12	24.53
51	250	12	22.9433
52	249	12	23.25
53	236	12	21.8667
54	253	12	22.0733
55	249	12	22.5267
56	243	12	21.4733
57	241	12	20.86
58	243	12	20.4267
59	249	12	19.5
60	239	12	17.5267
61	252	12	16.2933
62	245	12	14.75
63	250	12	13.45
64	247	12	13.62
65	262	12	13.5567
66	251	12	13.6067
67	247	12	12.91
68	246	12	12.9967
69	245	12	12.9833
70	241	12	13.2833
71	234	12	13.81
72	237	12	13.54
73	247	11	13.6433
74	248	11	13.63
75	250	11	13.18
76	246	11	13.7067
77	241	11	13.9667
78	251	11	13.68
79	241	11	13.9467
80	243	11	13.0467
81	240	11	13.7333
82	247	11	13.38
83	251	11	13.7067
84	252	11	13.5733
85	240	11	13.9333
86	243	11	12.9367
87	253	11	13.5
88	247	11	12.5733
89	240	11	12.21
90	248	11	11.97
91	250	11	12.29
92	240	11	12.3
93	244	11	12.9533
94	249	11	12.0867
95	253	11	12.2267
96	239	11	12.2433
97	246	11	12.6633
98	239	11	11.9633
99	256	11	12.04
100	242	11	12.3133
101	251	11	12.8
102	243	11	12.4867
103	233	11	12.7333
104	249	11	12.7233

105	244	11	12.9
106	252	11	12.3467
107	233	11	12.5633
108	252	11	12.3867
109	246	11	12.87
110	245	11	12.5733
111	243	11	12.6567
112	250	11	12.4733
113	242	11	12.3967
114	254	11	12.86
115	259	11	12.5967
116	251	11	12.17
117	248	11	12.8533
118	241	11	12.69
119	248	11	12.59
120	240	11	12.1833
121	243	11	12.41
122	251	11	12.1633
123	243	11	12.53
124	236	11	12.21
125	239	11	12.41
126	251	11	12.54
127	245	11	13.0633
128	257	11	12.76
129	226	11	12.6067
130	247	11	12.9033
131	252	11	13.0067
132	246	11	12.4267
133	239	11	12.4433
134	254	11	12.99
135	253	11	12.8433
136	262	11	13.4933
137	252	11	12.5967
138	236	11	12.27
139	250	11	12.7067
140	245	11	12.3733
141	251	11	12.8
142	248	11	12.4967
143	237	11	12.29
144	250	11	12.8433
145	247	11	12.6067
146	237	11	12.58
147	242	11	12.8767
148	252	11	12.97
149	248	11	12.25
150	236	11	12.4233
151	243	11	12.8567
152	253	11	13.5067
153	243	11	12.3267
154	235	11	13.16
155	248	11	13.2533
156	249	11	12.54
157	257	11	12.8
158	245	11	12.9533
159	238	11	12.79
160	250	11	12.59
161	231	11	12.06
162	240	11	12.7533
163	244	11	12.28
164	249	11	13.0567
165	250	11	13.0733
166	245	11	11.9333
167	248	11	12.1367
168	243	11	13.0933
169	246	11	12.83
170	239	11	12.58
171	253	11	12.8967
172	263	11	13.31
173	248	11	13.0767
174	247	11	12.6267
175	232	11	12.6467
176	240	11	12.3433
177	236	11	12.04
178	239	10	12.77
179	250	10	12.41
180	247	10	12.3933
181	247	10	12.48
182	237	10	12.4067
183	253	10	13.2067
184	246	10	12.66

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185     248     10      12.9267
186     241     10      12.3433
187     239     10      12.1333
188     244     10      12.58
189     239     10      12.8033
190     231     10      13.1867
191     237     10      12.8467
192     243     10      13.47
193     240     10      12.9433
194     243     10      12.53
195     237     10      12.2933
196     245     10      11.92
197     246     10      11.3933
198     252     10      11.4967
199     246     10      11.17
200     244     10      12.1333
201     253     10      11.5767
202     242     10      11.5633
203     249     10      11.3467
204     245     10      11.3333
205     246     10      11.0233
206     240     10      11.25
207     244     10      10.78
208     242     10      10.85
209     233     10      11.33
210     244     10      11.61
211     228     10      10.96
212     246     10      11.5933
213     240     10      10.7267
214     259     10      11.1833
215     245     10      10.65
216     245     10      11.33
217     254     10      10.92
218     238     10      11
219     242     10      11.3333
220     242     10      11.0633
221     249     10      12.2067
222     249     10      11.46
223     251     10      11.59
224     233     10      11.79
225     260     10      11.6267
226     242     10      11.53
227     238     10      11.45
228     241     10      11.5067
229     251     10      10.8167
230     238     10      11.0667
231     245     10      11.41
232     245     10      10.9733
233     255     10      11.3867
234     241     10      11.1033
235     229     10      11.07
236     250     10      10.9433
237     252     10      11.31
238     239     10      10.8233
239     252     10      11.53
240     234     10      11.3267
241     237     10      11.16
242     249     10      10.66
243     244     10      11.4567
244     235     10      11.0433
245     249     10      11.66
246     245     10      11.35
247     255     10      10.7833
248     255     10      10.8933
249     236     10      10.6567
250     249     10      11.3867

-- Best Individual =  [1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 1
-- Best Fitness =  10.0

-- Violations:
consecutive shift violations =  0
Shifts Per Week Violations =  0
Nurses Per Shift Violations =  0
Shift Preference Violations =  10

-- Schedule for each nurse:

gen     nevals  min     avg
0       300     727     1134.35
```

1	249	626	1011.37
2	252	600	913.14
3	249	587	821.12
4	231	463	748.643
5	249	446	681.97
6	241	392	618.493
7	253	369	563.943
8	251	331	507.723
9	242	265	454.183
10	253	218	410.1
11	234	197	365.523
12	238	197	329.437
13	247	189	298.467
14	247	107	266
15	246	107	243.293
16	251	107	224.463
17	236	107	206.153
18	252	83	184.86
19	245	76	169.133
20	256	70	152.103
21	240	70	135.327
22	243	60	119.95
23	245	50	107.58
24	252	44	97.77
25	258	43	91.7233
26	247	43	84.7933
27	247	33	77.0433
28	242	33	69.8967
29	255	33	63.8833
30	245	17	57.5233
31	251	14	53.9633
32	258	14	46.5067
33	233	14	41.78
34	245	14	37.2167
35	245	14	34.8433
36	239	14	32.8567
37	242	14	31.32
38	251	14	30.2567
39	233	12	27.9733
40	251	12	25.82
41	244	12	24.1
42	251	12	23.14
43	229	12	21.1967
44	253	11	20.31
45	241	11	18.8467
46	252	11	18.0467
47	239	11	16.33
48	249	11	14.77
49	230	11	14.3533
50	251	11	14.1467
51	242	11	12.9267
52	248	11	13.14
53	251	11	12.6433
54	242	11	12.4367
55	248	11	12.2233
56	250	11	12.4367
57	248	11	12.19
58	234	11	12.73
59	236	11	12.4233
60	247	11	12.3233
61	242	11	11.8167
62	249	11	12.2633
63	233	11	12.45
64	251	11	12.2
65	236	11	12
66	244	11	12.3233
67	249	11	12.0067
68	248	11	12.18
69	247	11	12.7067
70	250	11	12.22
71	244	11	12.29
72	257	11	12.3533
73	250	11	12.1467
74	254	11	12.3367
75	247	11	13.0033
76	246	11	12.7667
77	252	11	13.2433
78	252	11	13.1
79	233	11	12.6367
80	244	11	12.3533

81	241	11	13.3067
82	237	11	12.5733
83	232	11	12.9333
84	242	11	12.7367
85	251	11	13.01
86	234	10	12.8367
87	244	10	12.52
88	252	10	12.04
89	252	10	12.36
90	235	10	12.7333
91	251	10	12.4367
92	239	10	12.7367
93	240	10	12.3933
94	241	10	12.08
95	250	10	12.46
96	242	10	11.76
97	246	10	12.5533
98	250	10	11.45
99	233	10	11.6767
100	246	10	11.0033
101	242	10	11.2333
102	241	10	11.0233
103	242	10	11.16
104	249	10	11.2767
105	244	9	11.2833
106	255	9	11.3733
107	253	9	11.1633
108	249	9	10.98
109	252	9	10.88
110	246	9	11.65
111	248	9	11.73
112	246	9	11.6267
113	254	9	11.6433
114	246	9	11.5567
115	237	9	11.7433
116	239	9	10.7867
117	242	9	10.53
118	238	9	10.4133
119	250	9	9.88667
120	256	9	10.2667
121	241	9	10.52
122	246	9	10.0467
123	242	9	11.0133
124	250	9	10.57
125	251	8	10.02
126	243	8	10.73
127	242	8	11.07
128	245	8	10.02
129	244	8	10.49
130	256	8	10.1533
131	245	8	10.1933
132	239	8	10.2933
133	248	8	9.72
134	247	8	10.4367
135	250	8	10.4567
136	253	8	10.3633
137	244	8	10.56
138	256	8	9.69667
139	250	8	9.85333
140	246	8	9.82
141	239	8	8.87333
142	245	8	9.02667
143	245	8	8.97
144	234	8	9.65
145	235	8	8.85
146	245	8	9.24667
147	257	8	9.17333
148	245	8	8.74667
149	248	8	9.79667
150	247	8	9.11667
151	247	8	9.54333
152	237	8	9.56667
153	252	8	9.19
154	252	8	8.91333
155	240	8	9.40333
156	241	7	9.12333
157	246	7	9.18667
158	248	7	9.14667
159	250	7	9.05
160	242	7	8.99333

161	238	7	9.08
162	246	7	9.66667
163	248	7	9.37667
164	244	7	9.14
165	238	7	9.27
166	250	7	8.62333
167	251	7	8.51333
168	257	7	9.03667
169	248	7	8.69667
170	255	6	7.87
171	248	6	8.47667
172	246	6	8.45333
173	239	6	8.20333
174	247	6	8.54
175	252	6	8.46667
176	250	6	8.48
177	237	6	8.03
178	242	6	8.39
179	246	6	8.82333
180	245	6	8.67333
181	254	6	8.15333
182	235	6	7.96667
183	241	6	7.72667
184	239	6	7.68
185	240	6	7.43
186	252	6	8.06
187	251	6	7.65333
188	246	6	6.76667
189	229	6	7.23333
190	245	6	7.50667
191	245	6	6.88333
192	261	6	7.51
193	251	6	7.24
194	250	6	7.72
195	246	6	7.30667
196	248	6	7.46333
197	254	6	6.81333
198	249	6	7.67333
199	247	6	7.38667
200	250	6	7.29667
201	235	6	7.37333
202	248	6	6.86333
203	238	6	7.56333
204	242	6	8.14333
205	243	6	6.73
206	250	6	7.08667
207	241	6	6.92
208	250	6	7.78333
209	248	6	7.07
210	237	6	7.72333
211	245	6	7.64333
212	248	6	6.72333
213	244	6	7.40667
214	248	6	7.46667
215	236	6	7.49667
216	243	6	6.66
217	239	6	7.09667
218	237	6	7.25667
219	251	6	7.33667
220	243	6	7.28667
221	245	6	6.91667
222	248	6	7.48333
223	254	6	7.74333
224	250	6	7.30667
225	248	6	6.93667
226	245	6	7.29
227	250	6	7.59667
228	249	6	7.16667
229	255	6	7.10667
230	242	6	6.92333
231	240	6	7.29
232	249	6	6.81333
233	250	6	7.09333
234	256	6	7.76333
235	241	6	7.01667
236	244	6	7.26333
237	238	6	7.37333
238	245	6	7.39
239	245	6	6.89
240	246	6	7.17667

241	240	6	7.22667
242	253	6	7.09
243	251	6	7.01667
244	249	6	8.21667
245	241	6	7.36
246	236	6	7.5
247	243	6	7.02667
248	245	6	7.08667
249	250	6	7.43333
250	246	6	7.60667
251	249	6	8.06333
252	248	6	7.44
253	237	6	7.34667
254	247	6	7.69333
255	252	6	7.13333
256	238	6	6.99333
257	240	6	7.39333
258	253	6	7.65333
259	236	6	6.85
260	241	6	6.96
261	255	6	7.57
262	249	6	7.66333
263	241	6	7.63333
264	240	6	7.50333
265	243	6	7.80667
266	244	6	6.75
267	254	6	7.46
268	248	6	6.98667
269	246	6	6.93
270	241	6	7.23667
271	239	6	7.29667
272	250	6	7.64667
273	253	6	7.31333
274	241	6	7.19
275	245	6	8.21
276	243	6	7.75667
277	239	6	7.16
278	248	6	7.42667
279	248	6	7.47667
280	237	6	7.88
281	250	6	7.50667
282	245	6	6.88
283	239	6	7.7
284	256	6	6.95667
285	248	6	7.49333
286	254	6	7.45333
287	246	6	7.27
288	242	6	7.63
289	241	6	7.29667
290	235	6	7.01667
291	244	6	7.02
292	237	6	6.85
293	238	6	6.81667
294	250	6	7.33667
295	252	6	7.47
296	235	6	7.79667
297	235	6	6.95333
298	248	6	7.27333
299	242	6	7.39667
300	254	6	7.81667
301	240	6	7.15667
302	250	6	7.35667
303	251	6	7.63667
304	244	6	7.49667
305	242	6	7.50333
306	231	6	7.08333
307	252	6	6.99333
308	256	6	6.71667
309	242	6	6.97333
310	243	6	7.23
311	240	6	6.99667
312	243	6	7.09
313	245	6	7.61333
314	244	6	7.25667
315	256	6	6.99
316	243	6	7.36333
317	249	6	7.08667
318	248	6	7.08333
319	234	6	7.93
320	252	6	7.83667

321	245	6	7.78
322	251	6	7.36667
323	241	6	7.58333
324	244	6	7.73333
325	231	6	7.12333
326	253	6	7.09
327	256	6	7.73333
328	248	6	8.70333
329	237	6	7.24667
330	249	6	7.48667
331	236	6	7.14667
332	246	6	6.67
333	237	6	7.5
334	241	6	6.92333
335	244	6	7.32333
336	245	6	7.77
337	235	6	7.52
338	246	6	7.25667
339	249	6	6.97
340	239	6	6.91667
341	253	6	7.56667
342	254	6	7.20333
343	251	6	7.25
344	245	6	7.1
345	242	6	7.03
346	251	6	7.33333
347	242	6	6.96
348	231	6	7.74333
349	241	6	7.22333
350	249	6	7.21667
351	234	6	6.85
352	249	6	7.47667
353	249	6	6.95
354	243	6	7.62333
355	246	6	7.23
356	255	6	7.70667
357	243	6	7.15667
358	242	6	7.33333
359	247	6	7.28667
360	244	6	6.98667
361	247	6	7.11
362	247	6	7.07667
363	249	6	6.96
364	258	6	7.47667
365	242	6	7.50333
366	240	6	6.99667
367	242	6	7.05667
368	257	6	7.25
369	248	6	7.26
370	250	6	7.36333
371	255	6	6.91333
372	254	6	7.51667
373	242	6	7.47667
374	258	6	7.03
375	241	6	7.63667
376	242	6	7.39333
377	255	6	7.55
378	248	6	7.26
379	249	6	7.72333
380	247	6	7.16
381	254	6	7.34667
382	248	6	6.79667
383	250	6	7.97
384	247	6	7.81667
385	254	6	7.44
386	238	6	7.2
387	233	6	7.73667
388	247	6	7.88667
389	233	6	6.75333
390	248	6	6.74667
391	240	6	7.29
392	251	6	7.12667
393	250	6	7.25667
394	239	6	7.23667
395	258	6	7.62333
396	245	6	7.25333
397	251	6	7.5
398	246	6	7.05
399	249	6	7.80667
400	232	6	7.02333

