Lecture 6: September 21, 2016

Lecturer: Nagham Mohammad   *Notes By: Harsh Mistry*

6.1 Probability Rules and Conditional Probability

6.1.1 Relations from Set Theory

- The **Union** of two events A and B ($A \cup B$) is the set consisting of all outcomes that are either in A, in B, or in both events

- The **Intersection** of two events A and B ($A \cap B$) is the set of all outcomes in both A and in B

- The **Complement** of an event A denoted by $\bar{A}, A^c$, is the set of all outcomes that are not contained in A

- The **Empty Event** or the **Null Set** $\varnothing$

  - $\varnothing = \bar{S}$
  - $P(\varnothing) = 0$
  - $P(S) = 1$

6.1.2 De Morgan's Laws

Union and intersection interchange under complementation

- $\overline{A \cup B} = \bar{A} \cap \bar{B}$

- $\overline{A \cap B} = \bar{A} \cup \bar{B}$

More Generally Defined as :

- $\overline{A_1 \cup A_2 \cup \ldots \cup A_k} = \bar{A}_1 \cap \bar{A}_2 \cap \ldots \cap \bar{A}_k$

- $\overline{A_1 \cap A_2 \cap \ldots \cap A_k} = \bar{A}_1 \cup \bar{A}_2 \cup \ldots \cup \bar{A}_k$

6.1.3 Rules for Unions of Events : Addition Law of Probability of the Sum Rule

6.1.3.1 Mutually Exclusive Events

- The Probability of either event happening is the sum of their individual probabilities

- $P(A \cup A_2 \cup \ldots \cup A_k) = P(A_1) + P(A_2) + \ldots + P(A_K)$