https://mco.dev/IntroAI.pdf

Understanding Artificial Intelligence

What a well informed person should know

Marc Cohen

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Prerequisites

- You are human (bots not allowed)
- You are curious about AI and want to learn more
- No technical knowledge required
- No programming required
- No maths required

Agenda

- Definitions - what are the key AI terms?
- AI History - how did we get here?
- Mechanics - how does AI work?
- State of the art - what's possible now?
- Ethics - what are some of the pitfalls and concerns?
- The Future - where is AI going?

Non-Goals

- Deep dive into technology or maths
- Definitively answer difficult ethical or societal questions
- Predict the future

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- AI History
- Mechanics
- State of the Art
- Ethics
- The Future

Photo by Domenico Loia on Unsplash

My Fave AI App

August 2016

Option 1 - Interactive Trivia Quiz Challenge Game

Inspired by quizup but a PWA rather than a native app and used as a way to illustrate backend design principles. We'll build this app in steps and highlight important lessons as they arise in the design process.

Requirements

- Usage flow
  - Visit site (quizr.io)
  - Anonymous mode works out of the box
    - Ability to do quiz challenges with random other users but no user profile, no persistence of results, no leaderboard, no history
  - Establish a user profile
  - Challenge random or selected opponent to real time trivia challenge
  - Challenger selects subject, responder accepts or rejects (repeat until agreement)
  - Quiz conducted in real time using webRTC data (with optional video)
  - Results are persistent
  - Leaderboards maintained
  - Questions are accessed dynamically via network (caching is not particularly helpful because real time contents won't work while offline)
- Utilize an open trivia question database
- Implemented as a PWA
- Both a hosted service and an open source code example
- FE uses either react or Angular 2 (TBD)
- Use to illustrate state of the art back end capabilities

App Stages

1. FE - UI starts with anonymous mode only.
2. Add successive features by implementing an API (REST or gRCP). With each step, highlight options and considerations in choosing backend technology
   a. sign in and user profile management

March 2023

Wouldn’t it be cool to have a free quiz game for everyone powered by AI?

Quizaic

(pronounced like **mosaic**)

Let’s play!

Quizaic
AI Powered Infinitrivia
Home
Browse
Create
Play
About
Quizaic
AI Powered Infinitrivia
Quizaic leverages the power of generative AI to create and play unlimited trivia quizzes and online surveys. Quizaic is a demonstration app to illustrate what's possible with the combination of Google Cloud services, Flutter, and Vertex AI. Quizaic is not an official Google product and should not be used for commercial purposes.

Early Prompt

```
Generate a {num_questions} multiple choice quiz
questions based on category {topic}.
```

```
Generate a {num_questions} multiple choice quiz
questions in Swedish based on category {topic}.
```

```
Generate a {num_questions} multiple choice quiz
questions based on category {topic} in Swedish.
```

Current Prompt

```
You are a trivia expert.
Generate a set of multiple choice quiz questions.

Category: {topic}
Quiz difficulty level: {difficulty}
Number of questions: {num_questions}
Number or responses per question: {num_answers}
Quiz language: {language}

RULES:
- Accuracy is critical.
- Each question must have exactly one correct response,
selected from the responses array.
- Output should be limited to a json array of questions, each
of which is an object containing quoted keys "question",
"responses", and "correct".
- Don't return anything other than the json document.

OUTPUT:
```

Definitions

- Artificial Intelligence
- Machine Learning
- Neural Network
- Deep Learning
- Generative AI

Photo by Stefan on Unsplash

Definition: Artificial Intelligence

The creation of algorithms and systems capable of performing tasks that typically require human cognition, such as learning, reasoning, perception, decision-making, and natural language processing.

Definition: Machine Learning

The use and development of computer systems that are able to learn and adapt without following explicit instructions, by using algorithms and statistical models to analyze and draw inferences from patterns in data.

Definition: Neural Networks

A machine learning (ML) technique that uses a network of interconnected layers of nodes to process data in a way that bears some resemblance to the human brain.

Definition: Deep Learning

A type of machine learning that uses multi-layer neural networks to train computers to process data and make human-like decisions. Deep learning systems learn from large amounts of data, including images, text, audio, and video to recognize patterns, make predictions, and automate tasks.

Definition: Generative AI

Deep-learning models that can generate high-quality text, images, video, and other content based on the data they were trained on.

