AML5103 | Applied Probability and Statistics | Negating Statements

1. Consider the statement $\underbrace{A \Rightarrow B}$, which is the same as $\begin{cases} \text{If } A \text{ then } B, \\ A \text{ implies } B, \\ \text{not } B \Rightarrow \text{ not } A. \end{cases}$

Example: $\underbrace{\text{Monday} \Rightarrow \text{eat pizza}}_{A \Rightarrow B}$, which is the same as $\begin{cases} \text{If } \underbrace{\text{Monday}}_{A} \text{ then } \underbrace{\text{eat pizza}}_{B}, \\ \underbrace{\text{Monday}}_{A} \text{ implies } \underbrace{\text{eat pizza}}_{B}, \\ \text{not } \underbrace{\text{eat pizza}}_{B} \Rightarrow \text{ not } \underbrace{\text{Monday}}_{A}. \end{cases}$

Negation of $\underbrace{A \Rightarrow B}$ is $\underbrace{A \text{ and } \textbf{not } B}$.

Example: $\underbrace{\text{Monday} \Rightarrow \text{eat pizza}}$ gets negated to $\underbrace{\text{Monday and not eat pizza}}$.

2. Now consider the statement for all A, some statement is true about A.

   Example: all students who went to coaching did well on the exam.

   Negation of for all A, some statement is true about A is:

   there is at least one A, such that statement is not true about A.

   Example: all students who went to coaching did well on the exam gets negated to:

   there is at least one student who went to coaching such that they did not do well on the exam.

3. Now consider the statement there is at least one A such that some statement is true about A.

   Example: there is at least one student such that they completed a certification.

   Negation of there is at least one A such that some statement is true about A is:

   for all A, statement is not true about A.

   Example: there is at least one student such that they completed a certification gets negated to:

   for all students, they did not complete a certification.