```
-- Best Individual =  [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1
-- Best Fitness =  6.0

-- Violations:
consecutive shift violations =  0
Shifts Per Week Violations =  0
Nurses Per Shift Violations =  0
Shift Preference Violations =  6

-- Schedule for each nurse:
```

gen	nevals	min	avg
0	700	663	1145.6
1	621	566	1026.36
2	615	566	923.437
3	618	532	833.181
4	614	425	757.496
5	607	379	682.06
6	594	339	616.911
7	602	308	551.529
8	636	229	499.18
9	622	229	447.433
10	610	194	400.589
11	601	185	355.563
12	626	172	315.421
13	602	163	281.693
14	605	145	254.609
15	610	112	233.257
16	595	108	211.686
17	607	103	193.311
18	579	103	179.951
19	631	100	167.801
20	603	73	155.947
21	607	67	145.311
22	624	66	136.189
23	598	65	128.997
24	610	54	121.226
25	620	54	114.917
26	612	54	108.363
27	606	45	101.826
28	588	34	95.8686
29	609	34	90.8243
30	629	33	87.08
31	616	33	82.2114
32	607	33	77.4171
33	608	33	74.5629
34	602	33	70.5314
35	601	24	65.92
36	622	22	62.2986
37	597	22	57.67
38	582	14	52.2629
39	586	14	47.4643
40	607	14	42.1271
41	616	14	38.2014
42	604	12	34.6414
43	594	12	31.7786
44	620	12	30.1786
45	614	12	27.9643
46	583	12	26.3714
47	617	12	24.83
48	615	12	23.78
49	591	12	22.2657
50	604	12	21.2914
51	606	11	19.9914
52	591	11	19.3671
53	611	11	19.8514
54	624	11	18.7057
55	604	11	19.3086
56	619	11	19.2743
57	617	11	18.9343
58	597	11	18.9186
59	604	11	19.3386
60	600	11	18.7914
61	613	11	19.0386
62	615	11	18.9257
63	605	11	18.13
64	624	11	17.4257
65	628	11	16.3671
66	626	10	15.7443

```
67      628     10      14.8614
68      619     10      14.0129
69      601     10      13.9471
70      618     10      13.9529

-- Best Individual =  [0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0
-- Best Fitness =  10.0

-- Violations:
consecutive shift violations =  0
Shifts Per Week Violations =  0
Nurses Per Shift Violations =  0
Shift Preference Violations =  10

-- Schedule for each nurse:

gen     nevals  min     avg
0       700     718     1148.88
1       608     563     1043.44
2       611     563     946.417
3       622     516     854.447
4       635     509     780.223
5       611     459     712.45
6       617     401     648.726
7       603     278     595.72
8       604     278     535.856
9       592     278     491.959
10      600     241     445.406
11      621     197     403.536
12      601     192     363.01
13      615     147     326.239
14      628     103     294.043
15      622     103     259.377
16      600     95      230.491
17      606     95      208.66
18      606     94      188.107
19      605     82      169.07
20      618     82      154.514
21      610     72      139.951
22      621     63      130.241
23      615     54      121.311
24      620     45      111.641
25      613     45      105.977
26      612     45      100.839
27      617     44      94.2643
28      605     32      89.1357
29      616     32      83.41
30      607     32      78.5029
31      594     29      72.9371
32      600     25      68.8043
33      597     23      63.9514
34      613     21      58.7629
35      630     20      55.7486
36      609     20      50.9543
37      628     19      49.01
38      612     19      45.3171
39      612     11      43.8514
40      625     11      41.1114
41      594     11      39.3857
42      587     11      36.8043
43      613     10      35.0657
44      625     10      34.8729
45      598     9       32.5871
46      624     9       31.5371
47      612     9       29.9729
48      579     9       28.0929
49      620     8       25.86
50      599     8       24.7286
51      592     8       23.9643
52      601     8       22.6743
53      616     8       22.7871
54      612     8       22.2171
55      598     8       20.4743
56      612     8       19.8257
57      612     7       19.9929
58      603     7       19.1357
59      602     7       17.5857
60      615     7       16.4429
61      602     7       15.5514
62      606     7       13.5529
```

63	591	7	12.9957
64	624	7	13.1186
65	598	6	11.8443
66	610	6	11.3771
67	599	6	10.7529
68	613	6	10.8857
69	616	6	10.3443
70	603	6	10.1486
71	640	6	9.70429
72	612	6	9.73143
73	609	6	9.76
74	622	6	9.31571
75	599	6	8.57571
76	617	6	7.97429
77	592	6	7.76429
78	599	6	7.64857
79	610	6	7.53429
80	613	6	7.63143
81	627	5	7.73571
82	603	5	7.64
83	604	5	7.55286
84	622	5	8.09286
85	615	5	7.50286
86	612	5	7.35857
87	613	5	7.4
88	624	5	7.90143
89	605	5	7.42286
90	586	5	7.32429
91	588	5	7.57143
92	616	5	7.38429
93	602	5	7.43714
94	624	5	7.18714
95	614	5	6.49429
96	606	5	6.34429
97	600	5	6.09286
98	623	5	6.25286
99	601	5	6.52143
100	616	5	6.62143
101	619	5	6.46286
102	605	5	6.11429
103	607	5	6.40429
104	620	5	6.20143
105	615	5	6.21286
106	609	5	6.99571
107	621	5	6.78286
108	606	5	6.22143
109	613	5	6.42714
110	602	5	6.23857
111	611	5	6.29143
112	629	5	6.13714
113	609	4	6.40857
114	618	4	6.26
115	604	4	6.04857
116	618	4	6.31286
117	620	4	6.09286
118	621	4	6.37429
119	619	4	6.21429
120	598	4	6.27
121	606	4	6.43
122	616	4	6.27286
123	614	3	6.54714
124	623	3	6.30714
125	600	3	6.05143
126	615	3	5.61286
127	618	3	5.11
128	616	3	5.37143
129	621	3	5.40857
130	609	3	5.24286
131	604	3	5.27429
132	613	3	5.15857
133	603	3	5.63714
134	600	3	5.56143
135	616	3	5.20429
136	627	3	4.87
137	629	3	5.66429
138	624	3	4.75143
139	606	3	4.24571
140	607	3	3.88286
141	626	3	4.50571
142	612	3	4.19

```
143     634     3       4.29571
144     627     3       4.11143
145     606     3       4.07714
146     621     3       4.39714
147     602     3       4.11
148     609     3       4.21286
149     603     3       4.50571
150     602     3       4.41

-- Best Individual =  [0, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0
-- Best Fitness =  3.0

-- Violations:
consecutive shift violations =  0
Shifts Per Week Violations =  0
Nurses Per Shift Violations =  0
Shift Preference Violations =  3

-- Schedule for each nurse:

gen     nevals  min     avg
0       700     665     1137.24
1       612     609     1026.67
2       606     544     935.244
3       615     544     840.247
4       607     429     766.897
5       619     429     690.576
6       609     361     633.043
7       601     313     577.734
8       599     300     526.6
9       613     228     477.244
10      601     228     429.943
11      618     216     383.699
12      611     183     342.654
13      623     161     311.157
14      610     156     280.063
15      625     125     249.337
16      595     114     227.873
17      616     112     204.136
18      607     95      185.33
19      609     93      168.636
20      626     91      154.59
21      600     79      145.77
22      620     70      138.289
23      620     70      129.633
24      616     54      122.979
25      598     54      115.389
26      612     54      107.946
27      599     44      101.536
28      621     44      96.3757
29      605     31      90.0071
30      614     31      85.8143
31      608     31      82.5486
32      610     31      78.4314
33      623     29      74.87
34      606     29      71.8114
35      592     21      69.63
36      603     21      65.6271
37      601     19      62.94
38      612     19      60.73
39      620     19      58.1443
40      603     19      56.3543
41      602     19      53.67
42      604     10      48.5629
43      598     9       46.3029
44      608     9       45.13
45      613     9       41.37
46      616     9       36.6614
47      595     9       32.9
48      615     8       28.0357
49      617     8       23.34
50      607     8       20.7071
51      604     8       18.1357
52      603     8       15.5014
53      605     8       13.32
54      619     8       11.9843
55      623     8       11.4329
56      618     8       11.0671
57      599     8       11.0229
58      604     8       11.2
```

59	610	8	11.0629
60	604	8	10.5414
61	606	8	10.6829
62	603	8	9.98714
63	616	8	9.82286
64	613	8	9.91143
65	623	8	9.57
66	610	8	9.97286
67	603	8	9.60429
68	624	8	9.87143
69	606	8	9.26
70	590	8	9.50286
71	615	8	9.61714
72	590	8	9.23714
73	607	7	9.70857
74	617	7	9.51571
75	616	7	9.58429
76	614	7	9.51857
77	610	7	9.7
78	609	7	9.58143
79	604	7	9.70429
80	612	7	9.85
81	617	7	9.26571
82	603	7	9.62857
83	605	7	9.13714
84	631	7	9.56143
85	593	7	9.50286
86	602	7	9.53286
87	607	7	9.78143
88	610	7	10.1114
89	609	7	9.43857
90	606	7	9.70429
91	599	7	9.83857
92	596	7	9.83571
93	609	7	9.93714
94	607	7	9.78571
95	603	7	9.87
96	601	6	9.84857
97	614	6	9.73
98	621	6	9.93714
99	615	6	9.31286
100	605	6	8.42286
101	615	6	8.83143
102	600	6	8.69143
103	607	6	9.05429
104	618	6	9.1
105	616	6	8.79714
106	605	6	9.04
107	617	6	8.7
108	602	6	8.67429
109	617	6	8.42286
110	616	6	8.17429
111	630	6	7.58
112	621	6	7.68714
113	596	6	7.22714
114	599	6	7.52857
115	598	6	7.38429
116	622	6	7.24143
117	614	6	7.17143
118	602	6	7.59286
119	620	6	7.19143
120	602	6	6.98
121	594	6	7.33286
122	607	6	7.52143
123	604	6	7.61429
124	612	6	7.45714
125	606	6	7.26714
126	623	6	7.09143
127	596	6	7.70714
128	605	6	7.37
129	614	6	6.99286
130	623	6	7.30571
131	583	6	7.03571
132	611	6	7.64857
133	601	6	7.06857
134	626	6	7.42429
135	604	6	7.29429
136	609	6	7.28429
137	620	6	7.29857
138	600	6	7.49

139	596	6	7.30429
140	613	6	7.48429
141	589	6	7.15286
142	605	6	7.25143
143	609	6	7.62286
144	619	6	7.37857
145	615	6	7.39143
146	608	6	7.38857
147	608	6	7.22429
148	599	6	7.21571
149	615	6	7.46714
150	623	6	7.72429
151	620	6	7.87286
152	611	6	7.32857
153	610	6	7.47429
154	589	6	7.29571
155	615	6	7.52571
156	608	6	7.29
157	623	6	7.65571
158	620	6	7.06857
159	614	6	7.47857
160	626	6	7.16571
161	600	6	7.35
162	618	6	7.55857
163	626	6	7.05857
164	603	6	7.48571
165	612	6	7.36
166	622	6	7.70429
167	596	6	7.21
168	613	6	7.43
169	594	6	7.38
170	604	6	7.30143
171	603	6	7.39571
172	607	6	7.51714
173	611	6	7.59
174	604	6	7.53571
175	627	6	7.44714
176	594	6	7.50286
177	590	6	7.18
178	630	6	7.01429
179	606	6	7.06143
180	608	6	7.16286
181	592	6	7.16857
182	612	6	7.22714
183	606	6	7.36286
184	607	6	7.49571
185	616	6	7.45
186	610	6	7.38143
187	604	6	7.20143
188	610	6	7.16714
189	601	6	7.22429
190	591	6	7.48286
191	614	6	7.61286
192	613	6	7.24429
193	608	6	7.52571
194	618	6	7.15571
195	606	6	7.03
196	612	6	6.97429
197	616	6	7.40143
198	603	6	7.74429
199	608	6	7.21286
200	607	6	7.70143
201	603	6	7.40857
202	616	6	7.44857
203	606	6	7.69
204	621	6	7.67
205	628	6	7.32571
206	598	6	7.11429
207	606	6	6.9
208	606	6	7.46143
209	621	6	7.12429
210	602	6	7.30714
211	612	6	7.35
212	616	6	7.54857
213	618	6	6.91
214	610	6	7.36714
215	594	6	7.61
216	602	6	7.72571
217	593	6	7.40143
218	613	6	7.22714

```
219     619     6       7.25857
220     604     6       7.52571
221     601     6       7.36143
222     620     6       7.55286
223     601     6       7.04
224     602     6       7.78429
225     617     6       7.60143
226     627     6       7.77143
227     620     6       7.38714
228     595     6       7.45429
229     606     6       7.42
230     618     6       7.37571
231     619     6       7.49
232     595     6       7.23
233     582     6       7.14429
234     608     6       7.37143
235     620     6       7.68
236     625     6       7.66571
237     605     6       7.16
238     616     6       7.66143
239     603     6       7.39714
240     609     6       7.1
241     615     6       7.88857
242     622     6       7.58857
243     626     6       7.37429
244     602     6       7.70857
245     610     6       7.34857
246     601     6       7.53143
247     601     6       7.44429
248     606     6       7.33857
249     600     6       7.28857
250     592     6       7.41

-- Best Individual =  [1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 1
-- Best Fitness =  6.0

-- Violations:
consecutive shift violations =  0
Shifts Per Week Violations =  0
Nurses Per Shift Violations =  0
Shift Preference Violations =  6

