AI & Big Data Analytics for Society

Artificial Intelligence (AI)

- The ability of machines to think like human intelligence

Big Data Analytics

- The process of analyzing large datasets to extract insights and patterns

General vs Narrow AI

- General AI: Capable of performing any intellectual task like a human.
- Narrow AI: Specialized in a specific task, such as image recognition or NLP.

Fields of AI

- Image Processing
- Computer Vision
- Robotics
- Natural Language Processing (NLP)
- Expert Systems
- Machine Learning & Deep Learning

Supervised vs Unsupervised vs Deep Learning

- Supervised Learning: Uses labeled data for training.
- Unsupervised Learning: No labeled data, finds hidden patterns.
- Deep Learning: Uses neural networks for complex problem-solving.

Probability Distributions

- **Normal**: Bell-shaped, used in statistics.
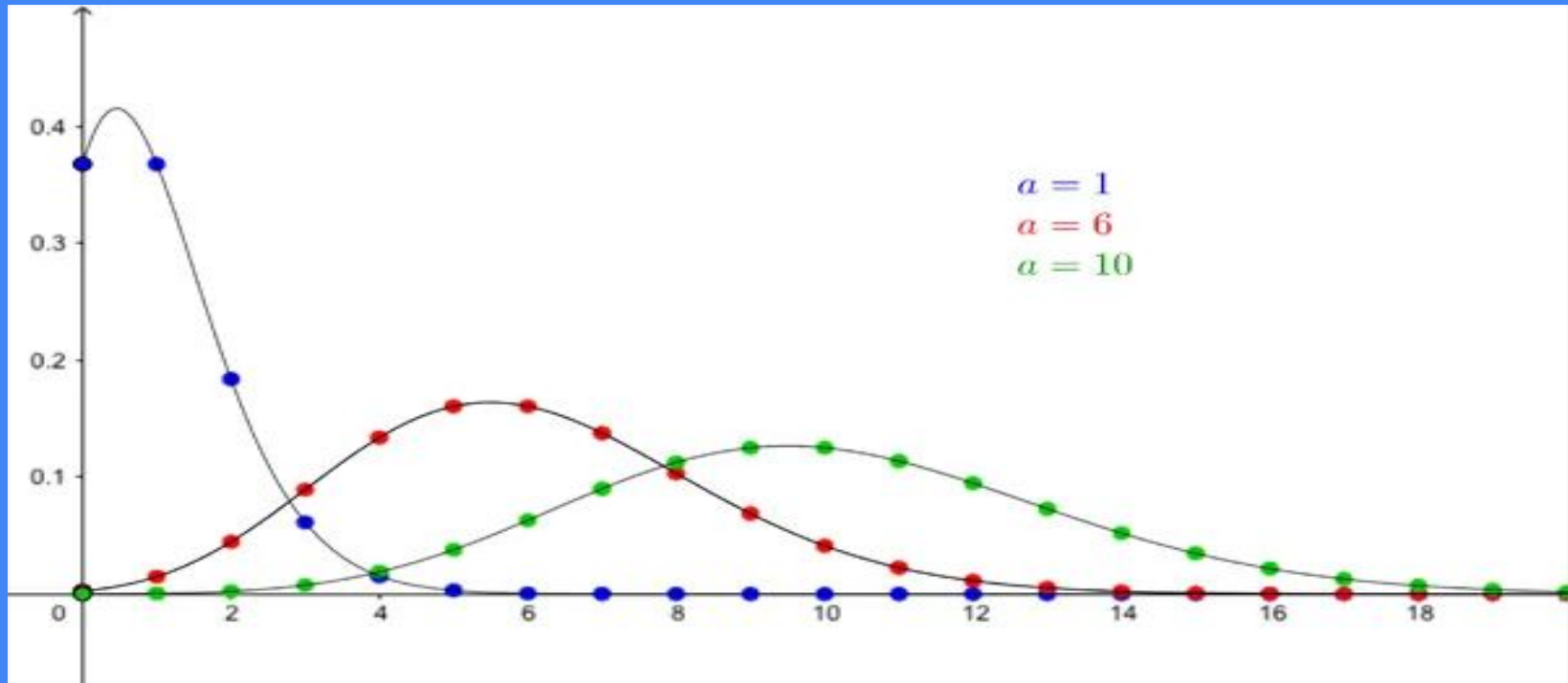- Example of Probability Distribution: Rolling a die (values: 1, 2, 3, 4, 5, 6)
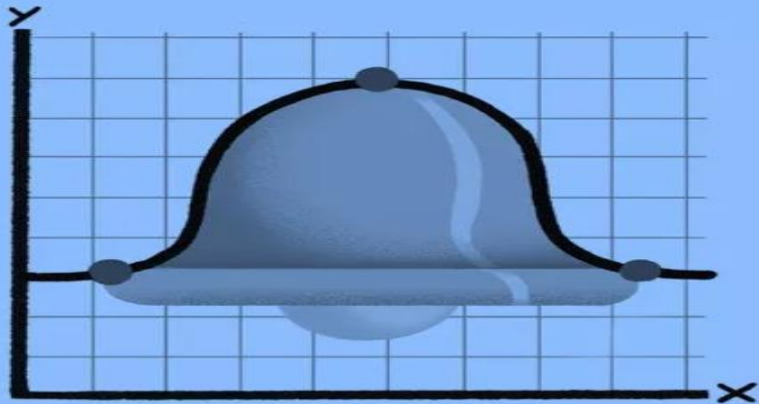
Bell Curve

