Names/ Usernames
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(a) A screenshot of the main page of the project showing all uploaded files.

MAE 384 Group Project

This github repository is for Matlab code which models the spraed of disease using the SIR model. This stands for Susceptible-Infected-Recovered which is used for many modern day epidemics. The goal of this code is to automously project the amount of people affected using transmission rates, recovery rates, total population, number of infected people,and number of people who are susceptible over time

Part 1

This MATLAB code simulates the spread of infectious diseases using the SIR (Susceptible-Infected-Recovered) model. The code generates plots the time evolution of the susceptible, infected, and recovered populations for each disease showing how the populations evolve over a period of 100 days. This code models different diseases by varying the parameters β: Transmission rate (rate at which individuals get infected) and γ: Recovery rate (rate at which infected individuals recover). It also implements Runge-Kutta 4th-order method to solve the SIR equations numerically.

Mathematical model that is described by the equations below

The Susceptible-Infected-Recovered (SIR model) describes the dynamics of a population divided into three compartments: $\mathbf{S}$ (susceptible), $\mathbf{I}$ (infected), and $\mathbf{R}$ (recovered). The system of differential equations governing this model is:

$$\frac{dS(t)}{dt} = -\frac{\beta}{N}S(t)I(t) \tag{1}$$

$$\frac{dI(t)}{dt} = \frac{\beta}{N}S(t)I(t) - \gamma I(t) \tag{2}$$

$$\frac{dR(t)}{dt} = \gamma I(t) \tag{3}$$

Where:

1. $S(t)$ is the number of susceptible individuals at time t,
2. $I(t)$ is the number of infected individuals at time t,
3. $R(t)$ is the number of recovered individuals at time t,
4. $N = S(t) + I(t) + R(t)$ is the total population (assumed constant),
5. β is the transmission rate (how often a susceptible individual gets infected),
6. γ is the recovery rate (how often an infected individual recovers).

Code Workflow for part 1: Initialization: Defines the total population ($N=1000$). Sets initial conditions ($S0=990, I0=10, R0=0$). Defines the parameters (β, γ) for the three diseases.

Numerical Solver: Implements the 4th-order Runge-Kutta method to solve the SIR equations iteratively over 100 days.

Visualization: Generates a plot for each disease showing the time evolution of $S(t), I(t)$, and $R(t)$.

Part 2

This section of the code used quadratic interpolation to provide smaller errors compared to linear interpolation. Quadratic interpolation uses higher orders of polynomials to give a closer approximation. Linear interpolation means

(b) A screenshot showing the content of the README file

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Part 2

This section of the code used quadratic interpolation to provide smaller errors compared to linear interpolation. Quadratic interpolation uses higher orders of polynomials to give a closer approximation. Linear interpolation means the function will be linear between two coarse time steps and it performs better if the function is almost linear as well

Part 3

This part of the code was used to approximate the amount of initially infected individuals using the SIR model with a constant amount of susceptible individuals and the amount of infected at a certain time. This part of the code was also used to help find the transmission rate of a disease based off of the same numbers used to find the individuals who were initially infected

Part 4

Part 4 was done in mostly the same way as part 1 but instead of the transmition rate being constant a function handle was used to find and used the transmition value for each time the loop was ran. Part 4 also included MATLABS fft function to plot the spectrum. The fft (Fast Fourier Transofrm) function converts discrete signals from the time domain to the frequency domain and provides information about the frequency content, phase, and other properties of the signal.

