

# Introduction to Artificial Intelligence

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# [ Turing Test (1950) ]

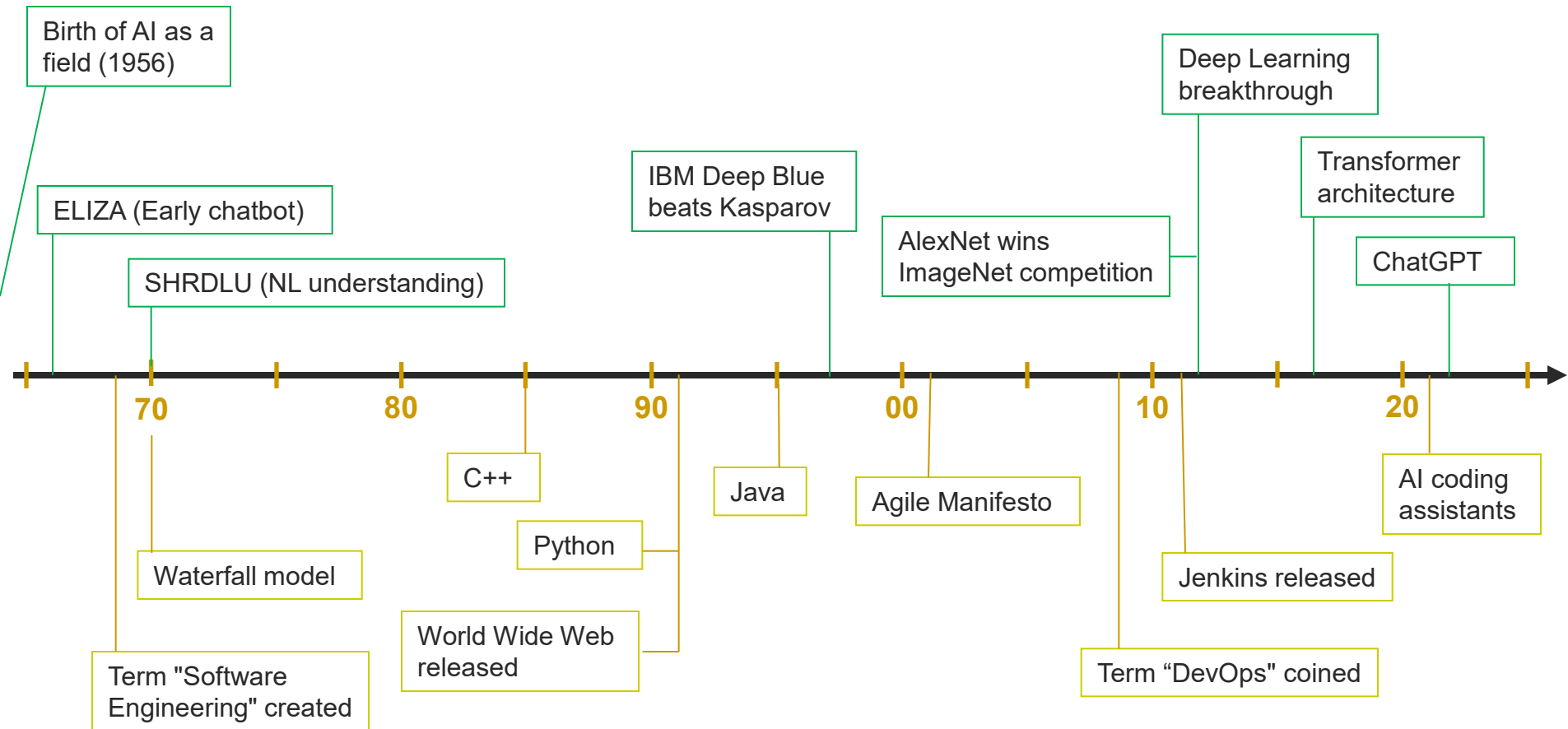
*“Machine intelligence is the machine's ability to converse with a human so convincingly that the interrogator cannot distinguish it from a person”.*

