

CODE
STATE OF NET

**State of .NET:
State of AI 2024**

**By Markus Egger
February 28, 2024 - Online**

About Our Presenter

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CODE Group
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“Helping People Build Better Software”

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What does AI mean for you?

“Skunk Works” Projects

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Talk to an AI Survey

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attending! Please complete this brief survey. If you do not attend, please do not watch the recording instead.

1. Name *

your answer

2. Company Name *

Enter your answer

Agenda

- Overview of current AI and AI capabilities
 - OpenAI and Azure OpenAI as a next-generation development platform and paradigm
 - Other models
 - Copilots as the new paradigm
 - Real-world examples
-
- The last time we looked at AI was in January 2023 😊

AI Overview



What is AI (Artificial Intelligence) and ML (Machine Learning)?

- The ability of a machine to perform “intelligent” tasks
- But what is “intelligent” in that sense?
- What is “intelligence” in any sense?
- “AI” is often described as “what’s just beyond what machines can do today”
- Today, we are generally talking about mathematical models and pattern matching



Examples of Computers being “Intelligent”

- Searching for data
- Playing Chess or GO
- Predicting user input
- Predicting the stock market
- Visual & audio recognition
- Machine translation
- Writing legal contracts



“Superhuman Intelligence”

- What does it mean to be “generally smarter than humans”?
 - Faster?
 - More memorization?
 - Considering more factors?
 - More complex?
 - More accurate?
 - Better pattern matching?
 - Fewer errors?
 - Self-aware?
 - Scalability?
 - ...
- Will we get there? When? Does it matter?
- *Note: It seems to me, we are even lacking proper vocabulary to discuss this issue at any depth*

Is Artificial Intelligence Dangerous?

- The “Singularity”
- Run-Away General Artificial Intelligence
- What today’s (and tomorrow’s) AI is **NOT**:
 - It’s not generally intelligent
 - It’s not conscious or self-aware
 - It’s not cunning
 - It doesn’t appreciate humor
 - It doesn’t have its own goals
 - It doesn’t have feelings, empathy, love, or appreciate beauty
 - It’s not self-motivated or driven by its own agenda
 - It’s not a person

AI and Robotics

- We are much further along in AI than in corresponding robotics
- Calculating what “should be done” in the world (such as performing a physical task) is more realistic than having a robot perform that task
- Once an AI algorithm is created, it can be shared worldwide and inexpensively... creating corresponding robots is expensive and time consuming



AI Impact on the Economy

- Estimates and timeframes for AI replacing human jobs vary greatly
- A rough average seems to be that by 2040-2050, about 50-60% of current jobs can be replaced by AI
 - Whether they will be, is a different question
- The expected characteristic is that mainly the “middle” will be affected, while low-skill and high-skill jobs should be around longer
- Clearly, this will have an extreme impact on society

Factors on “Winning the AI Game”



DATA, DATA, DATA, AND
MORE DATA (FREELY
AVAILABLE)



AVAILABILITY OF
COMPUTE POWER (CLOUD
AND OTHERWISE)



FUNDING AND
ENTREPRENEURSHIP

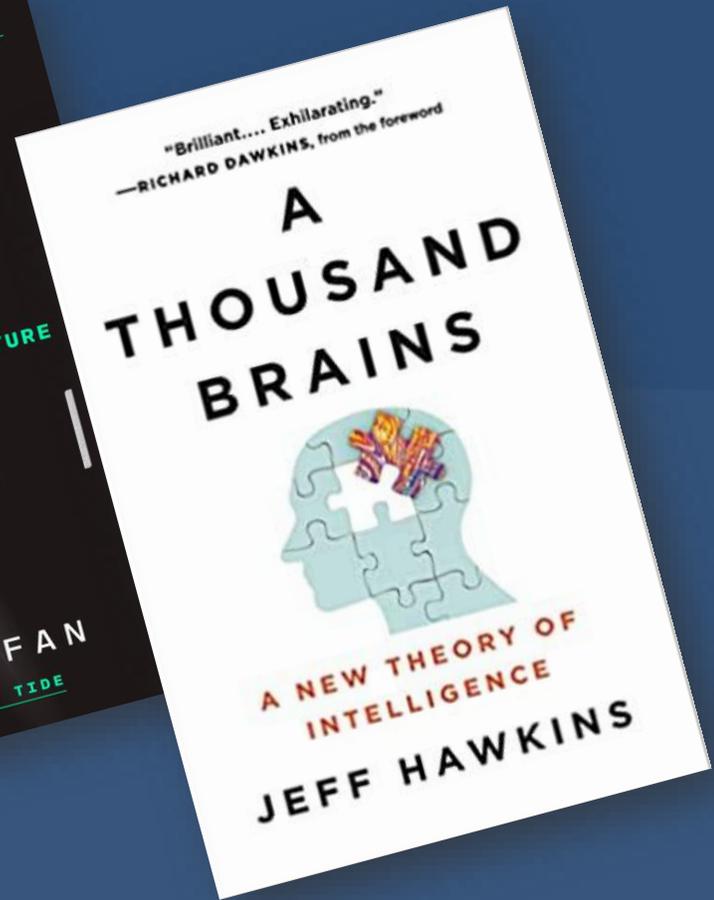
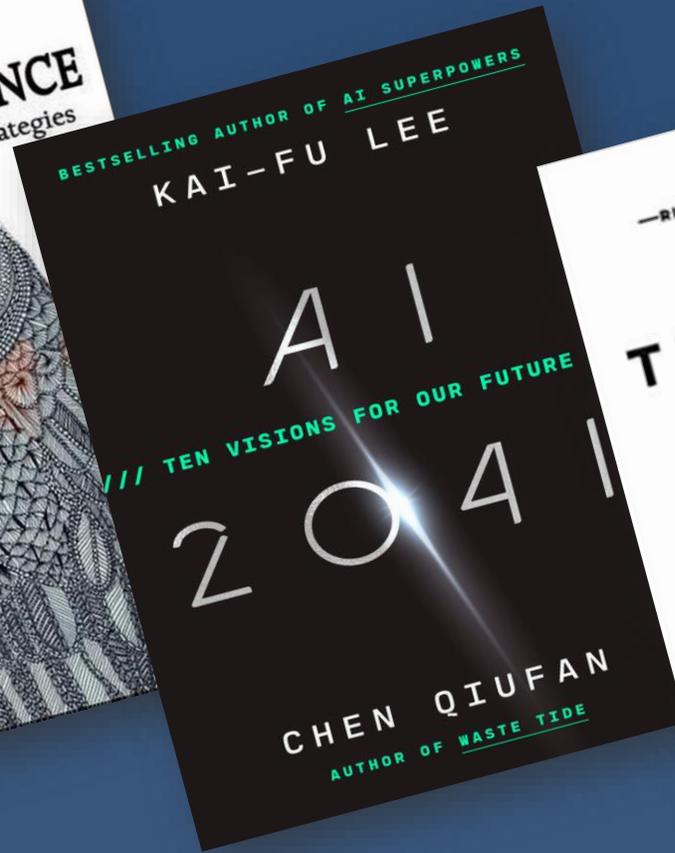
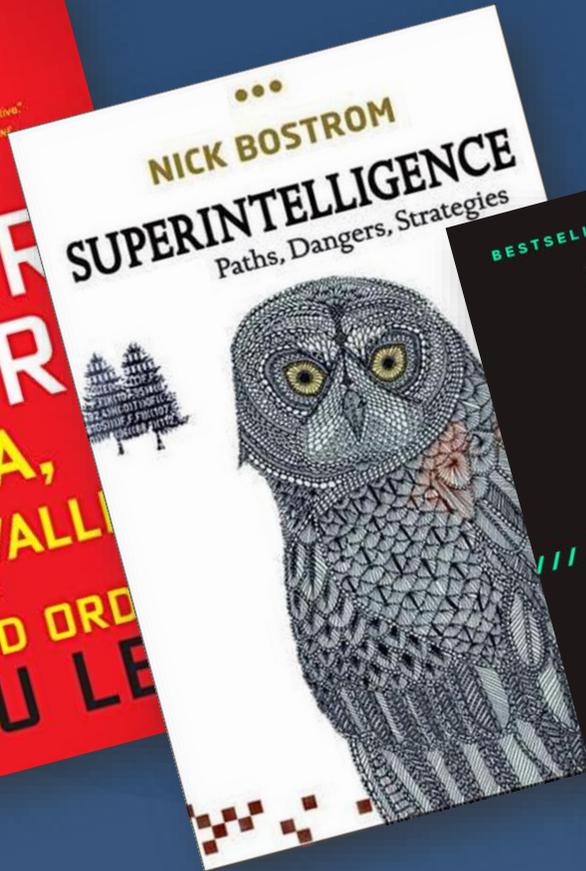
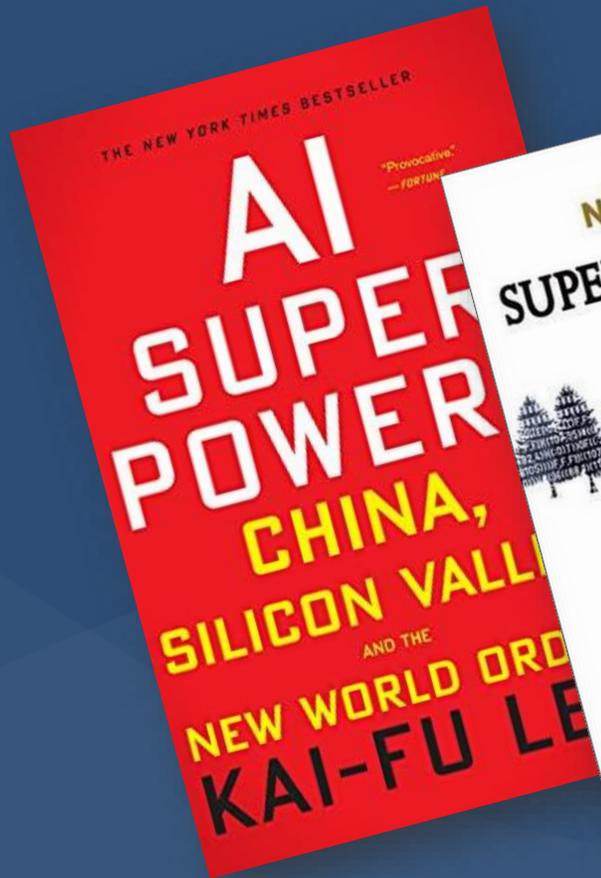


