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PreciseDose

Interactive Nurse Training & Dosage Simulator

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24AIM111 & **23MAT112**

Introduction to data structure and algorithms
Mathematics for Intelligent Systems 2

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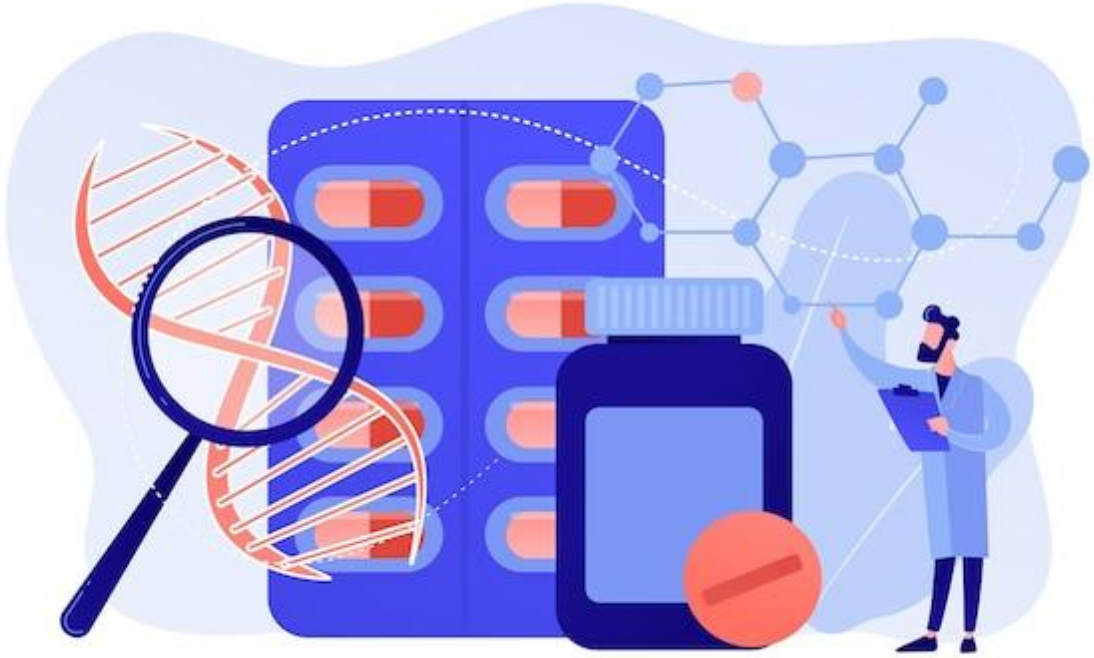
PRESENTATION LAYOUT

- Problem Statement
- Project Goals
- Progress till first review
- Interface Building
- Dataset generation and modelling
- Flow of simulation
- Future Goals
- Timeline



PROBLEM STATEMENT

How do we make an **interactive application** that can be used for nurse training and **personalized drug dosing** based upon the **real time** parameters, provided using voice input?

