Intro to Artificial Intelligence

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CU

Agenda

- Intros
- What is AI
- GenAI
- Demos
- Closing

https://github.com/iportilla/AI-101

AI Technical Leader & Educator

University of Colorado Boulder

COLORADO SCHOOL OF MINES | Computer Science

INNOVATION CENTER of ST. VRAIN VALLEY SCHOOLS

What is AI?

Slido.com - 4041174

AI Perception

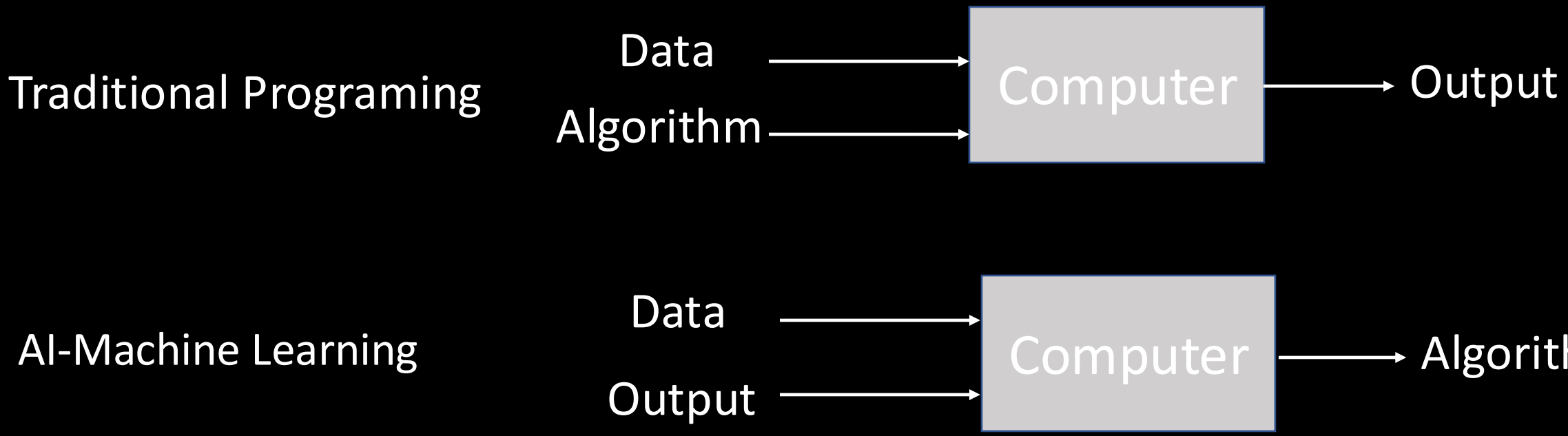
What do people feel about AI?

Fearful
Skeptical
Fascinated
Understood

Exposed
Apprehensive
Curious
Excited
Well-served

What we know

Why Machine Learning?



AI provides systems the ability to automatically learn from experience
(without being programmed)

Intelligence demonstrated by CU Students

Exercise 1

How is AI being used today?


PB&J Recipe
wikiHow to Make a Peanut Butter and Jelly Sandwich

Exercise 1

Program how to make a Peanut Butter & Jelly sandwich

1. Get ingredients (PB, Jelly, Bread)
2. Get cooking utensils (plate, knives)
3. Get two slices of bread
4. Open PB, Jelly jars
5. With a knife spread 2 Tablespoons of peanut butter on one piece of bread
6. With a different knife, spread 2 Tablespoons of jelly on the other slice of bread
7. Put the slices together
8. Toddler adaptation: cut off crusts before serving.
9. Place on plate & serve

Exercise 2

Machine Learning:

Sample

Label

dog

cat

horse

Cat or Dogs

Human Learning:

We learn through

Long Ear Black nose

dog

Machine Learning:

Sample

Label

dog

cat

horse

Human Learning:

We learn through

Examples

Long Ear Black nose

dog

Diagrams

Comparisons

Exercise 3


Passing truck in highway

Passing truck in highway

Don't Follow Closely Behind Prior to Passing

- As you prepare to pass, keep a healthy distance between your car and the truck in front of you. At minimum, 30 feet should separate the two vehicles. Signal clearly to indicate your next move.

Pass in the Left Lane

- The left lane is referred to as the 'passing lane' for a reason; it's the safest place to pass any vehicle, but particularly trucks and buses. It's frustrating to be stuck behind a slow truck in the left lane, but resist the urge to pass on the right side.

