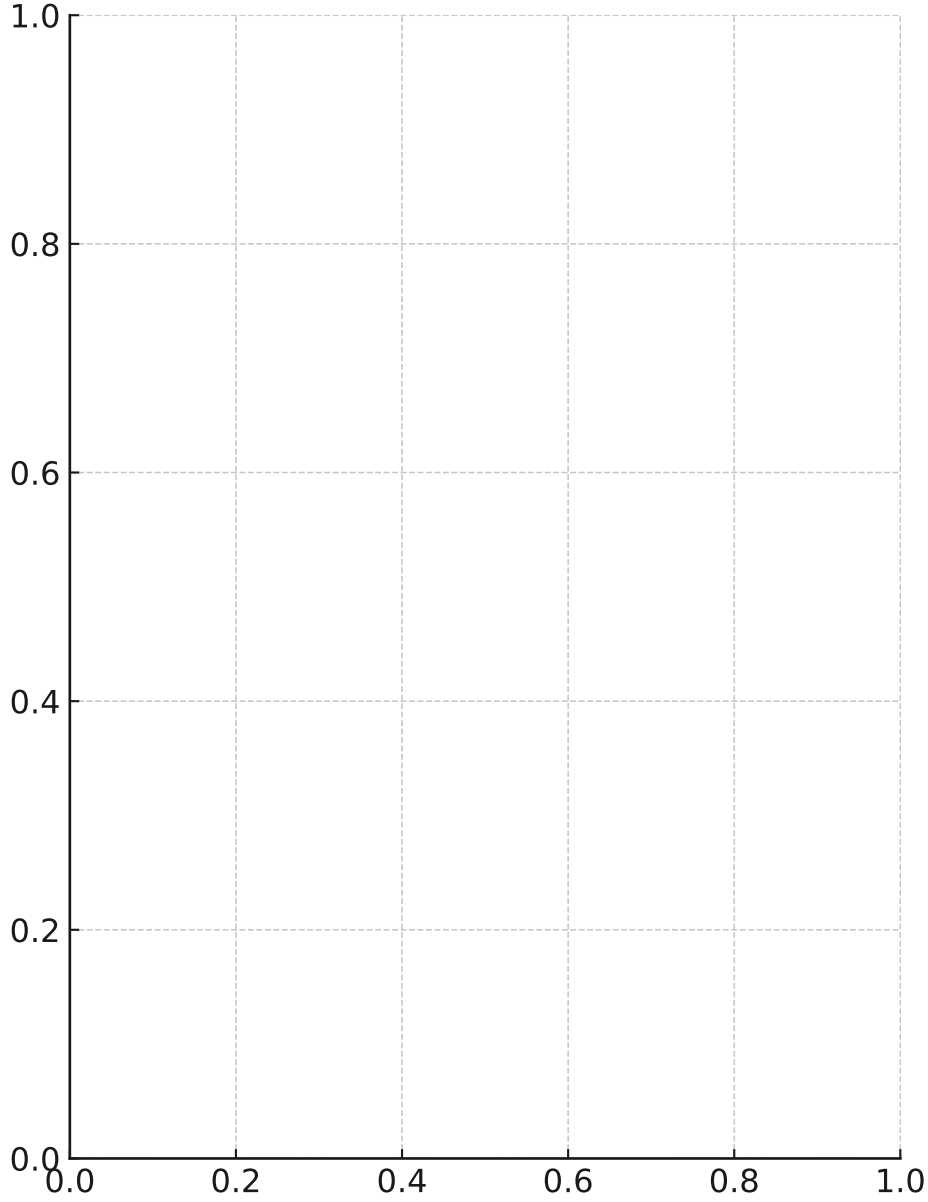
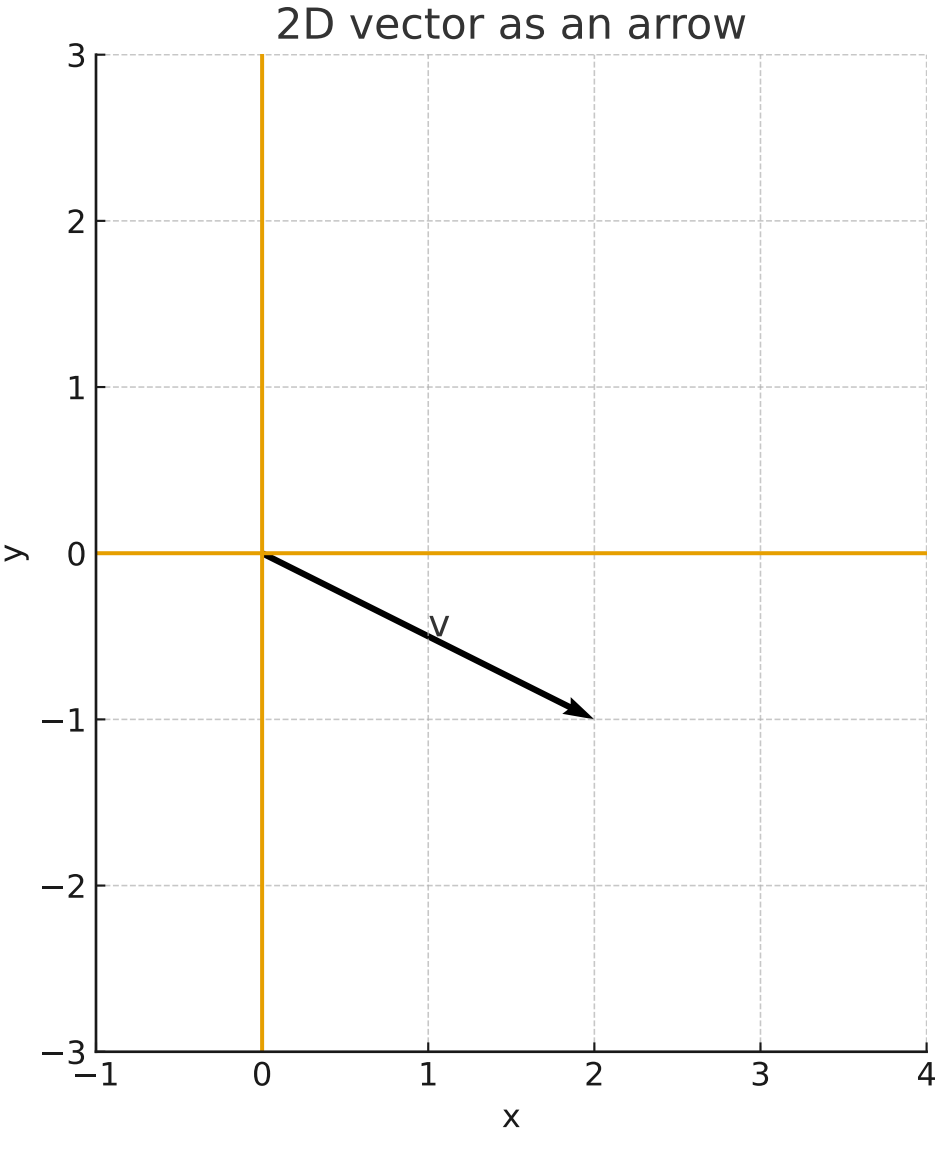
Philomathia — English Visual Deck