(c) A screenshot of "Insights/Contributors", showing the contribution activity of all members of the group. Additionally, for each contributor, click on "commits" and include screenshots of detailed history of contributions for each member of the group.
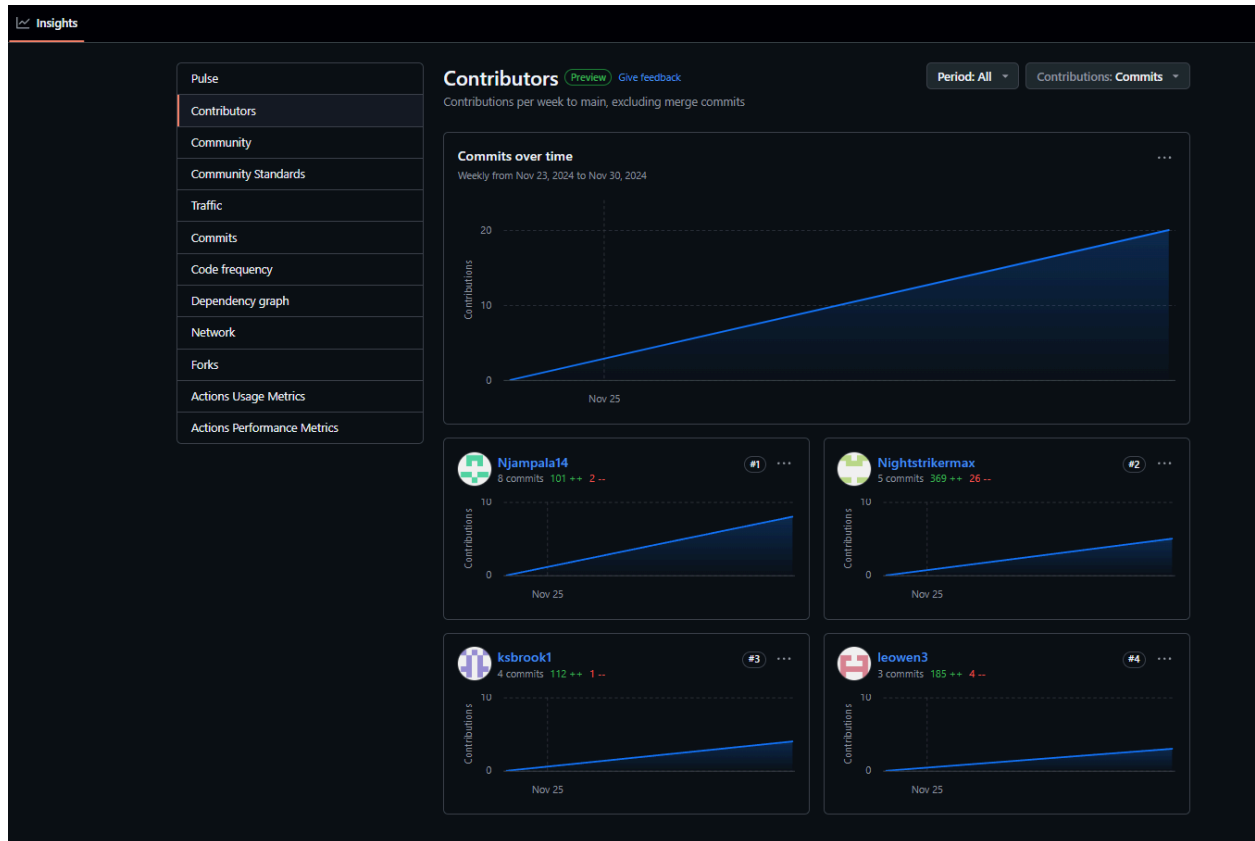
Commits

All users ▾   All time ▾

◦ Commits on Dec 6, 2024

pdf of matlab code and its outputs
Nightstrikermax authored 2 minutes ago
Verified   c744c20 〈〉

Update README.md
Njampala14 authored 4 minutes ago
Verified   55dc5d3 〈〉

Update README.md
ksbrook1 authored 5 minutes ago
Verified   0e2b9bc 〈〉

Update README.md
Nightstrikermax authored 15 minutes ago
Verified   6b2a505 〈〉

Update README.md
Njampala14 authored 16 minutes ago
Verified   6ff6f04 〈〉

Update README.md
Njampala14 authored 18 minutes ago
Verified   b4861bd 〈〉

Update README.md
Njampala14 authored 19 minutes ago
Verified   b8c3061 〈〉

Update README.md
leowen3 authored 20 minutes ago
Verified   46a3997 〈〉

Update README.md
Njampala14 authored 21 minutes ago
Verified   75e4847 〈〉

Update README.md
Njampala14 authored 25 minutes ago
Verified   2544016 〈〉

Update README.md
Njampala14 authored 27 minutes ago
Verified   ac20887 〈〉

Update README.md
Nightstrikermax authored 28 minutes ago
Verified   e6ae63f 〈〉

Add files via upload
Njampala14 authored 39 minutes ago
Verified   e34eeec 〈〉

full code with all parts/problems ⋯
Nightstrikermax authored 44 minutes ago
Verified   e83ef32 〈〉

◦ Commits on Dec 5, 2024

Add files via upload
ksbrook1 authored yesterday
Verified   8b9ca2d 〈〉

Delete mae384_project.pdf
ksbrook1 authored yesterday
Verified   3278811 〈〉

Add files via upload
ksbrook1 authored yesterday
Verified   ea7a67a 〈〉

Add files via upload
leowen3 authored yesterday
Verified   14b66c3 〈〉

Merge pull request #1 from Nightstrikermax/part-4 ⋯
leowen3 authored yesterday
Verified   a799336 〈〉

Add files via upload
leowen3 authored yesterday
Verified   68812f3 〈〉

◦ Commits on Dec 4, 2024

Initial commit
Nightstrikermax committed 2 days ago
57f9451 〈〉