**Alan Turing**

## ■ Imitation Game

- A human evaluator judges a conversation between a human and a machine
- The machine succeeds if the evaluator cannot identify it

# Timeline of Main AI & SE Events

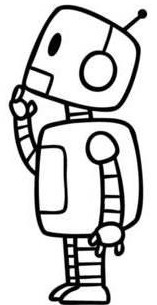


# [ AI Milestones by Decade ]

- 1960s: Early Programs
- 1970s: Symbolic AI
- 1980s: Expert Systems
- 1990s: Machine Learning
- 2000s: Data-driven AI
- 2010s: Deep Learning
- 2020s: Generative AI and Coding Assistants

# [ Dartmouth Workshop (1956) ]

- John McCarthy picked the name 'Artificial Intelligence' for the new field
  - With Marvin Minsky, Nathaniel Rochester and Claude Shannon
- The proposal goal is to make machines
  - use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves



# [ What is Artificial Intelligence? ]

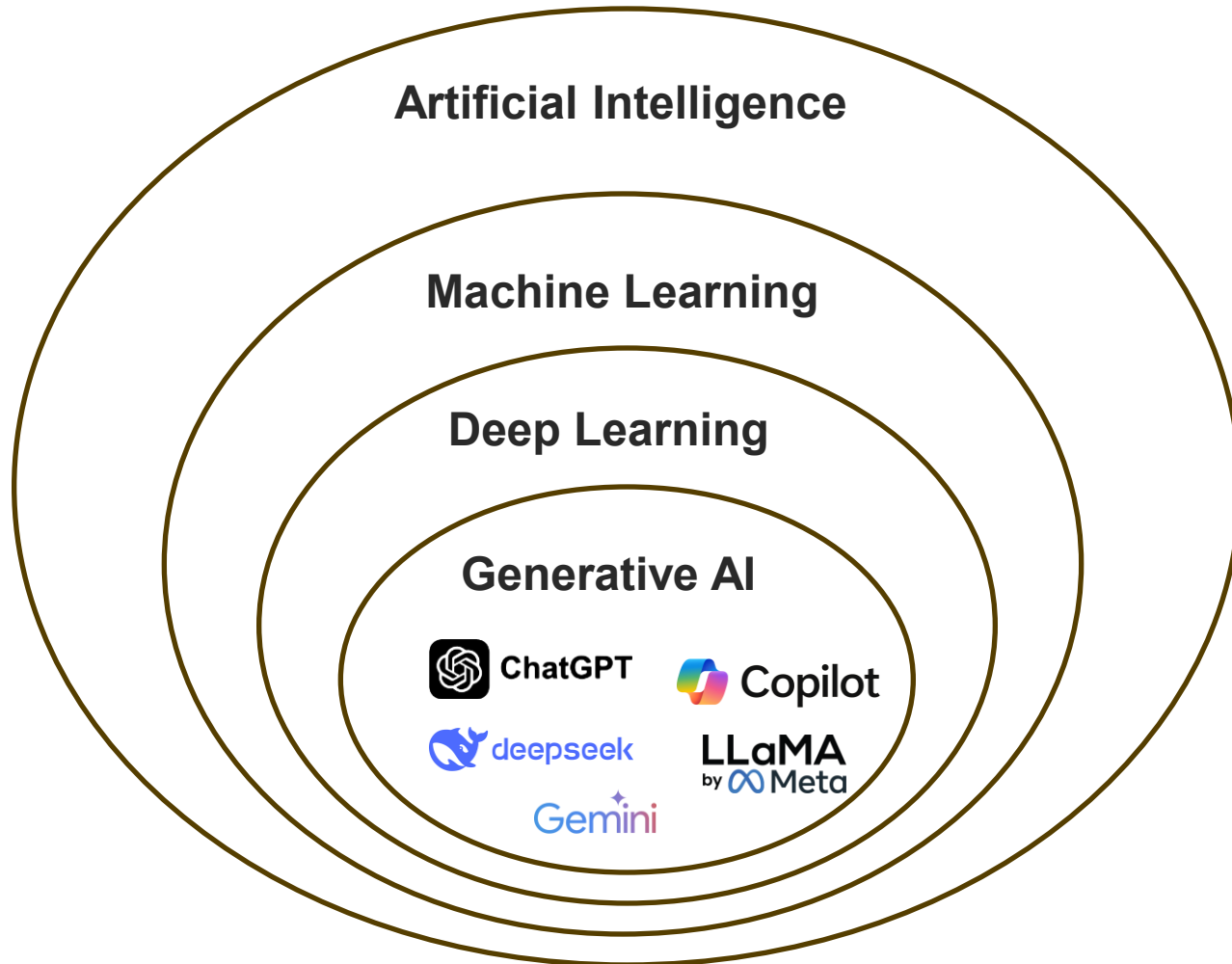
*“Machine learning is the field of study that gives computers the ability to learn without being explicitly programmed”.*

