Epidemic Engine Cloud-based API: Bridging Epidemic Simulators (GLEAM) with AI Algorithms

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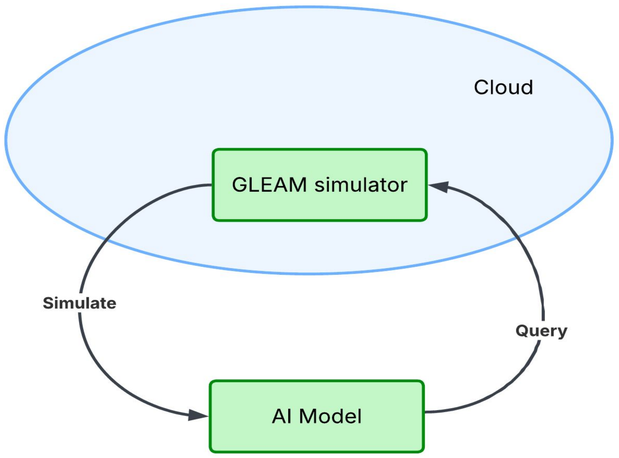
Background

Epidemic simulators model disease spread, but are computationally intensive.

AI surrogate models significantly reduce simulation time from weeks to days. However, current AI models rely on pre-simulated data, which is **costly to store and lacks adaptability** to evolving disease dynamics.

Research Goal

To develop an **Epidemic Engine Cloud-based API service** for real-time epidemic simulation framework that integrates traditional epidemic models with AI surrogate model acceleration.



Methodology: Model

GLEAM Model Integration:

Spatial, stochastic epidemic simulation uses real-world population and mobility data to generate high-fidelity data for training surrogate model.

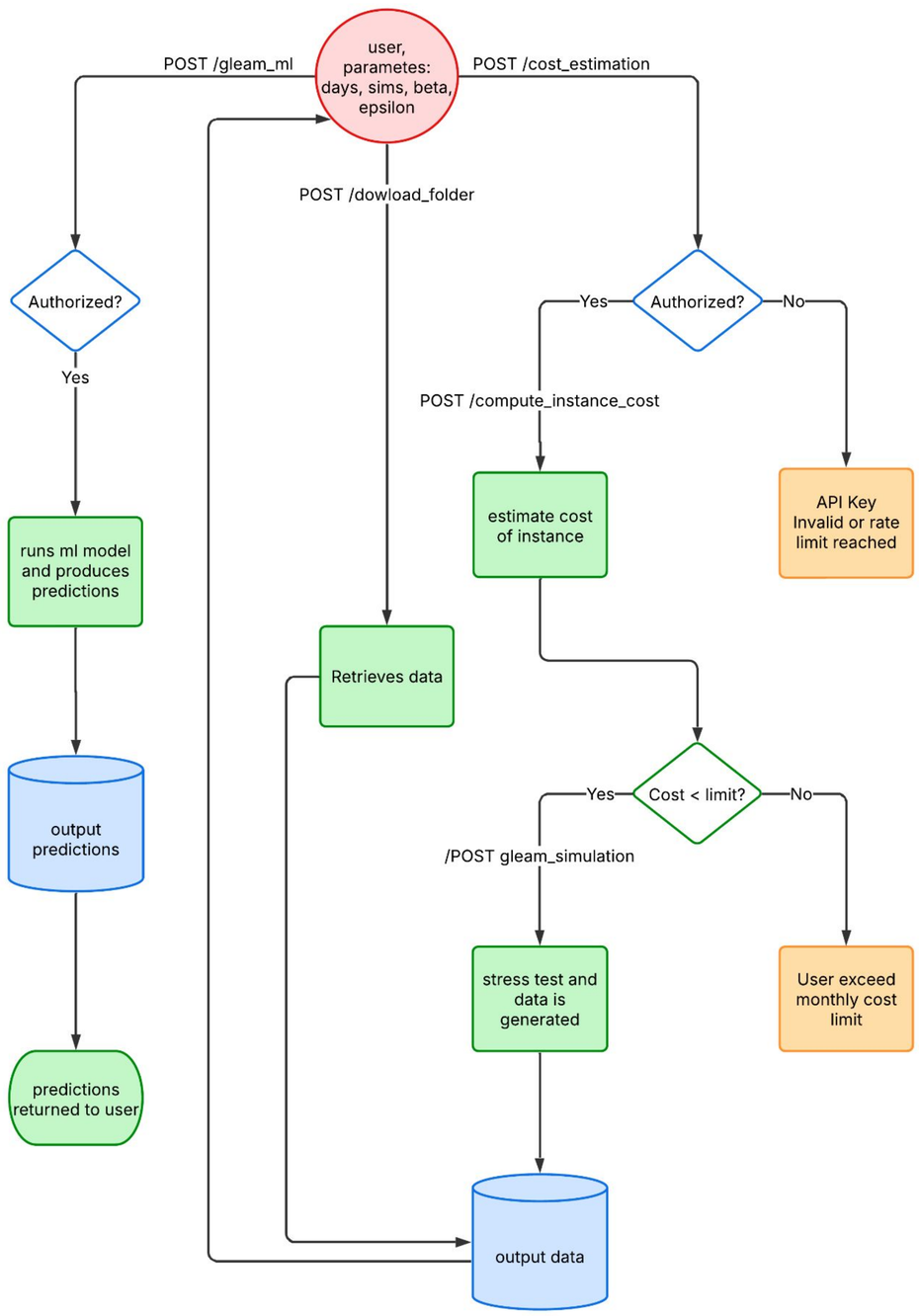
Bayesian Active Learning (BAL):