WELL-TRAINED AI
SCIENTISTS



A SUPPORTIVE POLICY
ENVIRONMENT

Recommended Reading





AI & Machine Learning in Practice Today

Our Capabilities Today

- Narrow Learning (Deep and Shallow)
- No real General Artificial Intelligence
 - Although that term is also used in confusing ways
 - I also question whether “general” AI is all that critical for our purposes
- The results we can already achieve are both mind-boggling and very practically useful

Using AI Today



BUILT INTO APPS AND
SERVICES



DEVELOPING AGAINST
PRE-TRAINED AIS



TRAINING YOUR OWN
AIS

Azure Cognitive Services

- Speech
 - Speech to text, text to speech, translation, speech and speaker recognition
- Language
 - Sentiment analysis, translation, question answering, conversation, recognition,...
- Vision
 - Computer vision, custom vision, face recognition
- Decision
 - Anomaly detection, content moderation, personalization
- **Azure OpenAI Services**

Who is OpenAI?

- Non-Profit OpenAI Incorporated
- For-Profit OpenAI Limited Partnership
- Founded in 2015 in San Francisco
- Microsoft made a \$11 billion investment and reportedly owns 49% of OpenAI LP
- All OpenAI Infrastructure runs on Azure



A History of OpenAI's Milestones

- GPT 3 was announced in 2020
- DALL-E was released in 2021
- GPT 3.5 was released in 2022
 - More than 5 million signups in the first five (!) days
 - The first truly useful “generative pre-trained transformer” (GPT)
- In January of 2023, Microsoft announced a \$10 billion investment
- GPT 4 released in March of 2023
- ** These are not the only models and products OpenAI released, but they are the most significant and visible ones.*

How OpenAI Defines AGI

- It is OpenAI's goal to create Artificial General Intelligence...
- ...which they define as AI that is "Outperforming humans on most economically viable work"

OpenAI's Key Products

- Large Language Models – GPT, ChatGPT,...
- Image Generation Models – Dall-E

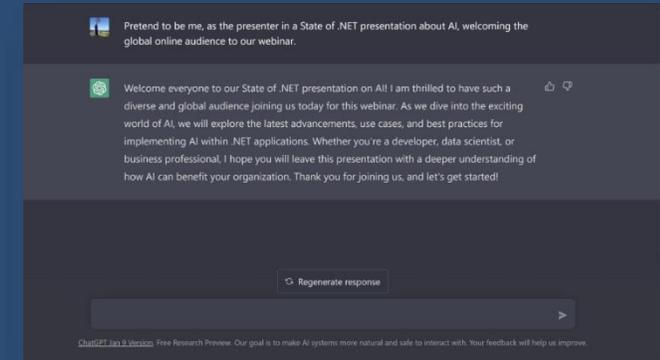
Other Models

- Stable Diffusion 3
- SORA Video Generation
- Whisper
- Gemini
- LLaMa 2/3
- Mistral

Language Models

OpenAI's ChatGPT

- *GPT = Generative Pre-Trained Transformer
- You have probably heard about this 😊
 - Although just very recently
- A technological leap that forms the basis for a lot of new tech
- Note that this is just a “text calculator” ... just a very good one 😊
 - The result is that this does a lot more than was anticipated, even by the creators
- Microsoft is very heavily invested



AI's Adoption Tsunami

- Netflix took 41 months to reach 1 million users
- Facebook took 10 months to reach 1 million users
- Instagram took 2.5 months to reach 1 million users

- ChatGPT took 5 days!

