Let's Build the AI Puzzle

Soft Introduction to Machine Learning

The Magic Behind Generative AI

Key Challenges and Limitations

Unleash the Power of Generative AI

Let's Build the AI Puzzle

Artificial Intelligence (AI)

Human desire to create a **digital brain**

General-purpose technology

Machine Learning (ML)

Dynamically digest and **learn patterns** from data

Complexity of Patterns

Simple ⬌ Complex

Deep Learning (DL)

Handle **more complex** patterns

Artificial Neural Networks (ANNs)

Generative AI (Gen AI)

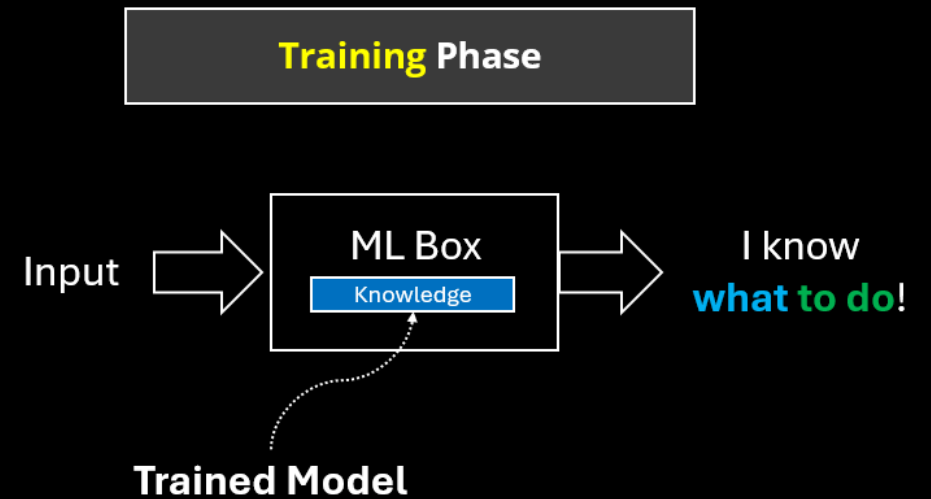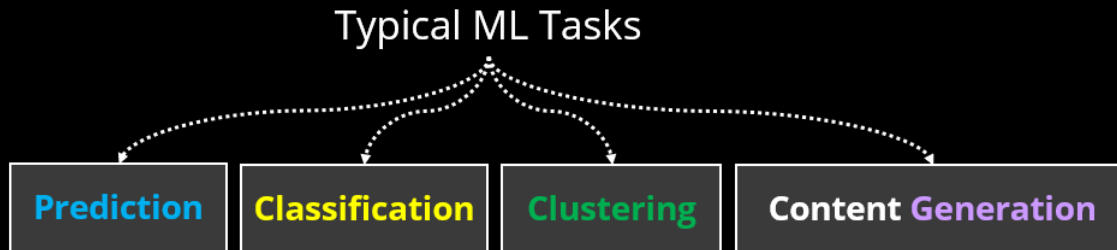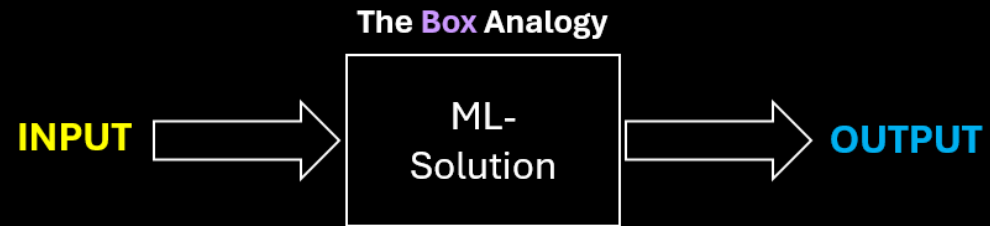Analyze **text** as a language

Create **NEW** content

Text | Image | Video | Audio

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The **Box** Analogy

INPUT → ML-Solution → **OUTPUT**

Typical ML Tasks

Prediction   **Classification**   **Clustering**   **Content Generation**

Training Phase

Input → ML Box [Knowledge] → I know **what to do**!

