Artificial Intelligence Basic Understanding

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ARTIFICIAL INTELLIGENCE – L1 (Beginner Level)

What is AI?

AI = Making computers **act smart like humans**.
Humans can do many intelligent things → AI copies them using machines.

Human Ability	Machine Equivalent	What It Does	Techniques	Examples
See	Computer Vision (CV)	Read images/videos	CNNs, ViT, YOLO	Face unlock, self-driving cars
Listen & Talk	NLP	Understand/generate language	Transformers, STT, TTS	ChatGPT, Siri, translation
Learn from Experience	Machine Learning (ML)	Learn patterns from data	Supervised, Unsupervised, RL	Spam detection, fraud detection
Make Decisions	Reinforcement Learning (RL)	Learn via reward/penalty	Q-Learning, PPO	Robotics, AlphaGo
Create	Generative AI	Generate new text, images, code	LLMs, Diffusion, GANs	ChatGPT, Midjourney
Remember & Reason	Knowledge-Based AI	Use facts & logic	Knowledge Graphs, Rules	Google Knowledge Graph
Act Autonomously	AI Agents / Agentic AI	Plan → Reason → Execute tasks	LLMs + Tools + Memory	AutoGPT, Devin, OpenAI Agents

Understand Large Text	Large Language Models (LLMs)	Reason, generate, retrieve	GPT, LLaMA, Claude	ChatGPT, Claude, Gemini

Simple Summary (L1)

AI = A machine version of human intelligence.
See → CV
Talk → NLP
Learn → ML
Decide → RL
Create → Generative AI
Reason → Knowledge AI
Act → AI Agents
Understand Language → LLMs

ARTIFICIAL INTELLIGENCE – L2 (Intermediate Level)

AI vs ML vs DL (Simple Analogy)

- **AI** → Goal: Make machines intelligent
- **ML** → Learning from data instead of writing rules
- **DL** → ML using deep neural networks
- **LLMs** → Advanced DL models that understand & generate language
- **Generative AI** → Create new content (text, images, video)
- **AI Agents** → AI systems that take actions, use tools
- **Data Science** → Preparing & analyzing data for AI

Example: Teaching a kid to recognize a dog

- **AI:** "Kid should recognize dogs."
- **ML:** Show many dog images → kid learns patterns.
- **DL:** Kid learns deeper features: fur, ears, nose, shape.
- **LLMs:** Kid learns to describe dogs in detail and reason about them.

- **AI Agents:** Kid can search for dogs, categorize them, write reports, take actions.

How AI Works (Implementation Steps)

1. **Collect Data** (images, text, audio, logs)
2. **Prepare Data** (cleaning, labeling, processing)
3. **Train Model** (ML/DL/LLM/GenAI)
4. **Test Model** (accuracy, F1, BLEU, mAP)
5. **Deploy Model** (APIs, cloud, mobile)
6. **Monitor** (performance, drift, feedback)
7. **Continual Learning** (MLOps & automation via agents)

AI Field Map (Clean Hierarchy)

Artificial Intelligence (AI)
│
├── Data Science (DS)
│
├── Machine Learning (ML)
│ └── Deep Learning (DL)
│ ├── Large Language Models (LLMs)
│ ├── Generative AI
│ └── Agentic AI (AI Agents)
│
├── Natural Language Processing (NLP)
│ └── LLMs
│
├── Computer Vision (CV)
│
├── Reinforcement Learning (RL)
│
├── Robotics

Key Takeaway (L2 Summary)

- **AI** = Make machines intelligent
- **ML/DL** = How AI learns
- **NLP/CV/RL** = Skills of AI
- **LLMs** = Advanced reasoning & language brain
- **Generative AI** = Creative side of AI
- **AI Agents** = Autonomous AI workers
- **Data Science** = Data foundation for AI

ARTIFICIAL INTELLIGENCE – L3 (Advanced Level)

1. AI = Goal (Human-like Intelligence in Machines)

AI systems have:

- **Perception** (CV, audio processing)
- **Learning** (ML, DL)
- **Reasoning** (LLMs, knowledge systems)
- **Planning** (AI Agents)
- **Action** (Robotics, agentic execution)

