CE 107:

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I. Probablity Theory

- Probablitity of an event - Number assigned to the event relfecting the likelihood with which it can occur or has been observed to occur
- A Probablity law for random experient is a rule that assigns the probablity of a certain event follows three conditions
    i. An event A may or may not take place; and it has some likelihood, which is 0 if it never occurs
    ii. Something must occur in our experiment
    iii. If one event negates another, then the likelihood that either occurs is the likelihood that one occurs plus th elikelihood that the other occurrs
- Random Experiment
    a) A random experiment is specified by stating an experimental procedure and a set of measurements and oversations
- Sample Space
    a) Any set of elements can be a sample space
    b) We only require that perfomring our experiment must result in one outcome
    c) We denote sample space by S or Ω
- Events
    a) An event associated with a random experiements corresponds to a proposition
    b) the event occurs if ANY of the outcomes that makes the proposition "true" takes place
    c) So, any event is associated with a subset of the sample space S and can be empty
    d) An impossibly event corrsponds to the empty set 0
- Example
    a) Life of a light bulb
    b) sample space: $S = \{x \epsilon R | x \geqslant 0 |\}$
- Prob Theory
    a) Constists of: Sample SPace, set of events F, probablity mesasure

- Probablity law:

  AI: $0 \leqslant P(A)$

  $A\mathbb{I}$: $P(\Omega) = 1$

  $A\mathbb{I}\mathbb{I}$: if $A \cap N = \oplus$then $P(A \cup B) = P(B) + P(A)$

II. Algebra of Events

   A) Natural Numbers: $[0, \infty)$

   B) Z: $(-\infty, \infty)$

III. SMT

   Contradiction is F

   True is T

IV. $\{\bigcup_{f=1}^{k} A_f\} \bigcap B = \bigcup_{f=1}^{k} (A_f \bigcap B)$

   Base case: let k $=$ 1then $A_1 \bigcap B = A_1 \bigcap B$. we assume that the result is true for $n \geqslant 1$

   We need to show that it also true for n$+$1. using the recursive definition of uncion of sets we have

V. Collorary

   A) Corollary $P(A^c) = 1 - P(A)$ Chance of something NOT happeneing

   B) $P(A) \leqslant 1$

   C) $P(\oslash) = 0$

   D) $P[A \cup B] = P[A] + P[B] - P[A \cap B]$