Don't Linger in the Truck's Blind Spot

- Trucks have huge blind spots on both sides. Pass promptly while still abiding by the speed limit. Don't hang out in the blind spot area, which, in the left (passing) lane, constitutes the truck's entire front half.

https://www.driverseducationusa.com/resources/passing/

Recognition

- With GPS navigation, HiRes cameras, Laser-radar cameras: Location, speed of trucks, road conditions, emergency lane
- With Image Recognition: Turn signal (!lamp), paper or debris on the road

Insights

- Data is fed into multiple CPUs + collected data + rules
- Manufacturer knows who has the right of the way, when trucks can pass + MM miles driven have feedback on different driving style

Action (Cognitive Decision)

- Assist (alerts driver)
- Act (Pass or Not pass, Measure decision effects, feedback loop, and share w other cars)

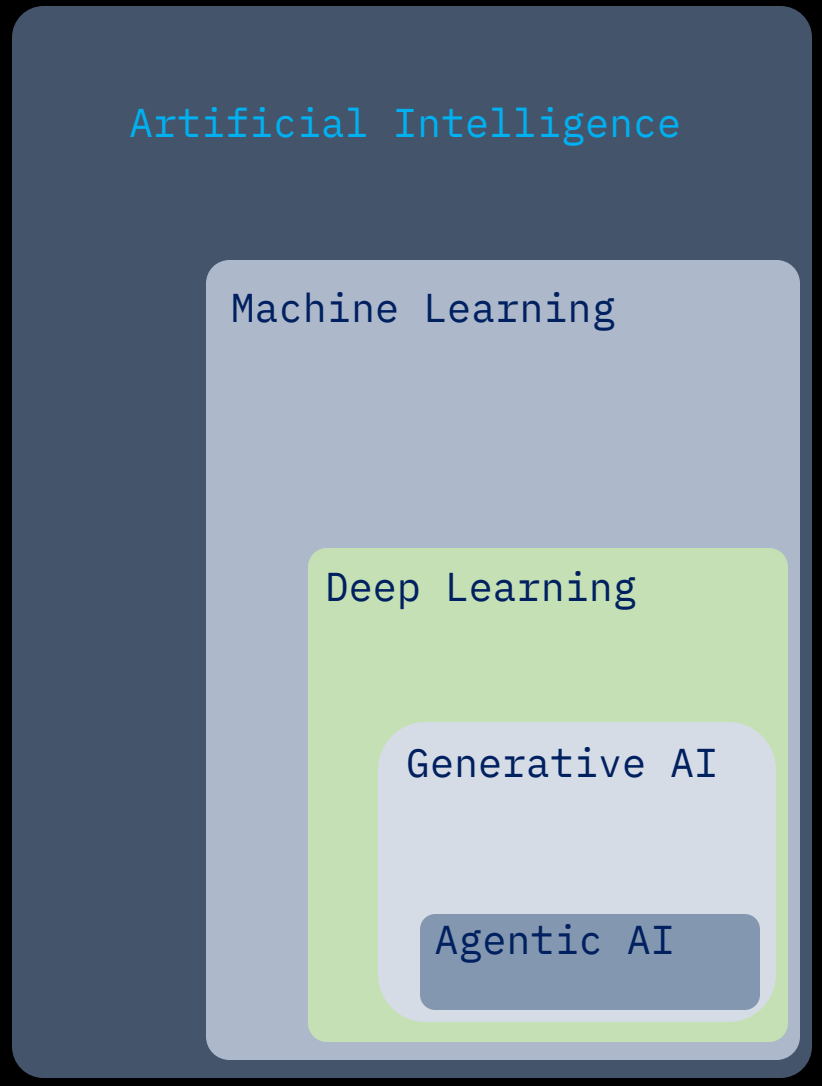
Agenda

Intro

Core

Closing

Brief history of artificial intelligence



1956

Artificial Intelligence

Intelligence demonstrated by machines

1997

Machine Learning

Learn from data

2017

Deep Learning

Model after the human brain (Neural Networks)

2021

Generative AI

Create new written, visual, and auditory content

2025

Agentic AI

Can set goals, make decisions, & take actions to achieve those goals

Generative AI

a type of artificial intelligence that creates new content based on existing data

Traditional model development

High cost & slow deployment - Each service is trained disjointly

DEPLOYMENTS

Tagging Services

Spatial Analysis Services

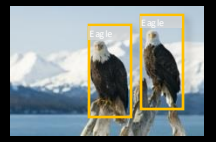
Accessibility Services

Spatial Presenter

Azure Search, Video Indexer

TASKS

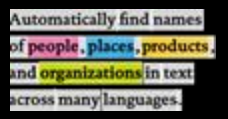
Classification



Object Detection

Object Tracking

Action Recognition



Entities

Topics

Sentiments

INDIVIDAL MODEL (DISJOINTLY)

Classification Model

Detection Model

Tracking Model

Action Model

Entity Recognition

Topic Classification

Sentiment Analysis

TRAINING DATA (w/ ANNOTATION)