-- Schedule for each nurse:

gen     nevals  min     avg
0       700     683     1133.37
1       618     633     1023.03
2       613     573     930.513
3       603     553     843.567
4       602     471     769.989
5       604     421     696.806
6       613     351     628.399
7       607     351     572.914
8       605     309     520.183
9       611     284     474.899
10      620     224     433.013
11      615     196     391.477
12      609     155     351.816
13      600     143     312.003
14      608     128     281.706
15      603     119     250.047
16      608     114     227.334
17      606     102     205.856
18      609     90      187.64
19      615     88      172.58
20      612     73      156.887
21      611     73      144.826
22      624     72      136.421
23      595     62      125.233
24      608     62      117.739
25      594     54      107.663
26      617     42      100.224
27      606     42      94.2857
28      605     41      88.3243
29      612     23      81.9771
30      595     23      74.3229
31      627     23      70.3071
32      625     23      64.51
33      614     22      59.7143
34      622     21      53.3471
```

35	620	15	48.8314
36	605	13	43.5429
37	609	13	39.22
38	613	13	35.9457
39	612	13	31.7143
40	621	12	28.5657
41	612	12	26.5114
42	608	11	23.74
43	609	11	21.0829
44	618	11	17.7814
45	611	11	16.3729
46	601	11	15.31
47	604	11	14.4843
48	623	11	13.5486
49	604	11	13.2886
50	615	11	13.0114
51	600	11	12.5286
52	607	10	12.1771
53	615	10	12.0686
54	609	10	12.4429
55	603	10	12.45
56	605	10	12.3414
57	594	10	12.2829
58	602	10	12.5357
59	594	10	12.4871
60	627	10	12.9043
61	598	10	12.3229
62	604	10	12.4857
63	614	10	12.1229
64	612	10	11.6243
65	608	9	11.3657
66	621	9	10.9571
67	599	9	10.9857
68	615	9	11.24
69	607	9	11.3357
70	625	9	11.1171
71	607	9	11.1086
72	618	9	11.4086
73	609	9	11.2157
74	608	9	11.7871
75	618	9	11.9229
76	602	9	11.5371
77	604	9	11.32
78	618	8	11.1
79	612	8	10.5271
80	614	8	10.66
81	613	8	10.5971
82	617	8	10.9543
83	615	8	11.0971
84	611	8	10.6243
85	619	8	10.6729
86	622	8	10.17
87	610	8	10.0371
88	612	8	9.88571
89	615	8	9.46286
90	628	8	9.25571
91	626	8	9.64
92	599	8	9.66429
93	628	8	9.60857
94	599	8	9.55
95	612	8	9.13571
96	610	8	9.17286
97	618	8	9.43286
98	598	8	9.52571
99	616	8	9.71143
100	592	8	9.72143
101	599	8	8.97857
102	624	8	9.45429
103	610	8	9.41714
104	602	8	9.67
105	606	8	9.33286
106	606	8	8.93429
107	604	8	9.57429
108	601	8	9.46571
109	616	8	9.20571
110	617	8	9.00571
111	613	8	9.85286
112	607	8	8.95143
113	616	8	9.21
114	618	8	9.19286

115	614	8	9.49429
116	614	8	9.36714
117	605	8	9.42571
118	609	8	9.77
119	608	8	9.51714
120	609	8	9.34286
121	612	8	9.17
122	618	8	9.37857
123	608	8	9.17857
124	595	8	9.66
125	614	8	9.17429
126	606	8	9.46143
127	594	8	9.40571
128	617	8	9.80429
129	615	8	9.40429
130	605	8	9.52714
131	605	8	9.63857
132	608	8	9.48571
133	611	8	9.73714
134	616	8	9.37857
135	617	8	9.56857
136	632	8	9.28571
137	619	8	9.24286
138	598	8	9.45143
139	608	8	9.15857
140	609	8	8.99857
141	609	8	9.32571
142	601	8	9.14286
143	612	8	9.39286
144	609	8	9.47714
145	601	8	9.32571
146	572	8	9.47143
147	609	8	9.89429
148	602	8	9.21286
149	578	8	9.82857
150	619	8	9.64429
151	625	8	9.70714
152	621	8	9.77571
153	609	8	9.63
154	606	8	9.79857
155	611	8	9.35714
156	606	8	9.6
157	604	8	9.19286
158	603	8	9.18429
159	602	8	9.09571
160	596	8	8.97
161	619	8	9.15429
162	603	8	9.27857
163	636	8	9.05286
164	607	8	9.31143
165	618	8	9.27286
166	603	8	9.44857
167	605	8	9.43
168	617	8	9.58429
169	611	8	9.38714
170	615	8	9.27857
171	608	8	9.07714
172	601	8	9.66714
173	619	8	9.08143
174	608	8	9.45714
175	608	8	9.27714
176	614	8	9.20429
177	609	8	9.26143
178	621	8	9.28143
179	625	8	9.19429
180	610	8	9.53143
181	610	8	9.59571
182	603	8	9.21286
183	602	8	9.55
184	617	8	9.23571
185	610	8	9.32286
186	608	8	9.36571
187	630	8	9.44857
188	624	8	9.9
189	596	8	9.42286
190	610	8	9.33714
191	600	8	9.31
192	613	8	9.23714
193	604	8	9.17571
194	627	8	9.17143

195	600	8	9.08714
196	608	8	9.49143
197	599	8	9.23714
198	611	8	9.23
199	608	8	9.22714
200	605	8	9.72286
201	603	8	9.51143
202	605	8	9.09429
203	602	8	9.21857
204	600	8	9.51714
205	601	8	9.19286
206	613	8	9.18714
207	585	8	9.09429
208	608	8	9.14857
209	617	8	9.19286
210	608	8	9.44143
211	603	8	9.62143
212	615	8	9.39714
213	618	8	9.14714
214	618	8	9.60143
215	598	8	9.34429
216	621	8	9.71714
217	618	8	9.60143
218	604	8	9.66571
219	610	8	9.26143
220	619	8	9.50857
221	614	8	9.39571
222	600	8	9.12857
223	617	8	9.60857
224	601	8	9.69714
225	619	8	9.77571
226	599	8	9.42571
227	598	8	9.32857
228	610	8	9.22
229	604	8	9.42571
230	598	8	9.07714
231	612	8	9.34143
232	607	8	9.54571
233	610	8	9.38857
234	599	8	9.45857
235	605	8	9.55714
236	609	8	9.37143
237	610	8	9.19857
238	597	8	9.65
239	609	8	9.45429
240	610	8	9.33
241	611	8	9.62143
242	614	8	9.45714
243	615	8	9.25
244	605	8	9.31286
245	627	8	9.51571
246	601	8	9.73857
247	608	8	9.32143
248	611	8	9.4
249	604	8	9.52
250	609	8	9.6
251	595	8	9.07714
252	603	8	9.29143
253	600	8	9.68429
254	605	8	9.23
255	607	8	8.91857
256	627	8	9.03143
257	600	8	9.45
258	603	8	9.16714
259	595	8	9.26857
260	603	8	9.15571
261	621	8	9.62429
262	605	8	8.82857
263	609	8	10.0857
264	603	8	9.88571
265	601	8	9.57286
266	608	8	9.36286
267	623	8	9.29857
268	606	8	9.39429
269	610	8	9.29857
270	614	8	9.23143
271	598	8	9.63857
272	603	8	9.77571
273	604	8	9.33857
274	604	8	9.55429

275	611	8	9.35
276	606	8	9.47
277	620	8	9.34286
278	582	8	9.19571
279	615	8	9.00857
280	612	8	9.05714
281	602	8	9.49143
282	621	8	9.44857
283	604	8	9.26286
284	610	8	9.41429
285	622	8	8.83286
286	614	8	9.70429
287	598	8	9.18429
288	601	8	9.72143
289	602	8	9.31
290	609	8	9.28
291	600	8	9.21714
292	617	8	9.15429
293	606	8	9.17429
294	608	8	9.48857
295	610	8	9.05714
296	600	8	9.43143
297	625	8	9.41857
298	622	8	9.49429
299	607	8	9.56
300	614	8	9.51429
301	625	8	9.31857
302	599	8	9.09714
303	604	8	9.02143
304	598	8	9.61143
305	625	8	9.18857
306	616	8	9.37
307	610	8	9.6
308	611	8	9.40286
309	603	8	9.46857
310	605	8	9.55286
311	602	8	9.52429
312	608	8	9.78429
313	606	8	8.95429
314	623	8	9.41
315	603	8	9.55286
316	621	8	9.01143
317	602	8	9.27286
318	619	8	10.06
319	609	8	9.38714
320	606	8	9.32286
321	618	8	9.75286
322	619	8	9.22571
323	618	8	9.65571
324	626	8	9.42429
325	586	8	9.04571
326	614	8	9.49714
327	619	8	9.31143
328	622	8	9.49571
329	614	8	9.73714
330	594	8	9.33286
331	599	8	9.41571
332	601	8	9.46714
333	613	8	9.46
334	606	8	9.59429
335	583	8	9.25
336	612	8	9.46857
337	619	8	9.18
338	606	8	9.25
339	588	8	8.92714
340	624	8	9.15
341	610	8	9.19
342	609	8	9.21429
343	613	8	9.10429
344	600	8	9.16714
345	614	8	9.4
346	624	8	9.34571
347	621	8	9.19
348	601	8	9.46571
349	614	8	9.25143
350	609	8	8.99286
351	612	8	9.14429
352	610	8	9.49
353	623	8	9.17286
354	598	8	9.34857

```
355     614     8       9.40143
356     599     8       9.45286
357     610     8       9.8
358     610     8       9.21429
359     617     8       9.23714
360     599     8       9.39714
361     608     8       9.20286
362     603     8       8.97857
363     617     8       9.33571
364     606     8       9.57286
365     593     8       9.11286
366     611     8       9.68714
367     601     8       9.43
368     625     8       9.23286
369     617     8       9.00429
370     585     8       9.21
371     610     8       9.44714
372     638     8       9.32143
373     612     8       9.06286
374     625     8       9.61
375     605     8       9.23429
376     615     8       9.04
377     597     8       8.92857
378     595     8       9.69429
379     619     8       9.72
380     577     8       9.30429
381     608     8       9.53571
382     595     8       9.19571
383     607     8       9.68143
384     624     8       9.08429
385     605     8       9.10714
386     583     8       9.52
387     612     8       9.47714
388     622     8       9.23571
389     604     8       9.41286
390     601     8       9.06143
391     605     8       9.34857
392     602     8       9.26429
393     599     8       9.33857
394     607     8       9.21
395     595     8       9.69714
396     636     8       9.20286
397     606     8       9.11857
398     611     8       9.57
399     600     8       9.62
400     597     8       9.38143

-- Best Individual =  [1, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 1, 0, 1, 0, 0, 0
-- Best Fitness =  8.0

-- Violations:
consecutive shift violations =  0
Shifts Per Week Violations =  0
Nurses Per Shift Violations =  0
Shift Preference Violations =  8

-- Schedule for each nurse:

gen     nevals  min     avg
0       1600    627     1141.76
1       1417    566     1034.67
2       1438    535     944.976
3       1421    412     862.863
4       1448    391     788.496
5       1434    302     710.517
6       1430    302     648.166
7       1430    301     587.996
8       1407    258     534.329
9       1449    247     485.911
10      1424    221     441.358
11      1429    195     398.724
12      1409    174     358.499
13      1445    137     323.228
14      1432    137     290.722
15      1412    113     263.776
16      1407    113     240.154
17      1400    107     217.839
18      1424    102     198.285
19      1431    91      183.729
20      1414    84      169.396
```

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21      1432    66      157.526
22      1395    66      147.695
23      1388    62      138.442
24      1449    62      132.453
25      1413    62      126.032
26      1418    44      120.512
27      1429    43      115.627
28      1405    37      111.343
29      1439    37      107.071
30      1423    37      102.601
31      1410    37      98.7244
32      1455    37      96.2262
33      1456    31      92.0131
34      1422    31      89.5637
35      1449    31      86.6756
36      1430    21      83.77
37      1462    21      80.5362
38      1430    21      76.64
39      1388    20      73.2588
40      1403    20      67.3175
41      1440    19      64.0113
42      1436    12      58.845
43      1456    12      55.0275
44      1449    12      51.3181
45      1438    8       47.755
46      1420    8       44.2025
47      1433    8       40.1656
48      1430    8       36.4975
49      1439    8       33.7725
50      1412    8       30.8894
51      1395    8       28.4962
52      1428    8       25.6231
53      1436    8       22.8463
54      1436    8       20.3
55      1450    8       18.2606
56      1433    8       15.8731
57      1444    8       13.6387
58      1406    7       12.0425
59      1414    7       10.9431
60      1435    7       10.6169
61      1438    7       10.3675
62      1422    7       9.78937
63      1394    7       9.915
64      1438    7       9.74062
65      1400    7       9.60938
66      1422    7       9.61375
67      1409    7       9.71375
68      1410    7       9.73563
69      1437    7       9.93812
70      1449    7       10.0544

-- Best Individual =  [1, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1
-- Best Fitness =  7.0

-- Violations:
consecutive shift violations =  0
Shifts Per Week Violations =  0
Nurses Per Shift Violations =  0
Shift Preference Violations =  7

-- Schedule for each nurse:

gen     nevals  min     avg
0       1600    595     1144.39
1       1400    560     1040.03
2       1399    443     947.876
3       1438    384     862.54
4       1459    384     779.903
5       1409    384     700.135
6       1414    318     633.041
7       1431    308     568.469
8       1441    250     513.974
9       1398    214     459.379
10      1429    214     411.808
11      1395    165     368.919
12      1439    164     330.952
13      1445    132     300.666
14      1430    94      270.434
15      1449    92      245.522
16      1407    90      222.861
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17	1446	71	202.595
18	1412	71	185.19
19	1435	71	171.293
20	1430	60	158.565
21	1399	60	146.928
22	1440	51	136.222
23	1437	51	127.064
24	1436	49	118.656
25	1452	29	110.86
26	1427	29	102.966
27	1410	29	95.4875
28	1440	29	89.3944
29	1414	29	82.0956
30	1434	29	75.5831
31	1434	28	70.3319
32	1432	20	64.5381
33	1423	19	58.8875
34	1426	19	54.6675
35	1433	10	50.5475
36	1409	8	46.5513
37	1427	8	43.0881
38	1432	8	39.1331
39	1415	8	35.7512
40	1424	8	32.595
41	1409	8	29.035
42	1418	8	26.1294
43	1432	8	22.9862
44	1439	8	21.2794
45	1445	8	19.9144
46	1445	7	18.3562
47	1409	7	17.2206
48	1415	7	15.95
49	1423	7	15.5956
50	1427	7	14.7438
51	1425	6	13.98
52	1437	6	13.6881
53	1452	6	13.1131
54	1423	6	12.9125
55	1448	6	12.5544
56	1432	5	11.7681
57	1438	5	11.5506
58	1430	5	10.7506
59	1459	5	10.5538
60	1438	5	10.2912
61	1440	5	9.56875
62	1461	5	9.32375
63	1397	5	8.95
64	1433	5	8.24
65	1411	5	7.92687
66	1424	5	7.35125
67	1423	5	7.27562
68	1444	5	6.96063
69	1413	5	6.65375
70	1427	5	6.355
71	1431	5	6.28062
72	1442	5	6.5175
73	1424	5	6.29125
74	1444	5	6.405
75	1443	5	6.59563
76	1440	5	6.41062
77	1440	5	6.1525
78	1407	5	6.265
79	1428	5	6.51063
80	1435	5	6.30938
81	1422	5	6.16
82	1438	5	6.42938
83	1442	5	6.28688
84	1409	5	6.15562
85	1412	5	6.50563
86	1419	5	6.0275
87	1406	5	6.31875
88	1431	4	6.49375
89	1437	4	6.08625
90	1424	4	6.015
91	1426	4	6.25437
92	1429	4	6.37188
93	1431	4	6.33875
94	1438	4	6.70062
95	1439	4	6.50375
96	1456	4	6.65875

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97      1463    4       6.49937
98      1436    4       6.18313
99      1420    4       6.42188
100     1424    4       6.52375
101     1429    4       6.48937
102     1453    4       6.4475
103     1434    4       6.63687
104     1424    4       6.80312
105     1420    4       6.795
106     1420    4       6.49
107     1414    4       6.59938
108     1414    4       6.44562
109     1454    4       6.1925
110     1431    4       5.82688
111     1409    4       5.34125
112     1460    4       5.07875
113     1415    4       5.03688
114     1453    4       5.2775
115     1456    4       5.15125
116     1429    4       5.32188
117     1421    4       5.07812
118     1428    4       4.86875
119     1428    4       5.4075
120     1443    4       5.20437
121     1396    4       5.03188
122     1437    4       5.22813
123     1416    4       5.25188
124     1410    4       5.39313
125     1467    4       5.46687
126     1425    4       5.195
127     1427    4       5.1875
128     1429    4       5.59438
129     1408    4       5.2075
130     1431    4       5.17625
131     1389    4       5.13438
132     1407    4       5.14313
133     1406    4       5.24563
134     1407    4       5.38938
135     1422    4       5.40375
136     1393    4       5.26
137     1375    4       5.25063
138     1410    4       5.19562
139     1424    4       5.44437
140     1435    4       5.30063
141     1453    4       5.08375
142     1425    4       5.07688
143     1426    4       5.28062
144     1423    4       5.22625
145     1409    4       5.18375
146     1426    4       5.17875
147     1419    4       5.28937
148     1418    4       5.065
149     1422    4       5.3125
150     1430    4       5.22125

-- Best Individual =  [0, 1, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0
-- Best Fitness =  4.0

-- Violations:
consecutive shift violations =  0
Shifts Per Week Violations =  0
Nurses Per Shift Violations =  0
Shift Preference Violations =  4

-- Schedule for each nurse:

gen     nevals  min     avg
0       1600    649     1145.59
1       1423    598     1040.86
2       1436    515     942.301
3       1394    457     853.452
4       1436    388     774.338
5       1416    365     698.732
6       1421    350     632.453
7       1402    310     565.438
8       1406    264     509.188
9       1425    198     459.664
10      1442    198     413.73
11      1425    183     372.383
12      1421    166     337.431
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13	1442	161	305.488
14	1422	144	274.923
15	1427	103	250.059
16	1406	103	227.547
17	1429	94	206.074
18	1408	87	188.651
19	1436	64	174.251
20	1431	53	161.286
21	1412	53	149.275
22	1450	53	140.874
23	1399	38	131.142
24	1447	38	125.086
25	1434	38	120.162
26	1445	38	114.022
27	1417	38	108.926
28	1431	29	105.007
29	1438	29	100.403
30	1435	29	97.04
31	1409	29	92.8431
32	1385	29	89.3388
33	1402	24	85.6644
34	1454	24	84.01
35	1419	24	80.8744
36	1450	24	78.1725
37	1425	24	76.3756
38	1436	20	73.99
39	1452	20	72.0987
40	1406	12	69.6112
41	1433	12	68.6831
42	1421	11	67.5675
43	1429	11	65.4587
44	1434	10	64.2537
45	1419	10	61.4
46	1443	10	59.1262
47	1452	10	57.6031
48	1462	10	55.5475
49	1415	9	53.4519
50	1431	8	51.37
51	1446	7	49.2475
52	1458	7	47.1437
53	1451	7	45.1844
54	1436	7	42.9625
55	1428	7	40.1912
56	1434	7	38.0244
57	1424	7	35.525
58	1444	7	35.2
59	1446	7	33.6325
60	1431	7	31.8637
61	1439	6	30.2681
62	1428	6	29.2737
63	1411	5	27.1456
64	1406	5	25.2812
65	1428	5	23.5437
66	1434	5	21.6431
67	1449	5	19.8494
68	1436	5	17.8756
69	1436	5	16.5012
70	1425	5	14.9781
71	1443	5	13.8825
72	1405	4	12.1025
73	1429	4	10.9006
74	1387	4	9.9125
75	1431	4	8.995
76	1427	4	8.51125
77	1417	4	8.13125
78	1426	4	7.59187
79	1420	4	7.09187
80	1431	3	6.82688
81	1431	3	6.91312
82	1422	3	6.5425
83	1425	3	6.13312
84	1441	3	5.91625
85	1439	3	5.77937
86	1424	3	5.6075
87	1437	3	5.60187
88	1429	3	5.38312
89	1431	3	5.35313
90	1438	3	5.41688
91	1434	3	5.70312
92	1431	2	5.48

93	1435	2	4.945
94	1422	2	4.79
95	1431	2	4.33375
96	1426	2	4.32125
97	1426	2	4.44937
98	1452	2	4.35062
99	1434	2	4.65625
100	1443	2	4.47312
101	1424	2	4.82562
102	1435	2	4.64813
103	1422	2	4.75437
104	1417	2	4.57437
105	1415	2	4.33688
106	1436	2	4.83688
107	1402	2	3.88625
108	1441	2	3.70875
109	1447	2	3.3925
110	1435	2	3.30125
111	1431	2	3.37875
112	1428	2	3.2575
113	1417	2	3.2775
114	1442	2	3.61563
115	1415	2	3.40187
116	1414	2	3.50625
117	1418	2	3.42625
118	1445	2	3.43625
119	1392	2	3.14812
120	1428	2	3.44
121	1447	2	3.37
122	1422	2	3.46563
123	1457	2	3.47938
124	1437	2	3.21
125	1431	2	3.64438
126	1395	2	3.35375
127	1386	2	3.23625
128	1447	2	3.42375
129	1426	2	3.535
130	1408	2	3.79937
131	1421	2	3.2475
132	1419	2	3.42375
133	1437	2	3.33562
134	1403	2	3.34
135	1420	2	3.17687
136	1436	2	3.25188
137	1416	2	3.35812
138	1425	2	3.45625
139	1422	2	3.59813
140	1415	2	3.34563
141	1420	2	3.54062
142	1411	2	3.43812
143	1421	2	3.42375
144	1421	2	3.6625
145	1425	2	3.17313
146	1452	2	3.2025
147	1419	2	3.16375
148	1426	2	3.36375
149	1409	2	3.57375
150	1422	2	3.38813
151	1441	2	3.4525
152	1433	2	3.78125
153	1432	2	3.47625
154	1418	2	3.50875
155	1419	2	3.52875
156	1406	2	3.48937
157	1410	2	3.445
158	1436	2	3.35438
159	1419	2	3.47875
160	1443	2	3.29562
161	1405	2	3.27188
162	1412	2	3.34313
163	1430	2	3.51562
164	1414	2	3.50875
165	1420	2	3.37562
166	1420	2	3.67313
167	1428	2	3.42625
168	1432	2	3.18125
169	1444	2	3.13813
170	1433	2	3.49125
171	1431	2	3.4475
172	1448	2	3.48813