- Essentials for Data/AI: concepts + code + visuals
- Student: Rooney • Date: 03 Nov 2025



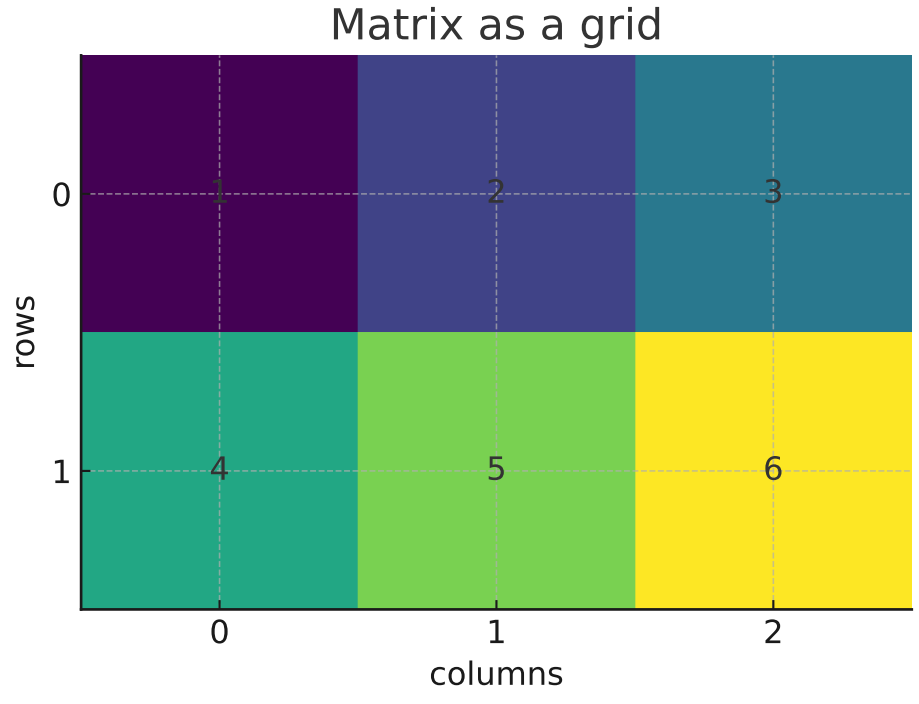
Vector

- Definition: Ordered list of numbers for direction/features.
- Intuition: A 2D arrow; or a product spec vector.



