Group #I2.03 - Modeling & Simulation of Academic Makerspace with AnyLogic

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IHM Makerspace

- Built in 2018
- Mostly used for class, research, and club projects
- Studio room contains twenty 3D printers, computers, laser-cutters, and soldering stations

Problem Statement

Without a predictive model, the Ingram Hall Makerspace struggles to address student needs in an efficient or cost-effective manner

Project Purpose

To construct an agent-based AnyLogic simulation that accurately predicts machine constraints with a level of reproducibility to remain relevant in Makerspace design regardless of machinery or service population.

Project Objectives

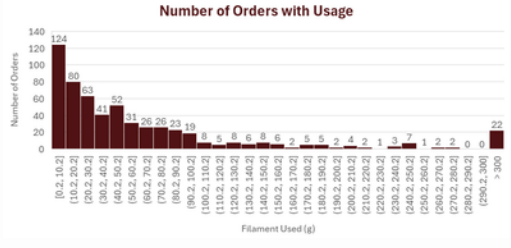
- Simulate Operational Times
- Model Maintenance Costs
- Describe 3D Printer Utilization
- Simulate RPM room space and workflow

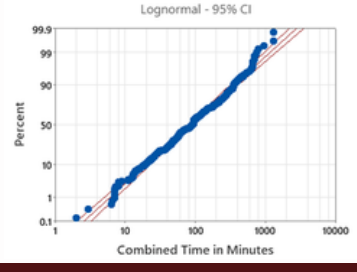
Our Data

- Data comes from an Excel file with printer usage from last semester (Fall 2025)
  - •The data is manually entered by the Makerspace Technicians every day
- •We received data from part of this semester which will be used to validate our analysis and predictions
- •The Makerspace Technicians follow the manufacturer specifications on performing preventative maintenance in batches

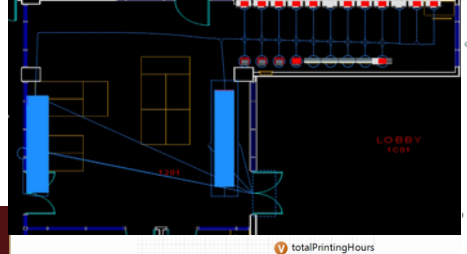
Goodness of Fit Test

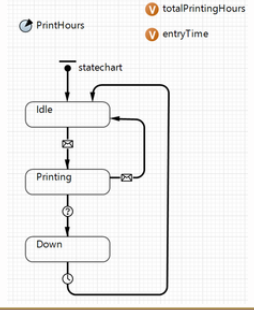
Distribution	AD	P	LRT P
Normal	39.370	<0.005	
Box-Cox Transformation	1.283	<0.005	
Lognormal	0.780	0.043	
3-Parameter Lognormal	0.763	*	0.538
Exponential	4.750	<0.003	
2-Parameter Exponential	4.724	<0.010	0.001
Weibull	3.862	<0.010	
3-Parameter Weibull	3.092	<0.005	0.000
Smallest Extreme Value	69.711	<0.010	
Largest Extreme Value	19.632	<0.010	
Gamma	4.737	<0.005	
3-Parameter Gamma	3.951	*	0.000
Logistic	26.924	<0.005	
Loglogistic	1.192	<0.005	
3-Parameter Loglogistic	1.142	*	0.144
Johnson Transformation	0.543	0.163	

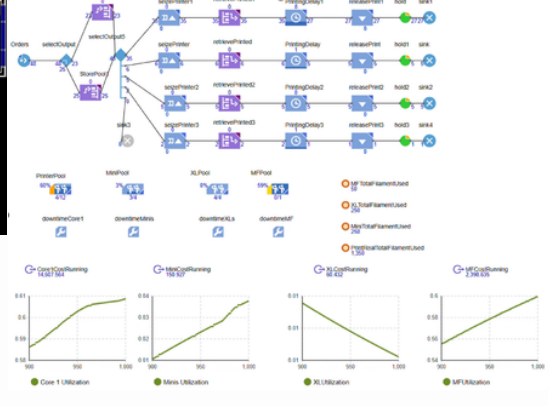




Current Accomplisments







- Two different methods of simulating downtime considered
- Downtime blocks are chosen for ease of implementation
- Costs are calculated at the end of simulation time in USD
- Filament usage is calculated during the simulation in grams

Constraints

- Data on usage over short period, little information on failures/maintenance
- Low amount of literature on modeling Makerspaces
- AnyLogic's lack of flexibility for collaboration (no live documents)
- JAVA based coding

Future Plans

- Research and select best approach for modeling
- Complete formation of maintenance equations
- Formulate AnyLogic Model
- Ensure Model functionality

Team Members

Left to Right: Natalie Huth, George Bruen, Aleah White

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