What were the challenges in writing the program? Or did it seem to go smoothly from the beginning?

At first, I took an object oriented approach. I switched to a procedural approach early on the development process because most of the data of the program was centralized in the genome. This allowed me to stow away the data modeling the genome at the start of the program and only mutate indices corresponding to the genes in the genome. In this way, I was able to focus more on the algorithm and less on the implementation.

Another program that I ran into was a bug in my crossover function. My first crossover function used the one-point crossover method, where a random index was chosen to split the genome of the child to include one parent's genes on the left, and the other's genes on the right. The mistake I made was corresponding the index of the crossover with the activities, instead of the genome. This mistake caused certain activities to be erased from the genome, and others duplicated. I fixed this bug by switching to a uniform crossover, where each gene in the child is randomly selected from either of the two parents.

What do you think of the schedule your program produced?

The schedule that my program produced is quite stellar:

10 SLA191A Roman201 Lock | SLA201B Beach301 Banks | SLA303B Frank119 Glen | SLA451B Loft310 Shaw
11 SLA101A Beach301 Lock | SLA201A Frank119 Banks | SLA304A Roman216 Glen | SLA451A Loft310 Singer
12 SLA291B Roman201 Zeldin | SLA303A Beach301 Banks | SLA449A Loft206 Shaw
13 SLA449B Loft206 Shaw
14 SLA101B Beach301 Lock | SLA291A Loft310 Zeldin | SLA394B Roman216 Singer
15 SLA191B Loft206 Zeldin | SLA304B Roman201 Glen | SLA394A Roman216 Singer

It has a fitness of approximately 18.8. The program outputs fitness in the range 18-19.

Some aspects about it that stand out:
1. *Room size*: All activities are assigned to rooms that are appropriate for their expected enrollment.
2. *Scheduling conflicts*: The schedule does not have any instances where an activity is scheduled at the same time in the same room as another activity.
3. *Facilitator load*: No facilitator is scheduled to oversee more than 4 activities total, and Dr. Tyler is not assigned to any activities.
4. *Preferred facilitators*: All activities are assigned acceptable facilitators (preferred or other).

Does it have anything that still looks odd or out of place?

At time 1300, there is only one activity. It seems odd that there is only one activity scheduled for 1300 because it's a relatively large gap in the schedule, and it may not be the most efficient use of time and resources. The first two time slots have 3 activities scheduled, and it may be resourceful to allocate one of those activities to 1300.

How would you improve the program, or change the fitness function?

I think there are several ways to improve the program and fitness function. One approach is to incorporate additional constraints or preferences in the fitness function to better reflect the specific requirements of the problem. Another option is to adjust the weights of the fitness function components to reflect the relative importance of each factor. Additionally, different optimization algorithms could be experimented with, such as constraint programming or machine learning techniques, to potentially yield better results.

Anything else you feel like discussing, asking about, bragging about, etc.

In developing a scheduling program with a genetic algorithm, I've learned a lot about optimization algorithms and the importance of fine-tuning the fitness function to reflect the specific requirements of the scheduling problem. It's been a challenging but rewarding experience to experiment with different algorithms and parameters to see how they affect the quality of the generated schedule. I'm particularly proud of my ability to balance the different constraints and preferences while generating a feasible and optimized schedule. While there is always room for improvement, I'm confident that the skills and knowledge I've gained through this project will be valuable in my future endeavors.