```
173     1447    2       3.11813
174     1431    2       3.40313
175     1436    2       3.19937
176     1435    2       3.26812
177     1416    2       3.48
178     1428    2       3.39438
179     1427    2       3.2825
180     1442    2       3.25875
181     1411    2       3.51125
182     1428    2       3.56937
183     1413    2       3.63125
184     1399    2       3.11625
185     1416    2       3.22313
186     1406    2       3.35562
187     1436    2       3.075
188     1444    2       3.405
189     1419    2       3.62312
190     1455    2       3.42
191     1456    2       3.32812
192     1439    2       3.2225
193     1418    2       3.47313
194     1437    2       3.4025
195     1433    2       3.41188
196     1441    2       3.38625
197     1450    2       3.59125
198     1435    2       3.29438
199     1441    2       3.35062
200     1418    2       3.615
201     1433    2       3.72187
202     1447    2       3.4525
203     1429    2       3.405
204     1420    2       3.52875
205     1430    2       3.36937
206     1433    2       3.17125
207     1434    2       3.68562
208     1432    2       3.42062
209     1419    2       3.4975
210     1419    2       3.44813
211     1399    2       3.63813
212     1418    2       3.37438
213     1424    2       3.38937
214     1430    2       3.48875
215     1455    2       3.60812
216     1430    2       3.59938
217     1413    2       3.5925
218     1447    2       3.4575
219     1430    2       3.46625
220     1395    2       3.3425
221     1425    2       3.435
222     1406    2       3.42125
223     1440    2       3.545
224     1412    2       3.46375
225     1429    2       3.69125
226     1404    2       3.49625
227     1408    2       3.45875
228     1445    2       3.3775
229     1435    2       3.45562
230     1439    2       3.50125
231     1421    2       3.20312
232     1441    2       3.52438
233     1420    2       3.63375
234     1390    2       3.40813
235     1431    2       3.54312
236     1432    2       3.43312
237     1402    2       3.4125
238     1395    2       3.325
239     1431    2       3.59
240     1432    2       3.57
241     1450    2       3.53313
242     1414    2       3.4
243     1442    2       3.3375
244     1425    2       3.47562
245     1437    2       3.86187
246     1412    2       3.49938
247     1415    2       3.41938
248     1445    2       3.15937
249     1423    2       3.26437
250     1445    2       3.19437

-- Best Individual =  [1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0
```

```
-- Best Fitness =  2.0

-- Violations:
consecutive shift violations =  0
Shifts Per Week Violations =  0
Nurses Per Shift Violations =  0
Shift Preference Violations =  2

-- Schedule for each nurse:

