1. ***Bayes Theorem, the Geometry of Changing Beliefs***

**Intuitive Understanding**

* + Bayes’ theorem is about updating **beliefs (probabilities)** when new evidence is introduced.
  + Instead of discarding prior knowledge, we adjust it step by step.
* **Geometric View**
  + Probabilities are visualized as **areas** within a space.
  + New evidence shrinks or reshapes these areas to reflect updated beliefs.
* **Key Insight**
  + The theorem ensures a **balance between prior beliefs and new data**.
  + Evidence should refine, not completely override, what we already know.
* **Applications**
  + Used widely in statistics, AI, and decision-making where probabilities must be updated continuously.

**2. *Bayes’ Theorem of Probability with Tree Diagrams & Venn Diagrams* Formal Definition**

* + Bayes’ theorem is expressed as:

P(A∣B)=P(B∣A)×P(A)P(B)P(A|B) = \frac{P(B|A) \times P(A)}{P(B)}P(A∣B)=P(B)P(B∣A)×P(A)​

* + This allows us to compute the probability of **A given B** using the reverse conditional probability.
* **Visual Tools**
  + **Tree diagrams** help in breaking probabilities into branches (sequential events).
  + **Venn diagrams** show overlaps between events, making conditional probability more intuitive.
* **Examples & Applications**
  + Medical test results (true positives/false positives).
  + Decision-making under uncertainty.
  + Step-by-step calculations make the concept clear.
* **Key Insight**
  + Bayes’ theorem is powerful when we have **limited or uncertain data** and want to refine estimates logically.