



PreciseDose

Interactive Nurse Training & Dosage Simulator

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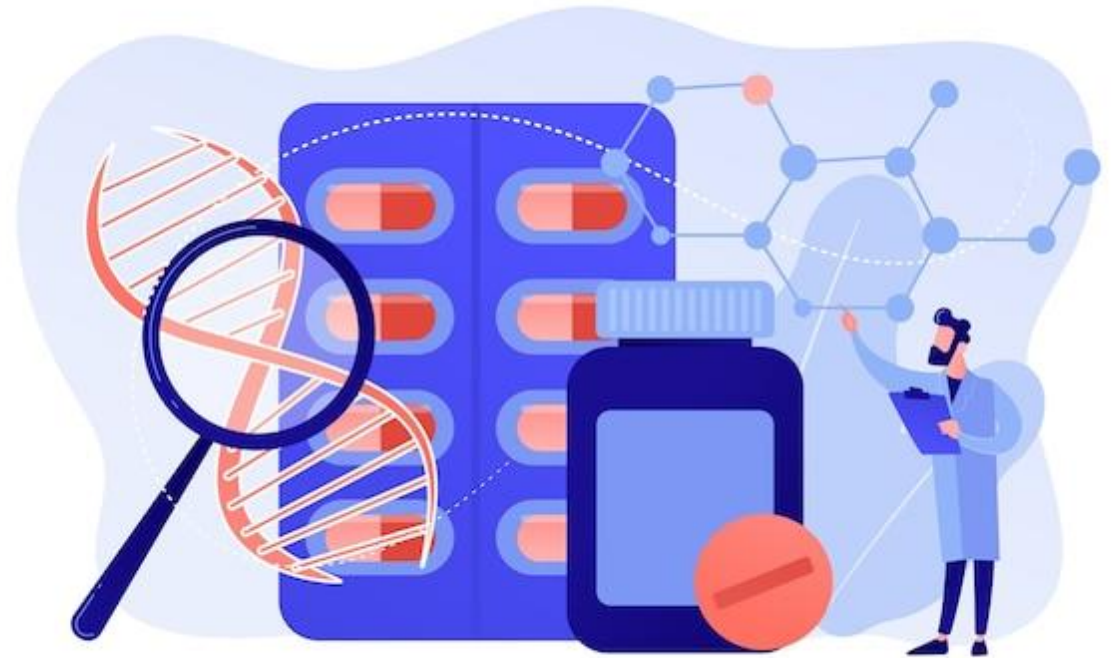
24AIM111 & 23MAT112

Introduction to data structure and algorithms
Mathematics for Intelligent Systems 2

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PRESENTATION LAYOUT

- Introduction
- Problem Statement
- Objective
- Literature Review
- DSA Part Incorporated
- Mathematics Part Incorporated
- Progress so far
- Timeline
- References



INTRODUCTION

Ever wondered? –

If our bodies are different, why the drug dosages would be same?

To cut off the traditional charts for drug dose estimation and to provide personalized drug dosage is one of the primers of AI in medical field.

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 **personalized drug dosage** for their training.

LITERATURE REVIEW

1

A4S: A user-friendly graphical tool for pharmacokinetic and pharmacodynamic (PK/PD) simulation

- Accelera For Sandwich, is a menu-driven MATLAB-based PK/PD simulator targeted at biomedical researchers with little PK/PD experience.
- In the author's view, a barrier in the biomedical field is a lack of user-friendly tools which allow "non experts" to use PK/PD models.

2

Translational PK-PD modeling analysis of MCLA-128, a HER2/HER3 bispecific monoclonal antibody, to predict clinical efficacious exposure and dose

- The aim of this study was to characterize the PK and PD of MCLA-128 and to predict a safe dose for Human usage.
- Monkeys were analyzed for drug response and allometric scaling was used to extrapolate PK parameters from monkeys to humans.

