MG 225 Aug 3:0

Decision Models

Instructor

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Department: Management Studies

Course Time: Mon, Wed, 9-10:30 AM

Lecture venue: Management Studies Class room 2

Detailed Course Page:

Announcements

Brief description of the course

This course deals with various useful operations research and machine learning modelling techniques like discrete event simulation, multi-objective optimisation and goal programming, artificial neural network, support vector machines, and data envelopment analysis. The objective is to introduce the students to these methods which can then be pursued later in future specialised courses.

Prerequisites

Probability and Statistics, Linear Programming

Syllabus

Module 1 - Discrete event simulation

Introduction to mechanism of Discrete Event Simulation

Model Validation and verification

Input modelling- fitting a theoretical distribution to a given data set

Random number generators

Random variate generators- inversion, convolution, acceptance/rejection

Output analysis - Steady state vs terminating simulation, comparing system outputs

Modelling - Introduction to SimPy simulation models

Module 2 - Multi-objective optimisation

Pareto optimality set

Methods of estimating pareto optimal sets

Evolutionary algorithms for efficient frontier

Goal programming

Module 3 - Artificial neural networks

Neural model

Perceptron learning rule

Backpropagation algorithm

Possible modification to backpropagation algorithm

Module 4 - Support vector machine

VC dimension

Structural risk minimisation

SVM - primal and dual formulations

Soft boundary SVM

Kernels

Module 5 - Data envelopment analysis

Relative efficiency, technical efficiency and mix efficiency

Constant returns to scale CCR model (primal and dual)

Variable returns to scale BCC model (primal and dual)

Additive models and translation invariance

Course outcomes

After taking this course a student should be able to

1. Build a discrete event simulation model in simply and perform statistical analysis to compare the outputs

2. Perform steady state and transient simulation output analysis

3. Understand the notion of pareto optimality

4. Develop method for estimating the efficient frontier

5. Build ANN and SVM models for classification problems

6. Develop DEA models for study the relative efficiencies of DMU's

Grading policy

Mid-term exam 25%

Final exam 25%

Assignments and project 50%

Assignments

Resources