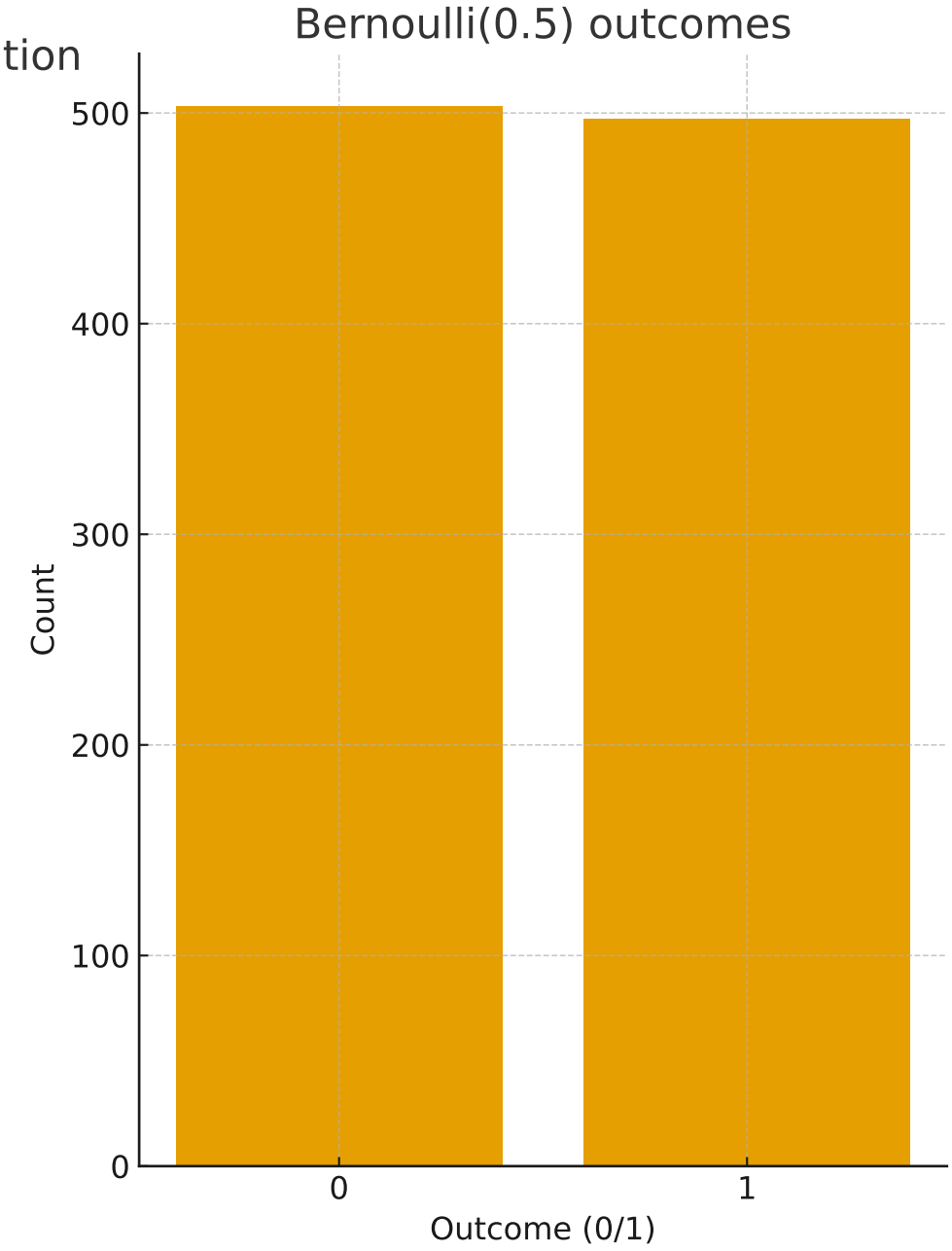
Matrix

- Definition: Rectangular array of numbers (rows × columns).
- Intuition: Spreadsheet or linear transform grid.



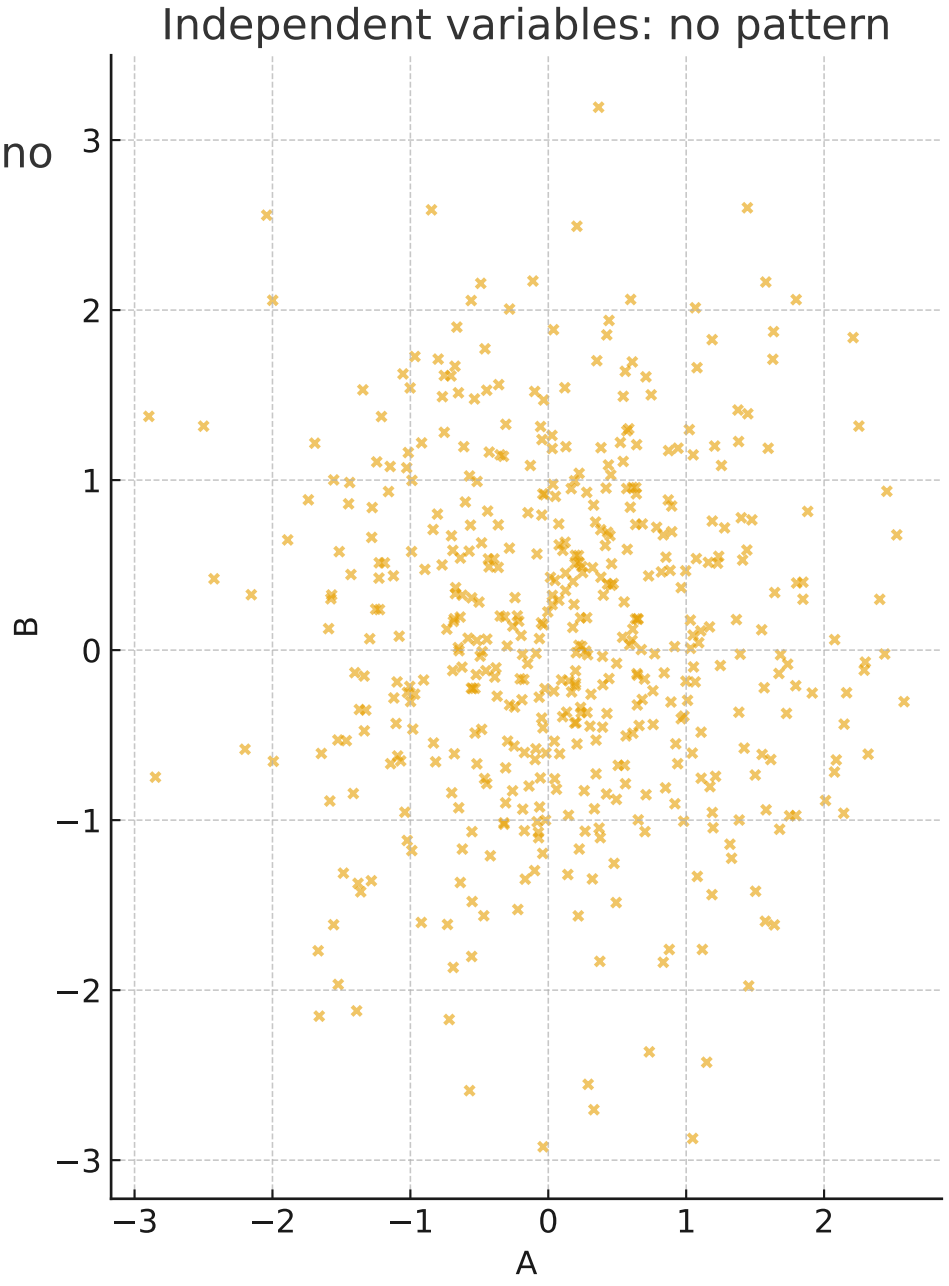
Probability & Distribution

- Definition: 0–1 measure of likelihood; a distribution assigns probabilities.
- Example: Bernoulli(0.5) coin flips.



