



Gym Simulation Model

Simulation Lab Project - Autumn 2022

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Abstract

Gymkhana has a number of sporting amenities, including a badminton court, table tennis court, a gym, and many others. The availability of resources is one of the key concerns regarding why people come to this area. Resources are the field and types of equipment. In particular, uncertainty in a good environment is a major threat to each and every organization. One such uncertainty is resource utilization. Proper resource utilization can be extremely beneficial for saving time and the number of users. Like any other organization in a service-oriented environment, a sports or recreation entity must also maximize resource utilization in order to maintain user satisfaction and productivity.

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1. Objective

To build a simulation model for Technology Student's Gymkhana Gym system and suggest improvements/modifications for improving the efficiency of the gym.

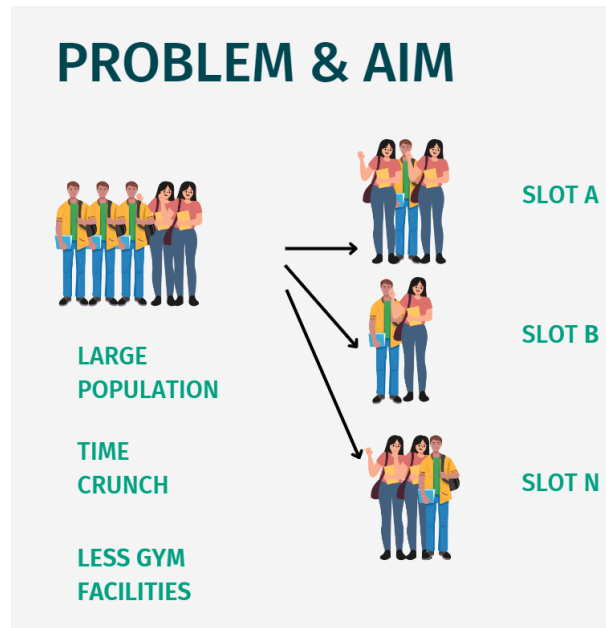
2. Goals

- To collect relevant data Technology Students Gymkhana, IIT KGP.
- To clean the collected data to remove creepencies and null values.
- To approximate the distribution of various features collected.
- Construct a temporal graph and do exploratory analysis.
- Build a simulation model with the collected data.
- Study the model, tune various parameters to find the most effective run.
- Interpret the parameters and translate them into real-life goals/improvements.

3. Problem Statement

To determine how efficiently each resource of the Gym was utilized. So that Gym supervisors can determine the correct amount of resources that are needed for efficient use prior to making a costly expenditure in terms of maintenance and electricity. By looking at simulation-model data, such as the number of males and females that use a specific piece of equipment, and then running simulation models with varying amounts of different resources, management can also ensure customer satisfaction by providing sufficient resources.

- The number of people allowed per slot is fixed. (around 70)
- Is there any way that we can improve the number of users per slot?

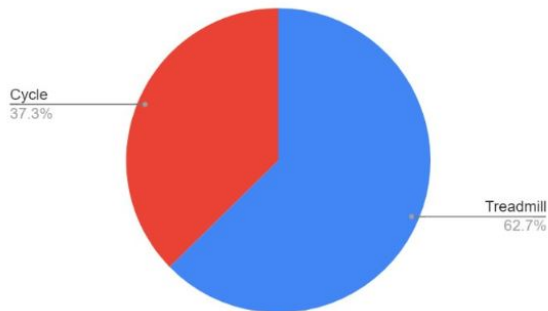


4. Problem Formulation

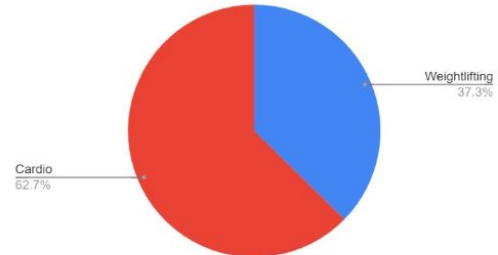
5. Survey and Analysis

MALE

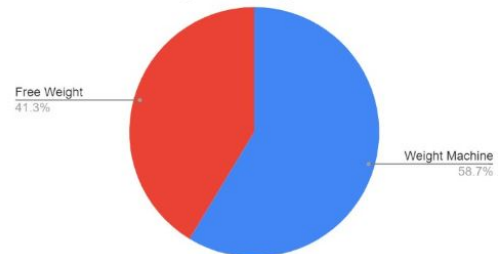
Count of Treadmill or Cycle ?



Count of Cardio or Weightlifting ?

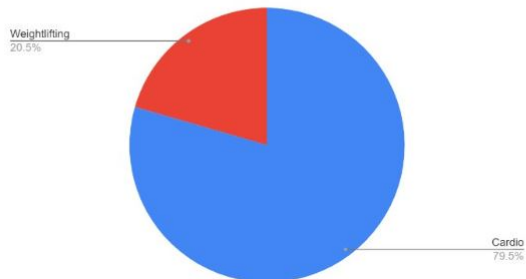


Count of Free Weight vs Weight Machine?