gen     nevals  min     avg
0       1600    626     1148.18
1       1398    503     1035.84
2       1417    467     941.681
3       1444    467     854.828
4       1428    408     773.757
5       1418    393     701.415
6       1424    336     637.067
7       1417    318     577.885
8       1437    240     521.144
9       1398    220     465.917
10      1443    219     419.41
11      1446    178     377.676
12      1426    147     338.021
13      1415    138     306.368
14      1431    125     276.774
15      1451    86      251.094
16      1450    86      225.511
17      1452    83      203.676
18      1435    68      185.082
19      1404    68      168.968
20      1430    66      155.477
21      1424    51      144.989
22      1409    50      134.597
23      1433    50      127.929
24      1439    50      120.573
25      1452    41      114.086
26      1428    41      107.539
27      1448    41      103.536
28      1403    40      99.5794
29      1413    39      96.1406
30      1433    28      92.7638
31      1447    28      87.9013
32      1441    28      85.0181
33      1441    28      81.8337
34      1415    28      79.4425
35      1422    22      76.1044
36      1439    12      73.5787
37      1410    12      70.3031
38      1419    12      67.5525
39      1429    12      63.8331
40      1434    12      61.9169
41      1415    11      59.6931
42      1416    11      56.3912
43      1430    10      52.8869
44      1438    8       50.2231
45      1459    8       47.4825
46      1430    8       45.1206
47      1424    8       42.9444
48      1443    7       39.2537
49      1443    7       36.0988
50      1408    7       33.0125
51      1399    7       29.7175
52      1438    7       26.9431
53      1431    7       23.8575
54      1438    7       21.0794
55      1443    7       18.4819
56      1448    7       16.125
57      1454    6       15.0019
58      1418    6       13.6169
59      1392    6       12.2063
60      1421    6       12.0269
61      1432    5       11.6319
62      1447    5       11.5456
63      1415    5       11.0044
64      1426    5       10.8044
65      1431    5       10.2825
66      1436    5       9.97937
67      1425    5       9.75938
68      1418    5       9.24312
```

69	1416	5	9.07812
70	1421	5	8.26812
71	1431	5	7.78313
72	1428	4	7.6025
73	1414	4	6.87375
74	1427	4	6.83375
75	1432	4	6.65813
76	1444	4	6.63312
77	1406	4	6.45188
78	1420	4	6.47875
79	1413	4	6.46312
80	1440	4	6.41812
81	1451	4	6.06562
82	1438	3	5.78188
83	1420	3	5.54812
84	1373	3	5.385
85	1433	3	5.43313
86	1409	3	5.63312
87	1424	3	5.44562
88	1435	3	5.5725
89	1431	3	5.43562
90	1446	3	5.535
91	1416	3	5.4
92	1450	3	5.77062
93	1440	3	5.3125
94	1435	3	5.37563
95	1432	3	5.3
96	1394	3	5.37
97	1434	3	5.6125
98	1418	3	5.63125
99	1443	3	5.73875
100	1439	3	5.76938
101	1427	2	5.6375
102	1407	2	5.40188
103	1418	2	5.34375
104	1443	2	5.13812
105	1437	2	4.58188
106	1434	2	4.15875
107	1410	2	4.56937
108	1421	2	4.51813
109	1417	2	4.59125
110	1434	2	4.64375
111	1438	2	4.60625
112	1441	2	4.87437
113	1453	2	4.69187
114	1441	2	4.77375
115	1442	2	5.02375
116	1411	2	5.00188
117	1414	2	4.53812
118	1420	2	3.97375
119	1424	2	3.8425
120	1421	2	3.33812
121	1395	2	3.27687
122	1438	2	3.28875
123	1426	2	3.1075
124	1426	2	3.28375
125	1393	2	3.05313
126	1404	2	3.21062
127	1437	2	3.26375
128	1421	2	3.33375
129	1424	2	3.38875
130	1425	2	3.57563
131	1416	2	3.35062
132	1428	2	3.27062
133	1438	2	3.29375
134	1425	2	3.35625
135	1446	2	3.29312
136	1427	2	3.36563
137	1417	2	3.53187
138	1425	2	3.50937
139	1412	2	3.41562
140	1429	2	3.39
141	1440	2	3.32687
142	1423	2	3.52125
143	1458	2	3.24063
144	1426	2	3.21375
145	1422	2	3.41688
146	1422	2	3.38313
147	1420	2	3.34813
148	1399	2	3.20562

149	1412	2	3.1425
150	1399	2	3.18125
151	1438	2	3.36313
152	1423	2	3.10812
153	1435	2	3.28187
154	1454	2	3.315
155	1418	2	3.31125
156	1432	2	3.25062
157	1410	2	3.36375
158	1429	2	3.67313
159	1433	2	3.09875
160	1413	2	3.2925
161	1435	2	3.32625
162	1412	2	3.31813
163	1434	2	3.43812
164	1433	2	3.27375
165	1411	2	3.20063
166	1410	2	3.14375
167	1416	2	3.19125
168	1419	2	3.37625
169	1427	2	3.28063
170	1429	2	3.38563
171	1392	2	3.28625
172	1432	2	3.66938
173	1432	2	3.525
174	1423	2	3.12688
175	1426	2	3.61813
176	1432	2	3.43
177	1422	2	3.22812
178	1443	2	3.44
179	1441	2	3.3075
180	1433	2	3.24125
181	1435	2	3.1275
182	1410	2	3.67687
183	1449	2	3.505
184	1434	2	3.23563
185	1451	2	3.165
186	1432	2	3.39375
187	1442	2	3.565
188	1451	2	3.30812
189	1442	2	3.36313
190	1439	2	3.4425
191	1448	2	3.27562
192	1441	2	3.35875
193	1414	2	3.395
194	1420	2	3.26875
195	1419	2	3.31312
196	1421	2	3.185
197	1423	2	3.29125
198	1404	2	3.40187
199	1413	2	3.42125
200	1414	2	3.24125
201	1434	2	3.3775
202	1393	2	3.29312
203	1432	2	3.32938
204	1434	2	3.40813
205	1400	2	3.27438
206	1437	2	3.18375
207	1402	2	3.28938
208	1455	2	3.21937
209	1432	2	3.15687
210	1416	2	3.44375
211	1466	2	3.09938
212	1393	2	3.25937
213	1425	2	3.37688
214	1455	2	3.07
215	1436	2	3.12688
216	1423	2	3.08312
217	1434	2	3.46813
218	1418	2	3.31
219	1430	2	3.20875
220	1445	2	3.29438
221	1437	2	3.4825
222	1411	2	3.19563
223	1404	1	3.29312
224	1412	1	3.3375
225	1421	1	3.65687
226	1420	1	3.44188
227	1435	1	2.98438
228	1445	1	3.69937

229	1426	1	3.55375
230	1407	1	3.335
231	1398	1	3.43562
232	1437	1	3.35625
233	1428	1	3.39062
234	1437	1	3.31813
235	1442	1	3.39562
236	1435	1	3.3825
237	1429	1	3.22562
238	1429	1	3.28625
239	1428	1	2.72812
240	1428	1	2.40687
241	1463	1	2.16188
242	1420	1	2.38125
243	1444	1	2.21687
244	1444	1	2.23062
245	1407	1	2.39312
246	1457	1	2.30437
247	1442	1	2.46687
248	1441	1	2.40375
249	1446	1	2.24437
250	1425	1	2.30313
251	1429	1	2.4025
252	1423	1	2.54125
253	1439	1	2.22313
254	1378	1	2.55563
255	1421	1	2.16875
256	1431	1	2.36313
257	1450	1	2.65125
258	1426	1	2.29375
259	1445	1	2.3925
260	1436	1	2.48062
261	1421	1	2.42188
262	1401	1	2.29625
263	1423	1	2.5675
264	1431	1	2.42062
265	1431	1	2.665
266	1453	1	2.28812
267	1404	1	2.19188
268	1406	1	2.30437
269	1416	1	2.43875
270	1396	1	2.40813
271	1439	1	2.45
272	1424	1	2.575
273	1423	1	2.77188
274	1434	1	2.41562
275	1417	1	2.37875
276	1416	1	2.56625
277	1457	1	2.34813
278	1438	1	2.21188
279	1408	1	2.09125
280	1412	1	2.07687
281	1412	1	2.27
282	1429	1	2.33062
283	1429	1	2.30812
284	1413	1	2.29688
285	1446	1	2.66375
286	1422	1	2.30625
287	1429	1	2.33937
288	1451	1	2.57437
289	1423	1	2.655
290	1414	1	2.5175
291	1431	1	2.33125
292	1388	1	2.39375
293	1429	1	2.48062
294	1416	1	2.43438
295	1428	1	2.44313
296	1425	1	2.42625
297	1431	1	2.36625
298	1414	1	2.17937
299	1439	1	2.37375
300	1410	1	2.18625
301	1424	1	2.19563
302	1430	1	2.35188
303	1419	1	2.11563
304	1438	1	2.29125
305	1431	1	2.35938
306	1424	1	2.30313
307	1429	1	2.52562
308	1423	1	2.34063

309	1417	1	2.26812
310	1413	1	2.26812
311	1424	1	2.39062
312	1438	1	2.3675
313	1414	1	2.39688
314	1427	1	2.26125
315	1446	1	2.16188
316	1437	1	2.40937
317	1427	1	2.41063
318	1436	1	2.36875
319	1435	1	2.28375
320	1411	1	2.26125
321	1413	1	2.45438
322	1439	1	2.40563
323	1417	1	2.37875
324	1406	1	2.6275
325	1417	1	2.27438
326	1429	1	2.22562
327	1431	1	2.2825
328	1407	1	2.265
329	1425	1	2.45875
330	1413	1	2.62938
331	1421	1	2.76437
332	1434	1	2.41063
333	1420	1	2.52813
334	1440	1	2.43438
335	1445	1	2.23875
336	1459	1	2.38187
337	1417	1	2.27062
338	1443	1	2.47438
339	1439	1	2.36375
340	1441	1	2.39875
341	1430	1	2.6775
342	1420	1	2.25937
343	1428	1	2.33062
344	1421	1	2.35688
345	1434	1	2.27625
346	1430	1	2.2475
347	1418	1	2.23062
348	1422	1	2.14062
349	1421	1	2.64188
350	1429	1	2.285
351	1443	1	2.59125
352	1425	1	2.32437
353	1403	1	2.40125
354	1429	1	2.7225
355	1435	1	2.44625
356	1444	1	2.21188
357	1433	1	2.4325
358	1432	1	2.46563
359	1427	1	2.2525
360	1455	1	2.335
361	1428	1	2.23813
362	1409	1	2.29375
363	1409	1	2.37938
364	1415	1	2.38313
365	1430	1	2.27375
366	1433	1	2.56562
367	1426	1	2.3075
368	1451	1	2.6825
369	1451	1	2.68688
370	1403	1	2.52188
371	1437	1	2.28875
372	1414	1	2.32063
373	1427	1	2.47812
374	1438	1	2.10562
375	1419	1	2.57687
376	1439	1	2.77875
377	1418	1	2.61437
378	1444	1	2.52125
379	1416	1	2.59063
380	1421	1	2.3075
381	1425	1	2.73125
382	1437	1	2.38937
383	1433	1	2.35438
384	1444	1	2.82313
385	1395	1	2.21
386	1446	1	2.10562
387	1425	1	2.38937
388	1409	1	2.33312

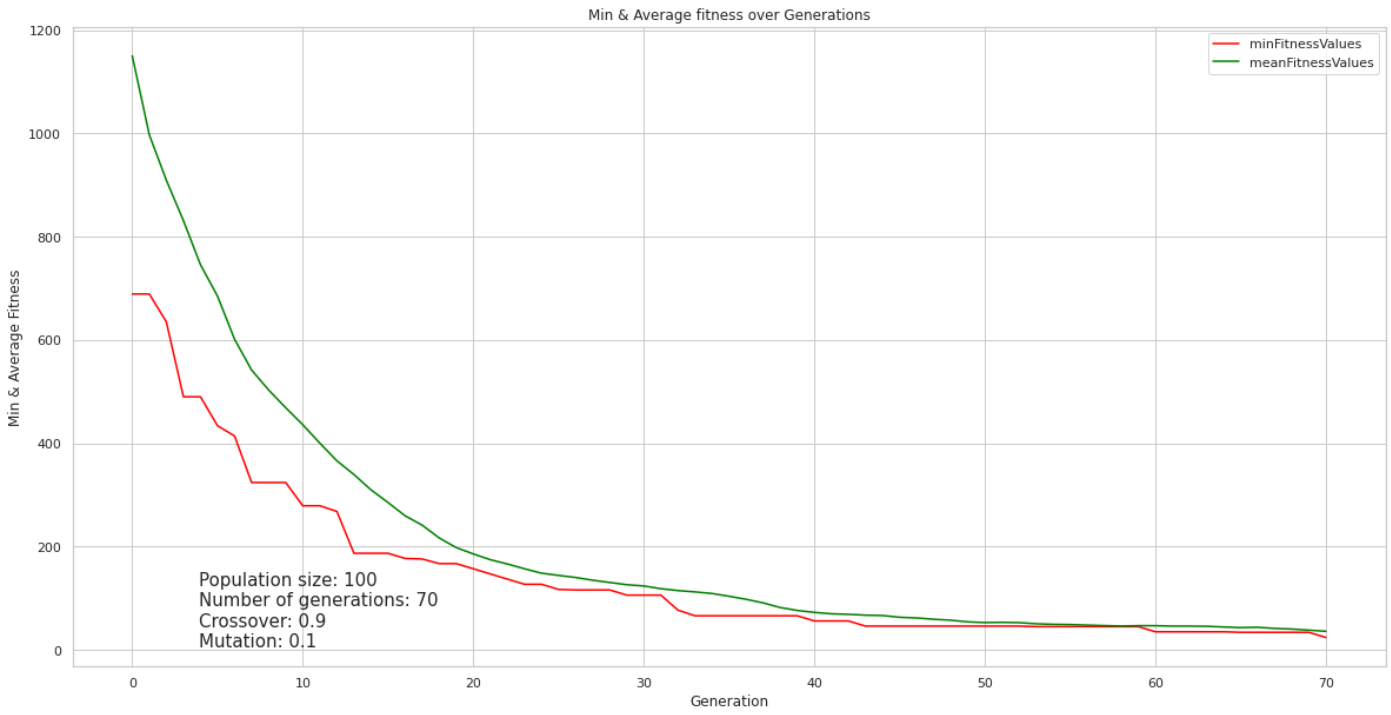
```
389     1422    1       2.43438
390     1416    1       2.385
391     1431    1       2.3475
392     1428    1       2.58
393     1441    1       2.42062
394     1431    1       2.1025
395     1415    1       2.37938
396     1444    1       2.35125
397     1416    1       2.32437
398     1425    1       2.21937
399     1427    1       2.345
400     1420    1       2.31062

-- Best Individual =  [0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 1
-- Best Fitness =  1.0

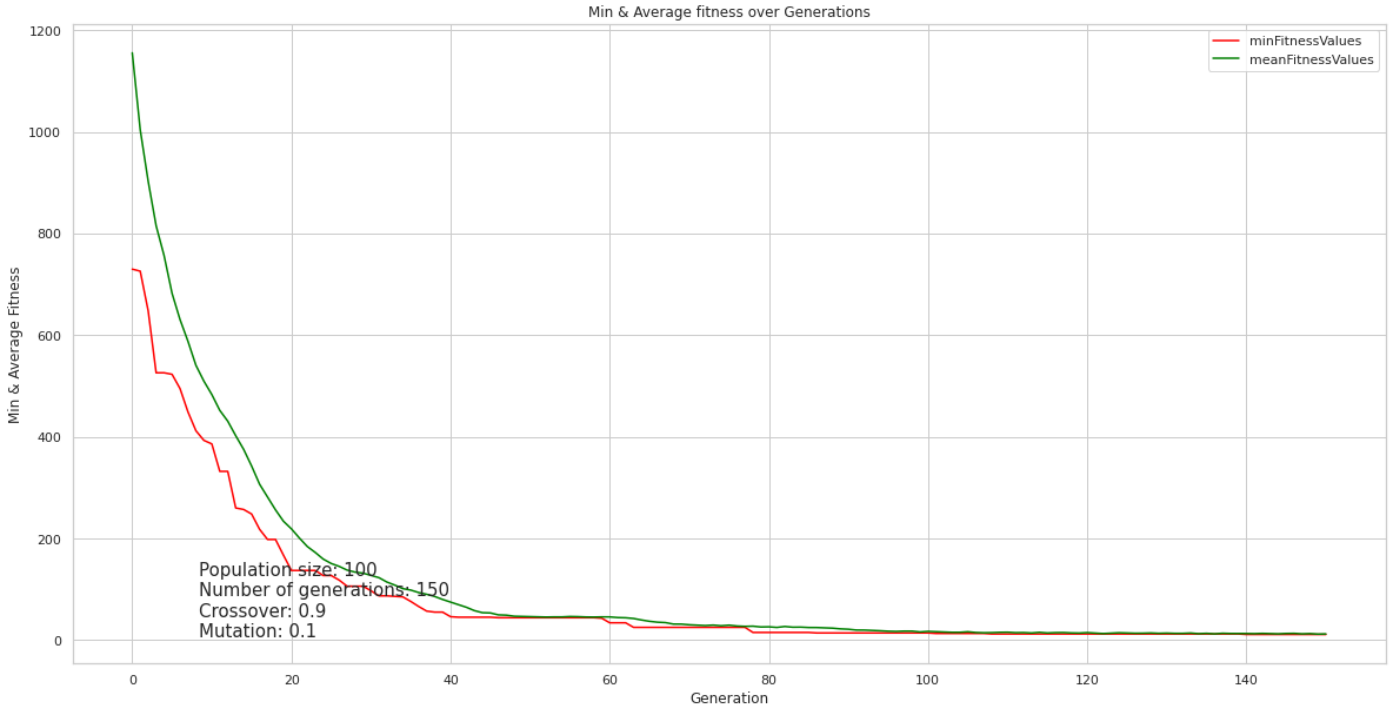
-- Violations:
consecutive shift violations =  0
Shifts Per Week Violations =  0
Nurses Per Shift Violations =  0
Shift Preference Violations =  1

