



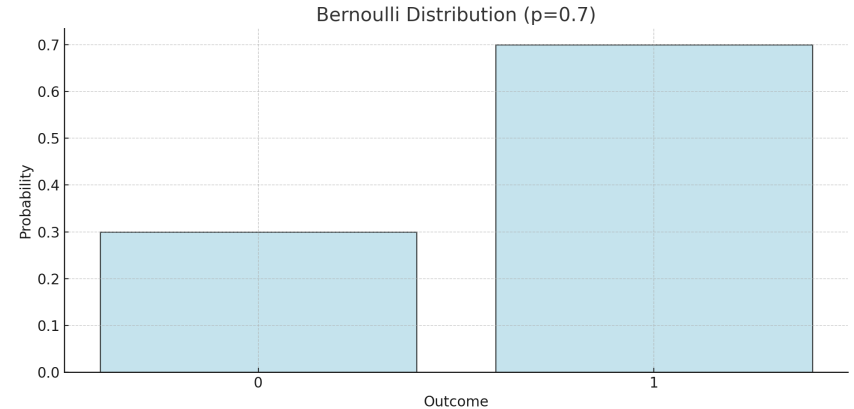
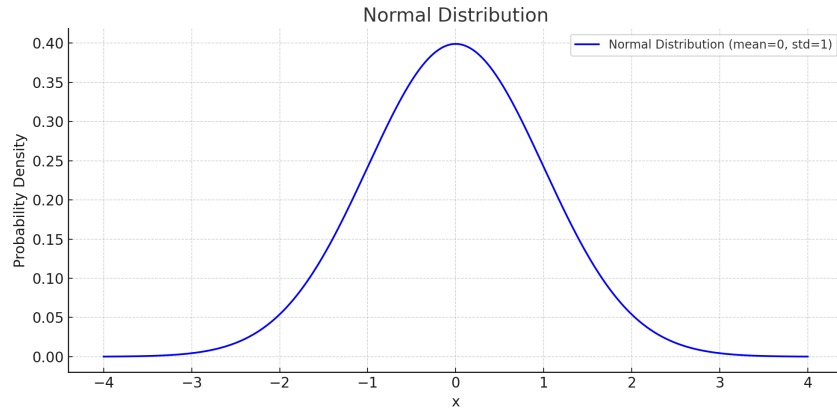
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WHITING SCHOOL
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Algorithms for Data Science

Statistical Algorithms: Mathematical Foundations

Probability Distributions



Mathematical Foundations

Bayes' Theorem:

$$P(A | B) = \frac{P(B | A)P(A)}{P(B)}$$

Expectation:

$$\mathbb{E}[X] = \sum_x xP(x)$$

Maximum Likelihood Estimation:

$$\hat{\theta}_{MLE} = \arg \max_{\theta} P(X | \theta)$$

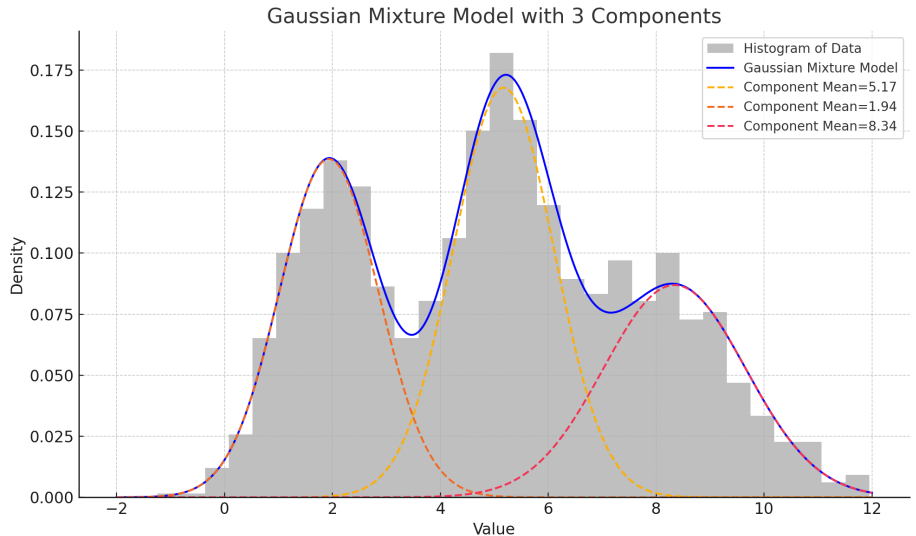
Statistical Inference Foundations

- **Posterior Inference:**

$$P(\theta \mid X) \propto P(X \mid \theta)P(\theta)$$

- **Gaussian Mixture Modeling:**

$$P(X) = \sum_{k=1}^K \pi_k \mathcal{N}(x \mid \mu_k, \Sigma_k)$$





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