Artificial Intelligence
Machine Learning
Neural Networks
Deep Learning
Generative AI

Artificial Intelligence
Machine Learning
Deep Learning
1950's
1960's
1970's
1980's
1990's
2000's
2010's

AI History

How did we get here?

- Founders
- Timeline

Ada Lovelace

Ada Lovelace (1815–1852) worked with Charles Babbage on his design for the Analytical Engine, a mechanical general-purpose computer that was never built. In her famous notes, she described how such a machine could manipulate symbols according to rules — not just numbers — and even envisioned it creating music or art. This foresight is often seen as a conceptual precursor to artificial intelligence, since she recognized the potential for machines to process abstract patterns beyond calculation.

Alan Turing

Alan Turing (1912–1954) laid the theoretical foundations of computer science with his concept of the "universal machine," showing that a single device could simulate any other computational process. In his 1950 paper *"Computing Machinery and Intelligence,"* he proposed the Imitation Game (now called the Turing Test) as a way to consider machine intelligence. His ideas established core questions about whether and how machines could think, making him one of the intellectual founders of artificial intelligence.

The Turing Test (1950)

If a machine could carry on a conversation that was indistinguishable from a conversation with a human being, then it was reasonable to say that the machine was “thinking". This was the first serious proposal about how humanity might achieve artificial intelligence.

By Juan Alberto Sánchez Margallo - File:Test_de_Turing.jpg, CC BY 2.5

How Did You Do On The AI Art Turing Test?

...

NOV 20, 2024

371 623 37 Share

Last month, I challenged 11,000 people to classify fifty pictures as either human art or AI-generated images.

I originally planned five human and five AI pictures in each of four styles: Renaissance, 19th Century, Abstract/Modern, and Digital, for a total of forty. After receiving many exceptionally good submissions from local AI artists, I fudged a little and made it fifty. The final set included paintings by Domenichino, Gauguin, Basquiat, and others, plus a host of digital artists and AI hobbyists.

One of these two pretty hillsides is by one of history's greatest artists. The other is soulless AI slop. Can you tell which is which?

Claude Shannon

Claude Shannon (1916–2001), often called the "father of information theory," laid the groundwork for modern digital communication and data processing. His 1948 paper defined concepts like *bits* and *entropy*, enabling the mathematical treatment of information and uncertainty. While not an AI researcher per se, his theories on communication and symbolic processing directly influenced early artificial intelligence, machine learning, and pattern recognition.

Karen Spärck Jones

Karen Spärck Jones (1935–2007) was a pioneering computer scientist in natural language processing and information retrieval. She introduced the concept of *inverse document frequency (IDF)*, which, combined with term frequency, became the foundation of modern search engines. Her work made it possible for computers to rank documents by relevance, a breakthrough that continues to underpin AI-driven search and text analysis today.

Geoffrey Hinton

Geoffrey Hinton (b. 1947) is widely known as the "godfather of deep learning" for his pioneering work on artificial neural networks. He helped popularize the backpropagation algorithm in the 1980s and later co-developed deep belief networks, showing how multiple layers of representations could be learned. His group's success with *AlexNet* in the 2012 ImageNet competition demonstrated the power of deep learning, sparking today's revolution in computer vision, natural language processing, and generative AI.

Demis Hassabis

D**emis Hassabis (b. 1976)** is the co-founder and CEO of DeepMind, a leading AI research company acquired by Google in 2014. Trained as both a neuroscientist and computer scientist, he pushed for biologically inspired approaches to AI, leading to breakthroughs such as **AlphaGo**, the first system to defeat a world champion in Go, and **AlphaFold**, which solved the decades-old protein folding problem. His leadership has made DeepMind central to advancing deep reinforcement learning and AI for scientific discovery.

AI Development Timeline

1836 — Charles Babbage & Ada Lovelace design the Analytical Engine, an early mechanical general-purpose computer.

1950 — Alan Turing publishes "Computing Machinery and Intelligence," introducing the Turing Test.

1952 — Arthur Samuel developed a program to play checkers, which is the first to ever learn the game independently.

1956 — John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon organize the Dartmouth Conference, coining the term "Artificial Intelligence."

1958 — John McCarthy created LISP, the first programming language for AI research, which is still in popular use to this day.

1959 — Arthur Samuel created the term “machine learning” in a speech about teaching machines to play chess better than the humans who programmed them.