-- Schedule for each nurse:
```

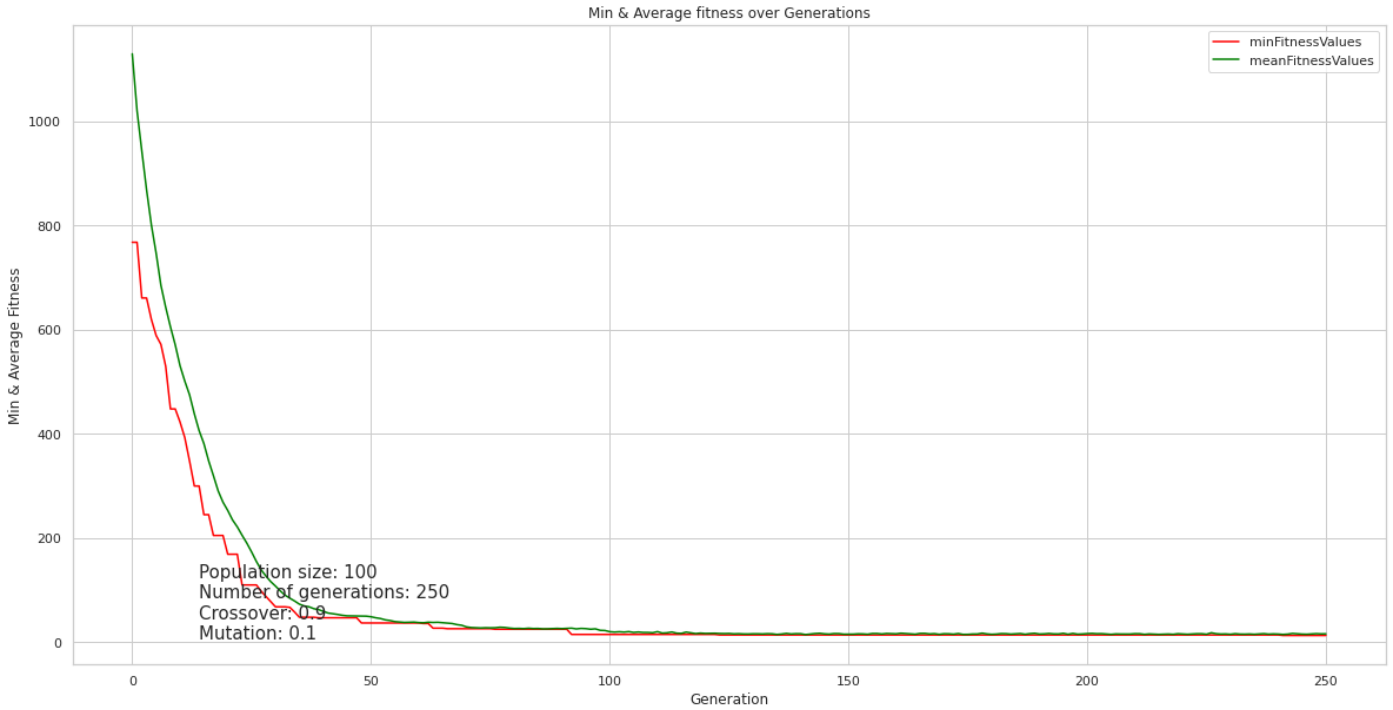
Nurse	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night
Debra	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0
Riann	0	1	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0
Velia	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	1	0	0
Synne	0	1	0	0	1	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0
Anona	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	1	0	0	0	1	0
Noell	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0
Fadwa	0	0	0	1	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	1
Zyana	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	1	0	0
Nurses Per Shift	2	2	1	2	2	1	1	3	1	2	2	2	2	2	1	3	2	1	2	3	1



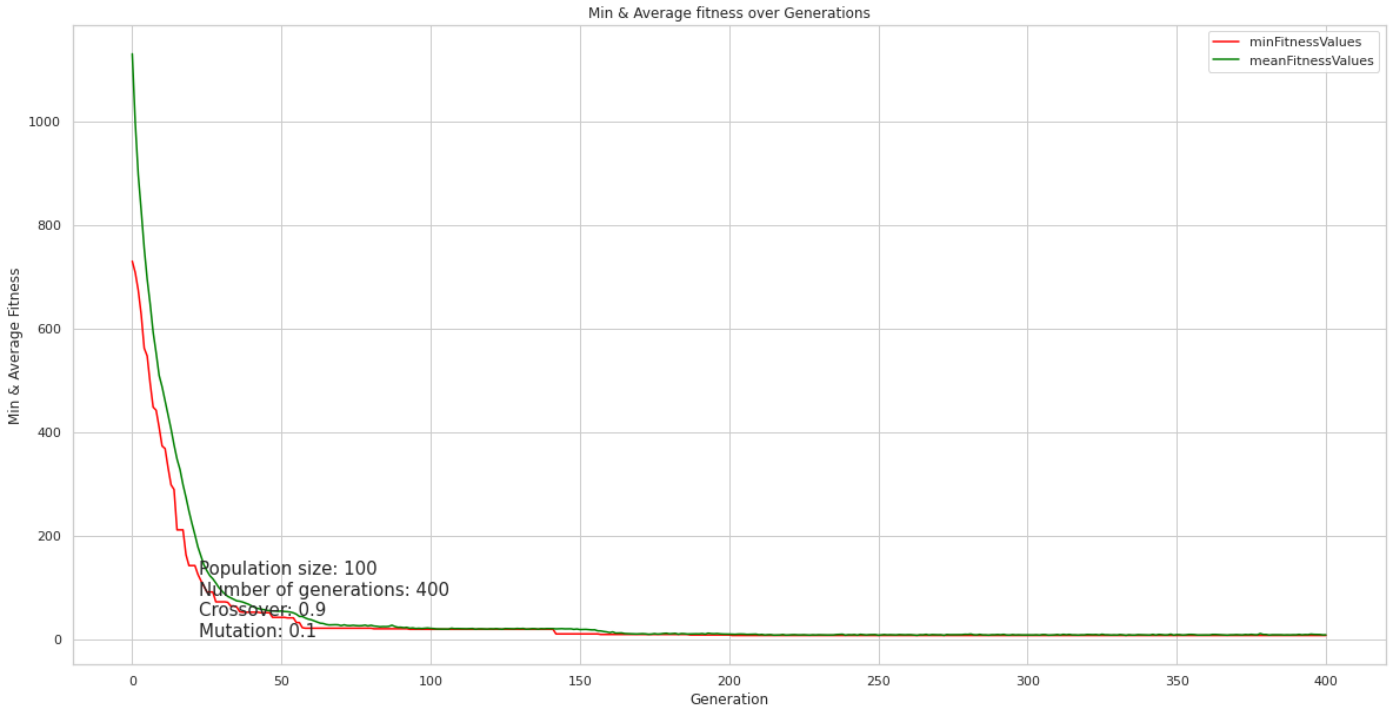
Nurse	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night
Debra	1	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	1	0	0
Riann	0	1	0	1	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0
Velia	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0
Synne	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0	0
Anona	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Noell	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0
Fadwa	1	0	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	1	0
Zyana	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0
Nurses Per Shift	2	2	1	2	2	1	2	2	1	2	3	1	2	2	1	2	2	1	3	2	1



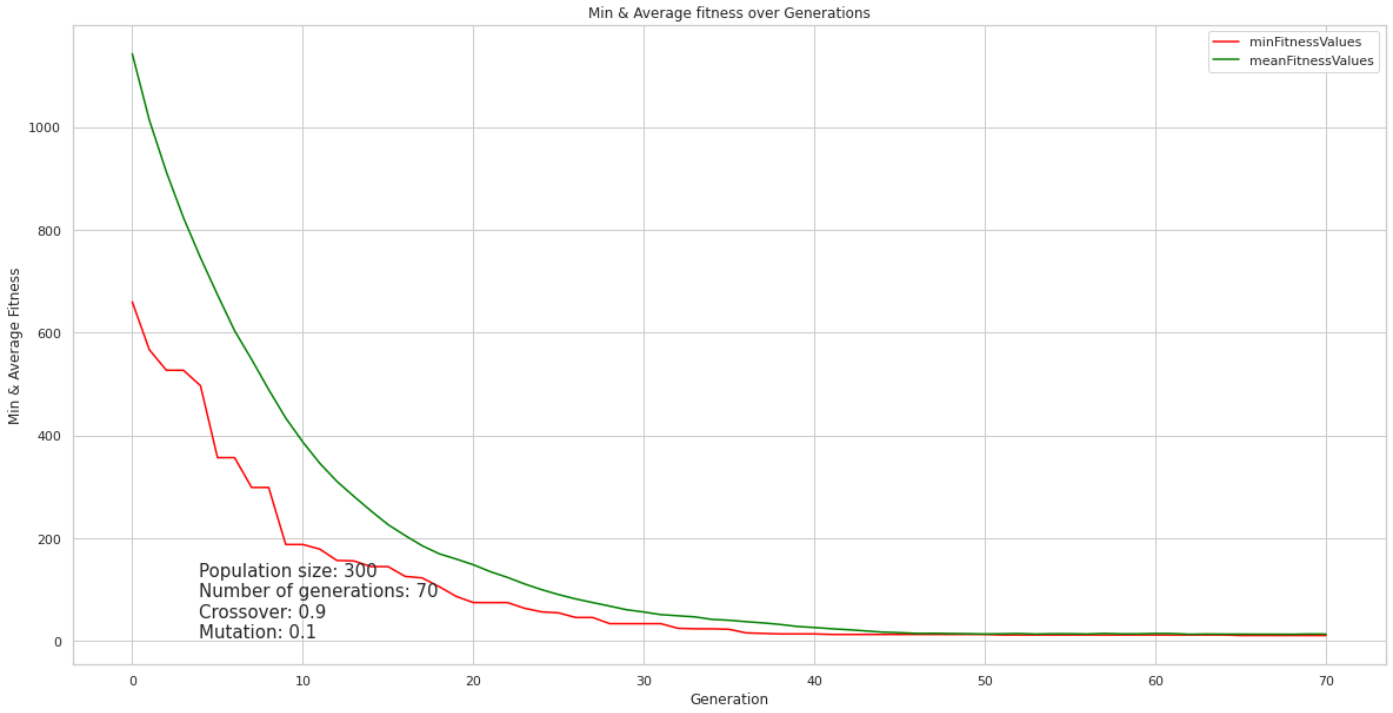
Nurse	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night
Debra	0	1	0	0	0	0	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0
Riann	1	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0
Velia	0	0	1	0	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
Synne	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0
Anona	1	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0
Noell	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	1	0	0	1	0
Fadwa	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	1
Zyana	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0
Nurses Per Shift	2	2	1	2	2	1	2	2	1	2	2	2	2	2	1	2	2	1	2	3	1



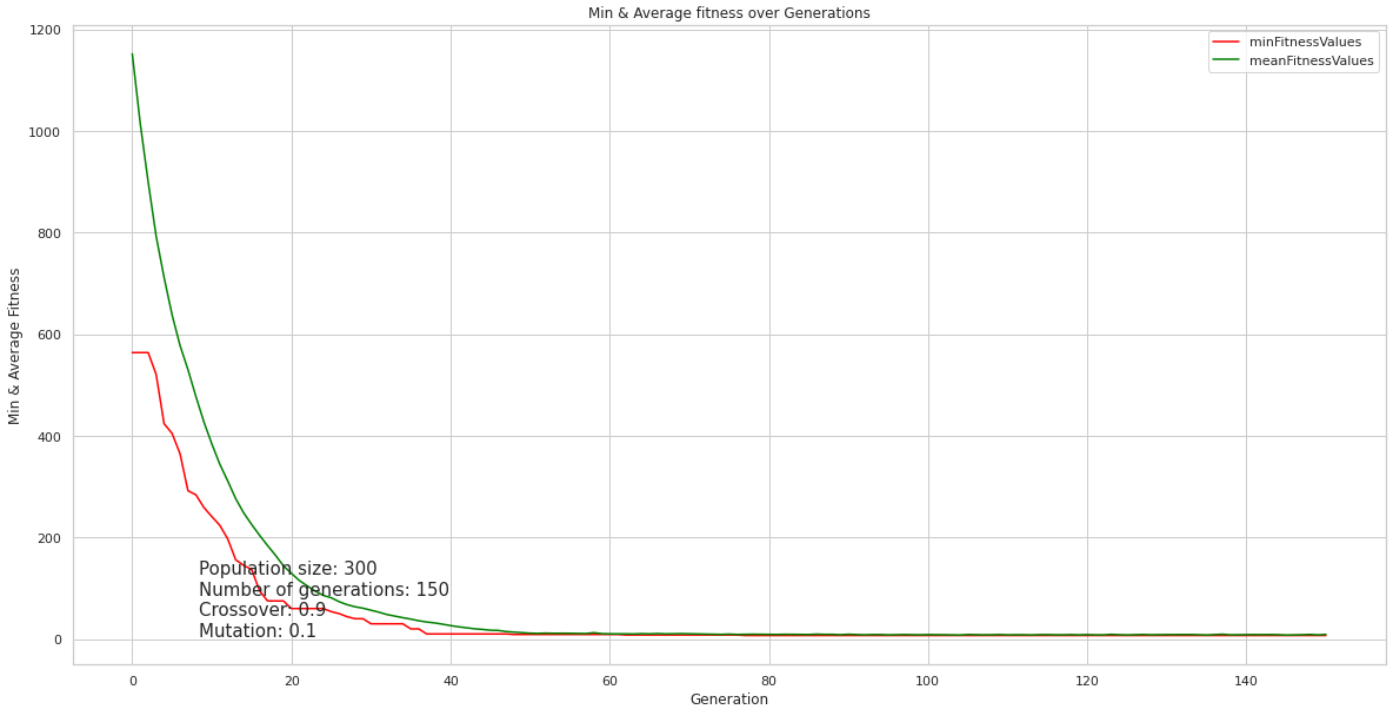
Nurse	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night
Debra	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
Riann	0	0	0	0	1	0	1	0	0	0	1	0	1	0	0	0	1	0	0	0	0
Velia	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0
Synne	0	1	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0
Anona	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	1
Noell	1	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0
Fadwa	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	1	0
Zyana	0	0	0	0	0	1	0	1	0	0	0	0	1	0	1	0	0	0	0	1	0
Nurses Per Shift	2	2	1	2	2	2	2	2	2	2	2	1	2	2	1	2	2	1	2	3	1



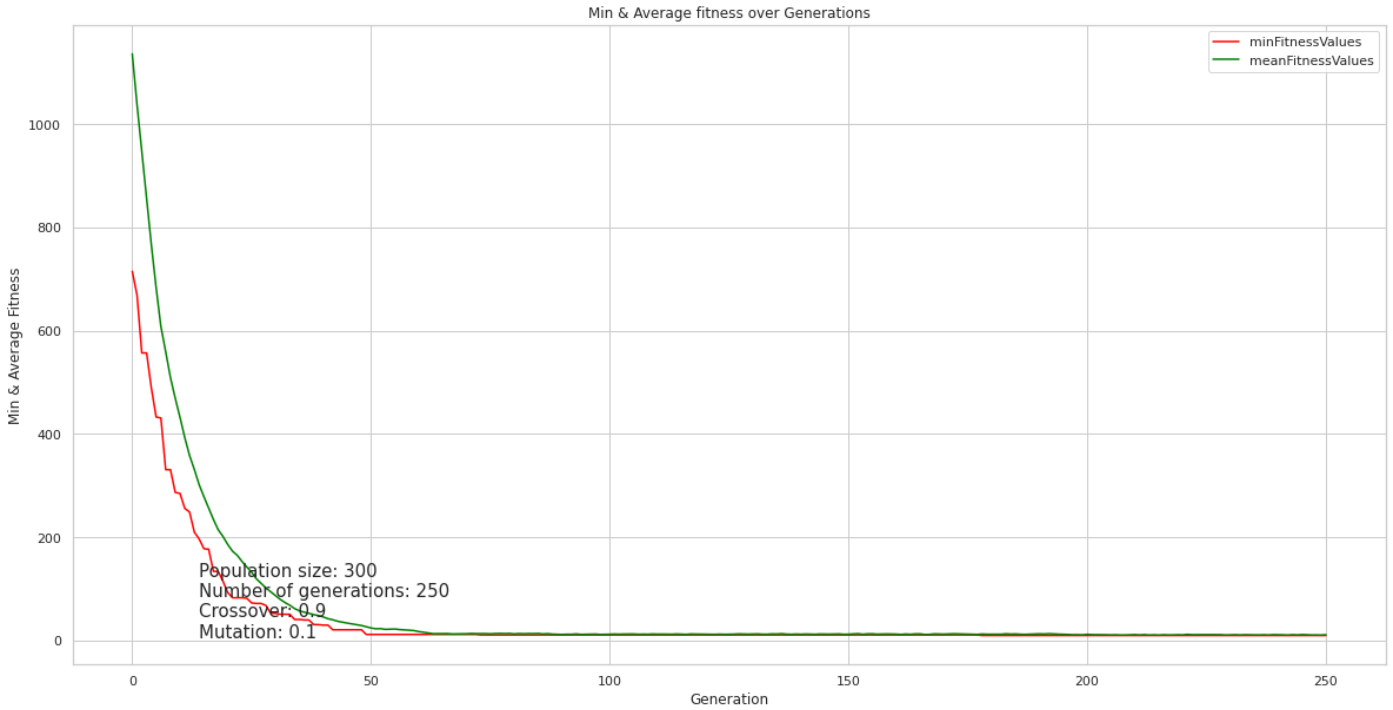
Nurse	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night
Debra	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0
Riann	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
Velia	0	1	0	0	1	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0
Synne	0	0	0	0	1	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0
Anona	0	0	1	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0
Noell	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	0	0
Fadwa	0	1	0	1	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0
Zyana	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	1	0	0	1
Nurses Per Shift	2	2	1	2	2	2	2	2	1	2	2	1	3	2	1	2	2	1	2	2	1



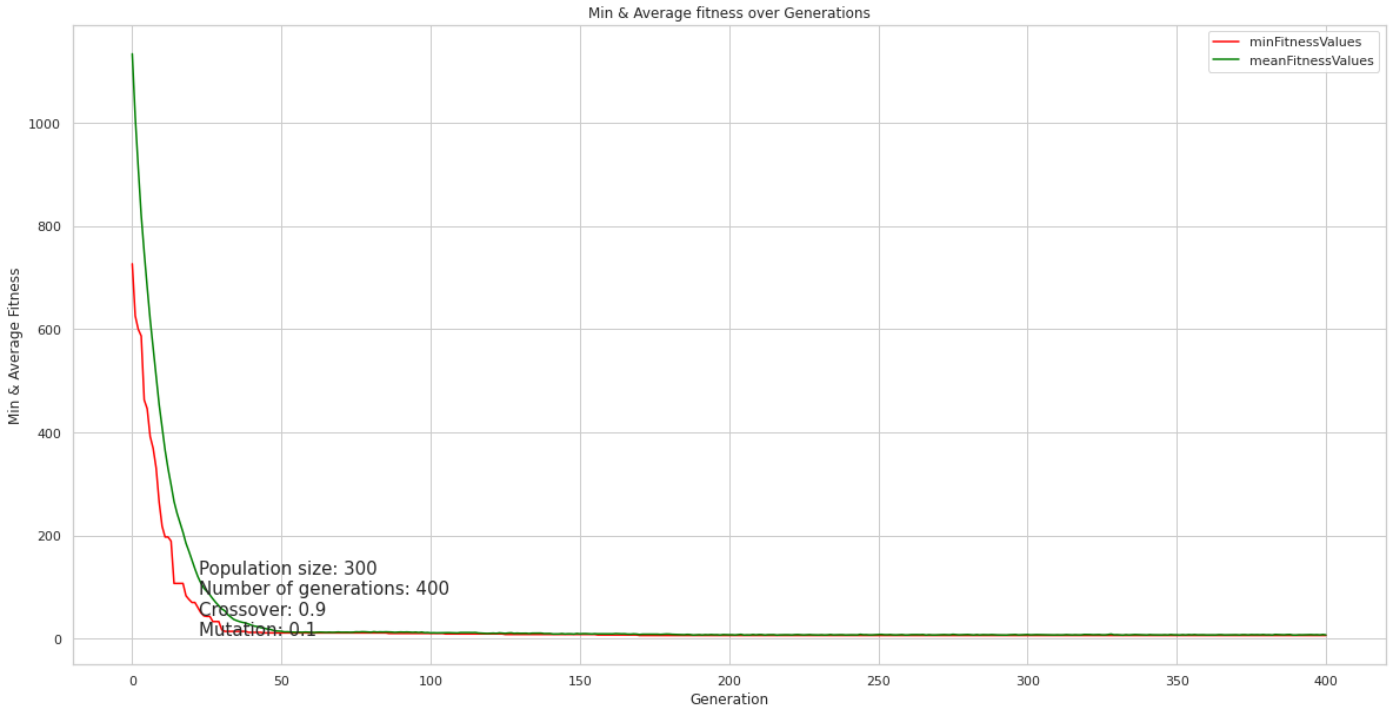
Nurse	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night
Debra	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
Riann	0	1	0	1	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0