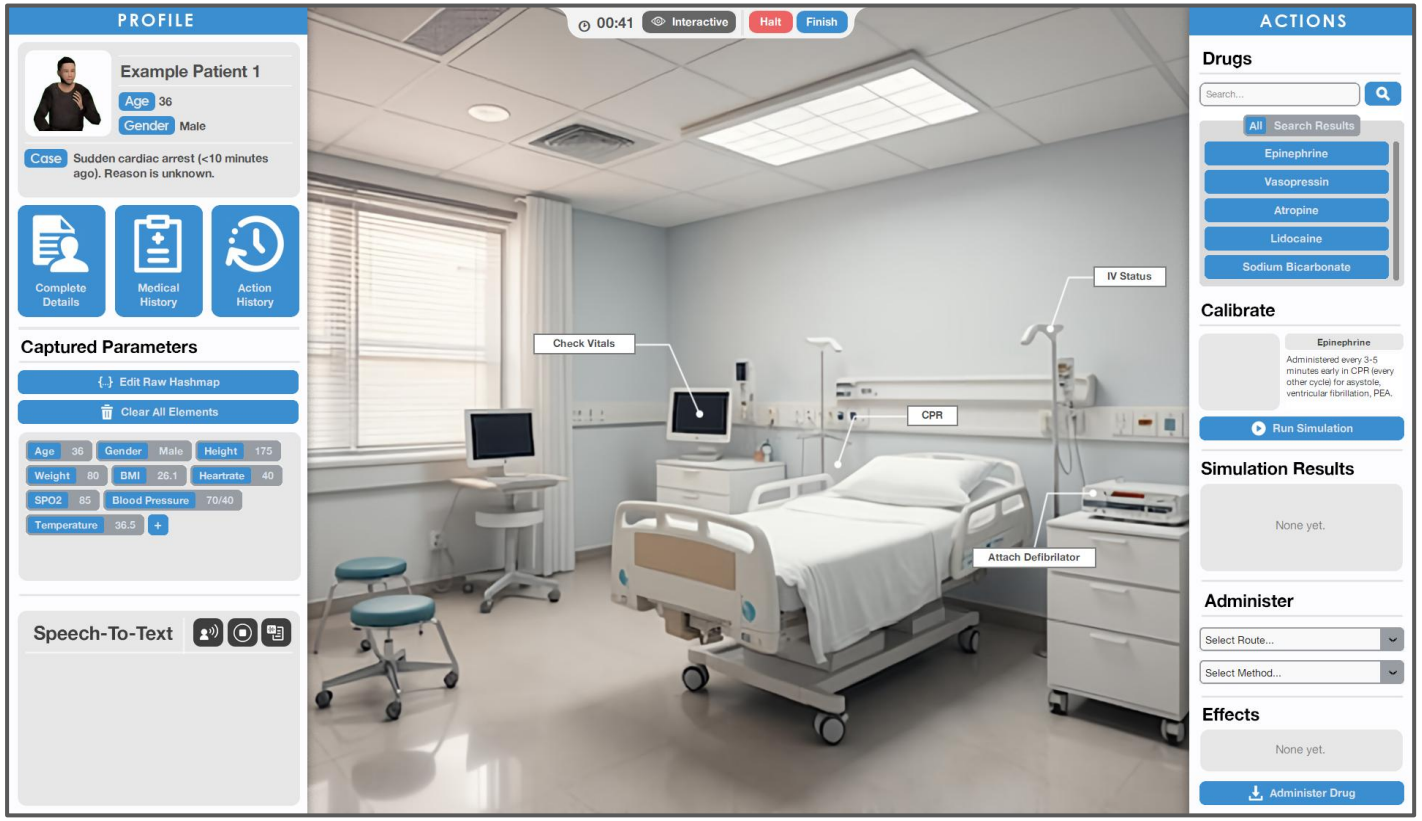
PROJECT GOALS

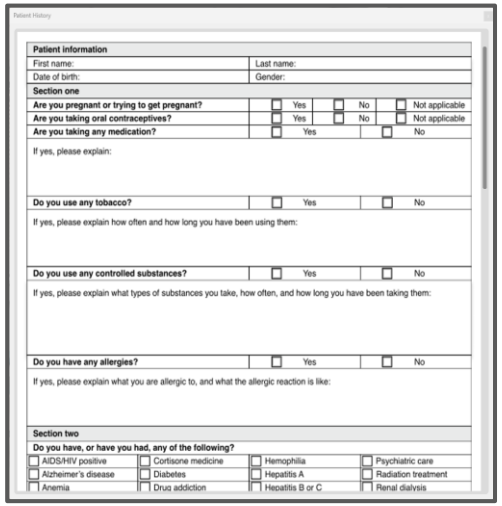
1. To make an **interactive user interface** than comprises of different cases and their drugs data.
2. To make the user practice for the drugs used in the taken medical cases.
3. To provide **external parameters via voice input** incorporated in the interface.
4. To **calibrate the drug dosage** using the external inputs provided and the standard dosages prescribed by CDSCO and provide way of administration.
5. Overall, to make a simulation which can help medical practitioners practice the drugs to be administered and provide **calibrated drug dosage** for their training.

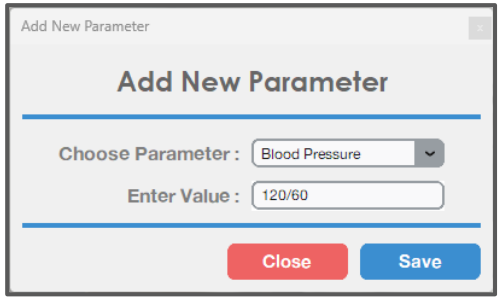
PROGRESS TILL FIRST REVIEW

- We had implemented the **speech-to-text model** that takes voice input from the user.
- The model also parses it through **LLAMA 3.2** which returns a **HashMap** of the key considerations.
- We made considerable progress in the UI and are were working on it's final design.
- Interface was partially coded with some interactive elements.

INTERFACE BUILDING







- We have done a complete re-design of the UI since the first review to improve versatility.
- Interface is fully coded. We have used a variety of data structures: **Graphs, Arrays, Linked Lists and HashMaps**
- Most of the elements are functional and interactable as of now.
- We have also interfaced MatLab through Python together to perform the dosage simulations.