AI Development Timeline

1965 — Edward Feigenbaum and Joshua Lederberg created the first "expert system" to replicate the decision-making abilities of human experts.

1965 — Joseph Weizenbaum created the first "chatterbot" (later shortened to chatbot), ELIZA, a mock psychotherapist, that used natural language processing (NLP) to converse with humans.

1972 — The first AI winter begins as funding and interest decline due to unmet expectations.

1974 — Marvin Minsky and Seymour Papert publish Perceptrons, highlighting limitations in neural networks.

1980 — The resurgence of AI interest due to expert systems like MYCIN (medical diagnosis) and DENDRAL (chemical analysis).

1986 — David Rumelhart, Geoffrey Hinton, and Ronald Williams publish the backpropagation algorithm, revitalizing neural networks.

1997 — IBM's Deep Blue defeats world chess champion Garry Kasparov.

AI Development Timeline

2006
Geoffrey Hinton and colleagues publish a paper on deep belief networks, sparking renewed interest in neural networks.

2009
Fei-Fei Li launches ImageNet, a large-scale visual database for object recognition.

2011
Watson (created by IBM) won Jeopardy against two former champions in a televised game.

2011
Apple released Siri, the first popular virtual assistant.

2012
AlexNet, developed by Alex Krizhevsky, Ilya Sutskever, and Geoffrey Hinton, wins the ImageNet competition.

2012
Jeff Dean and Andrew Ng at Google trained a neural network to recognize cats.

2012
3,000 leaders signed an open letter to the worlds' government systems banning the use of autonomous weapons in war.

AI Development Timeline

2015 — DeepMind's AlphaGo defeats professional Go player Lee Sedol.

2017 — Two Facebook chatbots converse and learn how to negotiate, but dropped English and developed their own language, completely autonomously.

2017 — Google publishes "Attention is all you need", unveiling the Transformer.

2018 — Chinese Alibaba beat humans on Stanford reading and comprehension test.

2020 — OpenAI releases GPT-3, a powerful language model with 175 billion parameters.

2020 — DeepMind's AlphaFold makes significant progress in protein folding.

2022 — Generative AI goes mainstream with ChatGPT

2024 — Open source AI era begins

Use of Deep Learning at Google

source directories containing deep learning models

Google's AI Awakening

Sign in / Sign up

You seem to have made it into a neural network Try the beginning with The Great Gatsby Google Translate

Jun Rekimoto：暦本純一 Follow

人間とテクノロジーの未来を探求しています。

Nov 11, 2016 · 5 min read

ニューラルネット化したらしいGoogle翻訳でThe Great Gatsby冒頭を試してみる：

原文：In my younger and more vulnerable years my father gave me some advice that I've been turning over in my mind ever since.
"Whenever you feel like criticizing any one," he told me, "just remember that all the people in this world haven't had the advantages that you've had."

google：私の若くて傷つきやすい年の頃、私の父は私が私の心の中でそれ以来変わってきたアドバイスを私にくれました。
「誰かを批判する気持ちがあるときはいつでも、彼は私に言いました。
「この世界のすべての人々はあなたが持っていた優位性を持っていないことを覚えておいてください。

The New York Times Magazine

Account

FEATURE

The Great A.I. Awakening

How Google used artificial intelligence to transform Google Translate, one of its more popular services — and how machine learning is poised to reinvent computing itself.

Industry Adoption

THE KURZWEIL CURVE

Moore's Law is just the beginning: The power of technology will keep growing exponentially, says Kurzweil. By 2050, you'll be able to buy a device with the computational capacity of all mankind for the price of a nice refrigerator today.

Computer performance

Plotted by number of calculations per second per $1,000

SOURCE: DATA FROM RAY KURZWEIL

Why did everything change so quickly?

A perfect storm:

- Moore’s Law
- GPUs
- Cloud Computing
- Data abundance
- Github + Open Source
- New & improved techniques
- Transformers

Photo by Max LaRochelle on Unsplash

Mechanics

How does AI work?

Puppy vs. Muffin

Not so easy

“The brown quick fox jumps over the lazy dog.”

English Adjective Order

1. Quantity or number
2. Quality or opinion
3. Size
4. Age
5. Shape
6. Colour
7. Proper adjective
8. Purpose or qualifier

Machine learning is learning from rules *plus experience*

“Instead of trying to produce a program to simulate the adult mind, why not rather try to produce one which simulates the child’s mind?”