**Arthur Samuel, 1959**

*“Artificial intelligence (AI) is a branch of computer science that enables machines to simulate human intelligence, learning, and decision-making to perform complex tasks”.*

**Russell & Norvig, 2021**

# [ AI vs. ML vs. DL vs. GenAI ]



# [ ELIZA (1966) ]

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- It was created by Joseph Weizenbaum
- It is recognized as the first chatbot
  - ELIZA did not possess true understanding, merely rephrasing user input.
  - It was one of the first chatbots attempting the Turing test (but it failed).

# A Conversation with ELIZA

Welcome to

```
EEEEEE LL      IIII  ZZZZZZ  AAAAA
EE      LL      II     ZZ     AA   AA
EEEEEE LL      II     ZZZ    AAAAAA
EE      LL      II     ZZ     AA   AA
EEEEEE LLLLLL IIII  ZZZZZZ  AA   AA
```

Eliza is a mock Rogerian psychotherapist.

The original program was described by Joseph Weizenbaum in 1966.

This implementation by Norbert Landsteiner 2005.

ELIZA: Is something troubling you ?

YOU: Men are all alike.

ELIZA: What is the connection, do you suppose ?

YOU: They're always bugging us about something or other.

ELIZA: Can you think of a specific example ?

YOU: Well, my boyfriend made me come here.

ELIZA: Is it important to you that your boyfriend made you come here ?

YOU: He says I'm depressed much of the time.

ELIZA: I am sorry to hear that you are depressed.

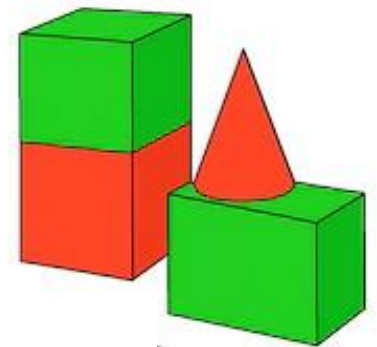
YOU: It's true. I am unhappy.

ELIZA: Can you explain what made you unhappy ?

YOU:

# [ SHRDLU (1970) ]

- It was developed by Terry Winograd
- An early natural-language understanding computer program
- The user instructs SHRDLU to move objects in the “blocks world”
  - *“Pick up a big red block”*
  - *“Put the red cone on the green block”*
  - *“Take the cone off”*



# [ Expert Systems ]

- Rule-based systems designed to replicate human expertise
- Example: MYCIN (1970)
  - A medical diagnosis system
  - It identifies bacteria causing infections (like meningitis) and recommend antibiotics

```
(defrule 52
  if (site culture is blood)
    (gram organism is neg)
    (morphology organism is rod)
    (burn patient is serious)
  then .4
    (identity organism is pseudomonas))
```