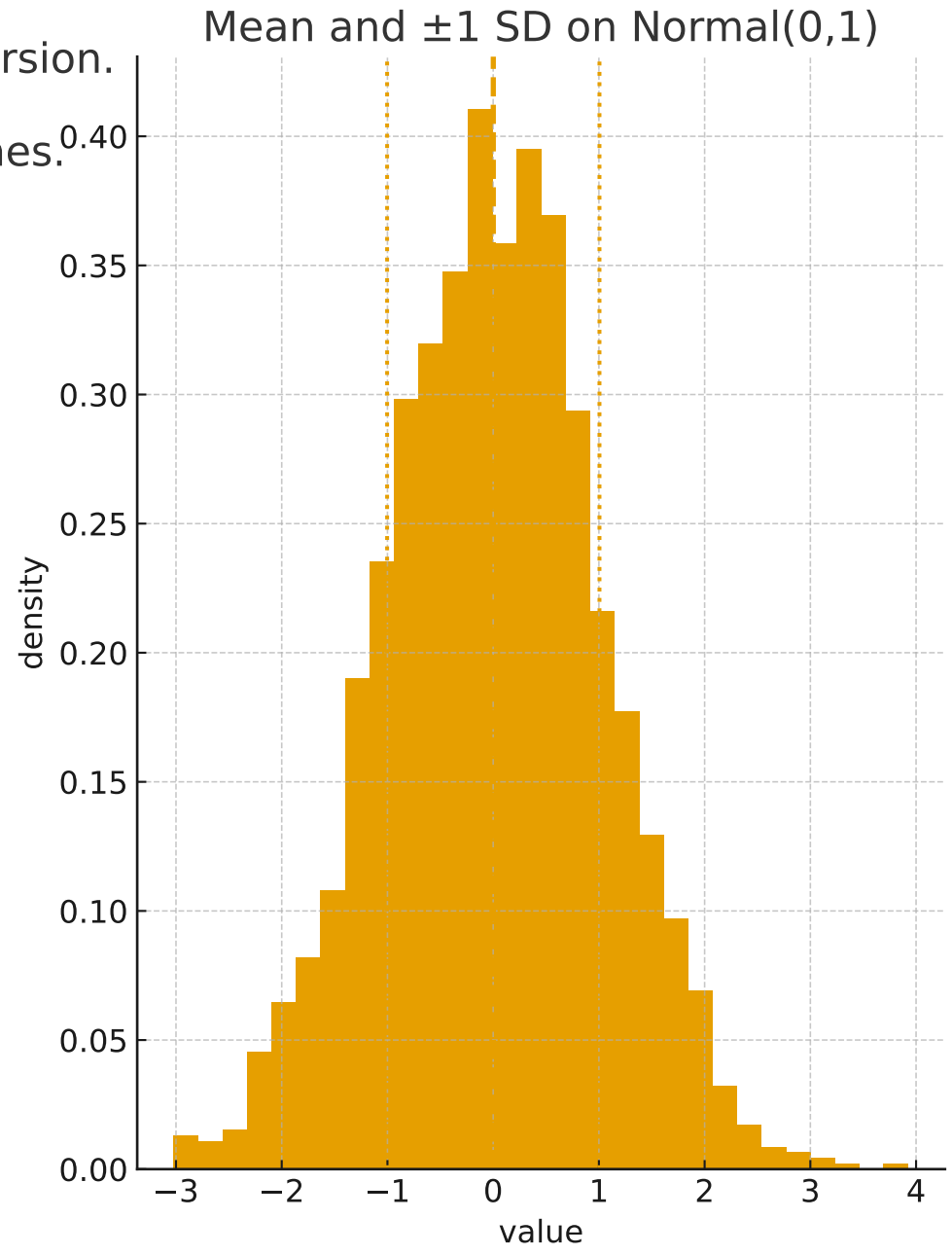
Independence

- Definition: Knowing X doesn't change P(Y).
- Example: Two separate fair coins; scatter shows no pattern.