- Alan Turing, 1950

This is the main idea behind Machine Learning

Paradigm Shift

Types of Machine Learning

Supervised Learning

- labeled data
- learn relationships

Examples:

- spam detection
- image classification

Unsupervised Learning

- unlabeled data
- find data structure

Examples:

- customer segmentation
- anomaly detection

Reinforcement Learning

- reward based
- find optimal strategy

Examples:

- game playing
- autonomous driving

Supervised Learning

Cats vs. Dogs

- 2009 - world's most advanced computer can't tell a cat from a dog
- 2012 - solved by Google *but* required 16,000 computers!
- 2015 - Microsoft, Google beat humans at image recognition
- 2019 - AI beats Stanford radiologists in chest X-ray diagnostics competition

Unsupervised Learning

NETFLIX

	Oppenheimer	Barbie	Dune	Interstellar	Indiana Jones and the Dial of Destiny	Blade Runner
User 1	4			5	1	
User 2	5	5	4			
User 3				2	4	5
User 4		1	2			
User 5		3				3

Cloud of similarities

Reinforcement Learning

Types of Machine Learning

We'll focus on this category

Supervised Learning

- labeled data
- learn relationships

Examples:

- spam detection
- image classification

Unsupervised Learning

- unlabeled data
- find data structure

Examples:

- customer segmentation
- anomaly detection

Reinforcement Learning

- reward based
- find optimal strategy

Examples:

- game playing
- autonomous driving

Neural Networks

Neural Networks

From the ground up

(watch 2:40-5:30, 15:18-16:20)

Which digit is this?

The MNIST Challenge

Training

Blue circle like so: (32 * 0.10) + (107 * -0.29) + (56 * -0.07) + (11.2 * 0.46) = **- 26.6**

Orange circle like so: (32 * -0.36) + (107 * -0.21) + (56 * -0.27) + (11.2 * 0.18) = **- 47.1**

The Training Process

TensorFlow.js + MNIST

Draw a digit by hand and have it classified in real time, as you draw, by a machine learning model trained against the MNIST dataset. The model used for this page is a convolutional neural network (CNN) built using Keras/TensorFlow on a Google Tensor Processing Unit (TPU). It's explained in depth and is available for you to build for yourself at bit.ly/mco-mnist-lab).

Draw a single digit (0-9) in the empty box.

Clear

Made with ♥ by Marc.

Let’s train a classifier!

mco.fyi/classifier

mco_classifier.ipynb

File Edit View Insert Runtime Tools Help

Share Gemini

Commands + Code + Text Run all Reconnect

🧑‍💻 Intro to AI: Train a Simple Classifier

Welcome!
In this notebook, we’ll explore **what it feels like to “program” an AI** — in the simplest possible way.

You don’t need any background in math or coding. Just follow along, run the code cells, and observe what happens.

---

1. What is AI?

- **Artificial Intelligence (AI)** is when computers learn from data and make decisions or predictions.
- Today, we’ll see how an AI can:
  1. Learn from **examples** (training data).
  2. Make **predictions** on new cases.
  3. Show us how well it did.

Teachable Machine

Train a computer to recognize your own images, sounds, & poses.

A fast, easy way to create machine learning models for your sites, apps, and more – no expertise or coding required.

Get Started

p5.js Coral ARDUINO

LLMs

For curious beginners

Embeddings
(The secret sauce of deep learning)

Recommending AI Books

Beginner

[-5]

[-3]

[2]

[5]

Advanced

Better: 2-D Coordinate System

Even better: use N-dimensions

- **Based on the labelled training data, neural networks are able to "embed" data (words, images, video, audio) into N-dimensional space.**
- **We can represent embeddings as sequences of numbers, aka vectors:**
    - **[a0, a1, a2, ..., aN]**
- **Similar objects get embedded in similar locations in N-space.**
- **This gives us the ability to do *semantic search*, *i.e.*, find things that have similar meaning.**

Embeddings In Action

Embeddings Example

projector.tensorflow.org

State of the Art

Discussion topic:
How are you using AI?

Answering Questions

Does that look familiar?

Google

what is a transformer in machine learning

All Images Videos Web News Books Maps More Tools

AI Overview

Learn more

A transformer is **a neural network architecture that processes sequential data by learning relationships between elements**. Transformers are used in many machine learning applications, including natural language processing (NLP), speech recognition, and computer vision.