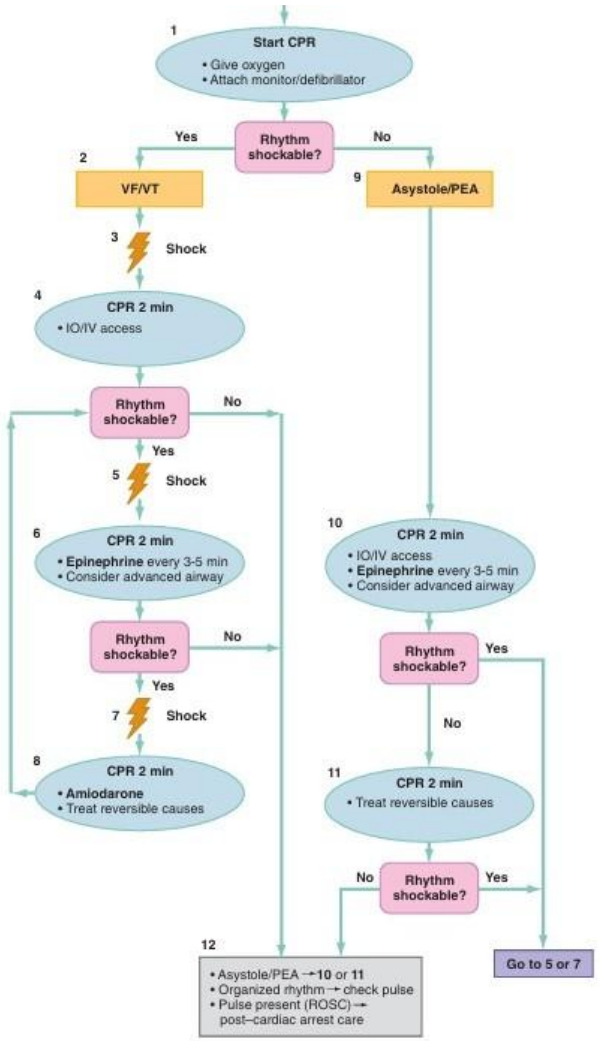
DATA STRUCTURES USED

Data Structure	Purpose
Graphs	• Used to store the **operational procedure** that is expected from the user. • This includes all the possibilities from start to end of the simulation, therefore requiring heavy branching and looping.
Linked List	• Used to store the decisions that are made by user during simulation. • **Faster indexing times** and they **grow in size** more naturally than dynamic arrays.
HashMaps	• Used to store **Key:Value pairs**. E.g: Patient details, drug parameters, settings, etc. • Dictionaries are Python's native implementation of HashMaps.
Fixed-Length Arrays	• Used to store **non-modifiable** and **ordered sequence** of data • For example, the list of drugs and administration methods that are available in the software is **always constant** and stored and displayed as an ordered list