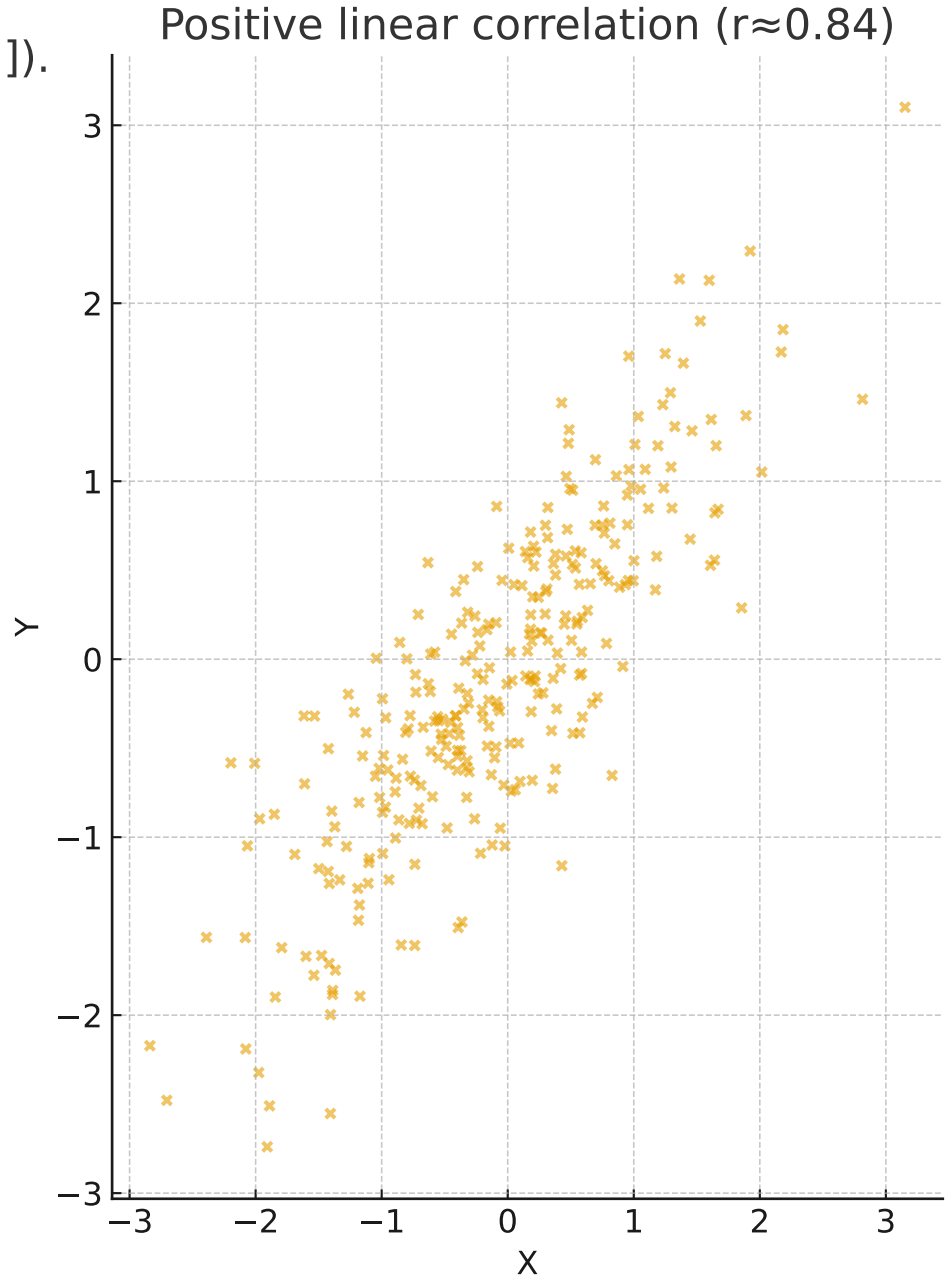
Expectation, Variance, Standard Deviation

- Mean = long-run average; variance/SD = dispersion.
- Example: Normal(0,1) with mean and ±1 SD lines.