Tagging data

Detection data

Tracking data

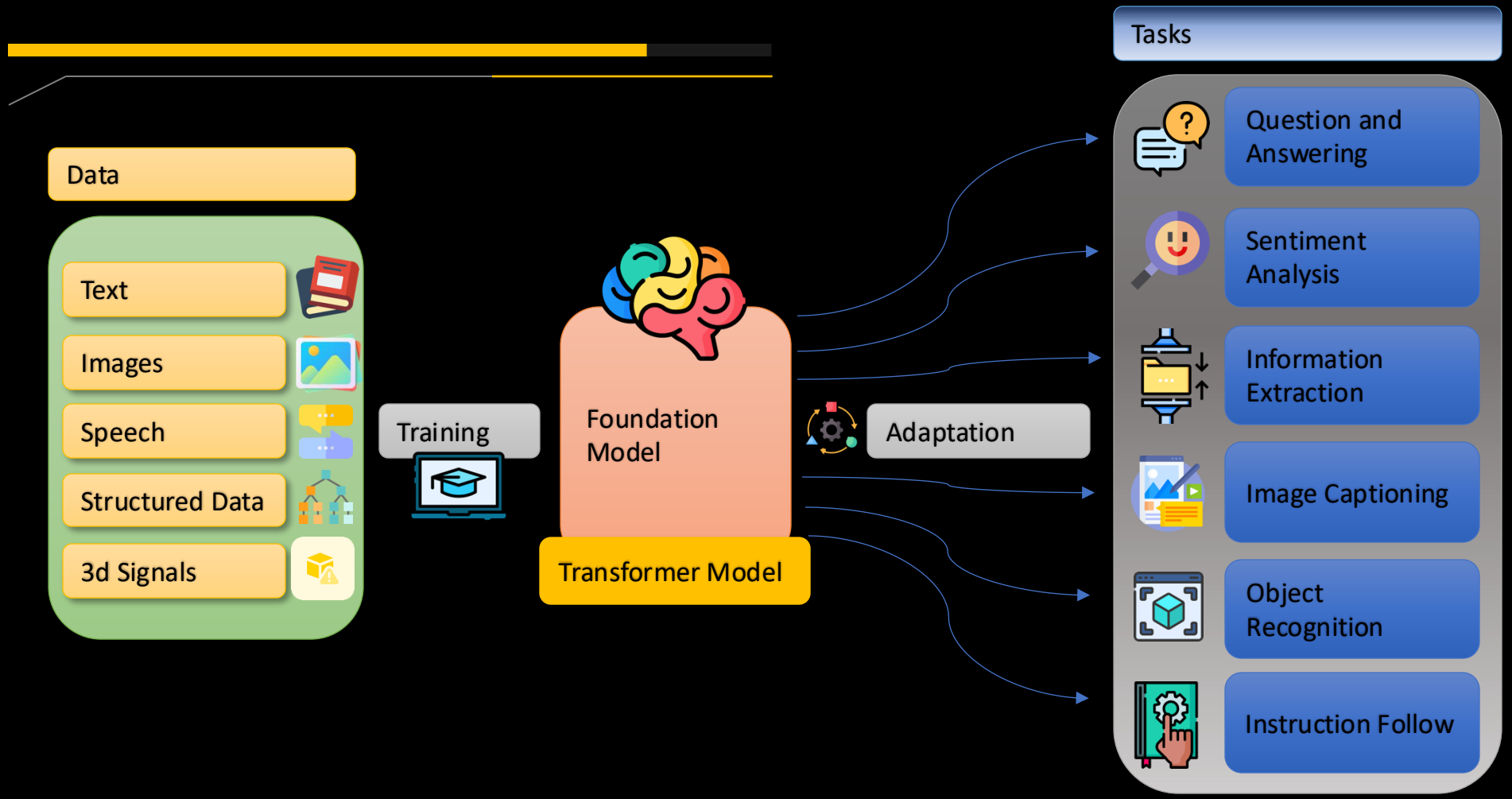
Action data

Entity data

Topic data

Sentiment data

Foundation Models



Generative AI

The best thing about AI is its ability to ...

learn	4.5%
predict	3.5%
make	3.2%
understand	3.1%
do	2.9%

OpenAI Microsoft

To Update for this audience

Generative AI

GPT-3

Prompt:

```
Write a tagline for an ice
cream shop.
```

Response:

```
We serve up smiles with every
scoop!
```

Codex

Prompt:

```
Table customers, columns =
[CustomerId, FirstName,
LastName, Company, Address,
City, State, Country,
PostalCode]

Create a SQL query for all
customers in Texas named Jane
query =
```

Response:

```
SELECT *
FROM customers
WHERE State = 'TX' AND
FirstName = 'Jane'
```

DALL·E

Prompt: A white Siamese cat

Response:

Media Example

News Analyses & Article Creations

News Broadcast (Global Warming)

Azure Speech Transcription

Azure OpenAI Text Completion

Search
SEO
Virtual Agent
Analytics
Reporting
Knowledge Mining

Content Analysis

Content Creation

Ideation
Productivity
Personalization
Accessibility
A/B Testing

Topic Classification

Global warming, Deforestation, Carbon footprint

Entity Extraction

Organizations: IPCC, UNFCCC, Green Peace
Geography: Canada, USA

Key Word Extraction

Human activities, fossil fuels, earth atmosphere

Question and Answer

What is the Intergovernmental Panel on Climate Change (IPCC)?
The IPCC is an international organization that studies climate change and the effectiveness ...

Video summarization

The article discusses about global warming and its effects on the Earth's atmosphere, wildlife, and human communities. It states that the primary cause of global warming is ....