Trained Model

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Structured

Unstructured → **INPUT** → ML-Solution → **OUTPUT**

Semi-structured

Features – Input Variables

- ✓ Numerical value (age)
- ✓ Categorical data (gender, color)
- ✓ Date and time
- ✓ Text
- ✓ Images
- ✓ Audio

#1 – **Supervised Learning**

#2 – **Unsupervised Learning**

#3 – **Semi-supervised Learning**
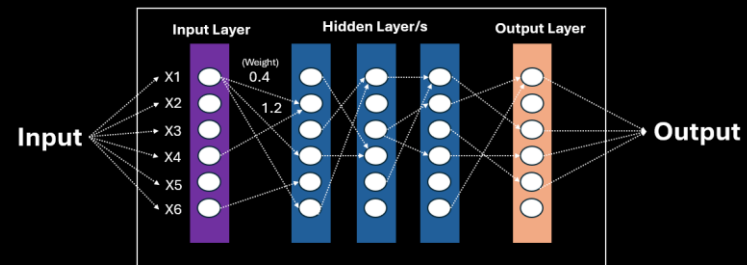
#4 – **Reinforcement Learning**

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Artificial Neural Networks (ANNs)

Input Layer — Hidden Layer/s — Output Layer

(Weight) 0.4

1.2

Input: X1, X2, X3, X4, X5, X6

Output

#1 – Recurrent Neural Networks

#2 – Convolutional Neural Networks

#3 – Transformers Architecture

Deep Learning Architectures

Transformers Architecture

Train **more complex generic** models

Foundation Models

Large-scale more generic models

Trained on **massive** amounts of data

Can be adapted to perform a **wide range** of tasks

Knowledge on a variety of topics, millions of topics
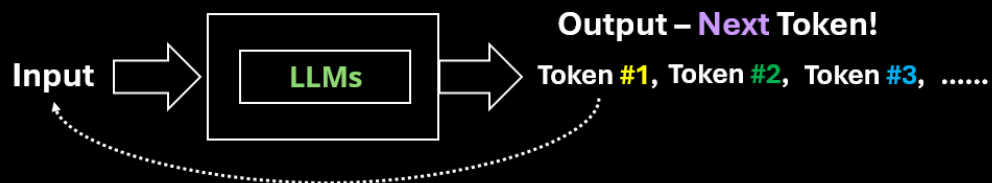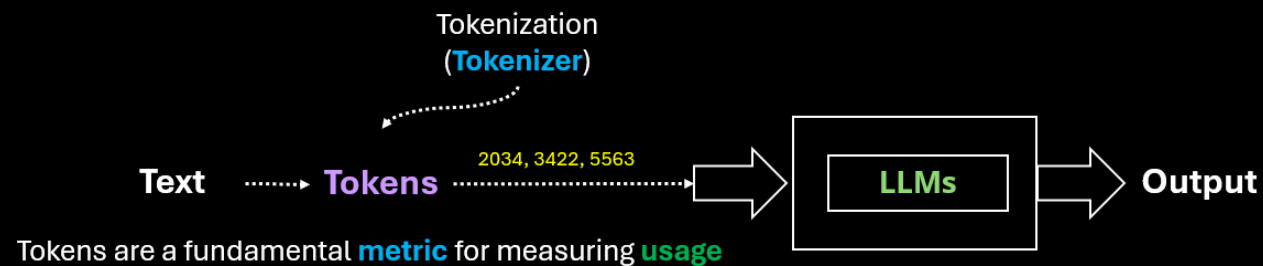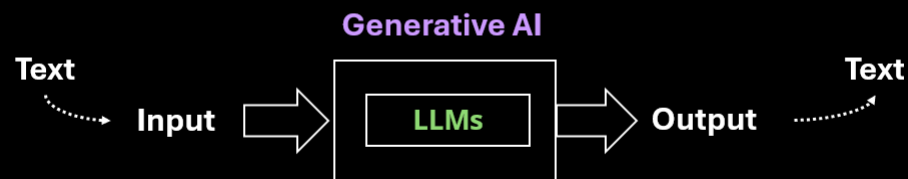
An expensive resource-intensive project

Job for the **BIG** players

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Foundation Models
Large Language Models (LLMs)

Generative AI

Text → Input → [LLMs] → Output → Text

Tokenization
(**Tokenizer**)

Text ⟶ **Tokens** — 2034, 3422, 5563 → [LLMs] → Output

Tokens are a fundamental **metric** for measuring **usage**

Output – Next Token!

Input → [LLMs] → Token **#1**, Token **#2**, Token **#3**, ...

Predict the next token based on calculating which **list of tokens** have a stronger statistical correlation

Token	Probability
Fence	12%
Sofa	**36%**
Roof	8%
Floor	**28%**
....	

