

# Game Theoretical Methodology and Technique for Internet Protocols

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# Self Study Requirement

- Become an Expert in the Subject of One Lecture
- Criteria:
  - Basic: understand all the proofs and ready to help other students to prepare for the midterm/final exam (4%)
  - Middle level: Acquire an appropriate dataset for big data analysis (input size  $<$  memory space  $<$  output database size  $<$  harddisk space, 3%)
  - Advanced: Understand one interesting new method and prepare a ppt file for next year students (2%)
  - Excellency: Propose/implement an appropriate algorithm or solve a problem at research frontier (1%)

# Assignments: submit answers to a total of 5 of them on Next Monday

Your final grade depends on the final average. We calculate the average

- Consider a market  $n$  sellers and one buyer. Design an auction for the buyer's auction market. Prove your auction is correct or not.
- Consider an auctioneer who decides the auction outcome according to the average of the bids. The winner is the person who bids the closest to the average and pays its own bid. Prove this auction protocol is truthful or not.
- Give a real example where the above auction is conducted, with proper documentation.

# Assignments II

- Competing auctions: Consider two sellers and  $n$  buyers. Each seller has one item to sell and each buyer wants to buy one item. The selling items are identical. That is, each buyer has the same private value  $v_i$  for the items. Assume that the two sellers each set up a 2-nd price auction market. The two auctions are conducted at the same time. Each buyer would go to one auction only. What would be the outcomes of the two auctions? Do the buyers have an equilibrium in terms of their choices of auction to participate? Would these two auction both be truthful?
- Find a Nash equilibrium for each of the five 2-personal games given in the lecture.

- Consider the following game between the three players A,B,C.
  - Each has a choice two strategies I, II.
  - The payment bi-matrix of A and B is the prisoner's dilemma.
  - The payment bi-matrix of B and C is the game of Chicken.
  - The payment b-matrix of C and A is the battle of sexes.

Find a Nash equilibrium according to the sum of values one gets.

- Find a freeware software for finding a Nash equilibrium.  
Discuss its merit.