Data Analysis

Sports Analytics

Create a predictive model that uses historical data to forecast player or team performance in various sports, helping in making informed decisions.

Analysis of Traffic Patterns

Analyze traffic data using statistical techniques to identify congestion patterns, optimize traffic flow, and improve urban transportation systems.

Predicting Equipment Failures

Apply survival analysis techniques to predict equipment failures based on historical maintenance records, helping with proactive maintenance planning.

Predictive Maintenance for Industrial Machinery

Use statistical models to predict maintenance needs and prevent machinery failures, optimizing production processes.

Simulation

Data-structure performance:

Study the performance of one or more selected data-structures when operations on the data struct and/or operation inputs are sampled from specific distributions. Example might be to insert values into a hashtable with a frequency that follows a geometric diustribution then query for the existence of a value in the hashtable where the value in question is sampled from the normal distribution.

Gameplay Analysis

Implement a simple game with some input parameters such as number of players or other starting conditions. Simulate a large number of games for each parameter and analyze how change of parameters effect the game outcomes.

Optimization of Supply Chain Management

Utilize statistical modeling and optimization techniques to optimize supply chain operations, including inventory management, transportation, and demand forecasting.

Web server allocation policies:

Simulate web server allocation policies that take into consideration Quality of Service.

Disease transmission in an artificial society model

Study disease transmission in the artificial society. Each agent has an immune system, baby agents inherent their immune system from their parents, there is a fixed "pool" of diseases that circulate within the artificial society, diseases are spread when the agents are in close contact, etc. When compared to a disease-free society, what is the impact of disease on the agent population?

Investigate the effects of landscape in an artificial society model

Within the context of the artificial society model presented in class, study the effects of the landscape (including boundary conditions, resource distributions, discontinuities, and overall shape) on carrying capacity for a model with reproducing agents.

Trade in an artificial society model

Extend the landscape model to include a 2nd resource, then study "trade" (economic interaction) within the society. That is, agents that have lots of one resource but little of the other will engage in trade with other agents that have an opposite distribution of resource wealth. What is the steady-state "price" at which this trade occur?

More simulation ideas:

https://www.cs.wm.edu/~andreas/umsa/projects.html