



Understanding Data

 @ankitrathi



What is Data?

raw information (numbers, text, images, or symbols)



Data Formats

Structured (spreadsheets, databases)

Unstructured (emails, videos, social media posts)

Semi-structured (JSON, XML)

Data Processing Cycle

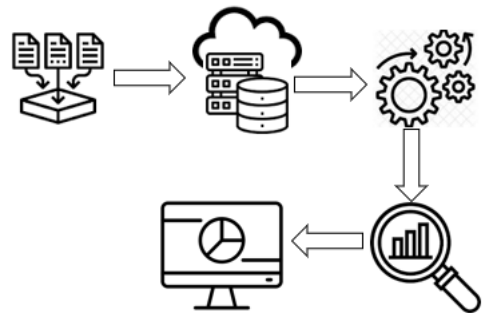
Collection (Sensors, surveys, transactions)

Storage (Databases, cloud, servers)

Processing (Sorting, filtering, analyzing)

Analysis (Trends, patterns, insights)

Visualization (Graphs, charts, dashboards)



Data Types & Examples

Quantitative (Numbers) → Sales figures, temperature

Qualitative (Descriptions) → Customer reviews, comments

Big Data (Massive sets) → Social media trends, IoT sensor data

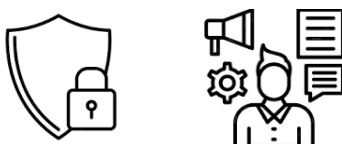


Importance of Data

Better Decisions (Business strategies, healthcare, AI)

Efficiency (Automation, predictive models)

Innovation (Machine learning, scientific research)



Data Challenges

Data Privacy & Security (Hacks, leaks, GDPR)

Data Overload (Too much data, hard to analyze)

Bias & Accuracy (Incorrect or misleading data)



Understanding

AI

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What is AI?

simulation of human intelligence in machines

Learning (Adapts from data)

Reasoning (Makes decisions)

Self-correction (Improves over time)



Types of AI

Narrow AI (Weak AI) → Specialized in one task (Siri, Google Translate)

General AI (Strong AI) → Thinks like a human (still theoretical)

Super AI → More intelligent than humans (future concept)

AI Subfields

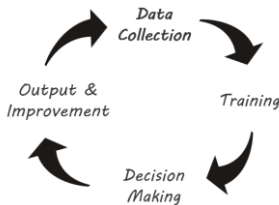
Machine Learning (ML) - Learns from data (Netflix recommendations)

Deep Learning (DL) - AI mimicking the human brain (self-driving cars)

Natural Language Processing (NLP) - Understands human language (Chatbots)

Computer Vision - Recognizes images (Face recognition)

How AI Works



Data Collection - AI learns from massive datasets

Training - Models adjust through experience

Decision Making - AI analyzes patterns

Output & Improvement - AI refines predictions over time

AI in Everyday Life

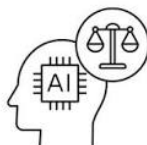
Voice Assistants (Alexa, Google Assistant)

Recommendation Systems (Netflix, YouTube)

Healthcare (Disease diagnosis, robotic surgery)

Autonomous Vehicles (Self-driving cars)

Finance & Security (Fraud detection, stock predictions)



AI Challenges & Ethics

Bias in AI - Unfair outcomes due to biased data

Privacy Issues - AI tracking and surveillance concerns

Job Automation - AI replacing jobs

Ethical AI - Ensuring AI benefits society



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What is Explainable AI (XAI)?

AI models often behave like black boxes—the 'why' remains missing
XAI aims to make decisions understandable & interpretable

Why Does Explainability Matter?

Trust - to trust AI decisions

Fairness - to prevent bias & discrimination in AI models

Regulations - to abide by Laws (i.e. GDPR)

Debugging - to improve AI performance

Safety - in healthcare, finance, autonomous systems



How AI Becomes Explainable?

Feature Importance - data points influencing the decision?

Decision Trees - breaking down decision path

Local vs. Global Explanations

Local: Why was this decision made?

Global: How does the model behave in general?



SHAP & LIME - Techniques for interpreting black-box AI

Model Transparency - Using simpler, more interpretable models



Trade-offs: Accuracy vs. Explainability

Deep Learning Models (Black Box)

- Highly accurate but hard to interpret
- Used in image recognition, NLP, etc



Simple Models (Transparent but Less Powerful)

- Decision trees, linear regression are more interpretable
- Used when explanations are critical (e.g. healthcare, finance)



Challenges & Future of XAI

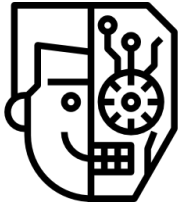
Trade-off: More explainability can reduce performance

Human Interpretation: Even simple explanations can be misunderstood

Bias Detection: XAI helps, but bias elimination is tough

Future: AI that explains itself in human-like language





Understanding GenAI

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What is Generative AI (GenAI)?

A type of AI that can create new content—text, images, music, code, and more—rather than just analyzing data

Like an AI artist, writer, or musician that generates original work based on patterns it has learned.

How Generative AI Works?



Training on Data: AI learns from vast datasets (text, images, code, etc.)

Pattern Recognition: Identifies relationships, structures, and styles

Content Generation: Uses learned patterns to create new content

Refinement & Feedback: Adjusts output based on user input or corrections

Popular Generative AI Models

GPT (Text) - Writes articles, chat responses, and summaries

DALL·E (Images) - Creates artwork from text descriptions

Codex (Code) - Writes and completes programming code

Jukebox (Music) - Generates songs and instrumental music



Challenges & Risks of GenAI

Misinformation - AI can generate fake news & deepfakes

Bias & Ethics - AI can reflect biases in its training data

Creativity Debate - Is AI-generated content real creativity?

Data Privacy - AI models are trained on vast amounts of public data



The Future of Generative AI

More human-like AI assistants

Personalized AI-generated content for individuals

AI that co-creates with humans in art, music, and writing

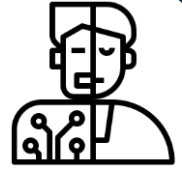
Ethical guidelines for responsible AI use



Understanding



Agentic AI



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What is Agentic AI?

AI systems that act autonomously, making decisions, setting goals, and taking actions without constant human intervention
Like a self-driving car that plans its route, adapts to traffic, and makes real-time decisions all by itself

Key Features of Agentic AI



Autonomous Decision-Making - sets its own tasks and goals

Planning & Reasoning - doesn't just respond; it strategizes

Adaptability & Learning - improves based on feedback

Memory & Context Awareness - remembers past interactions

Action Execution - takes real-world actions, not just predictions



How Agentic AI Works?

Perception: observes the environment (data, sensors, user input)

Decision-Making: determines the best action based on goals

Action Execution: performs tasks autonomously

Feedback Loop: learns from successes and failures



Traditional vs Agentic AI

Aspect	Traditional AI	Agentic AI
Task Execution	Predefined responses	Self-directed decision-making
Adaptability	Limited, follows rules	Learns and adapts
Autonomy	Requires human input	Acts independently
Memory	Short-term	Long-term memory & context



Challenges & Risks of Agentic AI

Loss of Control - AI taking actions beyond human oversight

Ethical Concerns - Who is responsible for AI decisions?

Unintended Consequences - AI optimizing for unintended goals

Safety & Security - Preventing rogue AI behaviour

