# CS 383 - GA Handout

February 23, 2025

Trace an evolutionary algorithm for employee scheduling using the parameters we discussed in lecture.

## 1   Step 0:

**Randomly Generate Initial Population**. Suppose that the randomly generated population consists of the following individuals:

| Population | |
|---|---|
| S0 = 110101011001010 | S5 = 110011010001111 |
| S1 = 101100101011011 | S6 = 011101001010110 |
| S2 = 010110011100101 | S7 = 100101111000011 |
| S3 = 111000111010100 | S8 = 001011100110101 |
| S4 = 001101010111001 | S9 = 111010010101101 |

## 2   Iteration 1

### 2.1   Selection

Using roulette wheel selection, which two individuals would be selected for reproduction? Since this selection technique is biased based on the fitness value, we first need to evaluate the fitness of each individual in the population. Compute the fitness and enter them into 'select.py'. Run the selection script to identify the individuals that would be chosen for the crossover in this iteration.

### 2.2   Crossover

Use the crossover operator we defined in lecture to produce two offspring from the S1 and S2 selected in the previous step. Add your offspring (S10 and S11) to the population.

## 2.3 Mutation

Mutations happen probabilistically. Suppose that no mutation occurs at this iteration. Add the new solutions to your population and continue with the second iteration.

# 3 Iteration 2

## 3.1 Selection

Add the fitness score from your new members of the population to the `fitness_values` list and run the script to select two members for reproduction.

## 3.2 Crossover

Perform crossover on the two selected individuals to generate two new members of the population.

## 3.3 Mutation

Suppose mutation occurs on S12 bit 2 (indexed from 0). Add the new solutions to your population and continue with the third iteration.

# 4 Iteration 3

## 4.1 Selection

Add the fitness score from your new members of the population to the `fitness_values` list and run the script to select two members for reproduction.

## 4.2 Crossover

Perform crossover on the two selected individuals to generate two new members of the population.

## 4.3 Mutation

Suppose a mutation occurs on both schedules at bit 6 (indexed from 0). Add the new solutions to your population and continue with the third iteration.

# 5 Termination

The iteration terminates after three iterations and outputs the individual with the best fitness score in our population. What would the output solution be?