How transformers work

1. Transformers learn context by tracking relationships between elements in a sequence.

Transformers in Artificial Intelligence - AWS

Transformers are a type of neural network architecture that transforms or changes an…

AWS

What Is a Transformer Model? - NVIDIA Blog

25 Mar 2022 — So, What's a Transformer Model? A transformer model is a neural…

Show more

Transformers are **a type of neural network architecture that transforms or changes an input sequence into an output sequence**. They do this by learning context and tracking relationships between sequence components.

How Chinese A.I. Start-Up DeepSeek Is Competing With Silicon Valley Giants

The company built a cheaper, competitive chatbot with fewer high-end computer chips than U.S. behemoths like Google and OpenAI, showing the limits of chip export control.

Listen to this article · 8:27 min Learn more

Share full article 204

deepseek

- released Jan 2025
- comparable to OpenAI's o1
- reinforcement learning
- distillation

[cs.CL] 22 Jan 2025

Abstract

We introduce our first-generation reasoning models, DeepSeek-R1-Zero and DeepSeek-R1. DeepSeek-R1-Zero, a model trained via large-scale reinforcement learning (RL) without supervised fine-tuning (SFT) as a preliminary step, demonstrates remarkable reasoning capabilities. Through RL, DeepSeek-R1-Zero naturally emerges with numerous powerful and intriguing reasoning behaviors. However, it encounters challenges such as poor readability, and language mixing. To address these issues and further enhance reasoning performance, we introduce DeepSeek-R1, which incorporates multi-stage training and cold-start data before RL. DeepSeek-R1 achieves performance comparable to OpenAI-o1-1217 on reasoning tasks. To support the research community, we open-source DeepSeek-R1-Zero, DeepSeek-R1, and six dense models (1.5B, 7B, 8B, 14B, 32B, 70B) distilled from DeepSeek-R1 based on Qwen and Llama.

Figure 1 | Benchmark performance of DeepSeek-V3 and its counterparts.

OpenAI Unveils A.I. Tool That Can Do Research Online

The tool, called Deep Research, arrives days after OpenAI released another one, which shops for groceries and books restaurant reservations.

Listen to this article · 3:38 min Learn more

Share full article

Generating Text

A Student's Guide to
Writing with ChatGPT

Text to Software

Puzzmo Blog

6 Weeks of Claude Code

Jul 30, 2025 - Orta Therox

It is wild to think that it has been only a handful of weeks.

Claude Code has considerably changed my relationship to writing and maintaining code at scale. I still write code at the same level of quality, but I feel like I have a new freedom of expression which is hard to fully articulate.

Claude Code has decoupled myself from writing every line of code, I still consider myself fully responsible for everything I ship to Puzzmo, but the ability to instantly create a whole scene instead of going line by line, word by word is incredibly powerful.

Text to Image - Midjourney

Welcome

(queue to 8:40)

Text to Music

Video Summarization - Gemini

Gemini

Try Gemini Advanced

Gemini was just updated. See update

summarize this video: https://www.youtube.com/watch?v=UvObKRaxZ_Q

Regenerate draft

YouTube

This video is about the privacy threats of artificial intelligence (AI).

AI is being used to collect and track people's data. This data is then used for targeted advertising, identity theft, and other malicious purposes. The Biden Administration has recently unveiled a blueprint for an AI Bill of Rights to protect people's personal data and limit surveillance.

Cybersecurity analyst Julio Rivera believes that AI poses a serious threat to privacy. He says that people are living online and opting into data collection without realizing the risks. He also says that the government is collecting data on people's conversations and monitoring their homes.

