The summary of the game theory course, and the take-away messages.

1: Strategic form game

Mixed strategy, **Best Response Strategy, Nash Equilibrium，Fixed Point，**Example of matrix game, DSE, Correlated Equilibrium

2: LP Duality

**Duality Theorem (various version)**, Farkas’ Lemma

3: Zero-sum game

Saddle Point, **MinMax Theorem**

4: Non-zero sum game

**Bronwer fixed-point theorem, Kakutani fixed-point theorem**

5: Game with infinite many pure strategies

**Rosen’s Theorem**

6: Second price auction and VCG mechanism

Truthful auction, **VCG mechanism**,

7: Bayesian Equilibrium

**First-price auction and its BNE analysis,** Cournot Competition,

8: Revenue-optimal mechanism design (Myerson)

**Myerson Lemma**, IC and IR constraints, Virtual value function.

9: Flow routing game

Pigou’s example, selfish routing, **Wardrop Equilibrium**, Socially optimal routing, **Price of Anarchy (PoA)**, Braess Pardox, General flow routing game, the first-order condition and WE, **PoA for linear latency function**,

10: Potential Game

**Congestion Game**, Potential function (various version)

11: Best expert problem

Regret analysis, **Multiplicative weight algorithm,** Doubling trick,

12: **Online Convex problem**

13: **Blackwell’s Approximation Theorem**

14: Dynamic Programming and zero-sum dynamic game

15: Robust Estimation

16: **Extensive-form game**

17: multi-stage game with observed actions

More topics:

The last homework:

P0: Please state the Hierarchy of Equilibrium Concepts

P1: What is the Tragedy of the commons? What is the Price of Stability, and the difference to the PoA?

P2: Please briefly state the history of Online Ad Auction. What is the GSP, and its equilibrium results?

P4: What is the fictitious play dynamic?

P5: What is the cooperative game, Shapely value and core?