ChatGPT is not “One Thing”

- ChatGPT is a collection of different models that get invoked as different tasks are performed
- GPT 3.5 is what most people use
- GPT4 is the “Big Kahuna”
- Codex for source code generation
- ...

Why GPT4 is so Amazing



We have two boxes. John puts a ball into the first box. He then leaves. Bob enters the room and moves the ball from the first to the second box. John returns that evening. Where is he looking for the ball?

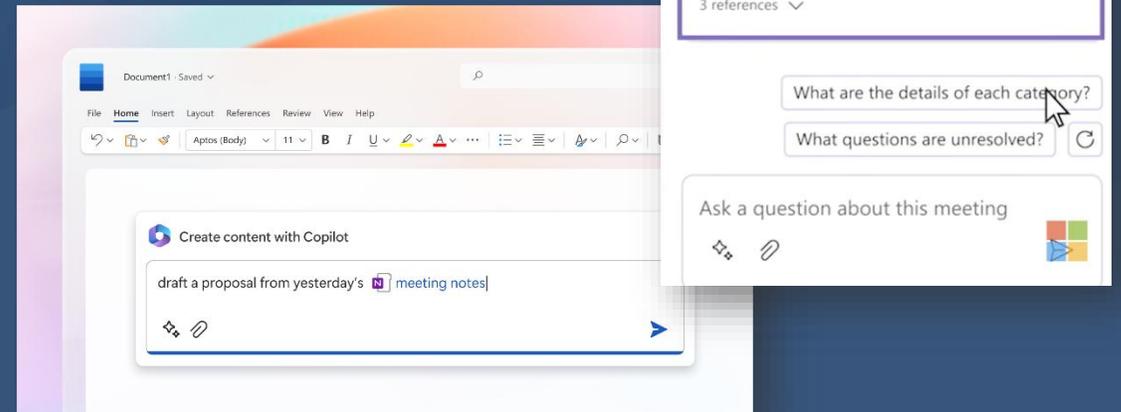
Side-Note: Local Models

- Not everything you do with these kinds of models has to run on Azure servers
- Check out Philipp Bauer's session (this room, Wednesday, 1:45pm) about local models



Microsoft Copilot

- Microsoft is now introducing Copilot features in practically all applications
- Copilots are expected to drastically improve productivity
 - They already are today!
- <https://news.microsoft.com/reinventing-productivity/>



GitHub Copilot

- GitHub Copilot assists in writing code
 - Now used by over 1 million developers
 - Productivity gains of more than 50%!
-
- Check out the recording from our State of .NET Webinar and on our YouTube channel!



Resulting Characteristics of Copilots

- Drastically improved productivity
 - Expected to improve 50%+ every year!
- Every year, twice as good. Every year, 1/10th of the cost.
- The situation is evolving extremely fast.
 - Faster than the Web wave was.
 - Faster than the Mobile wave was.
- We just went from “Software is eating the world!” to **“AI is eating software!”**.

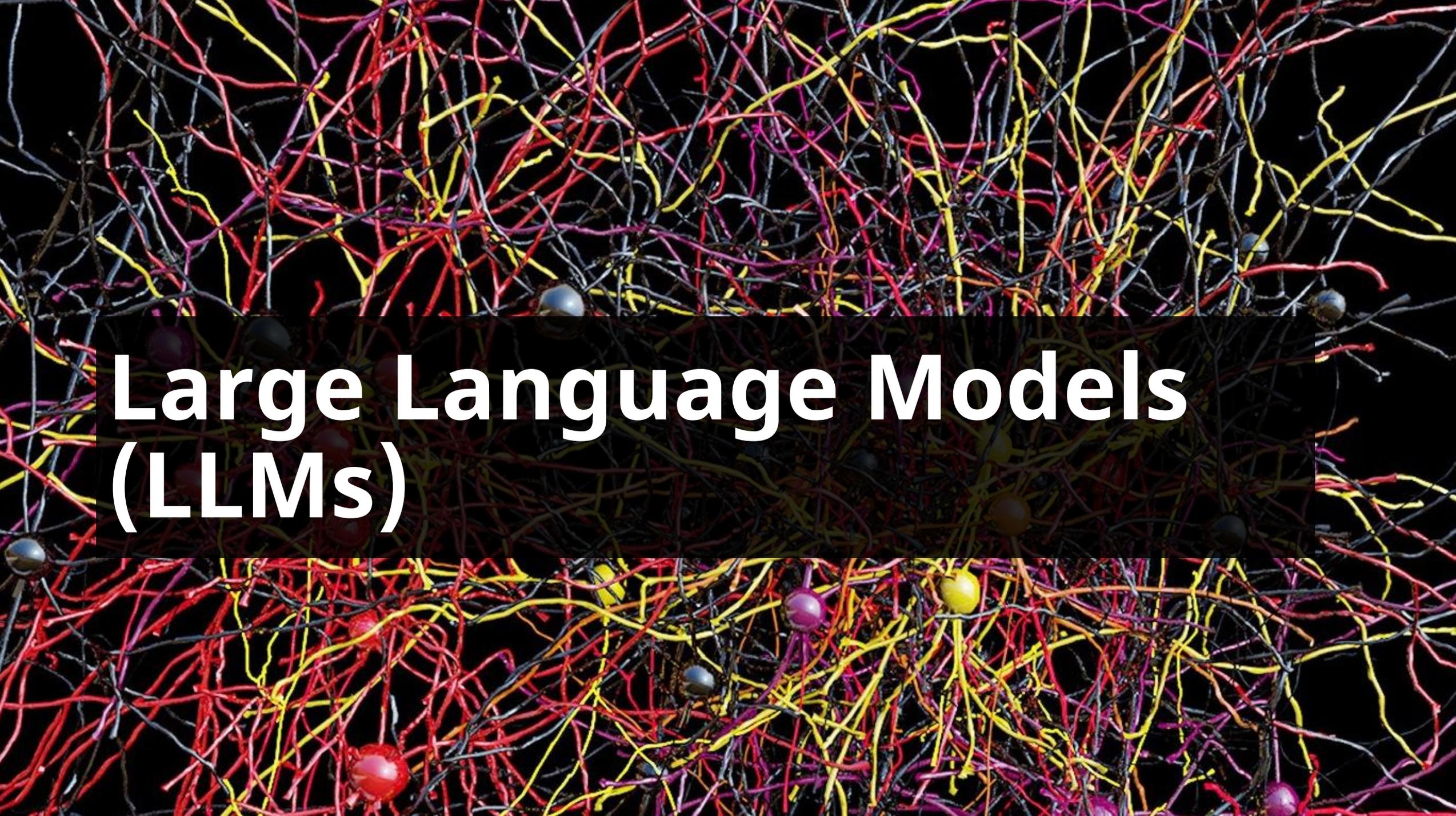
Resulting Characteristics of Copilots (cont.)