Add some level of randomness

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Self-Supervised Learning

Millions of sentences, billions, or **trillions** of words → LLM

#1 - **Contextual** Prompting

#2 - **R**etrieval **A**ugmented **G**eneration (**RAG**)

#3 - **Fine-Tuning**

Visitor Query ····> Support chatbot — Query **+ Extra Data** → Gen AI Model

Get Extra Data

Search internal data sources — DB
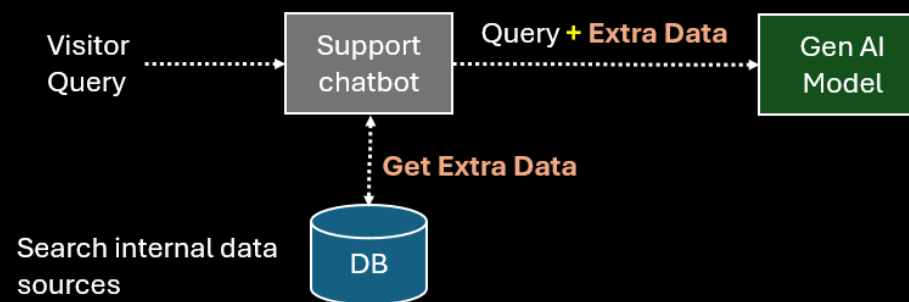
Key Challenges and Limitations
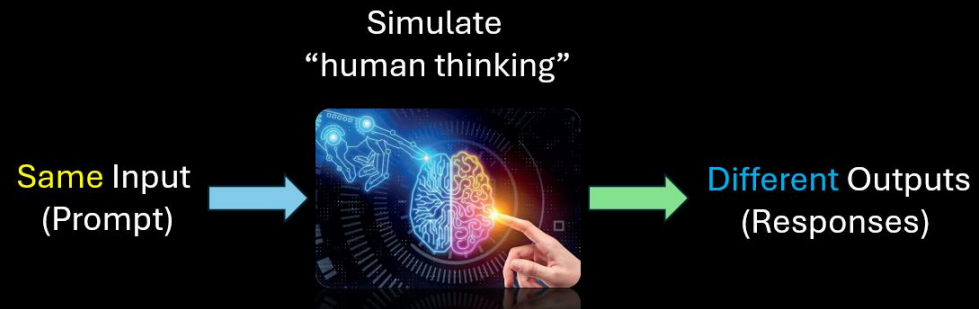
Input (Prompt) → Gen AI → Output (Response)

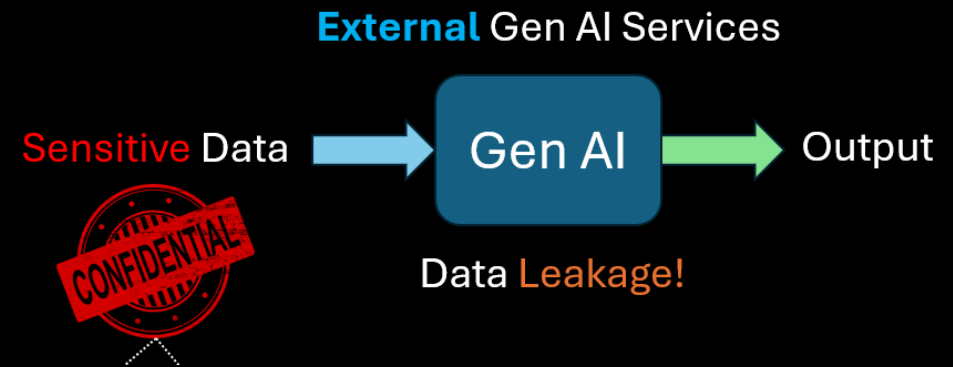"Garbage in, Garbage Out..."

Knowledge Cutoff Date

Included during training

Not Included
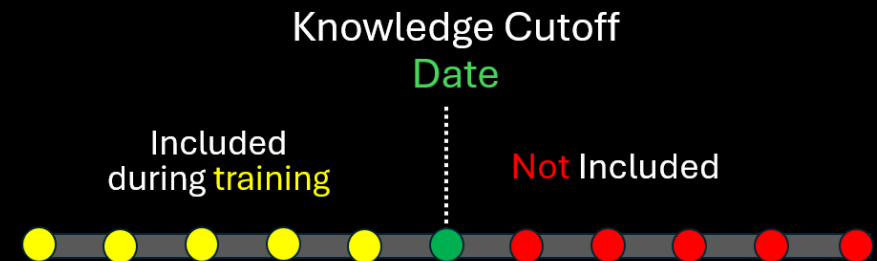
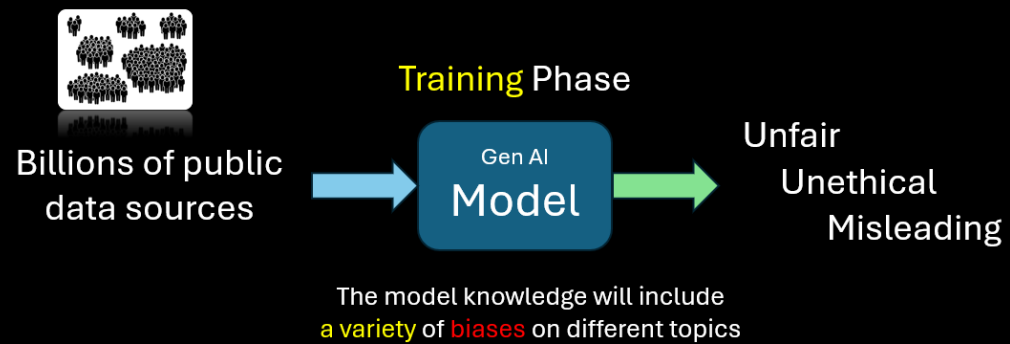#1- Re-train a model in repeated intervals