# [ Deep Blue beats Kasparov ]

- It demonstrates large-scale AI computation
- Garry Kasparov was the world champion in chess
  - Kasparov won in 1996
  - Deep Blue won in 1997



# [ AlexNet wins ImageNet ]

- AlexNet classifies images into 1,000 distinct object categories
  - Developed in 2012 by Alex Krizhevsky
- Its win is recognized as the start of the deep learning revolution
- After 2012, major technology companies (Google, Facebook, Microsoft) invested heavily in deep learning research

# [Transformer Architecture]

- It is based on the multi-head attention mechanism

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## Attention Is All You Need

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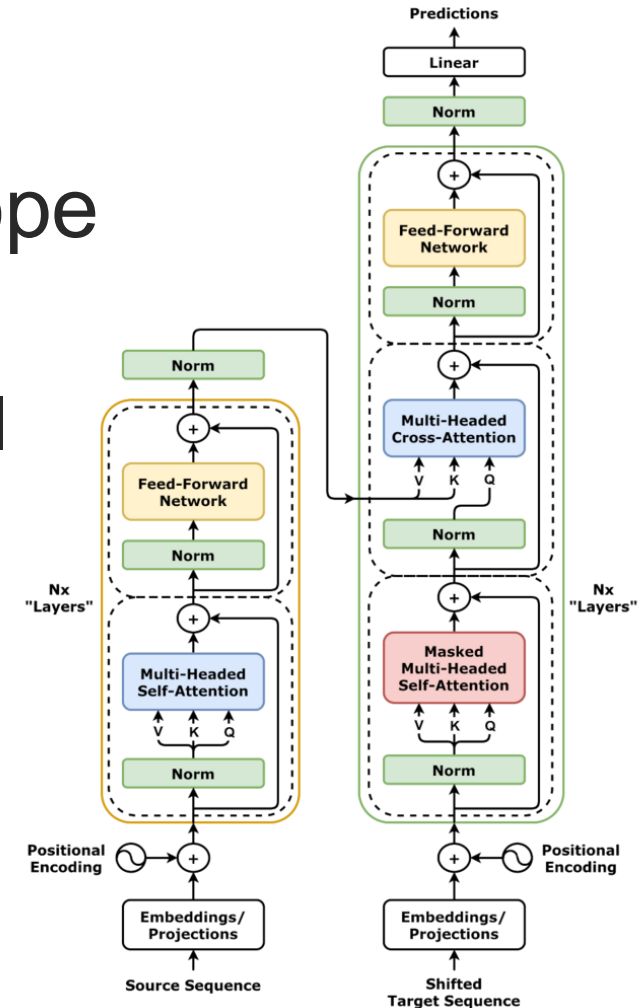
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# Transformer Architecture

- At each layer, each token is contextualized within the scope of the context window
  - Text is converted to numerical representations (tokens)
  - Each token is converted into a vector
- Later variations are adopted for training LLMs



# [ Large Language Models (LLMs) ]

- Every LLM is a form of Generative AI
  - Generative AI can create new content rather than just analyzing existing data
  - An LLM learns patterns from massive datasets to generate original outputs
- Transformer allows LLMs to “pay attention” to the relationships between words

# [ AI for Software Engineering ]

- The main expected benefit is automation
  - By applying AI across the entire lifecycle in partnership with human developers
- AI Tools in Software Development
  - *Claude Code*: terminal-based tool built for agent-style, multi-step workflows
  - *GitHub Copilot*: assistant for real-time code suggestions and chat-based help

# [ Bibliography ]

- Stuart Russell and Peter Norvig. **Artificial Intelligence: A Modern Approach**, 4th ed. Pearson, 2021.
- Ashish Vaswani *et al.* **Attention is all you need**. Advances in Neural Information Processing Systems (NIPS) 30, 2017.