- We are only at the very beginning of all this. We are basically dealing with the AI equivalent of toddlers 😊
- No true Singularity will result from this, but...
 - ...this may well be the start of drastic societal changes that makes the Industrial Revolution look like child-play.
 - ...AI may create security and regulatory nightmares

A Case Study

New York, NY – February 27, 2024 – [Klarna](#) today announced its AI assistant powered by OpenAI. Now live globally for 1 month, the numbers speak for themselves:

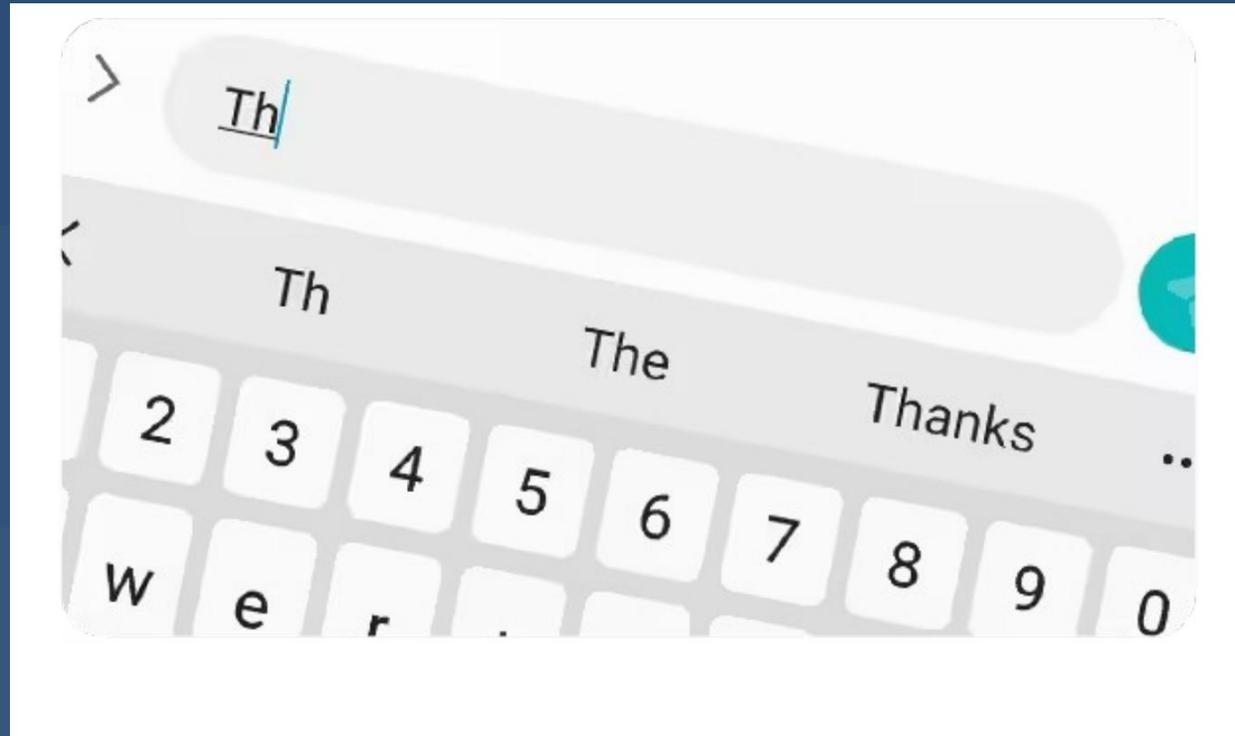
- The AI assistant has had **2.3 million conversations, two-thirds of Klarna's customer service chats**
- It is doing the equivalent work of **700 full-time agents**
- It is on par with human agents in regard to customer satisfaction score
- It is more accurate in errand resolution, **leading to a 25% drop in repeat inquiries**
- Customers now **resolve their errands in less than 2 mins compared to 11 mins previously**
- It's available in **23 markets, 24/7** and communicates in more than **35 languages**
- It's estimated to drive a **\$40 million USD in profit** improvement to Klarna in 2024



Large Language Models (LLMs)