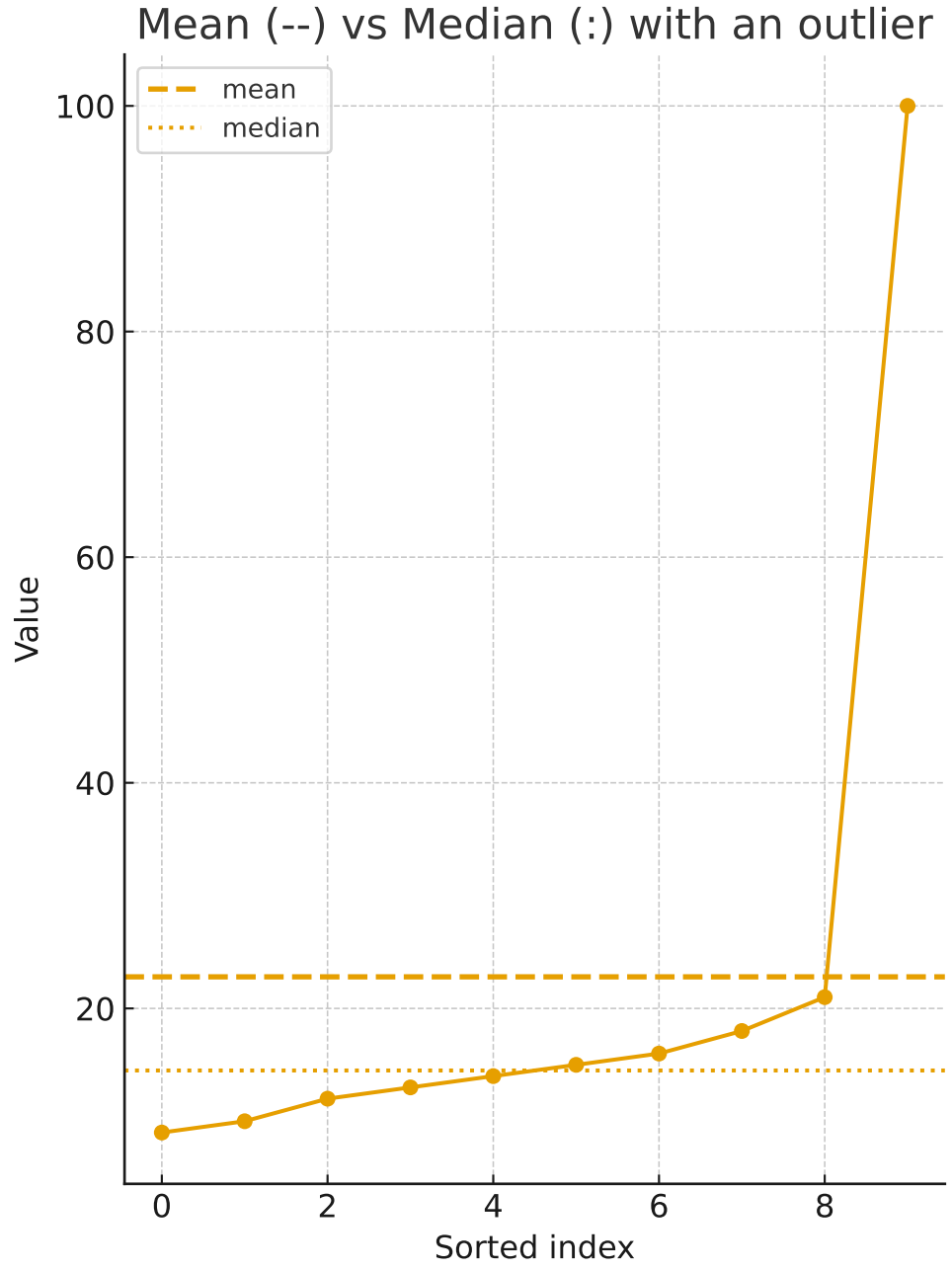
Linear Correlation

- Strength/direction of linear association (r in [-1,1]).
- Example: Y = 0.8·X + noise → positive r.



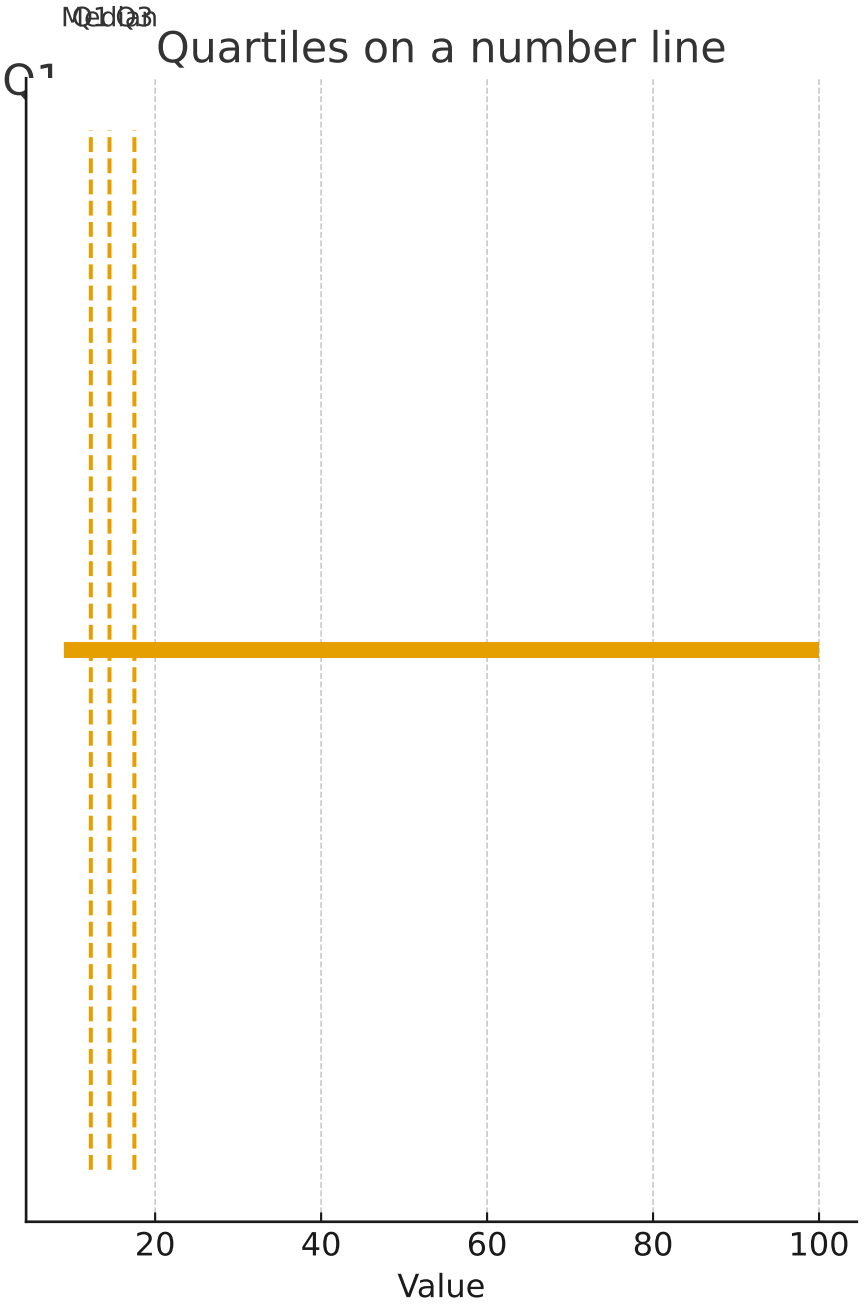
Mean, Median, Max, Min

- Mean is sensitive to outliers; median is robust.
- Min/Max show observed extremes.