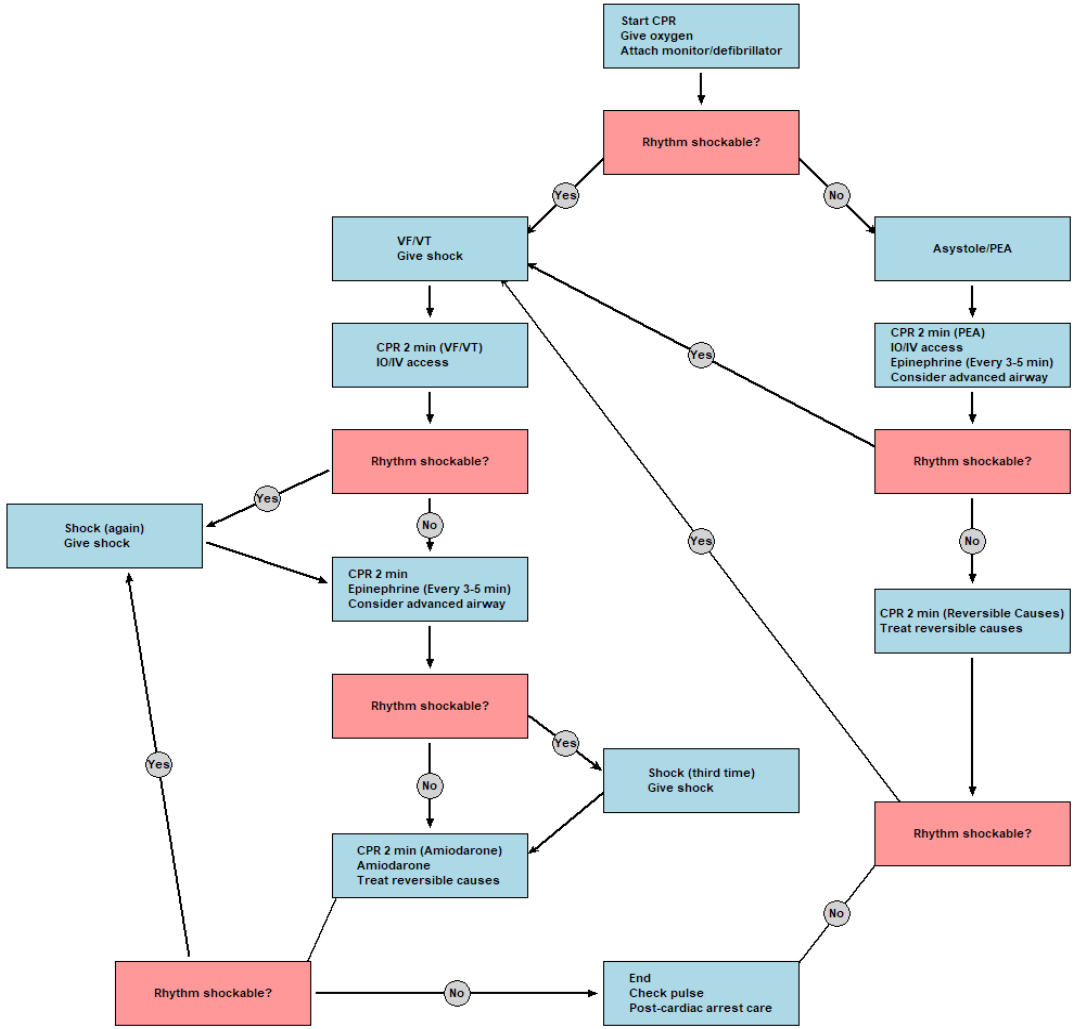
FLOW OF SIMULATION

- We used a custom Graph object to replicate the workflow of resuscitation in Python.
- The user inputs will be compared to this graph and the simulation will stop when the user deviates or makes a mistake.

Textbook

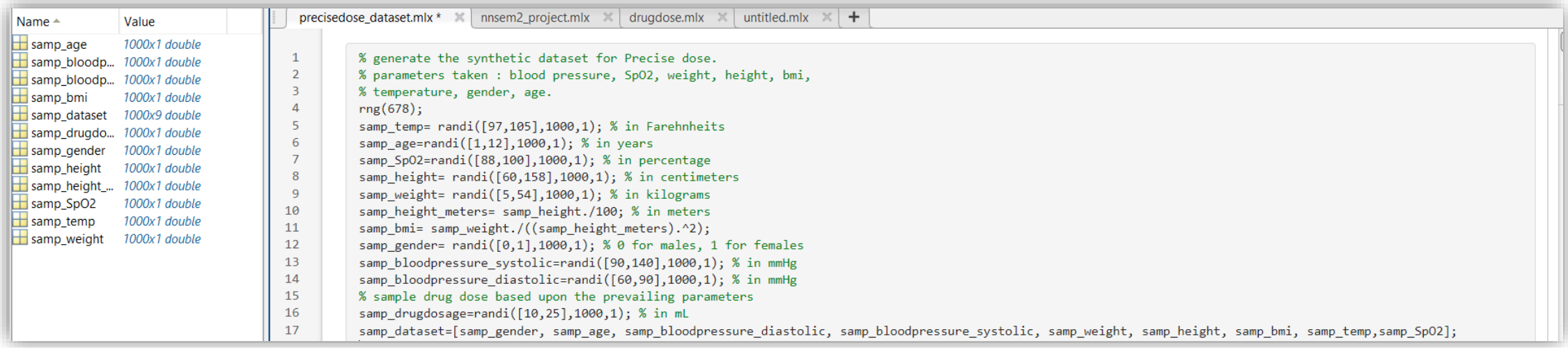


Python



DATASET GENERATION & MODELLING

- Synthetic data has been generated for modeling.
- **Parameters taken:** Blood pressure, SpO2, weight, height, BMI, temperature, gender, age.



- Using **polynomial curve fitting,** to find the relation between drug dosage and all the other parameters.
- Currently, we have included a simple dosing calculator in the interface.

FUTURE GOALS

- Finding the relation between the parameters using polynomial curve fitting.
- Based upon that equation, to model the drug dosage calibration model using MatLab and Simbiology.
- To integrated the interface and the model.
- To expand the project to more cases and be more thorough about cases.
- To improve versatility of the interface by adding more interactive elements that affect the simulation.

PROPOSED TIMELINE

Jan 3rd week

Title finalization + interface development + exploring SimBiology.

First Review

Feb 1st week

March 1st week

Interface completion & building the dosage calibrating model.

Tentative 2nd Review

March 1st week

March 4th week

Completion of both dosage calibration model and implementation.

Final testing and integration.

April 1st week

April 2nd week

Tentative final review

Thank You