['bel 'kərv]

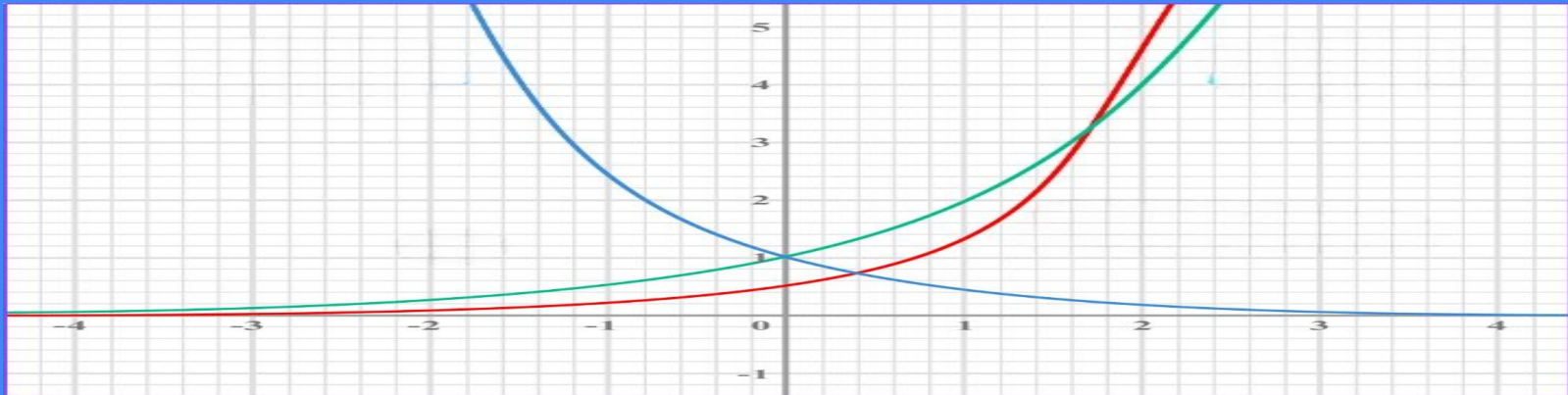A common type of distribution for a variable, also known as the normal distribution.

cont.......

