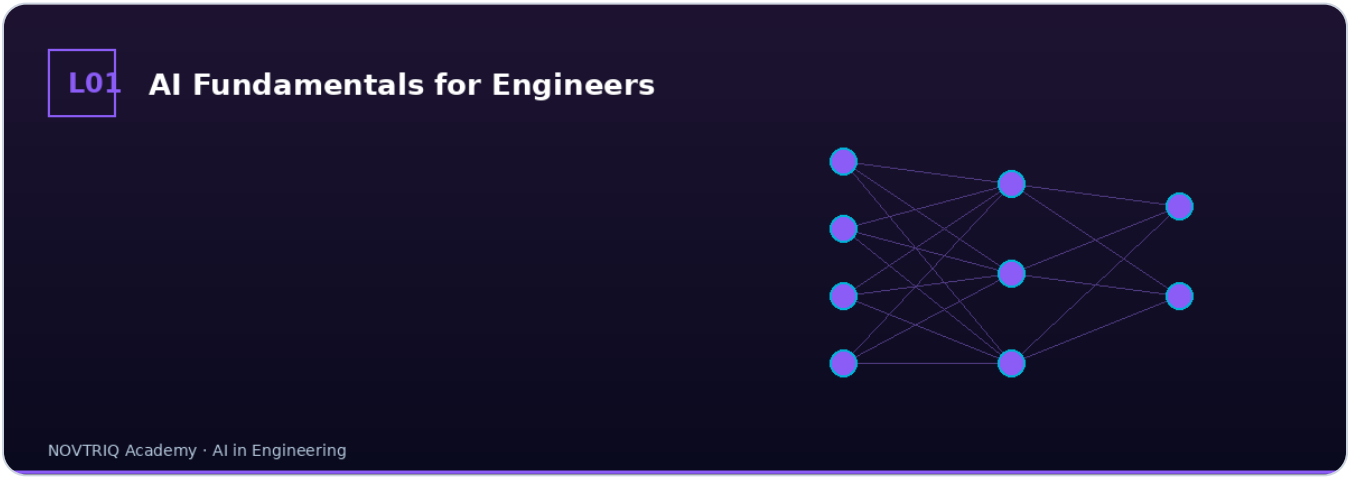
FREE

AI IN ENGINEERING

AI Fundamentals for Engineers

AI fundamentals — supervised, unsupervised, generative, agentic.



· **AI in Engineering** Lesson 1 of 8

AI is the most consequential technology engineers will deploy this decade. From predictive maintenance to generative design to compliance checking, AI is transforming engineering practice.

This lesson sets the foundational vocabulary: what AI is, how the major paradigms work, where they fit.

Learning objectives

Remember	Key terminology.
Understand	How the technology applies.
Evaluate	Where it works and where it doesn't.
Apply	Plan deployment in practice.

1 · Supervised vs unsupervised vs reinforcement

Supervised: learn from labelled data (e.g., predict equipment failure from historical data). Unsupervised: find structure in unlabelled data (e.g., cluster building energy patterns). Reinforcement: learn by trial and error with rewards (e.g., HVAC optimisation).

2 · Models and inference

Model = trained mathematical function. Training: feed data, adjust parameters. Inference: use trained model to predict on new data. Training expensive (compute, time, data); inference cheap.

3 · Generative AI

Generative models create new content from training data — text (LLMs like GPT-4, Claude), images (Midjourney, Stable Diffusion), 3D geometry. Major shift from discriminative AI (classify) to generative (create).

4 · Agentic AI

Agents combine LLMs + tools + memory to plan and execute multi-step tasks autonomously. Emerging in engineering: design exploration, compliance checking, project management. State of the art evolving rapidly 2024–2026.

5 · What this looks like on a real project

UK AI in UK consultancy

Major UK engineering firms (Arup, Buro Happold, AECOM) deploying AI for energy modelling, code checking, design optioneering since 2023.

EU EU AI Act 2024

EU AI Act effective 2024; high-risk applications include some engineering uses. Compliance staged through 2026.

UAE UAE AI strategy

UAE National Strategy for AI 2031 makes AI adoption a national priority. Built environment included via smart city initiatives.

6 · Why this matters

ML, deep learning, LLMs — you can now distinguish the AI types, understand what each is good for, and stop nodding when vendors over-promise. That literacy is the foundation: you can't evaluate AI claims without it, and your discipline is being reshaped by AI right now.

Quiz

Your score 0 / 5

1. Reinforcement learning learns from:

a) Labelled examples

b) Trial and error with reward signals

c) Random data only

d) Static rules

2. Inference vs training:

a) Same operation

b) Inference uses trained model to predict; training builds the model

c) Inference is more expensive

d) Training is one-shot only

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3. Generative AI distinguishes from discriminative AI by:

a) Slower processing

b) Creates new content rather than classifying existing

c) Better accuracy always

d) Rule-based only

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4. Agentic AI combines:

a) Just LLM

b) LLM + tools + memory + planning

c) Excel only

d) Hardware only

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5. UAE AI strategy target year:

a) 2025

b) 2031

c) 2050

d) Not specified

Answers (for print): 1b · 2b · 3b · 4b · 5b

Resources

PRIMARY SOURCES

- Goodfellow, Bengio & Courville — Deep Learning (textbook).
- Stanford CS229 Machine Learning notes.

STANDARDS AND GUIDANCE

- ISO/IEC 22989 — AI concepts and terminology.
- EU AI Act Regulation 2024/1689.

INDEPENDENT COMMENTARY

- Anthropic / OpenAI / Google research papers.

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