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2. Evolution of AI

Era	Approach	Technique	Strength	Weakness
1950s–1980s	Symbolic AI	Rules, logic, expert systems	Explainable	Cannot handle uncertainty
1990s–2000s	Statistical ML	Decision Trees, SVM, Naive Bayes	Works with data	Needs manual features
2010s–Now	Deep Learning	CNNs, RNNs, Transformers, LLMs	Learns raw data	Needs big data + GPUs
2023–Future	Agentic AI	LLMs + Tools + Memory + Planning	Autonomous actions	Hard to control

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3. Machine Learning (ML)

Types of ML

Type	What It Does	Examples	Algorithms
Supervised Learning	Learn from labeled data	Spam detection	Linear Regression, Neural Nets
Unsupervised Learning	Find hidden structures	Customer clustering	K-Means, PCA
Semi-Supervised	Mix of labeled + unlabeled	Fraud detection	Consistency models
Reinforcement Learning	Learn by rewards	Robotics, AlphaGo	Q-Learning, PPO

4. Deep Learning (DL)

Architecture	Used For	Example
CNNs	Vision	Object detection
RNN/LSTM/GRU	Sequential data	Speech, stock price prediction
Transformers	Language, vision, multimodal	GPT, BERT, ViT
GANs	Image generation	Deepfakes
Diffusion Models	Art generation	Stable Diffusion

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5. Specialized AI Domains

NLP

ChatGPT, translation, Q&A, sentiment analysis.

LLMs (Large Language Models)

GPT, Claude, Gemini, LLaMA → reasoning, coding, planning, summarization.

Generative AI

Text, code, images, video, music generation (ChatGPT, Midjourney, Sora).

AI Agents / Agentic AI

AutoGPT, Devin, OpenAI Agents → plan → reason → take actions → use tools.

Computer Vision

YOLO, segmentation, self-driving, medical imaging.

Reinforcement Learning

Robotics, gaming, dynamic optimization.

Knowledge-Based AI

Ontologies, knowledge graphs, expert systems.

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6. The AI Lifecycle (Technical)

1. Data Collection
2. Data Preparation (ETL, cleaning, labeling)
3. Model Training (ML/DL/LLMs)
4. Evaluation (Accuracy, F1, BLEU, mAP)
5. Deployment (APIs, cloud, mobile)
6. Monitoring (drift, latency)
7. Continuous Learning (MLOps)
8. Autonomous Improvement (AI Agents)

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7. AI Architecture Stack

Layer	Description
Application	Chatbots, CV apps, recommender systems
Model	GPT, BERT, YOLO, CNNs, RL agents
Algorithm	Gradient descent, attention, search
Data	Features, embeddings, vector DBs

Infrastructure	GPUs, TPUs, cloud, distributed systems
Ops	CI/CD, monitoring, retraining (MLOps)
Agent Layer	Tool use, planners, memory systems

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8. Example: Netflix Recommendations

- Collect user history
- Build embeddings
- Train ML/DL models
- Serve recommendations in real time
- Monitor feedback + retrain
- Automate system using agent pipeline

Core Pillars of AI

1. Machine Learning (Supervised, Unsupervised, DL, RL)
2. Natural Language Processing
3. Large Language Models (LLMs)
4. Computer Vision
5. Generative AI
6. Knowledge Representation & Reasoning
7. Planning & Decision-Making (AI Agents)
8. Data Science (Foundation Layer)

How AI Relates to ML, DL, NLP, LLMs, CV, DS

Field	Description	Relationship to AI	Examples
AI	Make machines intelligent	Parent field	Self-driving, chatbots
ML	Learn patterns from data	Core method for AI	Predictions, scoring
DL	Neural networks	Subset of ML powering modern AI	GPT, CNNs
Data Science	Extract insights from data	Supports AI through data prep	Analytics, dashboards
NLP	Language understanding	AI domain	ChatGPT, translation
LLMs	Advanced Transformer AI models	Subset of NLP + DL	GPT, Claude, LLaMA
CV	Image/video understanding	AI domain	YOLO, face unlock
Generative AI	AI that creates content	Built using LLMs + Diffusion	Midjourney, Sora
AI Agents	Autonomous action-taking AI	Built on top of LLMs	AutoGPT, Devin