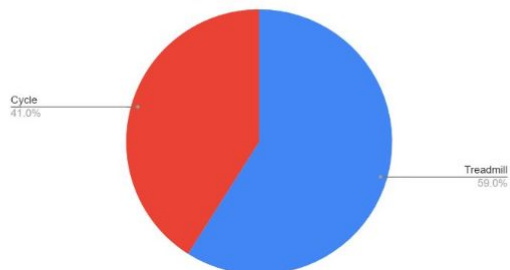


FEMALE

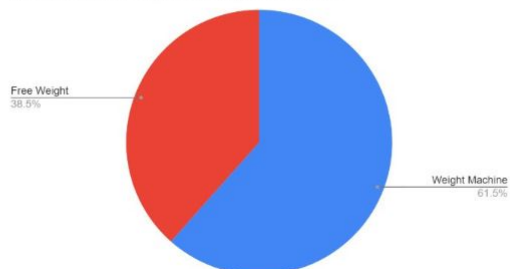
Count of Cardio or Weightlifting ?



Count of Treadmill or Cycle ?



Count of Free Weight vs Weight Machine?

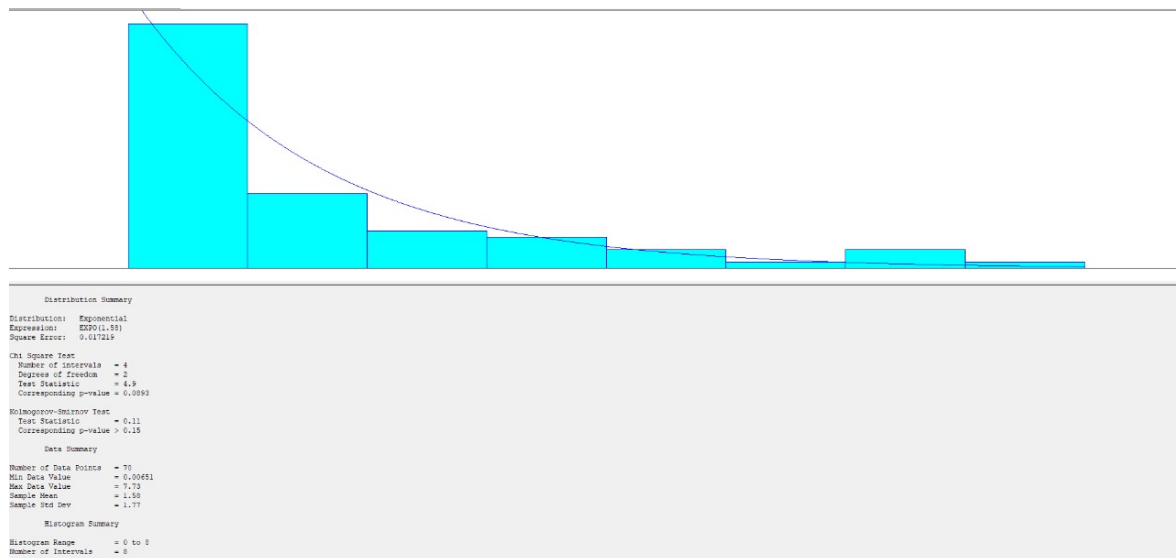


6. Distributions

6.1 Interarrival Time

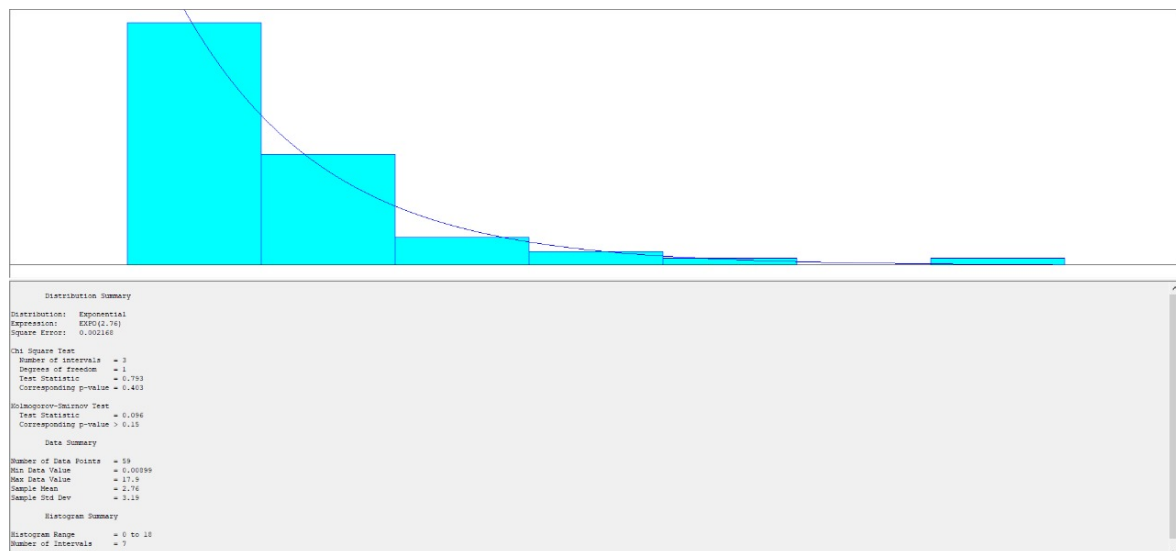
Male:

- Distribution: Exponential
- Expression: $\text{Expo}(1.58)$
- Squared Error: 0.017219

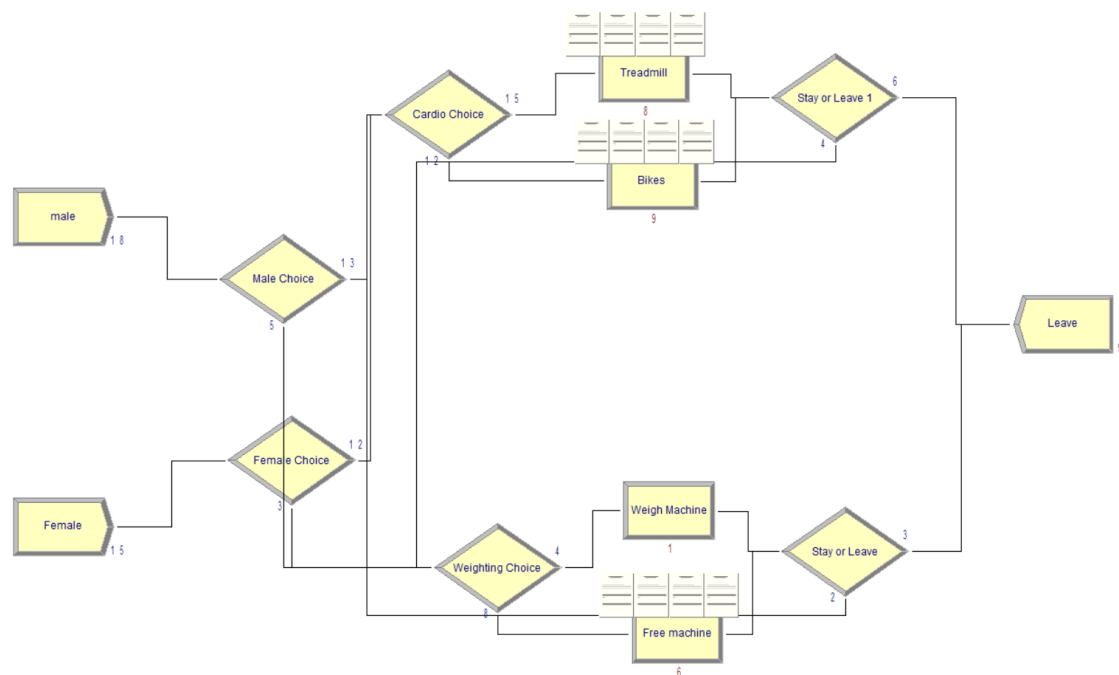


Female:

- Distribution: Exponential
- Expression: $\text{Expo}(2.76)$
- Squared Error: 0.002168



7. Model Designing



8. Results

A snapshot of the results is shown below:

Resource & Average Number in Queue

Treadmill.Queue.NumberInQueue	6.7872	(Insuf)	.00000	17.000	16.000
Bikes.Queue.NumberInQueue	4.6150	(Insuf)	.00000	11.000	10.000
Weigh Machine.Queue.NumberInQueue	4.8794	(Insuf)	.00000	12.000	11.000
Free machine.Queue.NumberInQueue	5.3632	(Insuf)	.00000	12.000	11.000

Resource & Average Queue waiting Time

Treadmill.Queue.WaitingTime	.22112	(Insuf)	.00000	.43016	8
Bikes.Queue.WaitingTime	.20836	(Insuf)	.00000	.34407	4
Weigh Machine.Queue.WaitingTime	.14634	(Insuf)	.00000	.29427	4
Free machine.Queue.WaitingTime	.15883	(Insuf)	.00000	.39761	3

9. Suggested Improvements

- We can clearly observe that Resource and average Queue waiting time for treadmills is greater than for bikes.
- Also, Entity and the average number in the queue for treadmills is greater than bikes.
- So, we can reduce the number of bikes by 1 and increase the number of treadmills by 1

10. Conclusion