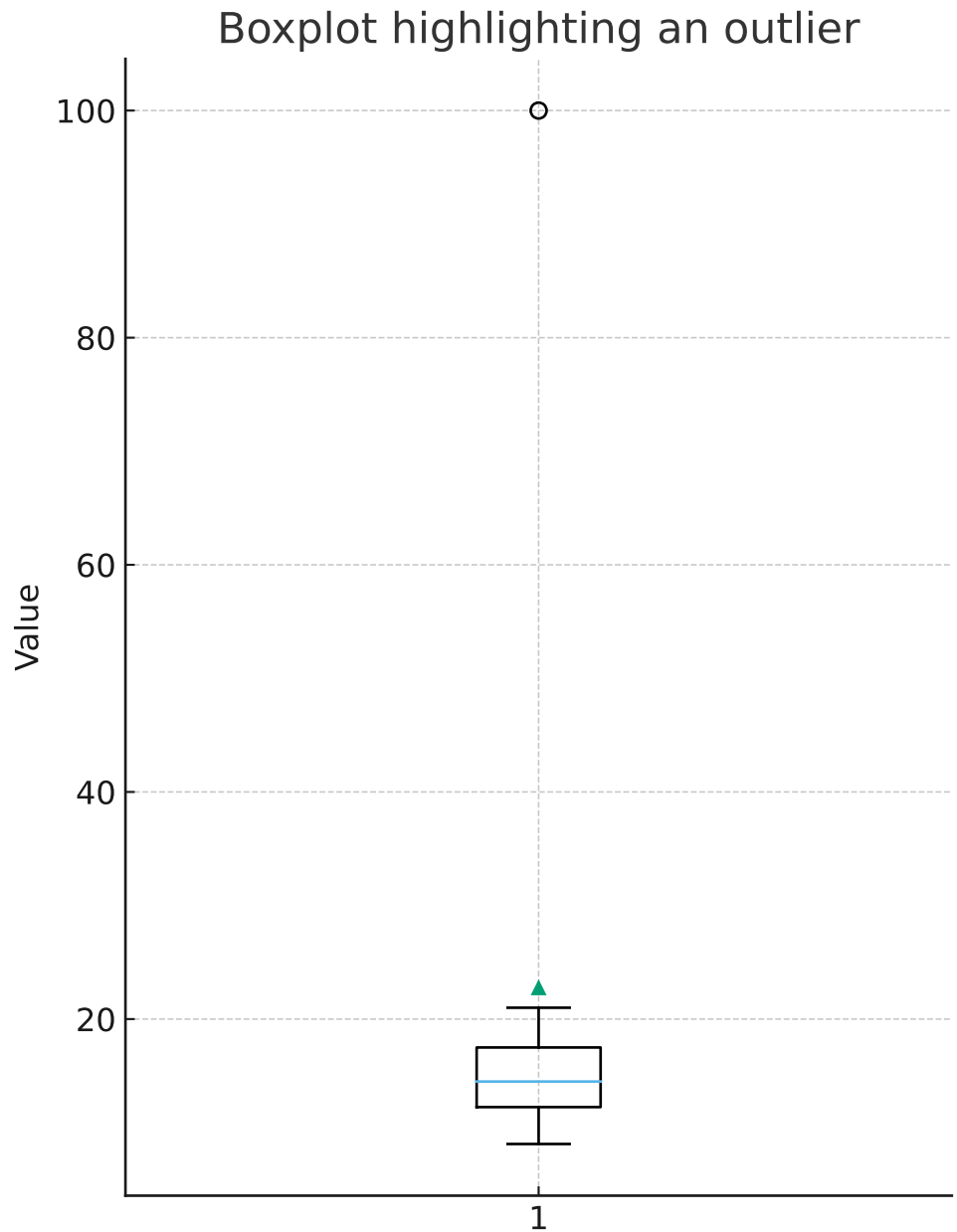
Quartiles

- Q1 (25%), Q2=median (50%), Q3 (75%); IQR = Q3 - Q1
- Central spread ignoring extremes.