Velia	1	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0
Synne	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
Anona	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Noell	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	1	0	1	0	0
Fadwa	0	0	0	0	1	0	1	0	0	1	0	0	0	1	0	0	1	0	0	0	0
Zyana	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0
Nurses Per Shift	2	2	1	2	2	1	2	3	1	2	2	2	2	2	1	2	2	1	2	2	1



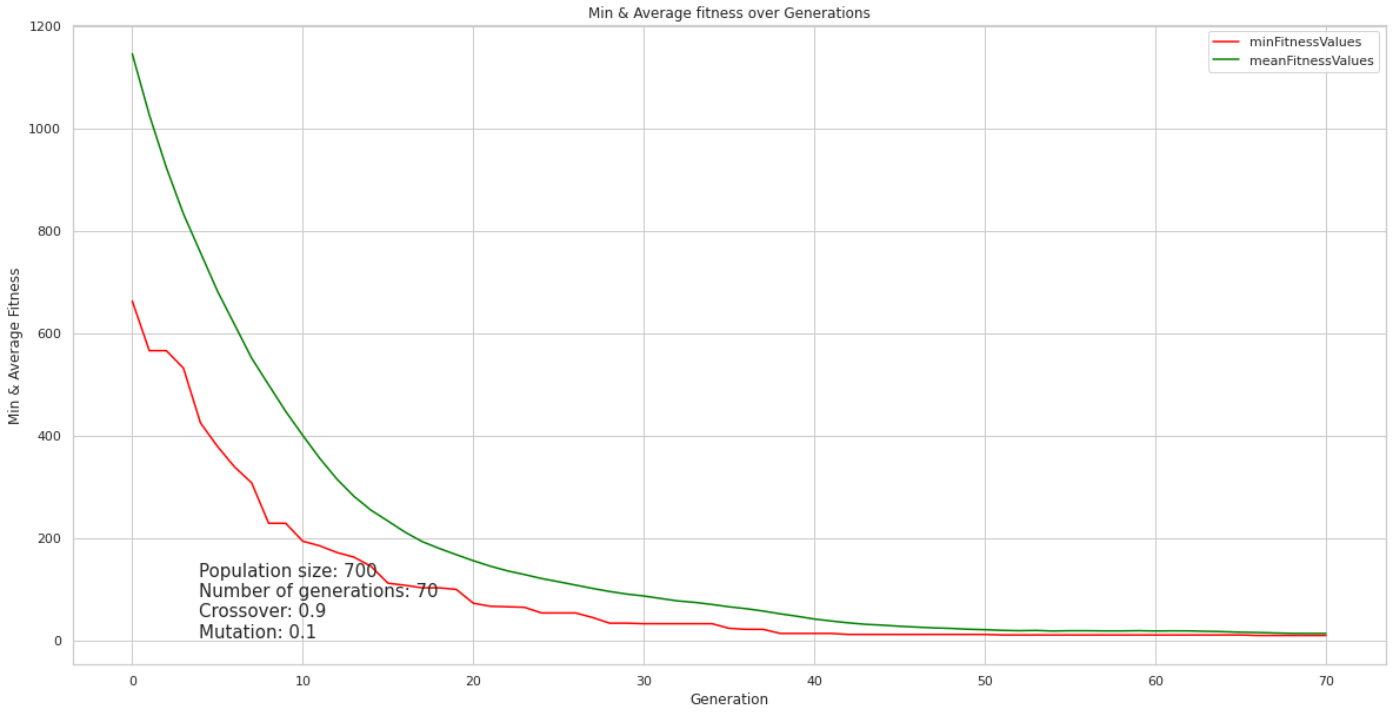
Nurse	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night
Debra	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0
Riann	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	1	0
Velia	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	1
Synne	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
Anona	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Noell	0	1	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0
Fadwa	1	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0	1	0	0	0
Zyana	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0
Nurses Per Shift	3	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2	2	2	2	1



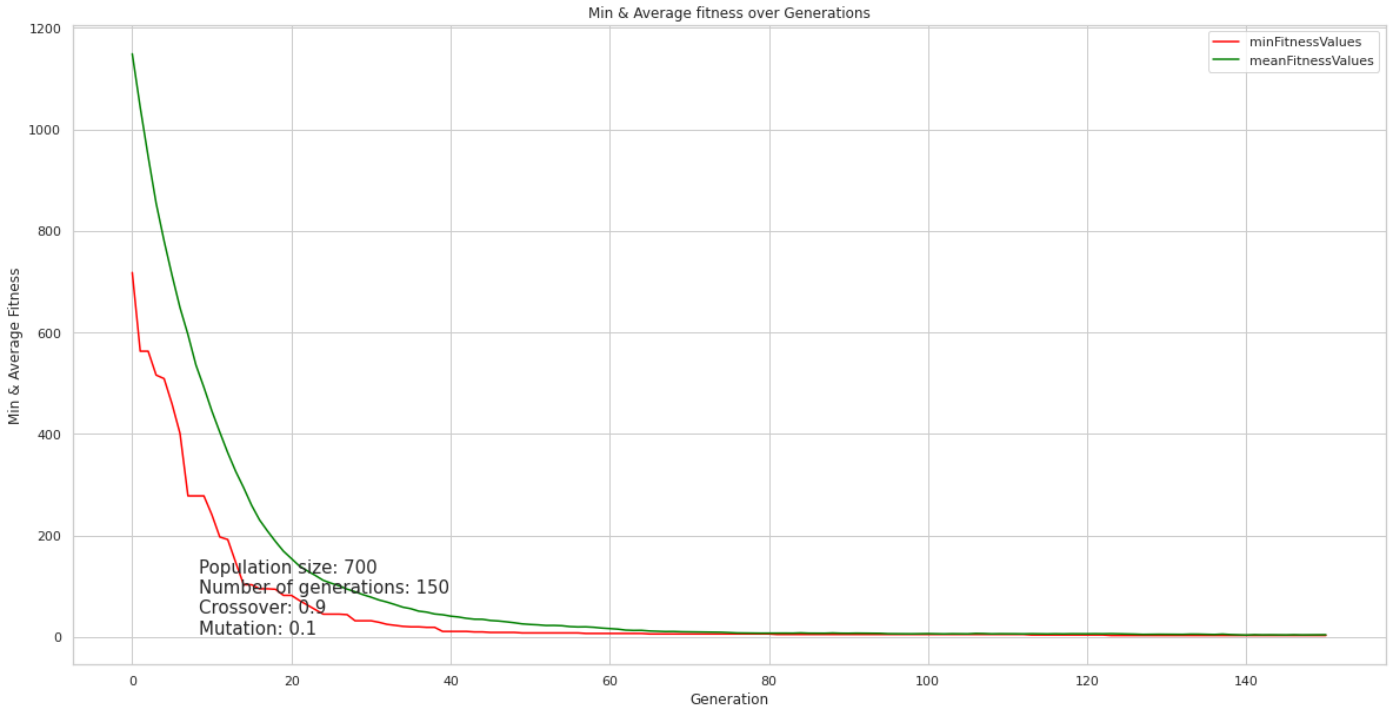
Nurse	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night
Debra	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0
Riann	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0
Velia	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	1
Synne	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	1	0
Anona	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
Noell	1	0	0	0	0	0	0	1	0	1	0	0	1	0	1	0	0	0	0	0	0
Fadwa	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1
Zyana	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	1	0	0
Nurses Per Shift	2	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2	2	2	2	2



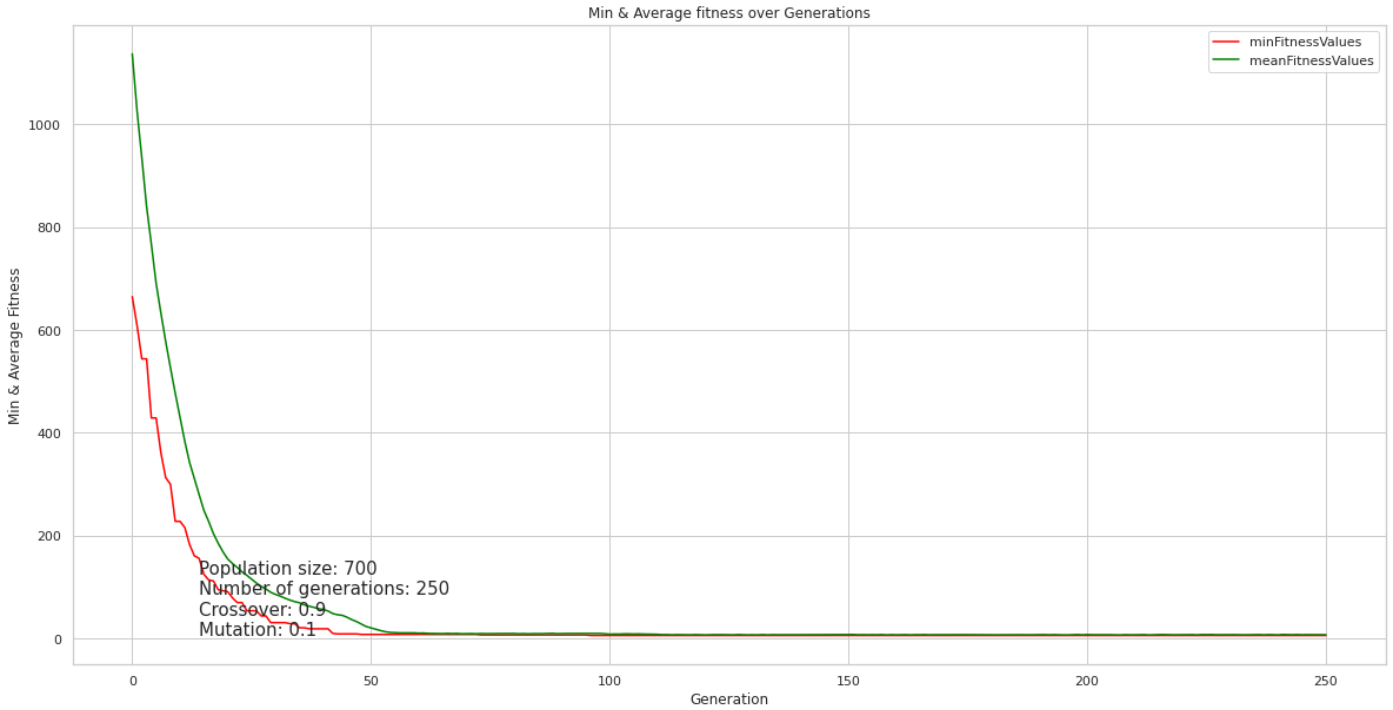
Nurse	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night
Debra	0	0	0	0	1	0	0	0	0	0	1	0	1	0	1	0	0	0	1	0	0
Riann	0	0	0	1	0	0	0	1	0	0	1	0	0	1	0	0	0	0	1	0	0
Velia	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
Synne	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0
Anona	1	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
Noell	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	1	0	0
Fadwa	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0
Zyana	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	1	0	0	0	1	0
Nurses Per Shift	2	2	1	2	3	1	2	2	1	2	2	2	2	2	1	2	2	1	3	2	1



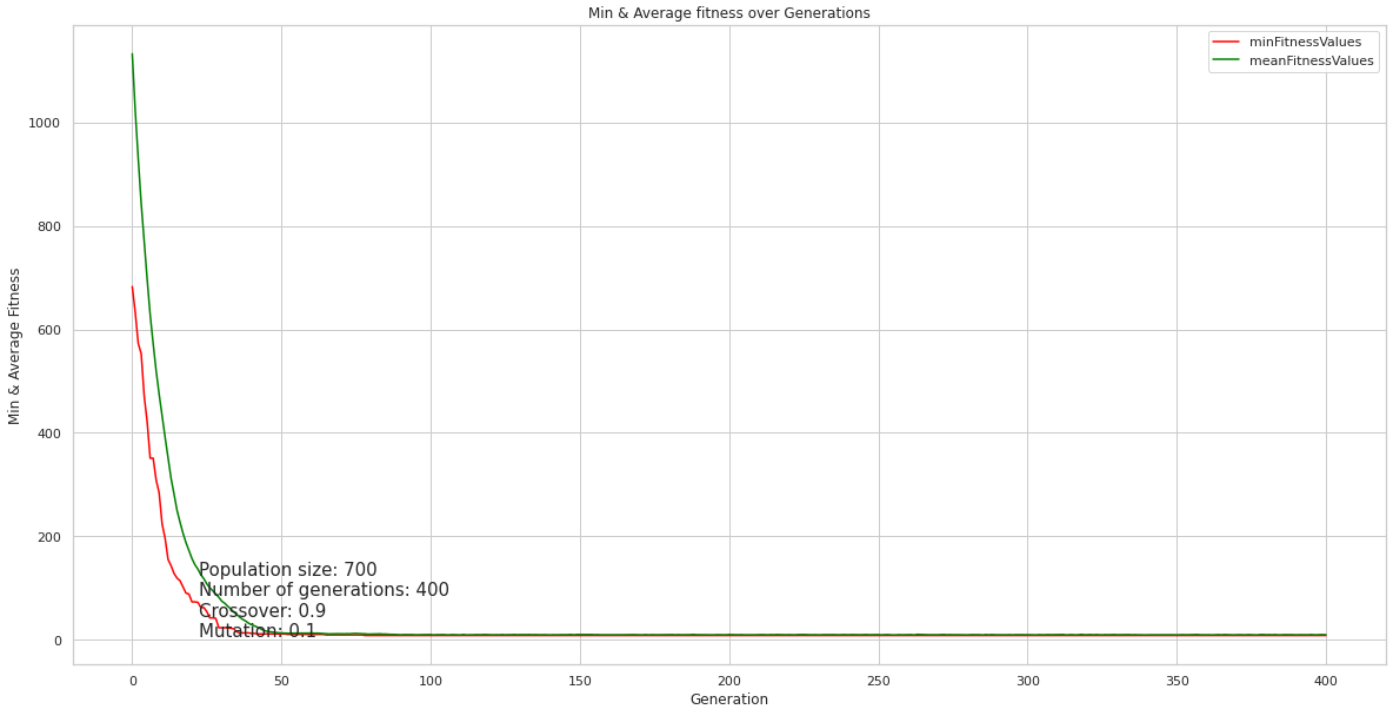
Nurse	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night
Debra	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0	0	1	0	0
Riann	1	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	1	0	0	0	0
Velia	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0
Synne	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0
Anona	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1
Noell	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
Fadwa	0	1	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0
Zyana	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	1	0
Nurses Per Shift	2	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2	3	1



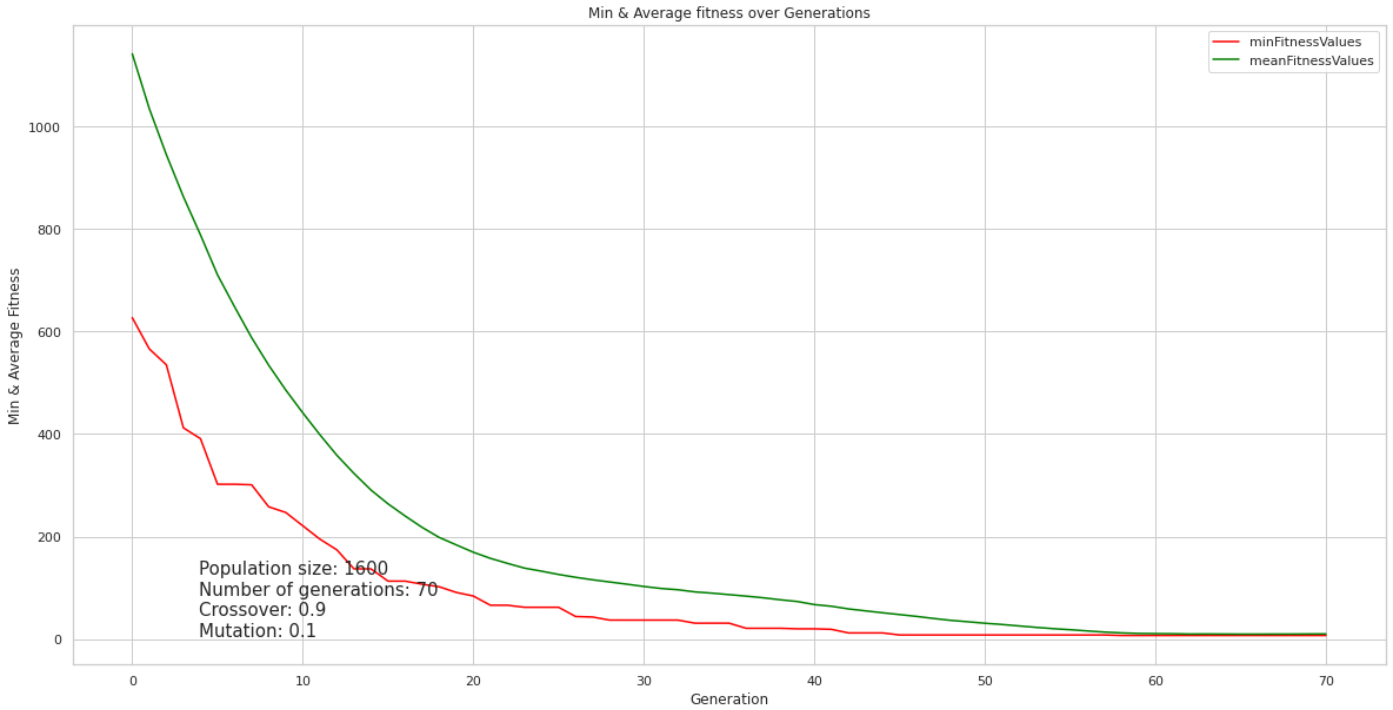
Nurse	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night
Debra	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	1	0	0
Riann	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0
Velia	0	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	1
Synne	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0
Anona	0	0	1	0	0	0	0	1	0	1	0	1	0	0	0	0	0	1	0	0	0
Noell	0	1	0	0	1	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0
Fadwa	1	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