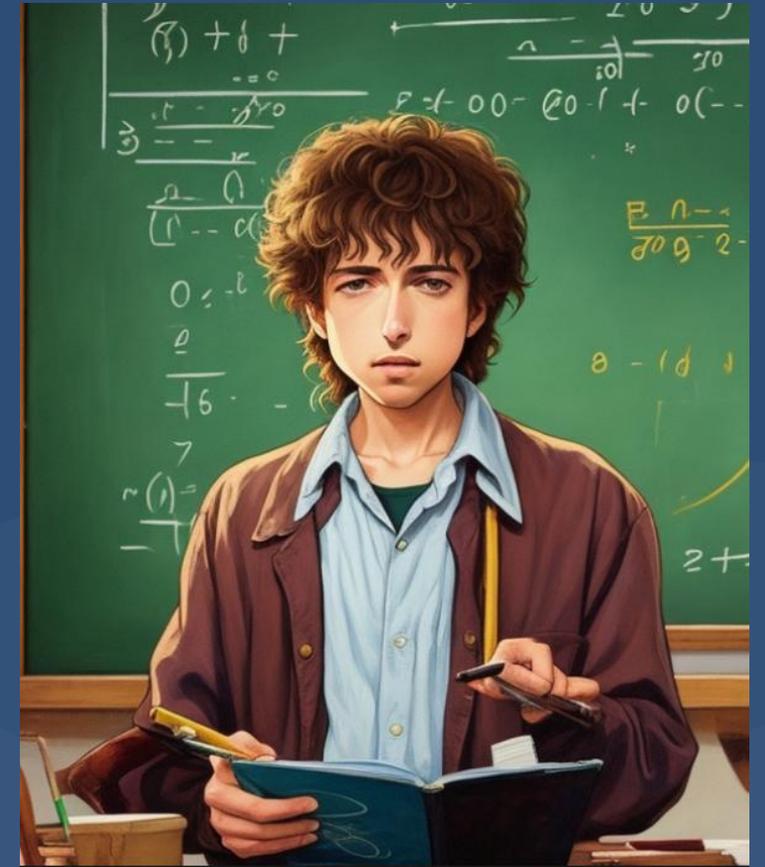
Large Language Models

- LLMs based on frequencies

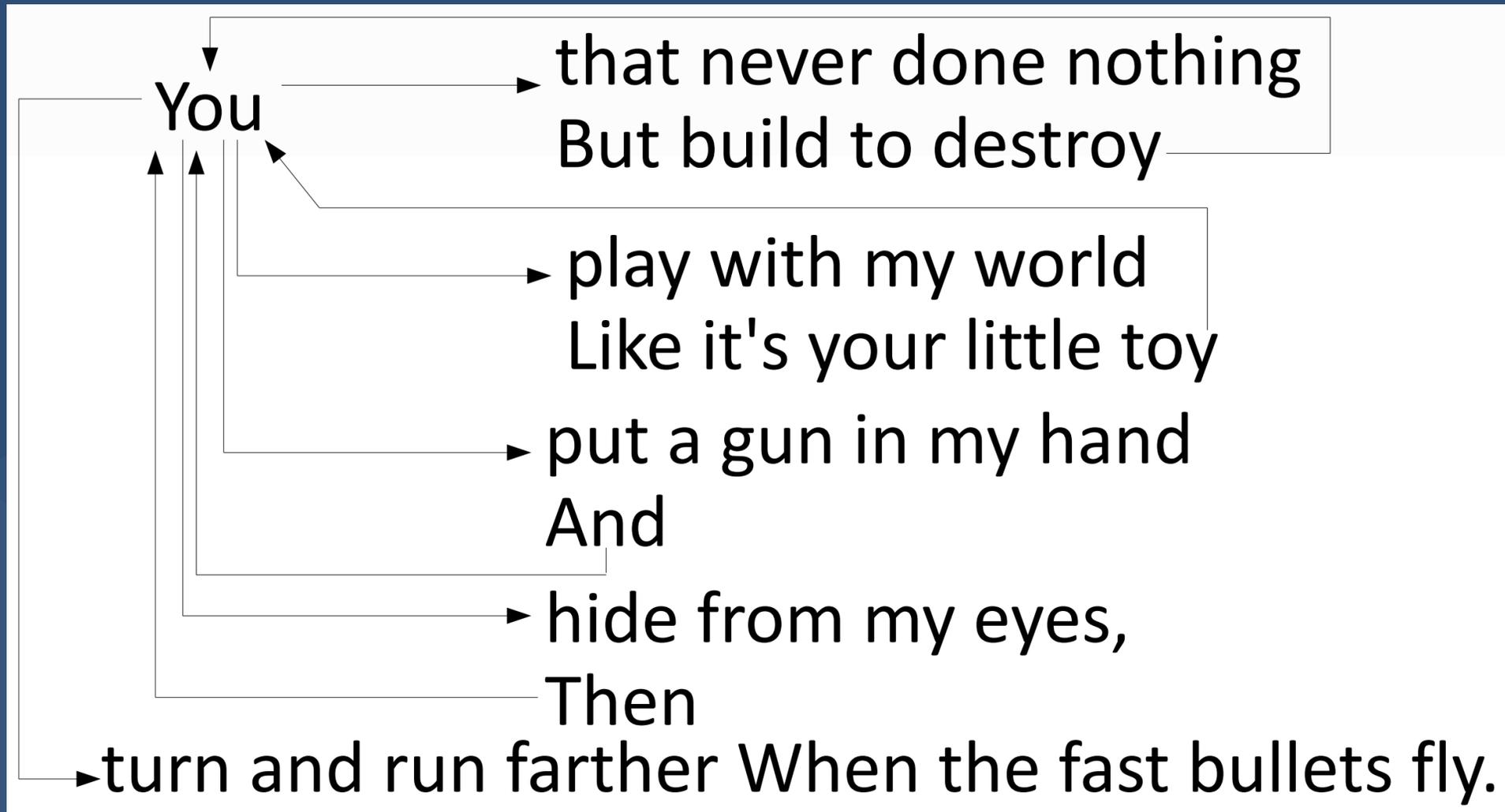


Large Language Models with Bob Dylan

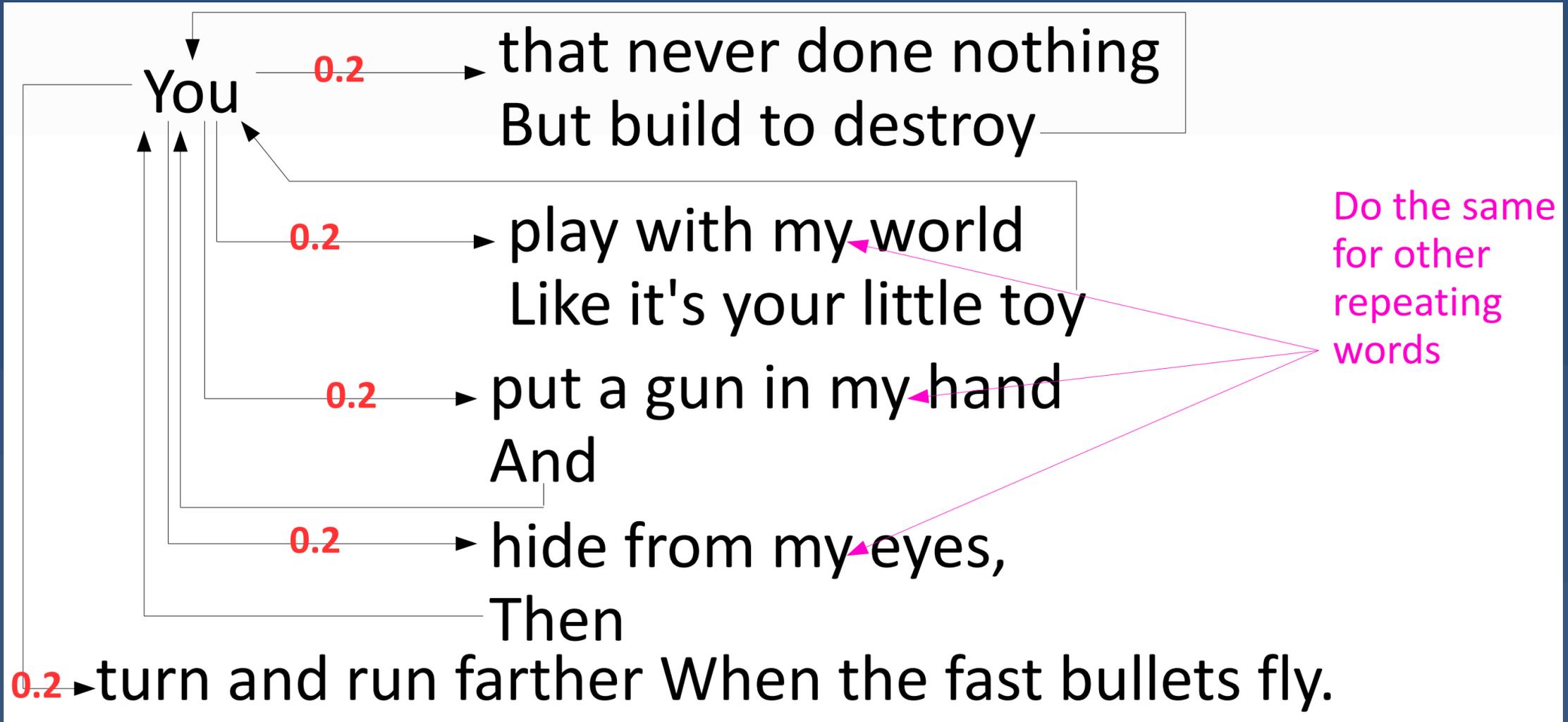
You that never done nothing
But build to destroy,
You play with my world
Like it's your little toy.
You put a gun in my hand
And you hide from my eyes,
Then you turn and run farther
When the fast bullets fly.