3

Therapeutic Drug Monitoring (TDM)

- TDM adjusts drug doses to achieve therapeutic levels, ensuring maximum effectiveness while minimizing side effects or toxicity.
- By monitoring drug levels in patients, doctors can tailor treatment plans based on factors like age, weight, metabolism, and comorbidities.

4

Predicting drug pharmacokinetics and effect in vascularized tumors using computer simulation

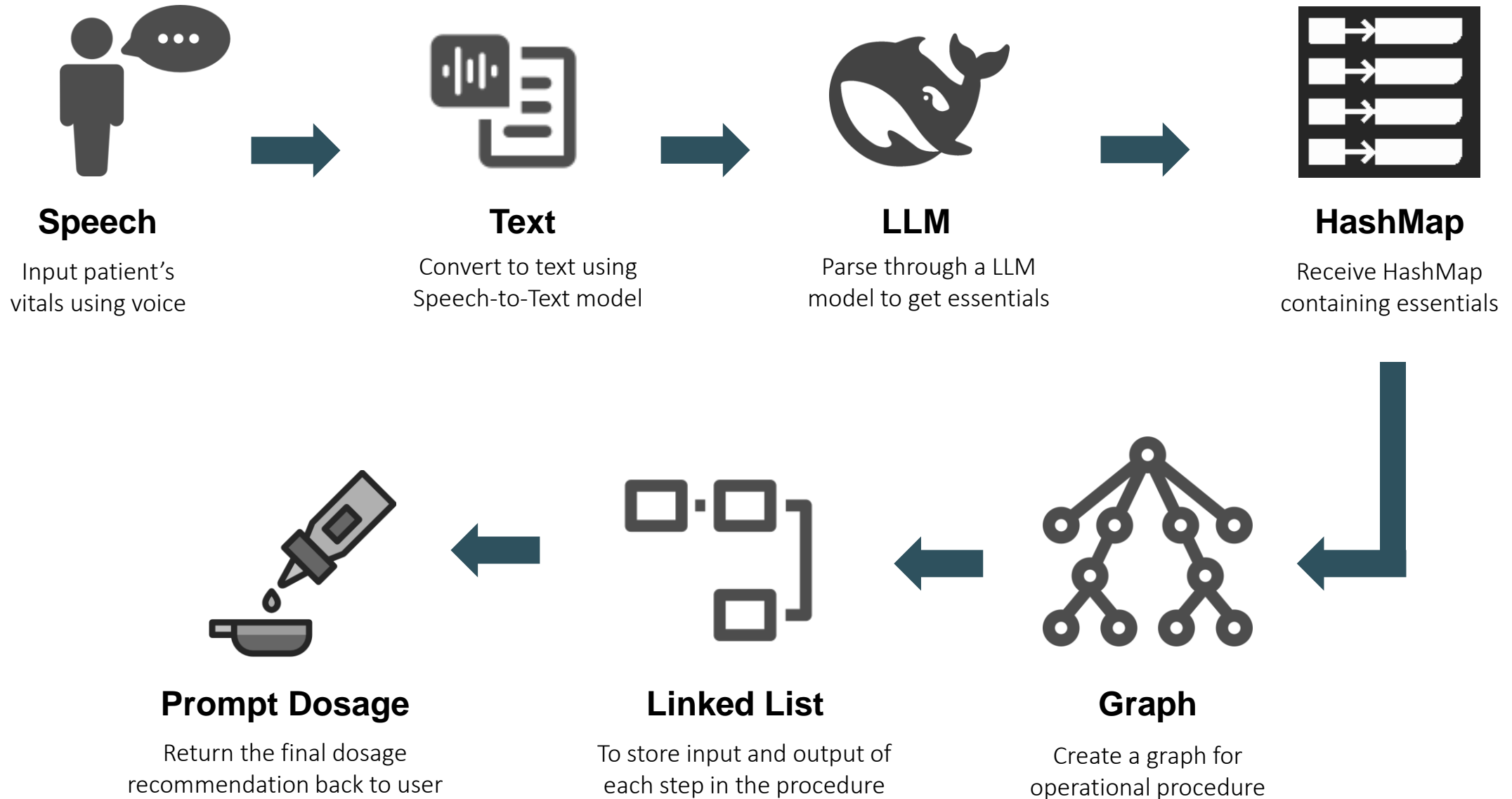
- This paper investigates the pharmacokinetics and effects of doxorubicin and cisplatin in vascularized tumors through 2D simulations.
- The model incorporates differential equations to simulate drug transport, cellular uptake, and tumor response.