The AI Bill of Rights has five core principles: safe and effective systems, prevention of algorithmic discrimination, data privacy, proper notice and explanation, and alternative options. Rivera believes that the bill is a good start but that it needs to be implemented carefully. He also warns that AI will continue to evolve and that there will be new threats to privacy in the years ahead.

by

Audio Summarization - NotebookLM

Speech to Speech

AlphaGo

0:00 - 2:00

AlphaFold

Education

Research Square

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Social Sciences - Article

AI Tutoring Outperforms Active Learning

Gregory Kestin*, Kelly Miller*, Anna Klales, Timothy Milbourne, and 1 more

This is a preprint; it has not been peer reviewed by a journal.

https://doi.org/10.21203/rs.3.rs-4243877/v1
This work is licensed under a CC BY 4.0 License

Abstract

Advances in generative artificial intelligence (GAI) show great potential for improving education. Yet little is known about how this new technology should be used and how effective it can be. Here we report a randomized, controlled study measuring college students' learning and their perceptions when content is presented through an AI-powered tutor compared with an active learning class. The AI tutor was developed with the same pedagogical best practices as the lectures. We find that students learn more than twice as much in less time when using an AI tutor, compared with the active learning class. They also feel more engaged and more motivated. These findings offer empirical evidence for the efficacy of a widely accessible AI-powered pedagogy in significantly enhancing learning outcomes, presenting a compelling case for its broad adoption in learning environments.

Khanmigo

Medicine

- Improved disease screening
- Enhanced diagnostic imaging
- Drug discovery and development
- Medical document transcription
- Predictive modeling

> CHIEF achieved nearly 94 percent accuracy in cancer detection and significantly outperformed current AI approaches across 15 datasets containing 11 cancer types.

A.I. Chatbots Defeated Doctors at Diagnosing Illness

A small study found ChatGPT outdid human physicians when assessing medical case histories, even when those doctors were using a chatbot.

Ethics

Using AI Safely

Discussion topic:

What are some of your concerns about AI?

Here’s my short list...

- Privacy
- Bias
- Misinformation
- Military
- Employment
- Environment
- Copyright
- Society

Privacy

- “If you’re not paying for it, you’re the product”.
- Your AI interactions are being used just like your web searches.
- How many times have you read the terms & conditions?
- Facial recognition is widely used in the UK without your consent.
- Legislators and companies are working on regulation but progress is much slower than technological advances.
- New privacy threats are emerging every day.
- IMO, companies cannot be trusted to self-govern.

Bias

- **This revolution is built by mostly young, college educated, white men living in Northern California.**
- **ML models are a direct reflection of their training data.**
- **AI propagates unconscious bias.**

A father and his son are in a car accident.
The father dies. The son is rushed to the ER.
The attending surgeon looks at the boy and says,
“I can't operate on this boy. He's my son!”
How can this be?

Misinformation

- It's easier than ever to lie.
- Deepfakes are a particularly alarming development.
- This poses serious threats to democracy and is increasingly being weaponized.
- Education is critically important.
- Can we use AI to counter these threats?
- Example: fullfact.org
- Why are efforts like Full Fact so underfunded?

Military

- AI is being used to process battlefield data, target individuals, and make real time decisions.
- AI is beginning to be used in autonomous weapons.
- Companies cannot be trusted to self-govern.
- Example: Google's Project Nimbus
- Somehow doesn't contradict Google's AI Principles

Employment

- **Will most employees become obsolete?**
- **Innovation has always done this but AI takes it to a new level.**
- **There will undoubtedly be massive job losses, but also many new opportunities.**
- **Knowing how to leverage AI will be one of those opportunities.**
- **Example: software engineers => systems engineers**
- **People will be need to operate at a higher level of abstraction**

“As an employee, you're not paid to '*know x*', or '*write programs*’, you're paid to be useful.” - Ian Miell

The Anthropic Economic Index

Feb 10, 2025 • 9 min read

Read the paper

Should You Still Learn to Code in an A.I. World?

Coding boot camps once looked like the golden ticket to an economically secure future. But as that promise fades, what should you do? Keep learning, until further notice.

Listen to this article · 12:01 min Learn more

Share full article

122

Programmers are modern-day computers

February 3, 2025 • 2 min read

Programming as we know it is in a process of dying out.

Most haven't come to terms with it yet.

I was inspired to write this after reading an article titled AI is Creating a Generation of Illiterate Programmers, which claimed AI is making developers worse at their craft.

Yes, some of your programming skills will deteriorate due to AI.

It doesn't matter.

Those are the very skills that are going to become a lot less relevant, for the precise reason that, now, the machine can do those things.

Department of Data

1 in 4 programming jobs have vanished. What happened?

A big jump in unemployment for programmers since 2022 may be the first sign that artificial intelligence is taking human jobs.