#2 - connect the model with online tools

Key Challenges and Limitations

Simulate "human thinking"

Same Input (Prompt) → Different Outputs (Responses)

Tabular Data ⇢ Gen AI → ???

Trained based on unstructured data (text)

Limited context window

Hallucinations

Input (Prompt) → Gen AI → Incorrect/Misleading Output

Lack the common sense of the average person
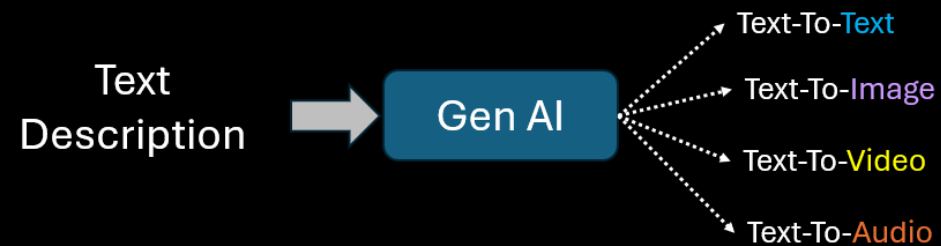
Input → Gen AI → Next Token, Next Token....
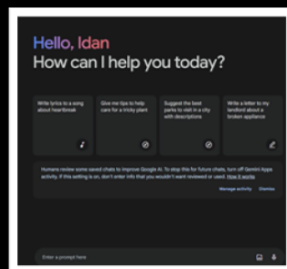Next Token, Next Token....
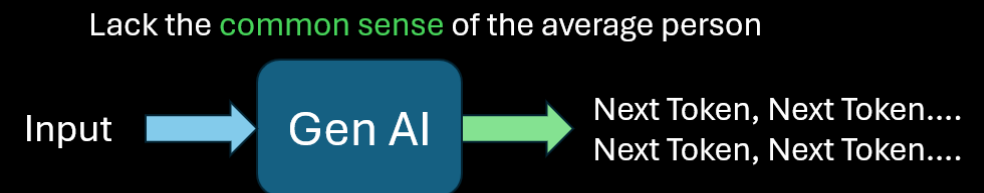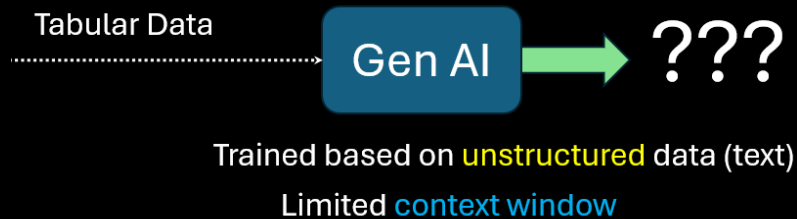
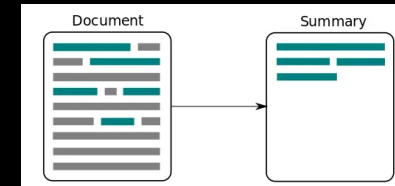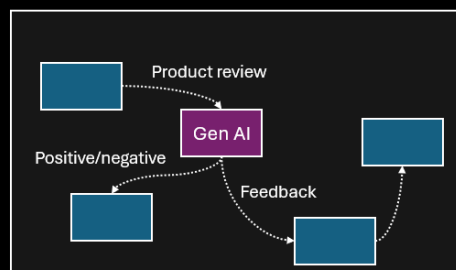Key Challenges and Limitations

Key Challenges and Limitations

Unleash the Power of Generative AI

Text Description → Gen AI

- Text-To-Text
- Text-To-Image
- Text-To-Video
- Text-To-Audio

#1 - Web-Based

Hello, Idan
How can I help you today?

#2 - Application-Based

Product review

Gen AI

Positive/negative

Feedback

Document → Summary

Brainstorm

blog
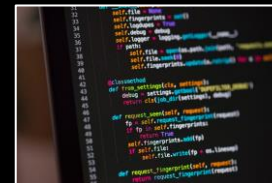
Prompt Engineering
Engineering better prompts