Game Theory

Game theory is a dynamic field where computer scientists, economists, biologists, and mathematicians collaborate to solve strategic problems. In this course, we will explore the subject using the book *Game Theory Alive!* by Anna Karlin (University of Washington) and Yuval Peres, along with additional topics from *Algorithmic Game Theory* by Tim Roughgarden (Stanford).

Benefits for Students

Game-theoretical thinking focuses on problem-solving where players are assumed to make the best possible decisions in response to any given strategy. This course blends real-world inspired problems with elegant mathematical concepts from Probability, Linear Algebra, Geometry, and Calculus.

- **Strategic thinking:** Students will enhance their ability to make informed strategic choices, a skill applicable to many professional environments.
- **Mathematical connections:** Students will appreciate the interconnection between various branches of mathematics, including Probability, Linear Algebra, Geometry, and Calculus, and apply what they've learned in other courses.
- **Interactive learning:** The lecture will be engaging, with plenty of interactive games to illustrate key concepts.

Topics Covered

The course will be divided into two main sections, drawing from specific chapters of the books by Karlin and Peres and Roughgarden.

1. **Games and Equilibria**
   (Based on Chapters 1, 2, 3, 4, and 7 of *Game Theory Alive!*)

   - Combinatorial games
   - Zero-sum games

2. **Markets**
   (Based on Chapters 1, 2, and 3 of *Algorithmic Game Theory* and Chapters 12 and 14 of *Game Theory Alive!*)

   - Auctions

3. **Other Topics**

   - Evolutionary and correlated equilibria
   - Cooperative games

Prerequisites

Students should have completed a course in Probability Theory and should be proficient in Calculus and Linear Algebra.

Instructor: Adrian Gonzalez Casanova. **Time:** Mondays and Wednesdays 3-4:15 PM