Large Language Models



Large Language Models – Edge Probabilities



Large Language Models as Generative AI

Use this model to generate Bob Dylan songs:

You play with my eyes,
Then you play with my world
Like it's your little toy.
You that never done nothing
But build to destroy,
you hide from my hand
And you hide from my ...etc...

Somewhat ok

Garbage

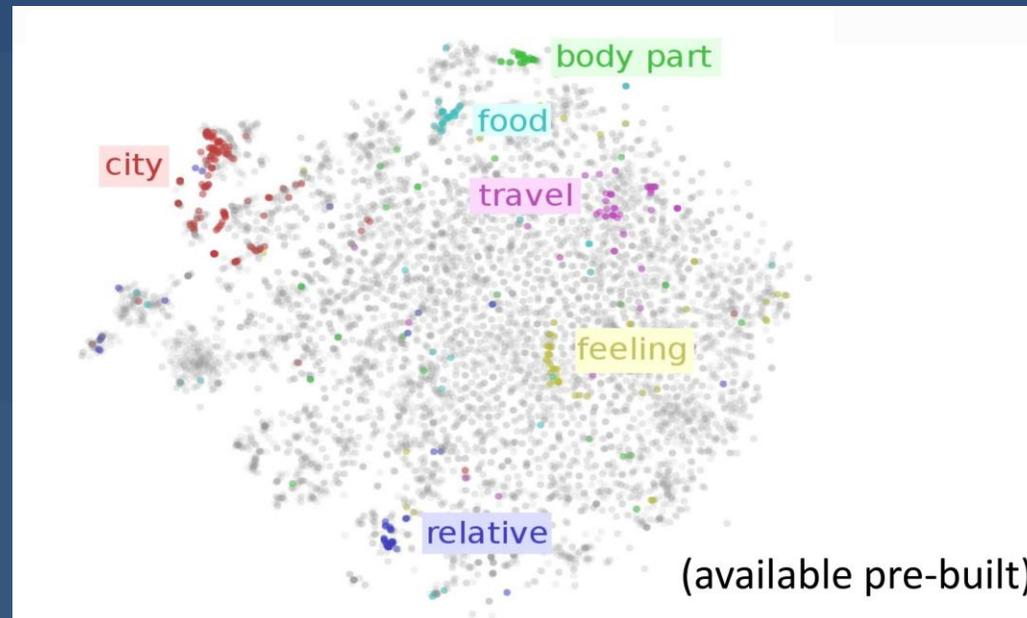


ORIGINAL

~~You that never done nothing
But build to destroy,
You play with my world
Like it's your little toy.
You put a gun in my hand
And you hide from my eyes,
Then you turn and run farther
When the fast bullets fly.~~

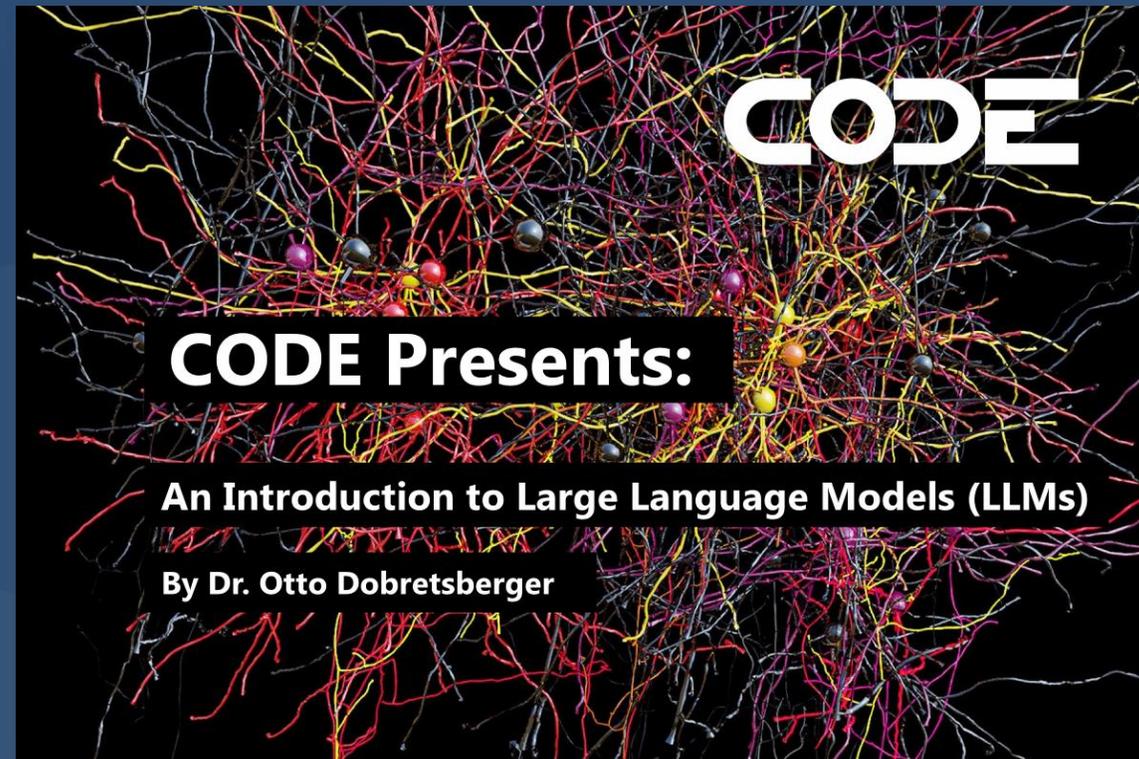
Large Language Models: Input

- The model takes in a sequence of words.
- (or more precisely, a sequence of numerical representations of those words, known as embeddings)
- This sequence is treated as the input for the neural network.



How Large Language Models Work

- Watch our CODE Presents seminar on how all of this works



The Scale Involved

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**All apps without
Copilot features
are now legacy!**

The Things You Can Build

Community Notes

Client: CCRCA - Cross Creek Ranch C.A.

