



# **MAT277 - Probability & Stochastic Processes**

*Winter 23'*

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## **S3 : Use Of Mathematics & Implementation Plan**

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Using the MDP (Markov Decision Process) and minimal spanning tree, train rescheduling can be mathematically modeled using a number of mathematical concepts and methods, including:

1. **Graph theory:** To determine the shortest route between nodes, the minimal spanning tree approach makes use of graph theory.
2. **Linear algebra:** In most cases, matrix multiplication, eigenvectors, and eigenvalues are used to solve the matrices that describe the MDP.
3. **Theory of probabilities:** The MDP is a stochastic process that takes into account the probabilities of various states and actions. These probabilities are computed using probability theory, and the best course of action is determined.
4. **Game theory:** In some circumstances, it is possible to depict the train rescheduling issue as a contest between the railway operator and the passengers. The best solution is determined by using game theory to evaluate the strategic interactions between the various parties. The Multi-agent model uses numerous agents which strongly depend on the behaviour of agents, some external events and also on the present state.