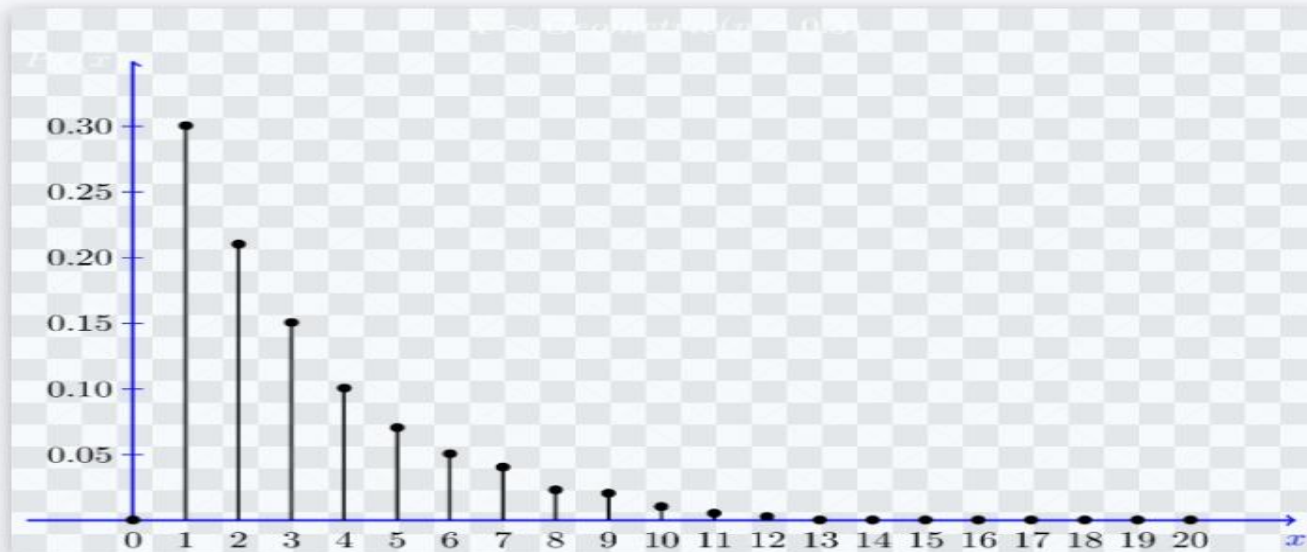- **Poisson**: Reference to Models rare events.

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- **Exponential**: Time between events in a Poisson process.
- Ex:

  1) Time until a radioactive particle decays
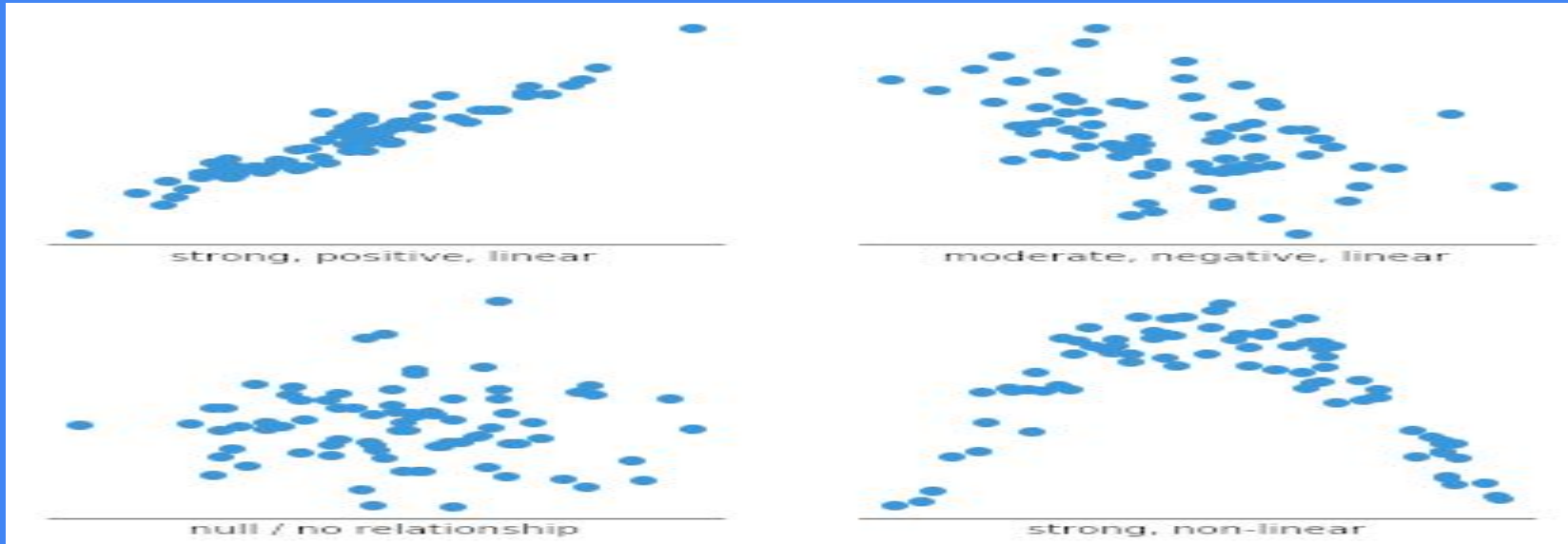
  2) Time between customer arrivals at a store