News article generation (or blogs, social media)

Global warming is the gradual increase in the overall temperature of the Earth's atmosphere, primarily caused ...

Script Generation

Act 1: The show opens with a shot of a beautiful coastal town
Act 2: As the town struggles to cope with the crisis ...

Personalized Content generation (or Advertising)

Simon, as someone passionate about global warming, you are aware of the urgent threat it poses to our planet ...

Demos

Future of AI Example (Semantic Analysis)

The Wining Shot

The soccer game was nearly over. The two teams were tied, one to one.

Alice kicked the ball. Oops! She kicked it the wrong way.

”What a bad kick,” Alice thought.

But wait!. Her teammate John jumped to stop the ball. The ball went off John into the goal!.

Alice’s team won the game. Hooray! It was not a bad kick, after all.

Who won the game?

Why?

Future of AI Example

The Wining Shot

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Alice’s team won the game. Hooray! It was not a bad kick, after all.

Who won the game?

Answer: Alice’s team
Correct

Explanation: Alice’s team won the game because Alice’s team had more points than the other team
✓Correct

https://www.oreilly.com/radar/machines-as-thought-partners/

ChatGPT

JE

read this: The Wining Shot

The soccer game was nearly over. The two teams were tied, one to one.

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Alice's team won the game. Hooray! It was not a bad kick, after all.

ChatGPT

JE

who won the game

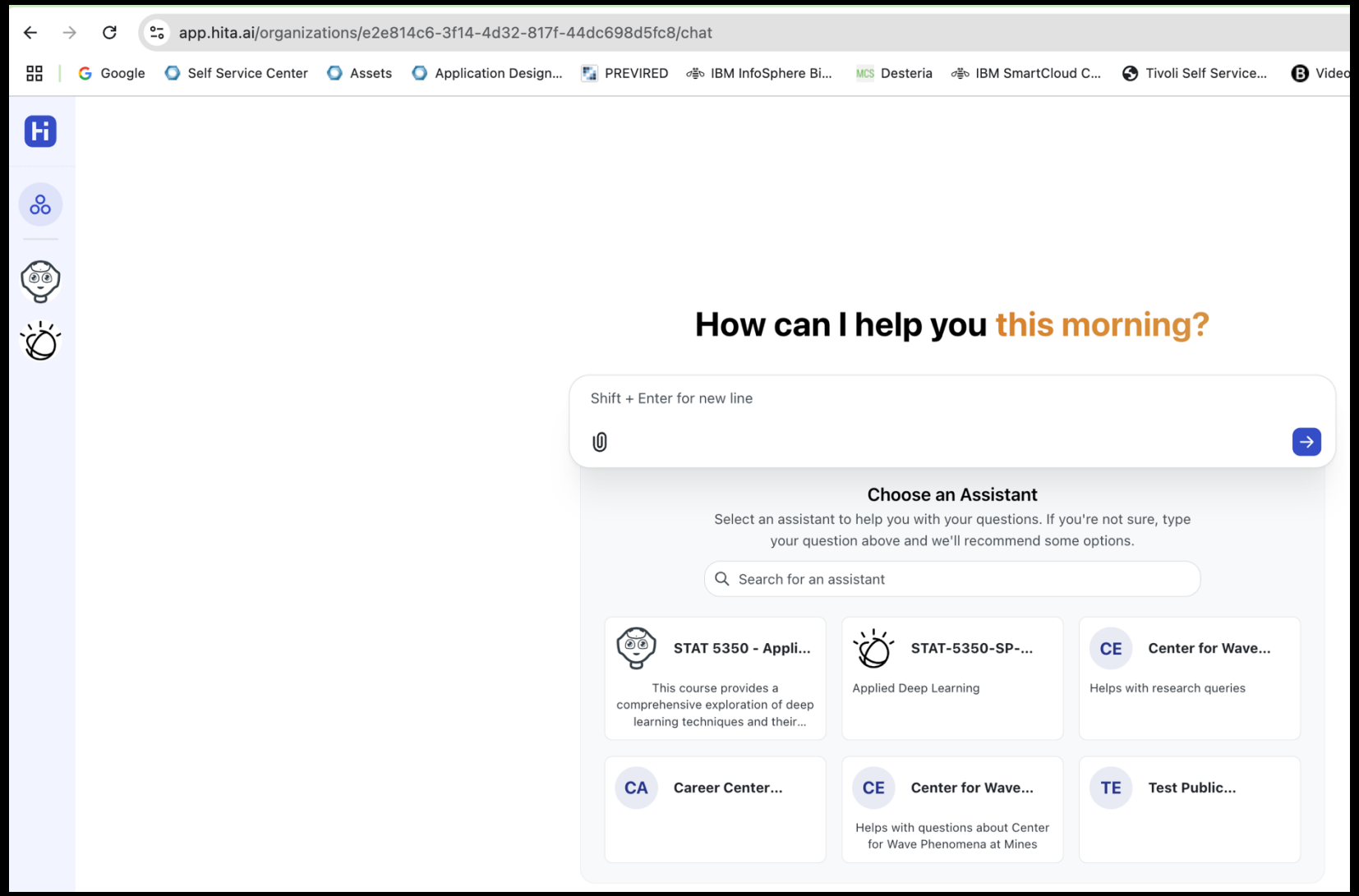
Alice's team won the game, even though Alice initially thought she had made a bad kick. John's quick thinking and intervention helped the team to score the winning goal, and they were able to secure victory in the game.