Section: - All - Search: [] Show: Active Inactive All

Active	Comcode	Section	Headline	View	Expiration	Last Change	By
✓	CCRCA	* New Flashes	*** NewFlash - Access Device Deactivation		12/31/24	08/31/22	Gattis_K
✓	CCRCA	* New Flashes	***News Flash*** Beacon Cove Trail - Incorrect in USPS Database		08/31/23	07/20/23	GonzalezJ
✓	CCRCA	* New Flashes	***NewsFlash*** 2023 Pool Season		01/01/24	04/28/23	GonzalezJ
✓	CCRCA	* New Flashes	***NewsFlash*** Camp Flewellen Access Under Maintenance		10/31/23	07/21/23	GonzalezJ
✓	CCRCA	* New Flashes	***NewsFlash*** Cross Creek West (CCW) Trash Service		01/01/24	01/18/23	Moore1
✓	CCRCA	* New Flashes	***NewsFlash*** Delay Long Grass Cutbacks		08/31/23	06/07/23	GonzalezJ
✓	CCRCA	* New Flashes	***NewsFlash*** Fountain Issues		01/01/24	07/27/23	GonzalezJ
✓	CCRCA	* New Flashes	***NewsFlash*** Lake Dye		01/01/25	06/21/23	GonzalezJ
✓	CCRCA	* New Flashes	***NewsFlash*** Lakes of Cross Creek Fountain		12/31/23	06/26/23	GonzalezJ
✓	CCRCA	* New Flashes	***NewsFlash*** Mosquito Complaints **Update**		12/01/23	05/30/23	GonzalezJ
✓	CCRCA	* New Flashes	***NewsFlash*** Swallow Nests Spotted in CCRCA		09/30/23	07/14/23	GonzalezJ
✓	CCRCA	* New Flashes	***NewsFlash***Pine Park and Adventure Island Drinking Fountains Under Maintenance		09/30/23	07/21/23	GonzalezJ
✓	CCRCA	* New Flashes	**NewsFlash*** Bacteria Found Within BCCRCA		09/30/23	07/18/23	Reyes
✓	CCRCA	* New Flashes	Lakes of Cross Creek Ranch - gate damaged		08/05/23	07/05/23	Reyes
✓	CCRCA	Access	Access - Amenity Access - How to Obtain Amenity Access		04/11/23		GonzalezJ
✓	CCRCA	Access	Access - Amenity Access - Mobile Credentials One-Time Free Replacement		04/11/23		GonzalezJ
✓	CCRCA	Access	Access - Amenity Access - New Amenity System FAQ		04/11/23		GonzalezJ
✓	CCRCA	Access	Access - Amenity Access - Processing Time		04/11/23		GonzalezJ
✓	CCRCA	Access	Access - Amenity Access - Reactivation Request		04/11/23		GonzalezJ
✓	CCRCA	Access	Access - Amenity Access - Troubleshooting - Devices		04/11/23		GonzalezJ
✓	CCRCA	Access	Access - Gated Service Area - Access		04/11/23		GonzalezJ
✓	CCRCA	Access	Access - Gated Service Area - Gate Entry Issues (EZ Tag/Code)		04/11/23		GonzalezJ
✓	CCRCA	Access	Amenity Access Devices - Temporary Pass		06/30/23		GonzalezJ
✓	CCRCA	Access	Gate Access - Emergency Number		04/11/23		GonzalezJ

Searching for: **pool schedule**

The pool season is from May 1-September schedules for each month are released in the month prior or sooner. The schedule can be found in the CCR App. Flewellen Creek Pool has a maximum capacity of 100 people and is open to all residents. Adventure Island Pool has a maximum capacity of 100 people and is open to all residents. Adventure Island Pool has a splash pad, dedicated lap lanes, and a splash pad. Greenthread Park offers a large-scale resort pavilion complex with water features and slides. The park has a pavilion, event lawn, and trails. Greenthread Park Pool was closed temporarily for renovations. It was also closed for the day of the pool closure due to fecal material. Gate repairs were scheduled for the weekend of 6/24/23. The pool hours were released on May 24, 2023. Labor Day Adventure Island 10:00 a.m. - 8:00 p.m., Greenthread Park 10:00 a.m. - 8:00 p.m., and Flewellen Creek Pool 10:00 a.m. - 8:00 p.m.

Source Documents:

- ***NewsFlash*** 2023 Pool Season
- Amenities - Splash Pad at Adventure Island
- Amenities - Greenthread Park
- How to Access Pool Schedule via My CCR App
- Amenities - Adventure Island
- Greenthread Park
- **NewsFlash** Greenthread Pool Closure 6/29/23
- *** NewsFlash - Labor Day Pool Hours
- *** NewsFlash - Greenthread Park Pool - Gate Closure
- 2023 June & July Swimming Pool Hours
- Procedures - Swim Lessons at Flewellen Creek Pool

Suggested Follow-Up Questions:

- What are the specific pool schedules for each month?
- How can I view the pool schedule?
- What are the maximum capacities for each pool?

Was sind die Öffnungszeiten der Schwimmbäder?

Searching for: **pool hours**

Die Schwimmbadzeiten variieren je nach Ort. Greenthread Park Pool ist derzeit aufgrund von Renovierungsarbeiten geschlossen. Die vollständigen Öffnungszeiten für Juni und Juli 2023 können im My Cross Creek Ranch-App oder auf der Website unter www.mycrosscreekranch.com eingesehen werden. An Feiertagen wie dem Labor Day gibt es spezielle Öffnungszeiten. Weitere Details zu Öffnungszeiten und Poolvermietungen sind in den entsprechenden Dokumenten zu finden.

Source Documents:

- 2023 June & July Swimming Pool Hours
- *** NewsFlash - Labor Day Pool Hours
- Greenthread Park Pool Closure
- Amenities - Flewellen Creek Pool
- Amenities - Splash Pad at Adventure Island

Suggested Follow-Up Questions:

- Welche speziellen Öffnungszeiten gelten an Feiertagen?
- Was sind die Öffnungszeiten des Splash Pad im Adventure Island?
- Kann der Pool gemietet werden?
- Sind Schwimmkurse erhältlich?
- Gibt es Beschränkungen bezüglich der Kapazität der Schwimmbäder?

Azure OpenAI for Developers

- OpenAI features are now available to use in our own applications through Azure OpenAI
 - You can currently sign up for approval
- Azure OpenAI provides access to OpenAI features with all the added Azure benefits
 - It is also possible to use OpenAI features directly from OpenAI, but the Azure version already adds a lot, and will likely add more in the future
- This provides an API that allows us to create our own Copilot-style features

Side-Note: ML.NET

- Machine Learning library for .NET developers
- Supports shallow and deep learning for narrow models
- Execution and training in all .NET applications
- Great for developers who already know .NET
- Support for model standards, such as ONNX or TensorFlow

