

EE5311 Assignment 1 (AY24/25 Semester 2)

This assignment counts toward 25% assessment for the course. This assignment is due for submission by **22 March 2025**.

The assignment problem below is open-ended and may admit many possible solutions. Bearing in mind that the assignment provides you an opportunity to practice what you learn in this course, it is recommended that you think about how physics-guided machine learning techniques might help you solve the problems.

You **may** discuss the assignment problem and solution methodologies with other students and the instructor, but you are **not allowed** to share code or project report with other students. The Canvas discussion forum is a great place for discussions and/or clarification regarding this assignment.



Caution

Any copying or plagiarism will hamper your own learning, and may also result in disciplinary action against you.

Problem Statement

You work at a pharmaceutical company that is developing a new drug to treat a rare blood disorder. The drug is designed to control the level of blood platelets in patients. The drug is administered to patients in the form of two pills (A and B) taken daily. The dosage of the drug controls the rate at which the blood platelet level changes in the patient's body. The exact pathways through which the drug affects the blood platelet level are not well understood, but it is clear that the blood platelet level changes over time as a non-linear function of drug dosage and current blood platelet level.

The company has collected data from a clinical trial where the drug was administered to patients over a period of 10 months. The data consists of drug dosage for the patient, and the relative blood platelet level (relative to the start of the trial) of patients over time (every 0.5 months) during the trial. Your task is to develop a model that can forecast the relative blood platelet level of a patient over time given the drug dosage.

The `data1.txt` file contains the data collected from the clinical trial. The file contains several patient records. Each record begins with information on the drug dosage in grams for drug

A and B, followed by a comma-separated-value (**csv**) table of time and relative blood platelet level. The time is in months, and the relative blood platelet level is a real number (ratio of measured platelet count to the platelet count at the start of the trial).

To test whether your model is effective, you are required to forecast the relative blood platelet level of a patient over time given the drug dosage (A: 2.1 g, B: 2.4 g). The results will be compared against the actual relative blood platelet level of a patient given that drug dosage. You should store your results in a **results.csv** file in your submission.

Submission requirements

(25 marks)

You are required to submit a **zip** file (name the file with your login ID, e.g., **e1234567.zip**) containing the following:

- Brief report (**page limit: 2 pages**) in **pdf** format (please do NOT submit Word documents!), clearly outlining the method used.
- A **results.csv** file containing your results. The file should have 2 columns, with the first column being **time**, and the next column being forecasted relative blood **platelet** level. The file should only contain forecasted relative blood platelet level from time 0 to 10 months in steps of 0.5 months.
- Well-commented runnable code yielding your results. Running this code should create an identical **results.csv** file as your submission. You should include a **README.txt** file with instructions on how to run your code.

Caution

All filenames and format of the `results.csv` must be exactly as described above. If the file format is different, the file may not be considered for grading.