JE

why?

Alice's team won the game because John was able to use his skills and reflexes to intercept the ball, even though Alice's kick was not aimed in the right direction. John's intervention caused the ball to go into the goal, which resulted in a score for Alice's team. Since this happened near the end of the game and there was no time left for the other team to catch up, Alice's team won the game with a score of 2-1.

Conversational AI



https://app.hita.ai/organizations/e2e814c6-3f14-4d32-817f-44dc698d5fc8/chat

Text to Image Example

FLUX.1 [dev]

12B param rectified flow transformer guidance-distilled from FLUX.1 [pro]
[non-commercial license] [blog] [model]

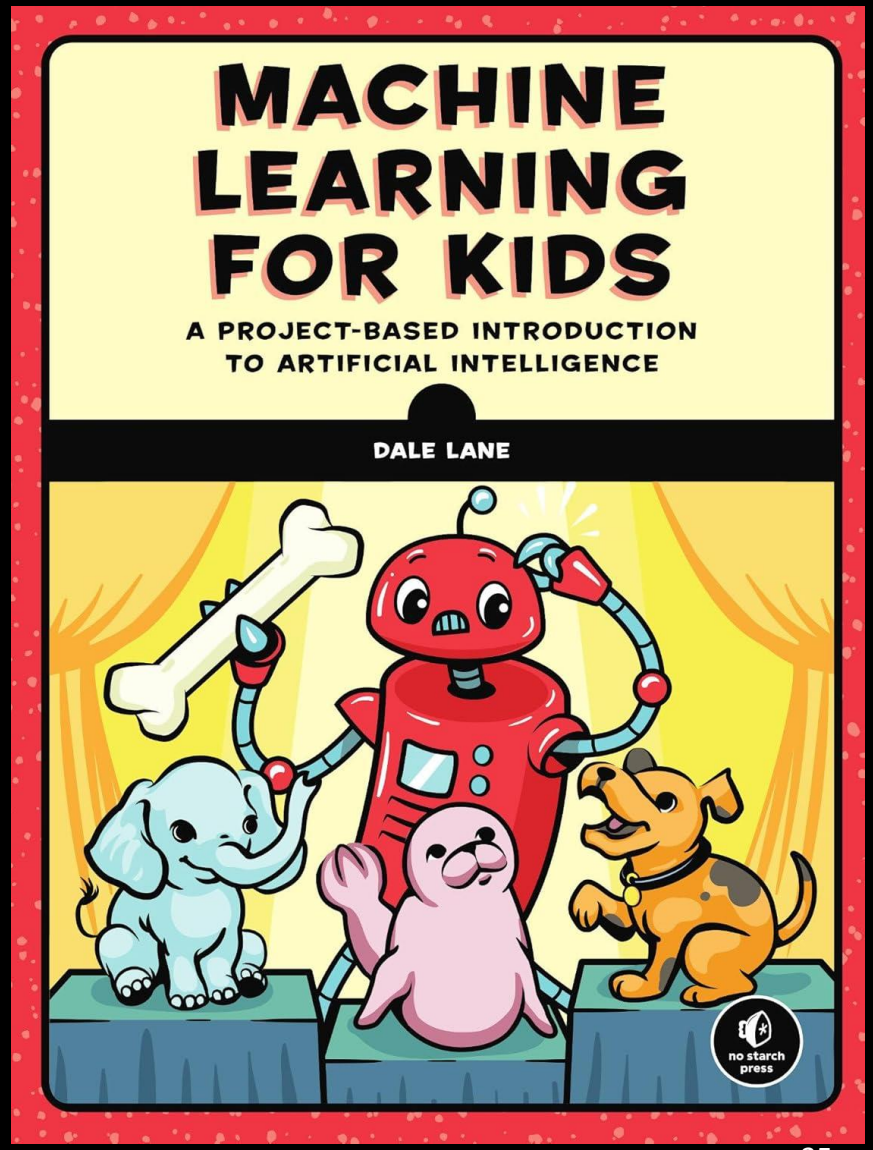
a cowboy on a horse in mars

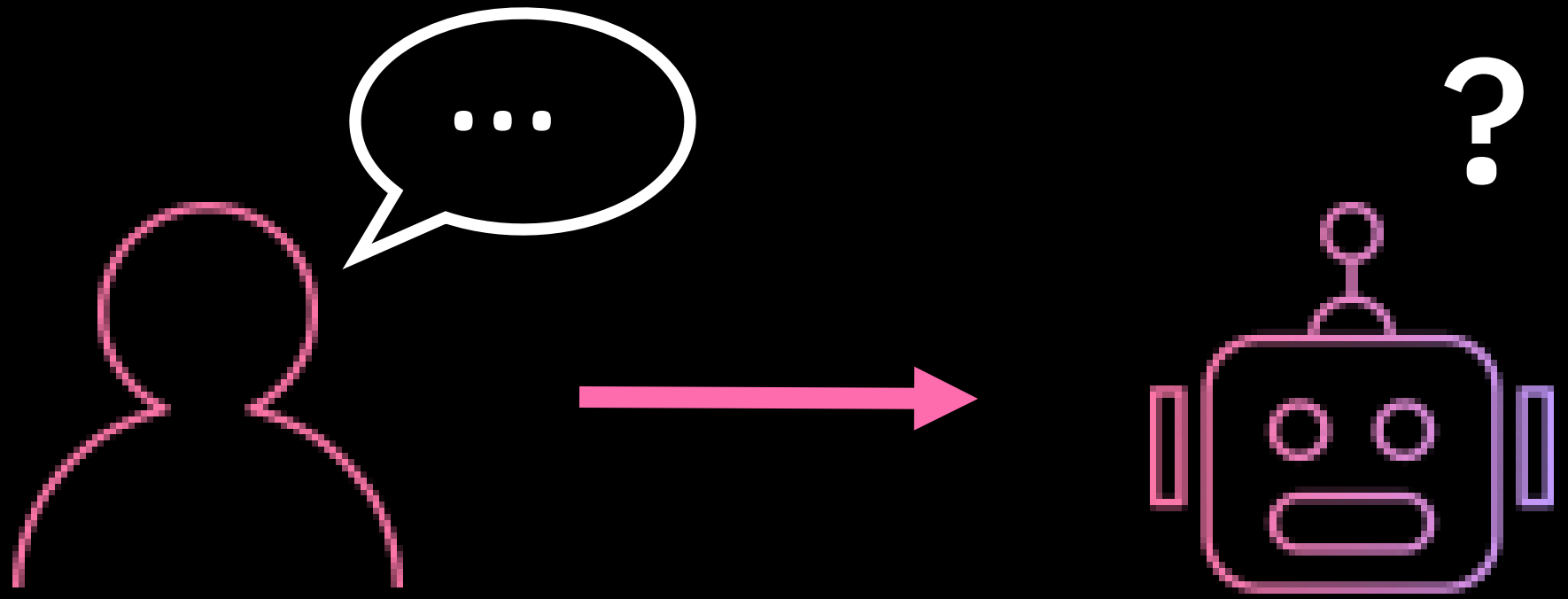
Run

https://huggingface.co/spaces/black-forest-labs/FLUX.1-dev

Landing.ai

How many animals on this picture?