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- Bernoulli: Binary outcomes (success/failure).
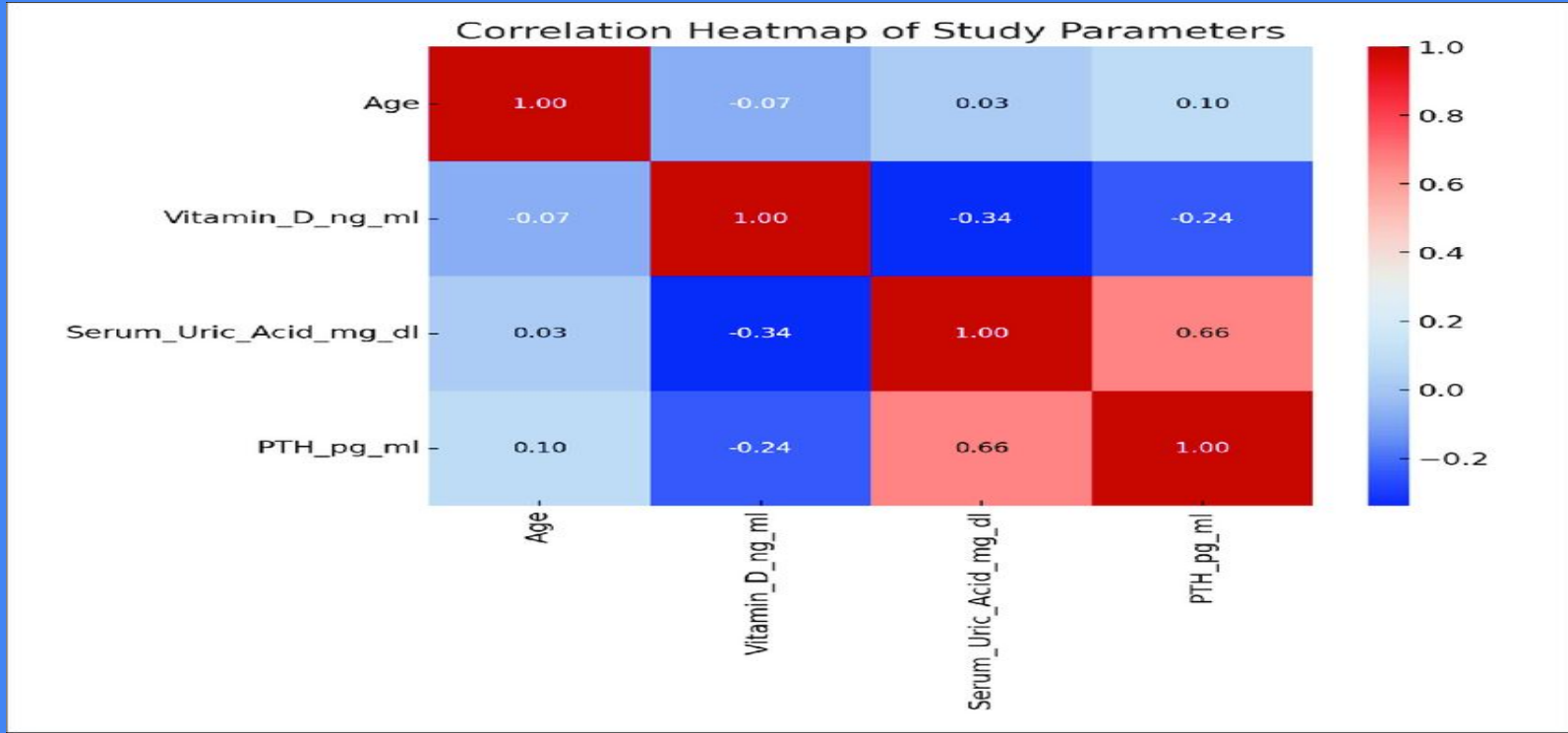
Distribution & Visualization
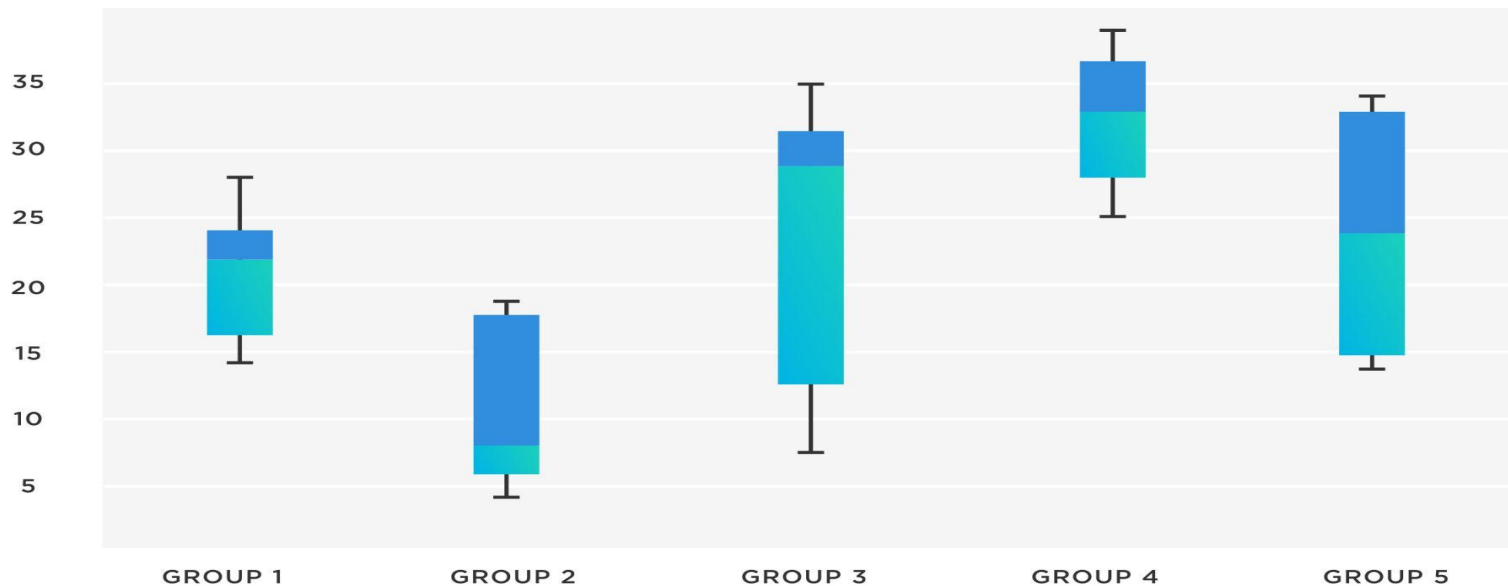
- Scatterplots: Show relationships between variables.

