Graduate Methodologies in Cognition, Mathematics and Information S1

Course description and aims
The theme of this course is “Decision Making Models.” This course deals with mathematical methods for modeling and analyzing competitive or social decision making situations through discussion, group work, lectures and working on exercise problems. Specifically, this course gives definitions, examples and analysis methods of “games in normal form,” “games in extensive form,” “option form,” “graph models,” “simple games,” “games in characteristic function form,” and “committees.” These are mathematical models for describing and analyzing decision making situations, which the students are expected to understand upon completion of this course.

This course aims to cultivate the students’ abilities to:
- select an appropriate mathematical model for describing and analyzing a focal decision making situation;
- describe a real-world decision making situation by a mathematical model;
- analyze the mathematical model and draw some insights on the situation from the results of the mathematical analysis; and
- convey the mathematical analysis results to others concisely.

Three Reports and a Poster Presentation
Students are required to submit three reports:
1. Background Report:
   On the background and the detail of a real-world decision making situation;
2. Model Report:
   On the model of the situation;
3. Analysis Report:
   On the analysis of the situation.

Also, they are required to give a poster presentation based on these reports at the end of the term.

Evaluation
Evaluation will be based on:
1. Three reports (20% each);
2. Three reports (10% each; 30% total);
3. Poster (20%); and
4. Presentation (20%)

Schedule and Class room
Every Friday, 10:45-12:15, Room W9-707
Class 1 : Guidance
Class 2 : Games in normal form: Definition, Dominant strategy equilibrium and Nash equilibrium
Class 3 : Games in extensive form (1): Definition
Class 4 : Games in extensive form (2): Backward induction and subgame perfect equilibrium
Class 5 : Option form: Definition and Stability concepts
Class 6 : Graph models (1): Definition and Transition time analysis
Class 7 : Simple games and weighted majority games (1): Definition
Class 8 : Simple games and weighted majority games (2): Dictator, veto, unanimity, properness and symmetry
Class 9 : Simple games and weighted majority games (3): Power indices and coalition power comparison
Class 10 : Games in characteristic function form (1): Definition
Class 11 : Games in characteristic function form (2): Core, Shapley value and nucleolus
Class 12 : Committees (1): Definition
Class 13 : Committees (2): Stable alternatives
Class 14 : Presentation (1)
Class 15 : Presentation (2)

Examples of Report Topics
Brexit: An Analysis of Britain’s exit out of the European Union using Game Theory
Analysis for Falsely Accusation on the Train

Instructions

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3. Poster (20%); and
4. Presentation (20%)

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Examples of Report Topics

Evaluation Sheets

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