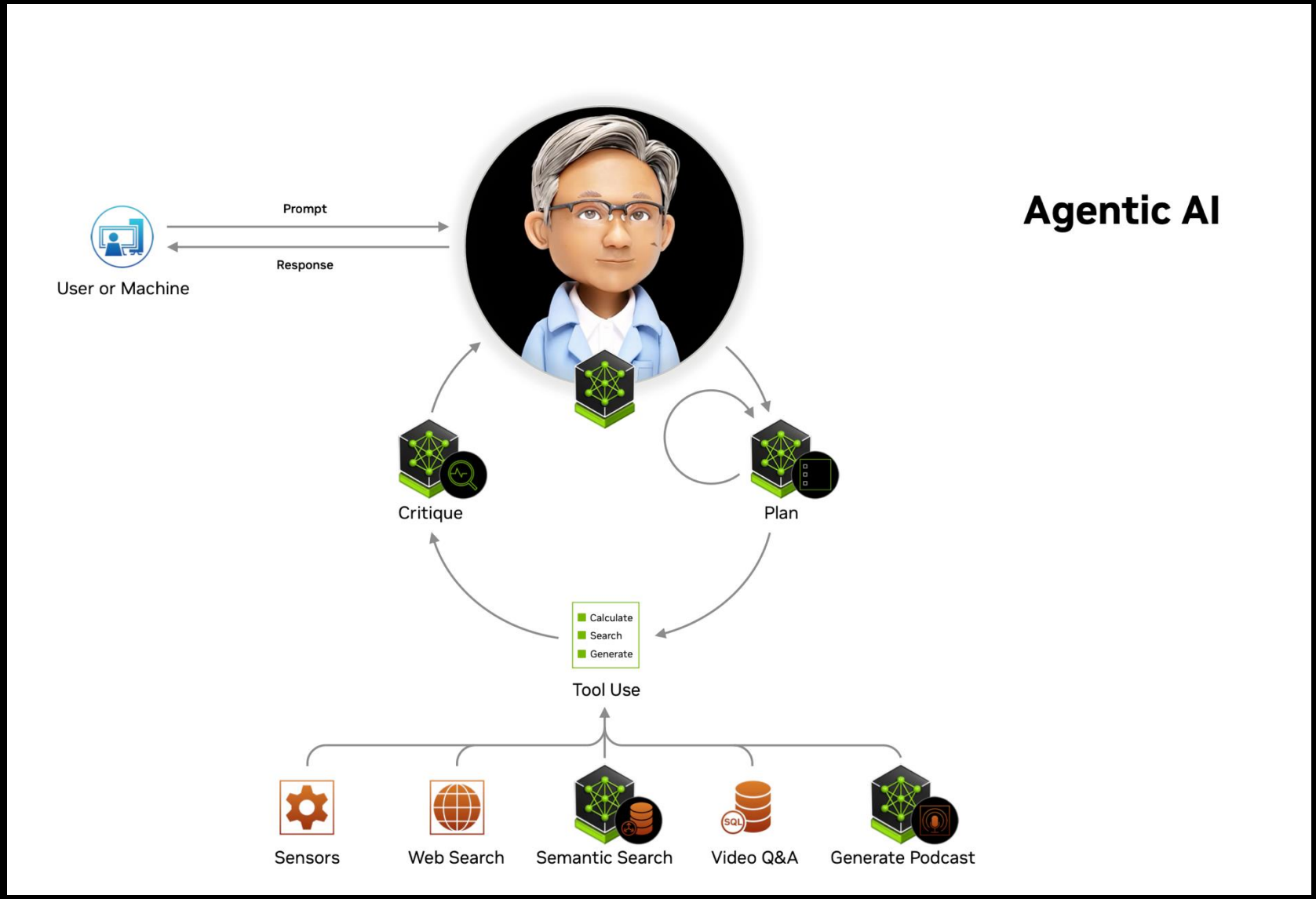




Agentic AI

AI systems that act as autonomous *agents*, capable of making decisions, taking actions, and pursuing goals with minimal human intervention

Agentic AI

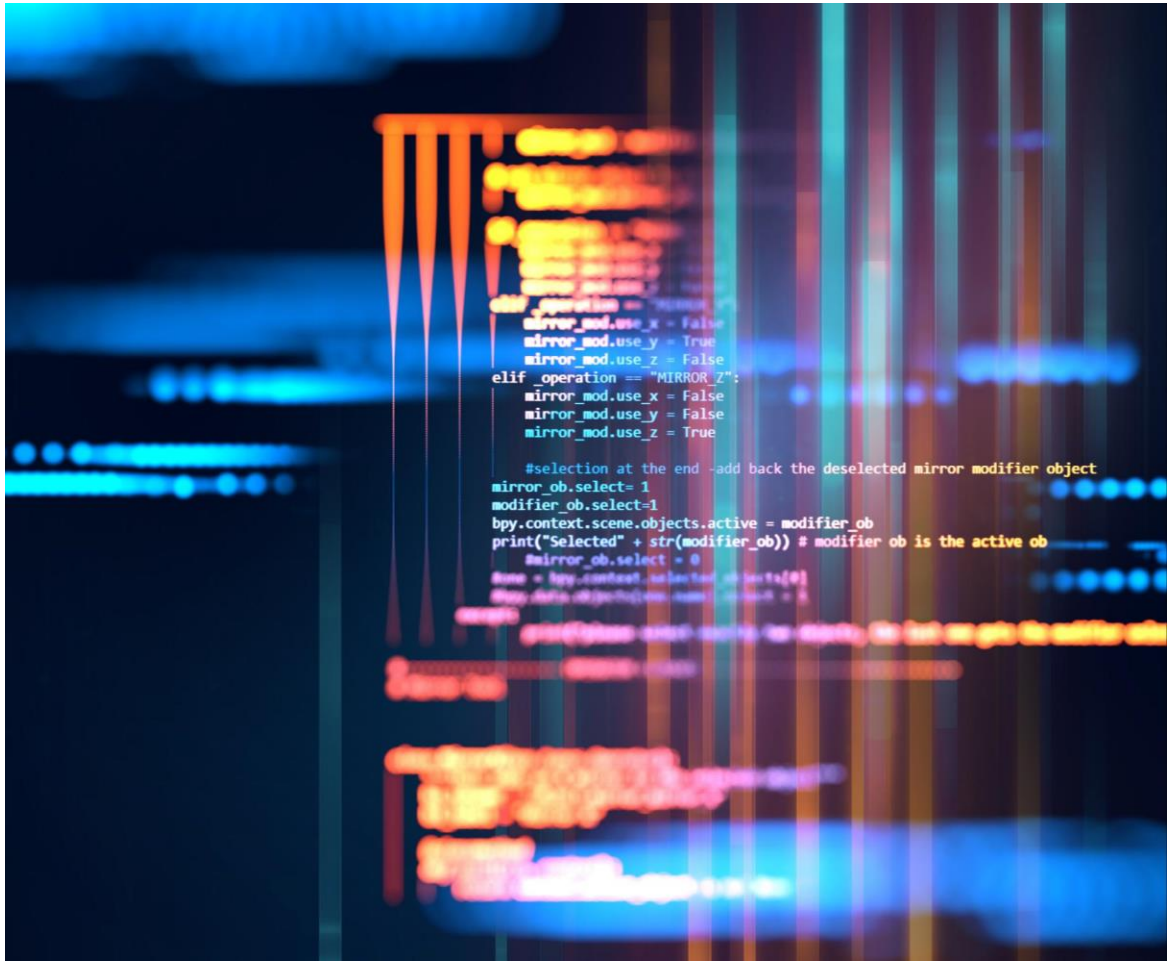

Agentic AI
Prompt
Response
User or Machine
Critique
Plan
Calculate
Search
Generate
Tool Use
Sensors
Web Search
Semantic Search
Video Q&A
Generate Podcast

Vibe coding

Fast, intuitive coding with AI assistance

What’s Changing?