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- Heatmaps: Display correlation strengths.
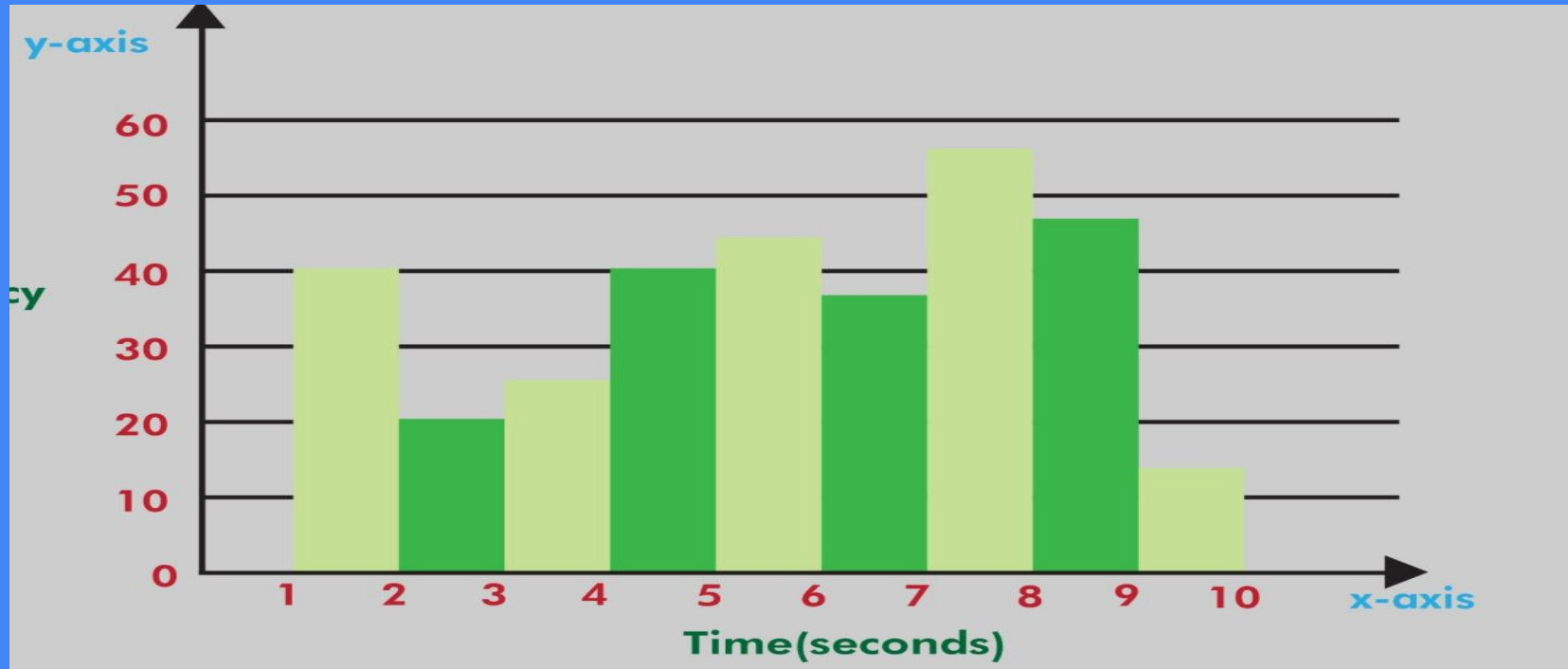

