Project Report: Workflow Simulation

Goal

The project simulates how a workflow operates during a business day, focusing on customer transactions, processing times, and system performance. The aim is to understand bottlenecks and estimate waiting times under different scenarios.

What I Did

1. Set the Study Window

- The simulation runs between 10:00 AM and 8:00 PM.

- This gives a realistic day-long picture of operations.

2. Analyzed Transactions

- Grouped data into 15-minute intervals to see how many transactions happen over time.

- This helped identify peak hours and slow periods.

3. Created Time Patterns

- Converted transaction times into hourly values and added mathematical features (like sine waves) to capture daily patterns.

4. Simulation Setup

- Defined a workflow simulation using the SimPy library.

- Transactions arrive at different rates depending on the time of day.

- Each transaction goes through processing resources, which can cause waiting lines.

5. Scenarios Tested

- Simulated multiple "what-if" cases, such as:

- Fewer staff vs. more staff.

- Longer vs. shorter service times.

- Each scenario measured average wait time and system throughput.

6. Results & Insights

- Plotted average wait times for different scenarios in a bar chart.

- Found that increasing staff reduced waiting time significantly, especially during peak hours.

- Showed how resource allocation decisions can balance efficiency and cost.

Why This Matters

This workflow simulation can be applied to real-world operations such as call centers, hospitals, or retail checkout systems. It gives managers a data-driven way to experiment with staffing levels

before making expensive changes in real life.