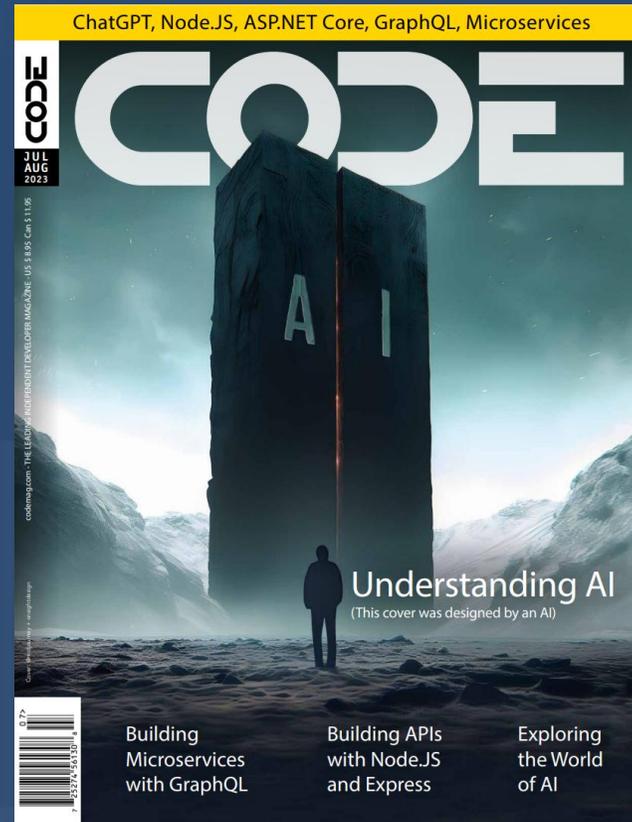
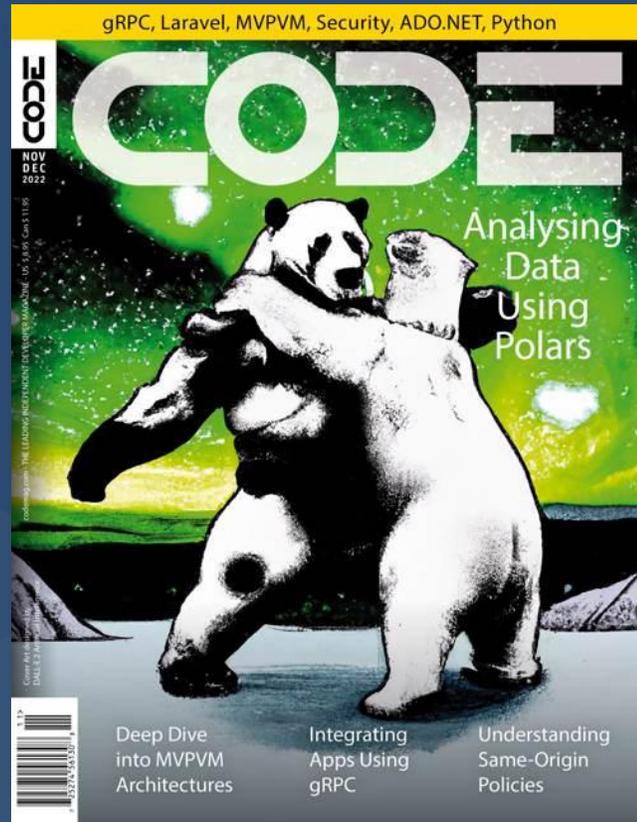
Combining LLMs with other AIs

- Predicting Titanic Survivors
- This cannot be done by LLMs alone (at least not very well)



Art Generation

OpenAI - DALL-E 2



DALL-E 3

- Now available as a preview with API access











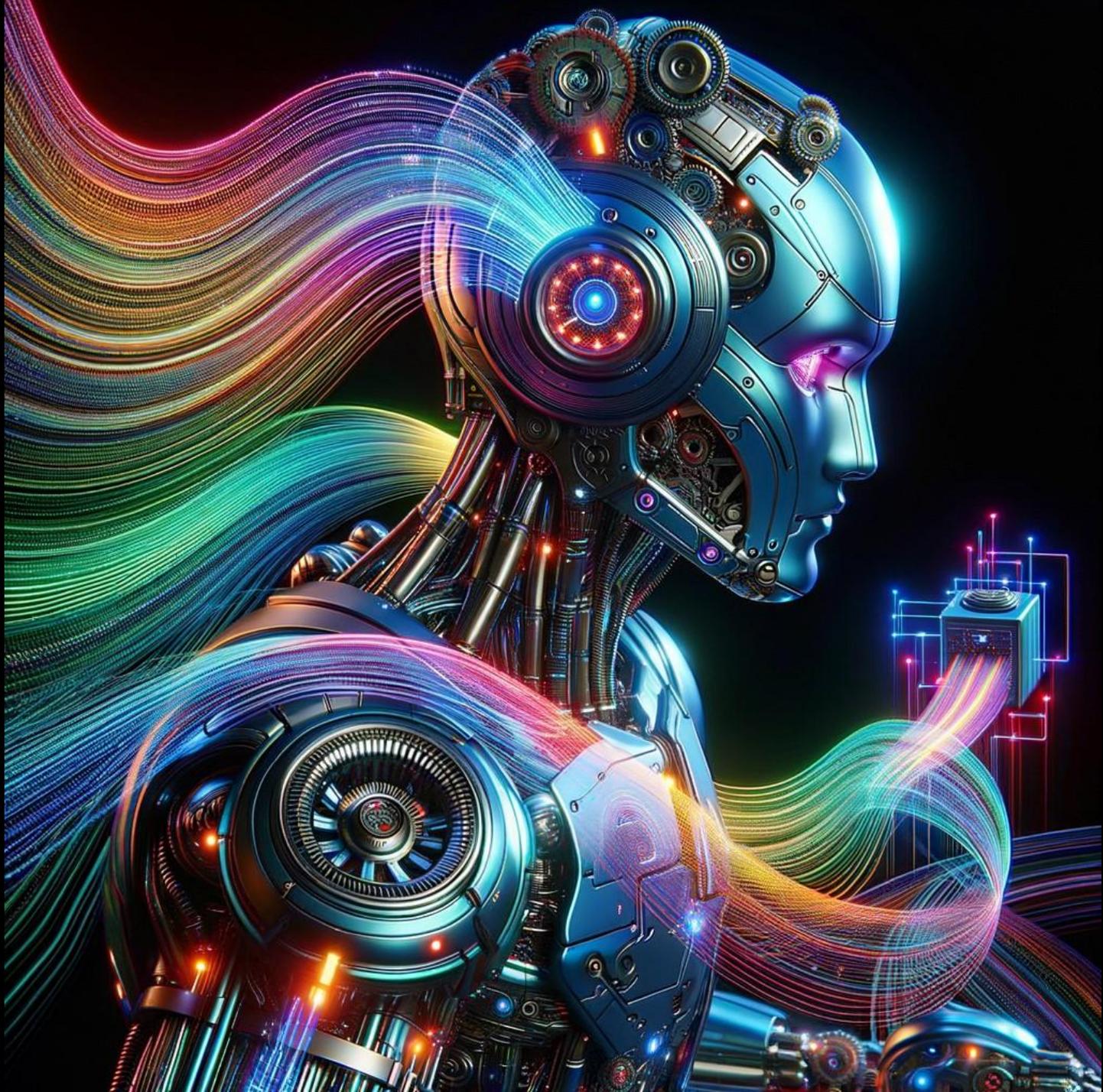












Related Recording

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Thank you for attending! Please complete this brief survey. If you do not attend, you will not be eligible to win. If you do not attend, please do not watch the recording instead.

Name *

Your answer

2. Company Name *

Enter your answer

Q&A

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