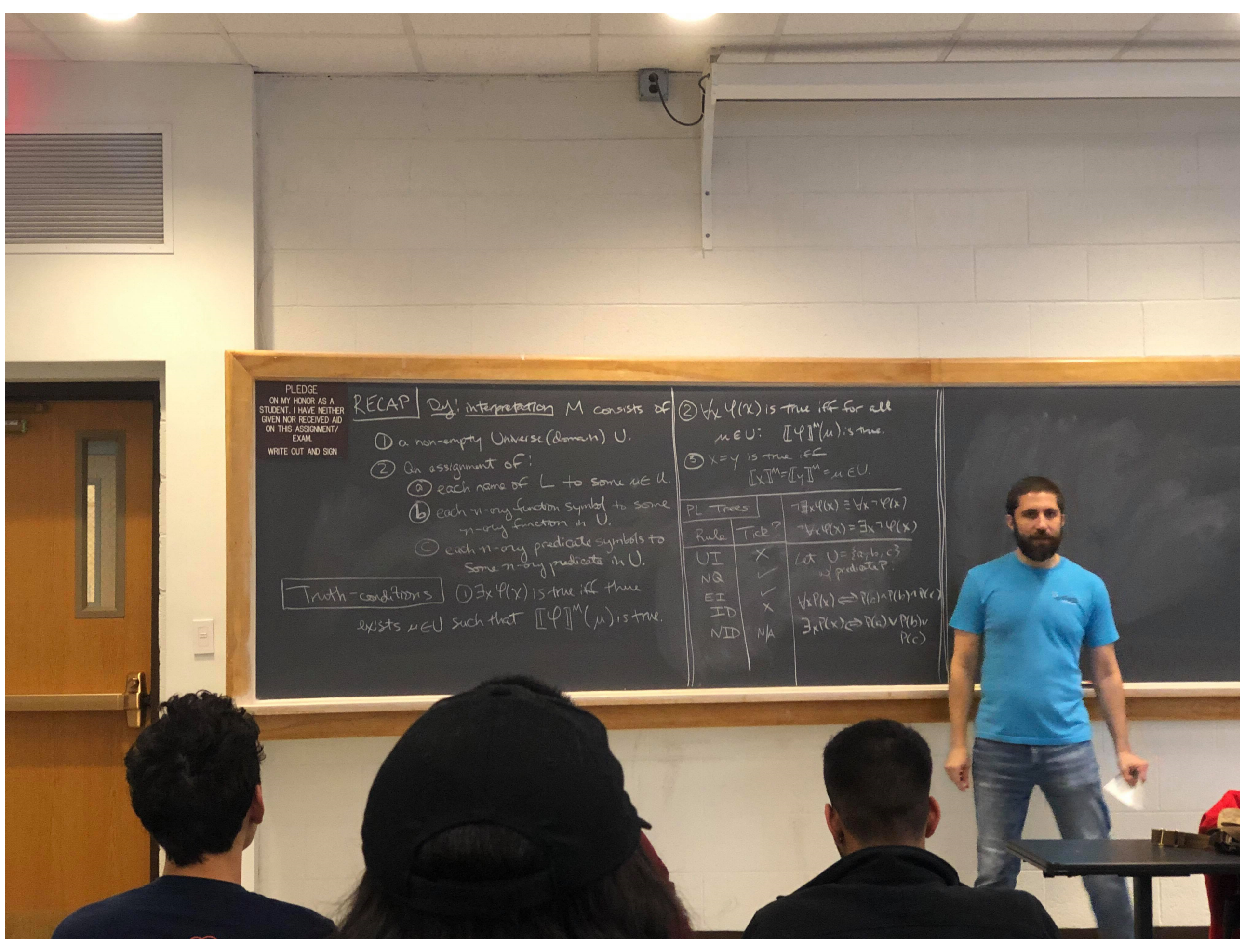
Lecture 11

Friday, February 8, 2019 9:05 AM



intelligence - ability to solve problems with available shortcuts
- airplane (artificial flight): isn't accomplished the same way as flight is, but still has the same overarching function
- another definition: ability to behave rationally

minimalist view on rationality - everything that isn't irrational
- decision theory
- game theory
- parameter learning or statistical learning (sometimes machine learning, but not a great term): involve learning the structure of the decision problem

perfect vs. imperfect information
- perfect - knowing the probability distribution of all the different states
- imperfect - don't know probability distribution; must work backwards (where parameter/statistical learning comes in)

rationality condition - never leaves $ on the table

in game theory, we look for the best return on utility (value) - taking the most money
- choice matrix: matrix in which **actions/options/prospects** appear in the rows of the table, and columns include the states of the world (omega)
  - the states of the world must be **mutually exclusive** and **exhaustive (fills all of the sample space)**
  - options: pick A, pick B
  - always pick for the greater value - but sometimes there's uncertainty as to the states of the world
  - two types of uncertainty:
    - known -
    - unknown - determined with statistics
- larry wasserman's "all of statistics"
- data grounding mechanism --> probability theory --> distribution/data in the world
- opposite of this problem is statistics: distribution/data in the world --> statistics --> infer mechanism of producing that data

rational expectations
- two components: rational disbelief and rational preferences (or rational preference structures)
  - A < B < C < A, for instance, results in a "money pump" - consecutive loss of money to get back to the same place
- uncertain belief - probability results in a graded disbelief (.75 probable means there's a .25 chance it won't occur, WOW!)
  - definition: function P is a probability function (Kulgorum axioms?) IFF
    1) for event E in omega (sample space), P(E) is within real numbers and P(E) >= 0
    2) P(sample space) = 1
    3) for any recursively enumerable (RE) sequence of disjoint sets (mutually exclusive) E1, E2… satisfies P(union from i=1 to infinity, Ei) = summation of probability of each event, Ei (measuring area within the sample space)
- knowledge!
  - P(empty set) = 0
  - if A is a subset of B, then P(A) <= P(B)
  - probability of A union B = P(A)+P(B)-P(B intersect A)
  - 0 <= P(A) <= 1 for any event A
  - let A^C denote the complement of the set A, P(A^C) = 1-P(A)
  - if (A intersect B) = empty set, then P(A union B) = P(A) + P(B)

definition: partition P of a set S is a grouping of all elements x within S such into non-empty subsets s.t. x is within S* subset S, for exactly one subset

claim: a partitionality function sums to 1 across some partition of omega (sample space).

rational preferences: so what constitutes irrational preferences
- definition: a decision problem consisting of
  - a set of prospects (actions/options) P
  - a set of states of the world omega (sample space) with probabilities that are independent of any action taken
  - outcomes/payoffs for each x in omega x P (cartesian product of states and probabilities)
- probability distributions have nothing to do with each other (A and B are independent, and probability function for A has no reference to B whatsoever)
- for A independent of B, P(A joint B) = P(A)*P(B)

arithmetic model for PC
- define two different constants, 0 and 1, with two different operators + and * for addition and multiplication
- 0 + 0 = 1 + 1 = 0 (ACCEPT IT)
- 0 + 1 = 1 + 0 = 1
- 0 * 0 = 0 *1 = 1 * 0 = 0
- 1 * 1 = 1
- 0 --> false, 1 --> true, + --> or, * --> and
- for V: [| A v B |] = [|not(notA and notB)|] =

see images