5

Predicting warfarin dosage from clinical data: A supervised learning approach)

- This paper attempts to build a warfarin dosage prediction model utilizing supervised machine learning.
- Multilayer perceptron, model tree, k nearest neighbors, and support vector regression were evaluated. Mean absolute error (MAE) and standard deviation of errors ($\sigma(E)$) were the evaluation metrics.

DSA PART INCORPORATED



MATHEMATICS PART INCORPORATED

- Using SimBiology, a toolbox available in MATLAB, we will be building a model for personalized the drug dosage.
- The parameters leveraged for the model are -age, gender, weight, spo2 level, heart rate, past history (if any), temperature.
- The advantage of using SimBiology is that it incorporates ODE for the simulation on dynamic real time data.
- The cases taken up for simulation are: **Adult, Paediatric and Neonatal** Resuscitation.



PROGRESS SO FAR

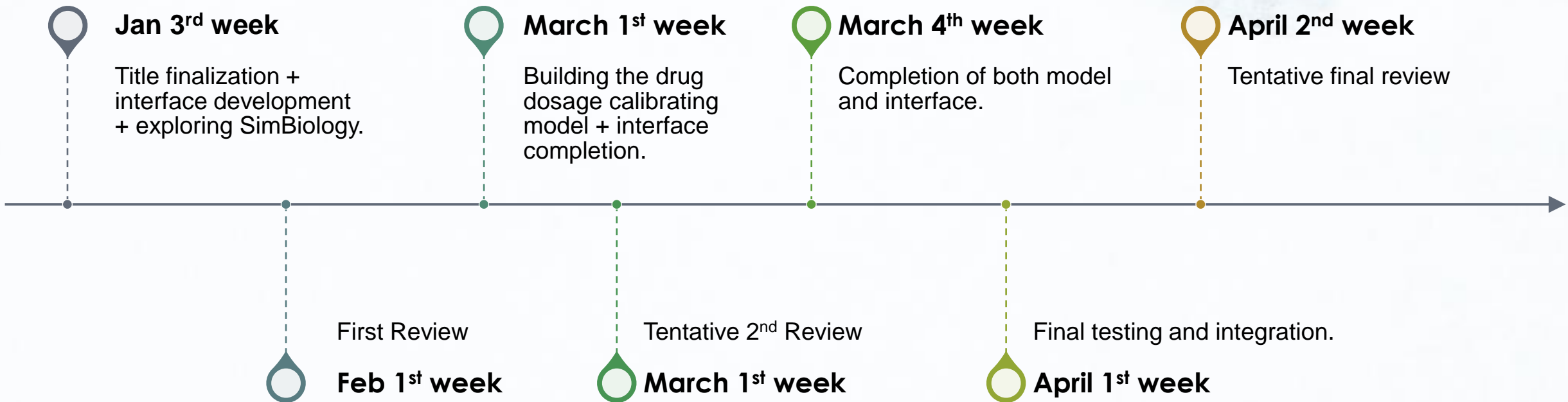


- We have implemented the **speech-to-text model** that takes voice input from the user.
- The model also parses it through **LLAMA 3.2** which returns a **HashMap** of the key considerations.
 - We have also made considerable progress in the UI and are working on it's final design.
 - Interface is partially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

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PROPOSED TIMELINE





Thank You