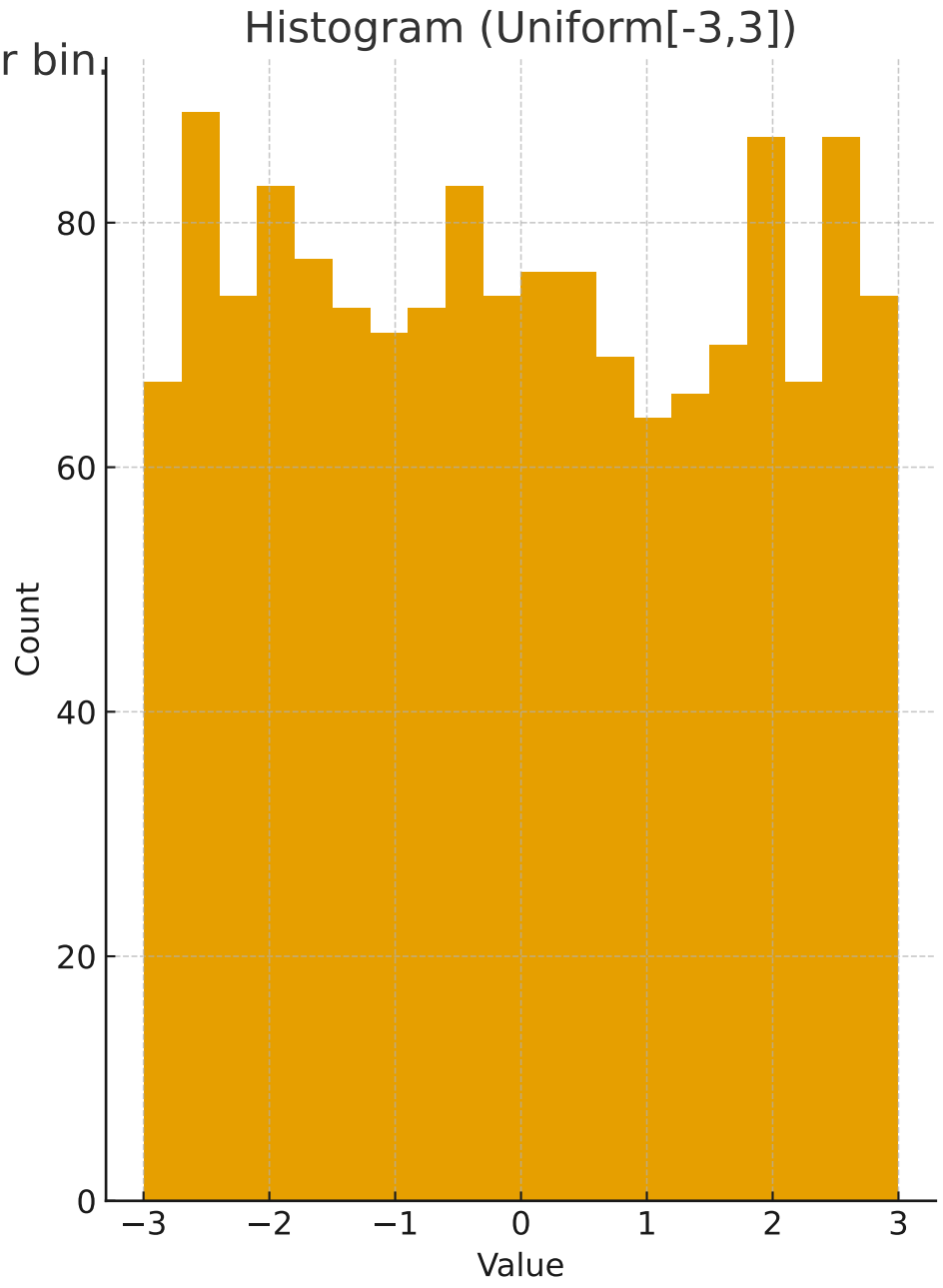
Boxplot

- Summarizes median, Q1–Q3, whiskers, outliers.
- Fast distribution overview.



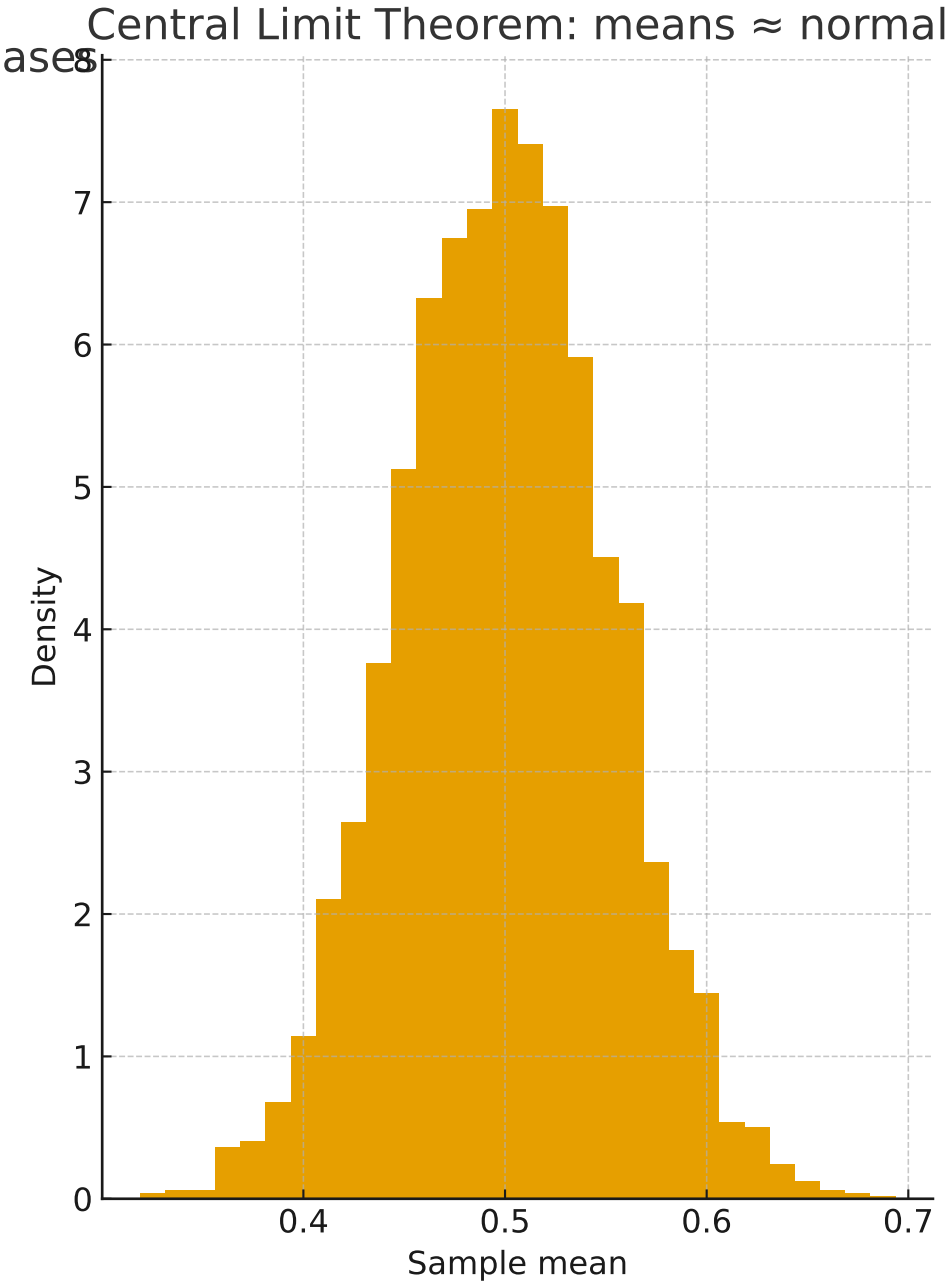
Histogram

- Groups values into bins; bar heights = counts per bin.
- See shape, skew, spread.



Central Limit Theorem

- Sample means tend to a normal shape as n increases.
- Example: Means of n=30 Uniform[0,1] draws.



Derivative

- Instantaneous rate of change; slope of tangent.
- Example: f(x)=x^3-2x^2+x-1 with one tangent.