Zyana	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	1	0	1	0	0
Nurses Per Shift	2	2	2	2	2	1	2	2	1	2	2	2	2	2	1	2	3	1	2	2	1



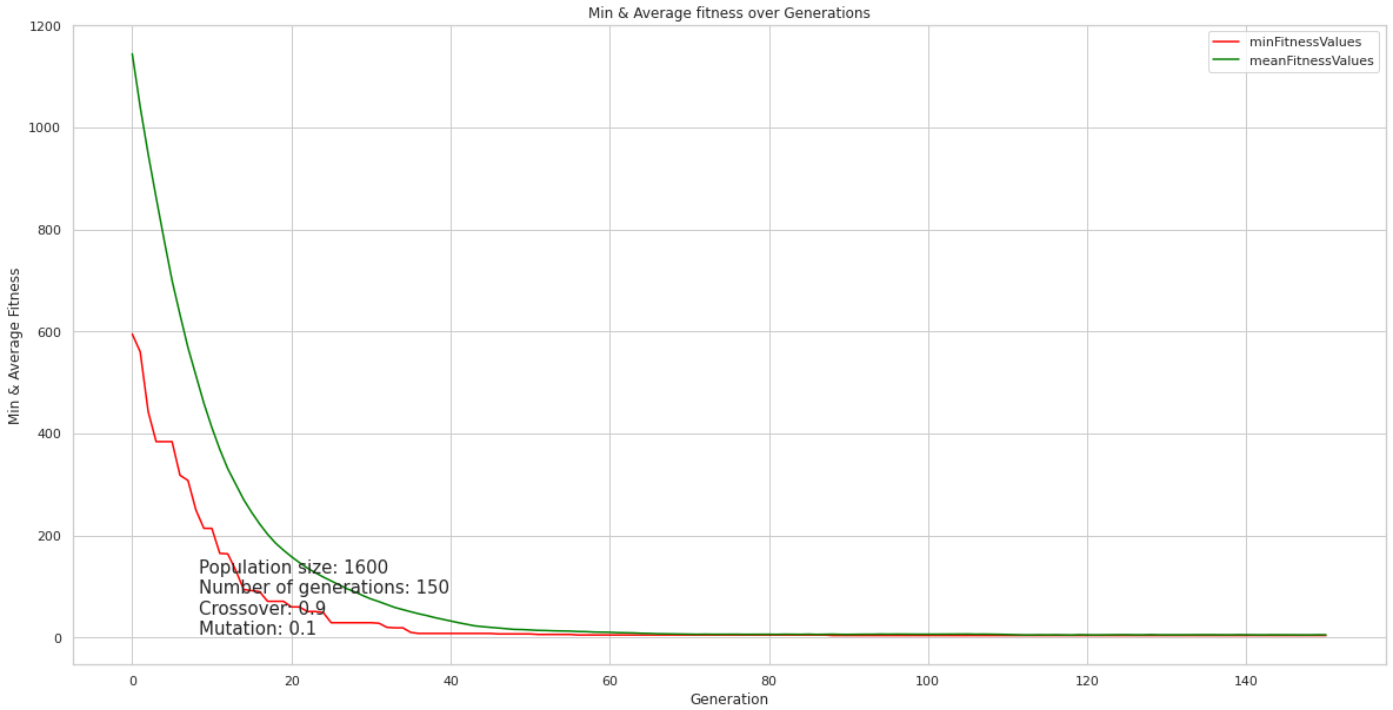
Nurse	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night
Debra	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0
Riann	0	0	0	0	0	1	0	1	0	0	1	0	1	0	0	0	0	0	0	1	0
Velia	0	1	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1
Synne	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0
Anona	0	0	1	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0
Noell	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1
Fadwa	0	0	0	1	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0
Zyana	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	1	0
Nurses Per Shift	2	2	1	2	2	1	2	2	1	2	3	1	2	2	2	2	2	1	2	2	2



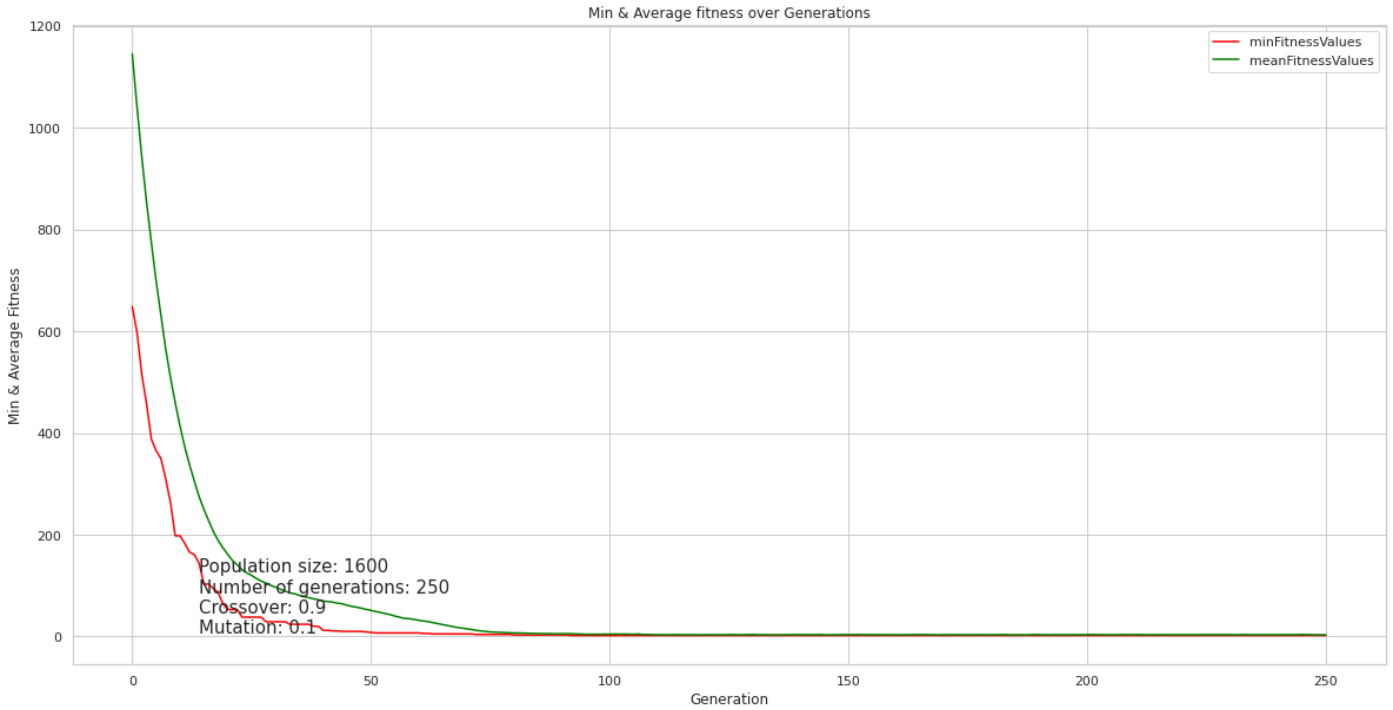
Nurse	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night
Debra	1	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Riann	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Velia	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0
Synne	0	1	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	1	0	0
Anona	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1
Noell	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	1	0
Fadwa	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	1	0	0	1	0
Zyana	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	1
Nurses Per Shift	2	2	1	3	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2	2



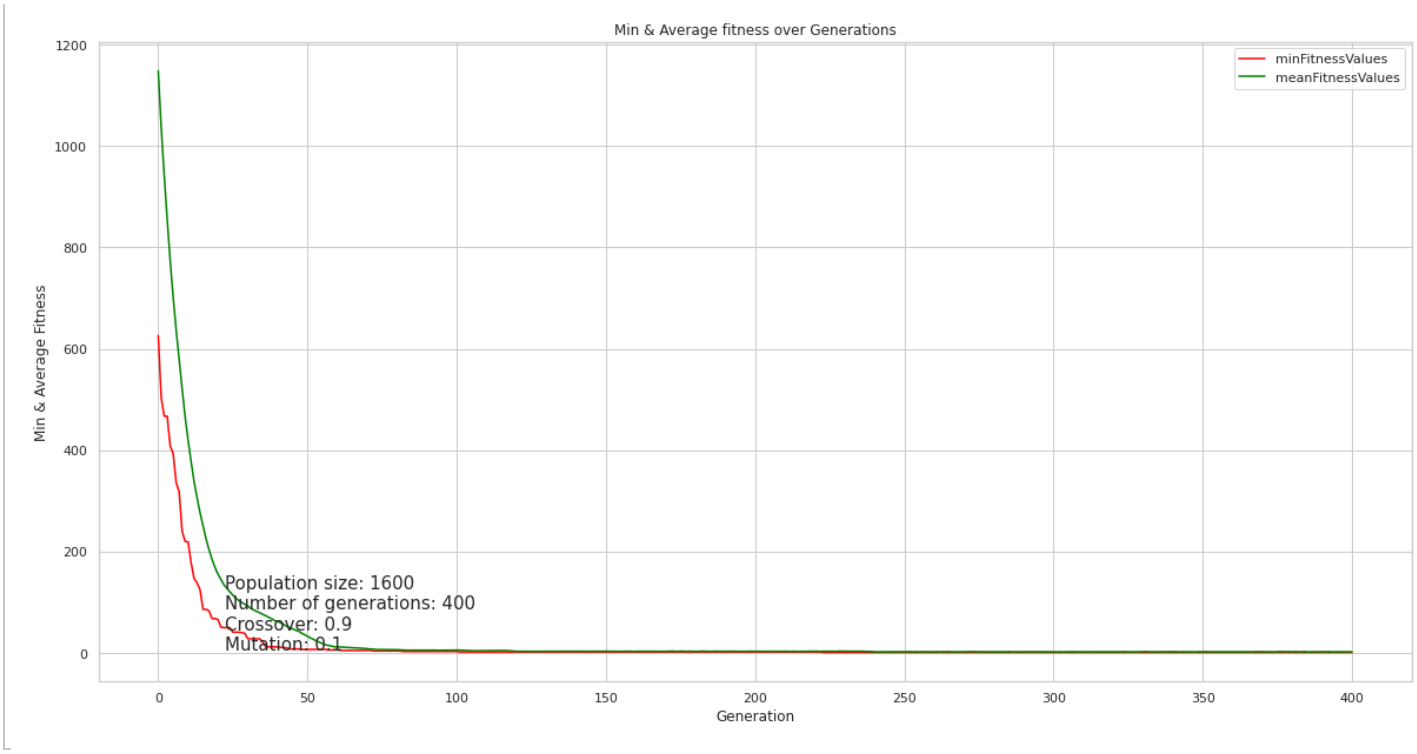
Nurse	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night
Debra	0	1	0	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0	0
Riann	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	0	1	0	0
Velia	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	1
Synne	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0
Anona	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
Noell	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
Fadwa	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0	0	0	0
Zyana	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0
Nurses Per Shift	2	2	1	2	2	1	2	2	2	2	2	1	2	2	2	2	3	1	2	2	1



Nurse	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night
Debra	1	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0
Riann	0	1	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0
Velia	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0
Synne	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0
Anona	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1
Noell	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0
Fadwa	0	0	1	0	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
Zyana	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	0	0	0	0	1	0
Nurses Per Shift	2	2	1	2	2	1	2	2	1	2	2	2	2	2	1	2	2	2	2	2	1



Nurse	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night	morning	evening	night
Debra	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0
Riann	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	1	0	0
Velia	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Synne	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0
Anona	0	0	1	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1
Noell	0	1	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
Fadwa	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	1	0	1	0
Zyana	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0
Nurses Per Shift	2	2	2	2	2	2	2	2	1	2	2	1	2	2	1	2	2	1	2	2	1


Min & Average fitness over Generations
minFitnessValues
meanFitnessValues
Min & Average Fitness
Generation
Population size: 1600
Number of generations: 400
Crossover: 0.9
Mutation: 0.1
0
200
400
600
800
1000
1200
0
50
100
150
200
250
300
350
400