Correlation Heatmap of Study Parameters

cont………

- Box Plots: Data distribution insights.

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Histogram

Prior vs Posterior Probability

- Prior Probability: Initial belief before new evidence.
- Posterior Probability: Updated probability after new evidence (via Bayes' Theorem).
- Example: Weather prediction before and after new satellite data.

Statistical Models for Structured and Unstructured Data

- Structured Data: Uses traditional models (e.g., Linear Regression, Decision Trees).

- Unstructured Data: Uses advanced models (e.g., Neural Networks, NLP techniques).

- Example: Sales data (Structured) vs Social Media Text (Unstructured).

Maximum Likelihood Estimation (MLE)

- It is widely used in regression, classification
- Often used to solved using optimization techniques like Gradient Descent
- Gradient is a fancy word for Derivation

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- Example: Estimating mean and variance of a dataset.
- Variance (σ^2): How far values are from the mean is called as Variance

Importance of AI & Big Data

- Enhances decision-making processes.

- Drives automation and efficiency.

- Facilitates real-time insights for businesses and governance.

- Improves quality of life through predictive analytics

Impact on Healthcare

- AI-powered diagnostics and predictive analysis.

- Personalized medicine and treatment recommendations.

- Efficient management of healthcare records and patient data.

- Disease outbreak prediction and prevention.

Impact on Finance

- Fraud detection and risk management.

- Automated trading and personalized financial services.

- Credit scoring and loan approval automation.

- Chatbots for customer service in banking.

Impact on Education

- Personalized learning experiences through AI-driven platforms.

- Automated grading and assessment tools.

- Virtual tutors and AI-powered education assistants.

- Data-driven policy decisions for better curriculum design.

Impact on Smart Cities & Governance

- AI-enabled traffic management and transportation planning.

- Smart energy management and sustainability initiatives.

- Predictive policing and crime analysis.

- Digital governance and citizen engagement through AI-powered chatbots.

Ethical Considerations & Challenges

- Data privacy and security concerns.

- Bias in AI algorithms and decision-making.

- Job displacement due to automation.

- Regulation and policy framework for responsible AI usage.

Career Map: AI & Big Data Analytics

- Entry-Level: Data Analyst, AI Research Assistant
- Mid-Level: Machine Learning Engineer, Data Scientist
- Senior-Level: AI Architect, Chief Data Officer
- Specializations: NLP Engineer, Computer Vision Engineer, AI Ethics Consultant

Q&A

- Questions and Discussions