Viral Agent-Based Model Interface

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Introduction

Agent-based models (ABMs) are widely used to simulate infectious disease spread, but many research systems lack user-friendly interfaces.

At TCU, a CUDA-based viral ABM required users to:

- Manually edit parameters in code
- Recompile and rerun simulations
- Interpret raw outputs

This resulted in:

- Slow experimentation
- Increased user error
- Limited accessibility

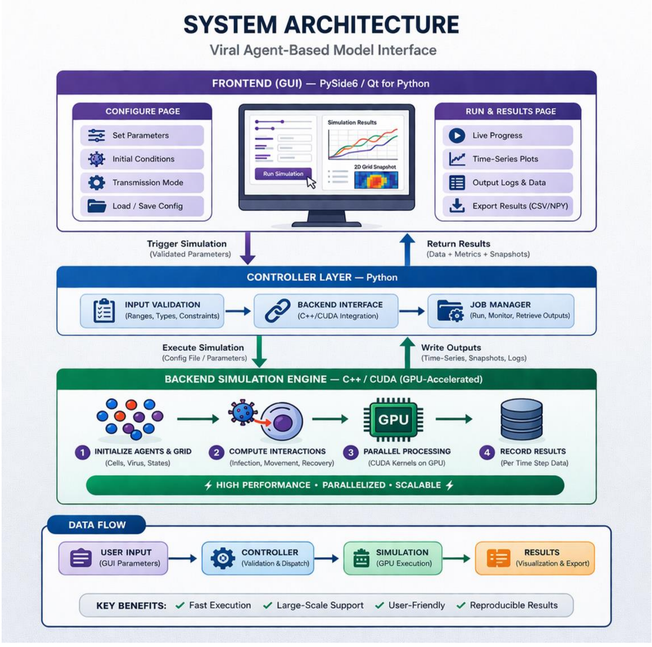
Motivation:

An intuitive interface is needed to streamline simulation setup and analysis.

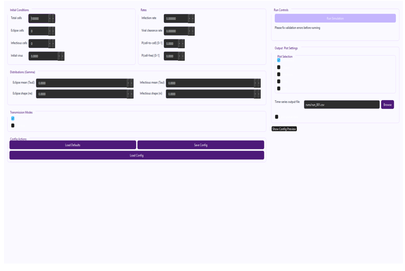
Project Objectives

This project aimed to enhance the usability and accessibility of a viral agent-based simulation platform by:

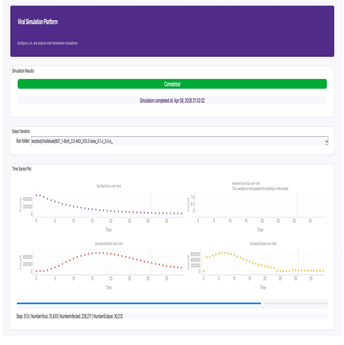
1. Developing a graphical user interface (GUI)
   - Simplifies configuration and execution of simulations
2. Improving codebase structure
   - Refactoring for readability, maintainability, and scalability
3. Enabling visualization and analysis
   - Generate plots and exportable data outputs
4. Reducing user error through validation
   - Prevent invalid parameter configurations



Graphical User Interface

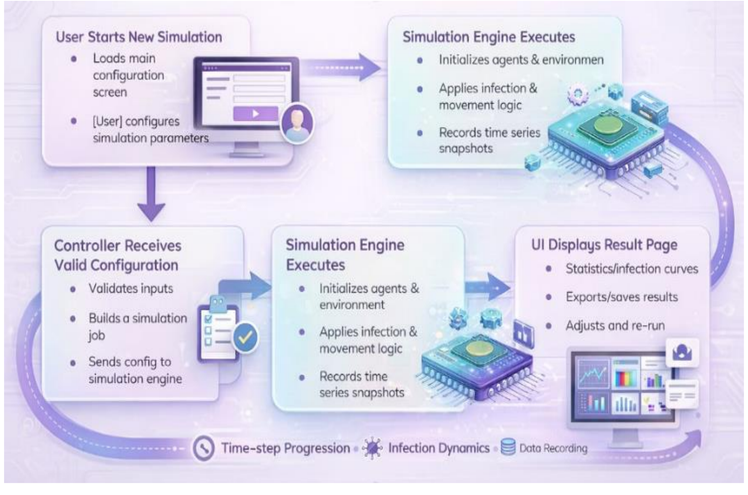


Configuration Page



Post-Simulation Page

Workflow Diagram



Impact & Conclusion

The developed interface improves the usability of the viral agent-based model by:

- Removing manual code modification
- Enabling rapid experimentation and iteration
- Reducing user error through validation
- Providing clear result visualization
- Improving accessibility for students and researchers

Conclusion

Integrating a user-friendly GUI with a high-performance backend enhances efficiency, usability, and accessibility in computational epidemiology workflows.