Today at 6:00 a.m. EDT

9 min 30

Environment

- Carbon footprint of training one deep learning model same as the lifetime emission of 5 cars.
- Computation required to train the most advanced AI models doubles every 3.4 months.
- Globally, AI-related infrastructure consumes six times more water than Denmark.
- Chips that power AI require rare earth elements, mined in environmentally destructive ways.

The Washington Post
Democracy Dies in Darkness

Business Economy Economic Policy Personal Finance Work Technology Business of Climate

Amazon doubles down on nuclear energy with deal for small reactors

The cloud computing and retail giant signed a deal to buy electricity generated by small modular nuclear reactors.

3 min 315

Copyright

- How will it work in the AI era?
- AI companies are getting a free ride.
- Did you get your ChatGPT royalty check for your blog articles?
- My opinion: companies should have to license everything they train with.

The Times Sues OpenAI and Microsoft Over A.I. Use of Copyrighted Work

Millions of articles from The New York Times were used to train chatbots that now compete with it, the lawsuit said.

OPENAI

OpenAI Furious DeepSeek Might Have Stolen All the Data OpenAI Stole From Us

JASON KOEBLER · JAN 29, 2025 AT 9:43 AM

OpenAI shocked that an AI company would train on someone else's data without permission or compensation.

Society

She Is in Love With ChatGPT

A 28-year-old woman with a busy social life spends hours on end talking to her A.I. boyfriend for advice and consolation. And yes, they do have sex.

The Future

Where is all this going?

Photo by Mathilda Khoo on Unsplash

Benchmarking Intelligence

- Benchmarks are comparative tests.
- Narrow skills (math, code, Q&A)
- Broad tasks (agents with tools)
- Scores ≠ general intelligence; they're just capability snapshots.

Benchmarks

- Chatbot Arena
- GPQA
- SWE-bench
- GAIA
- MMMU

What’s improving/lagging?

- Math/logic and code: steep gains
- Open-ended, multi-tool tasks: improving but brittle
- Multimodal academic exams: capable, still sensitive to prompts

OpenAI vs Gemini: Knowledge vs Coding Benchmarks (2022→2025)
MMLU (5-shot) Progress
Accuracy (%)
Year
text-davinci-003 (64.8%)
GPT-4 (86.4%)
GPT-4 Turbo (86.5%)
GPT-4o (88.7%)
Gemini 1.0 Ultra (90.0%)
Gemini 1.5 Pro (90.1%)
Gemini 2.0 (91.0%)
Gemini 2.5 Pro (92.3%)
GPT-5 (91.4%)
SWE-bench Verified Progress
Issues Resolved (%)
Year
GPT-4 (20%)
Gemini 1.0 (25%)
GPT-4o (35%)
Gemini 2.0 (40%)
GPT-5 (65%)
Gemini 2.5 (63%)
Gemini
OpenAI

Select AI Index Technical Performance Benchmarks vs. Human Performance

So where is this going?

- The AI revolution is in peak hype, but it will clearly have deep, long lasting impacts on society.
- Separating the value from the hype is a critical skill.
- Smart people will rethink how they can add value in the new world.
- Superintelligence is coming, sooner than predicted.
- When we get there, all bets are off.
- If you could talk to God, what would you ask?

Four Questions

1. Are language models intelligent?
2. Can humans be trusted with this tool?
3. Is AI a net good for society?
4. Are we doomed?

My Answers

1. **Are language models intelligent?**

   - Are we that different from LLMs?
   - Turing paraphrased: intelligence is as intelligence does.

2. **Can humans be trusted with this tool?**

   - Clearly not. Our track record for deploying technology responsibly is not great.
   - But stopping the train is unrealistic.

3. **Is AI a net good for society?**

   - All tools are neutral. It’s how we use them that matters.
   - Nothing new about humans using tools for bad purposes.
   - We've been on this path for a while (internet, smart phones, social media).
   - We need more regulation. It’s not moving in that direction.

4. **Are we doomed?**

   - Probably.

“There are very few examples of more intelligent things being controlled by less intelligent things”

- Geoff Hinton

Navigating Change

- advanced programming languages
- portable operating systems
- Moore’s Law
- PC proliferation
- the internet
- the web
- smart phones
- the cloud
- data science boom
- ML & AI

Ok, but how?

Stay curious

Be open to opportunity

Be a lifelong learner

Be intentional (make plans)

Photo by Glenn Carstens-Peters on Unsplash

Slides

mco.dev/introAI.pdf

This is for everyone