Uses latent information gain (LIG) function to select relevant data, enhancing model performance with fewer data points.

AI Surrogate Model:

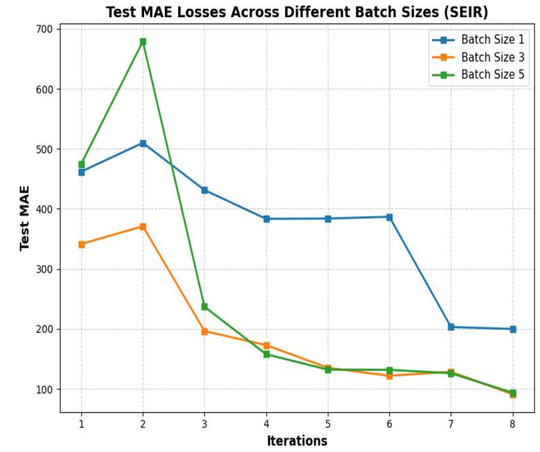
AI surrogate model uses BAL to optimize the amount of data needed to train down to 30% of data while achieving the same performance.

API Architecture Program

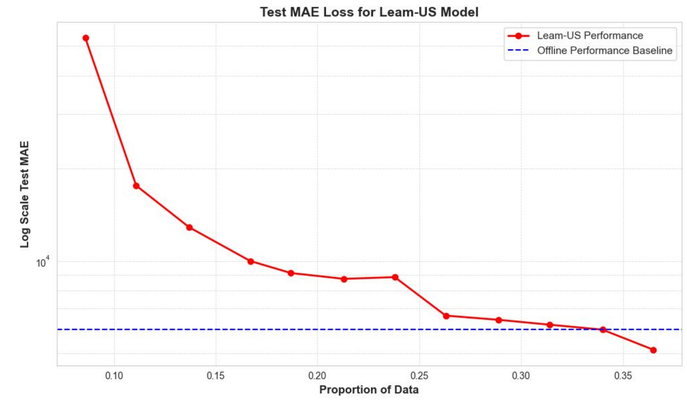


Results

SEIR training batch size experiment: Used greedy batch selection



Performance comparison between Leam-US and offline



Conclusion

Our API seamlessly integrates AI surrogate models with the GLEAM simulator, facilitating real-time epidemic forecasting. By employing Bayesian Active Learning, the model significantly reduces computational costs while preserving high accuracy.

References & QR Code

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