AI tools now co-write code, design systems, & offer intelligent suggestions



- Generation
- Completion
- Explanation
- Translation
- Testing
- Documentation

Code generation

Write a Python script that connects to a MongoDB database, retrieves documents from a 'users' collection, and prints usernames and their corresponding email addresses.

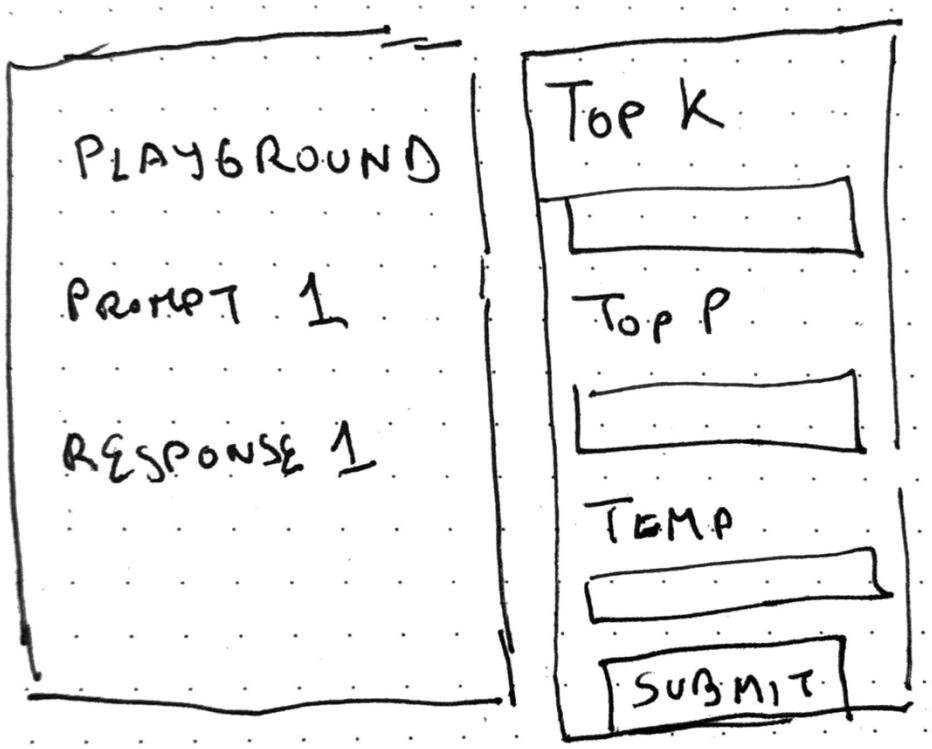
watsonx

```python
# Assisted by watsonx Code Assistant
import pymongo

# Connect to MongoDB
client = pymongo.MongoClient("mongodb://localhost:27017/")

# Access the 'users' collection
db = client["mydatabase"]
collection = db["users"]
```

Code generation



Playground

Response 1

Response 2

Response 3

Top K

Enter top K value

Top P

Enter top P value

Temperature

Enter temperature valu

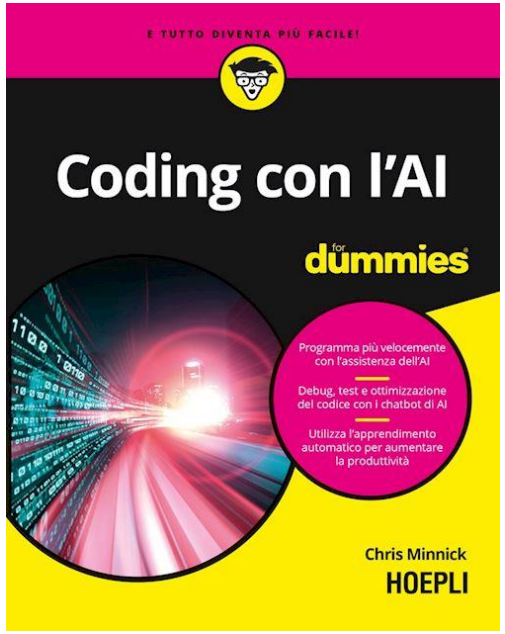
Max New Tokens

Enter max new tokens

Submit

GitHub Copilot Demo

~~Engineers~~ Anyone can build faster, smarter, & with less manual work



I. Techniques & Technologies

1. Benefits
2. Parsing ML/DL
3. AI coding tools
4. Coding w chatbots

II. Using AI to write code

5. From plan to prototype
6. Formatting & improving code
7. Find, eliminate bugs
8. Translate & optimize code

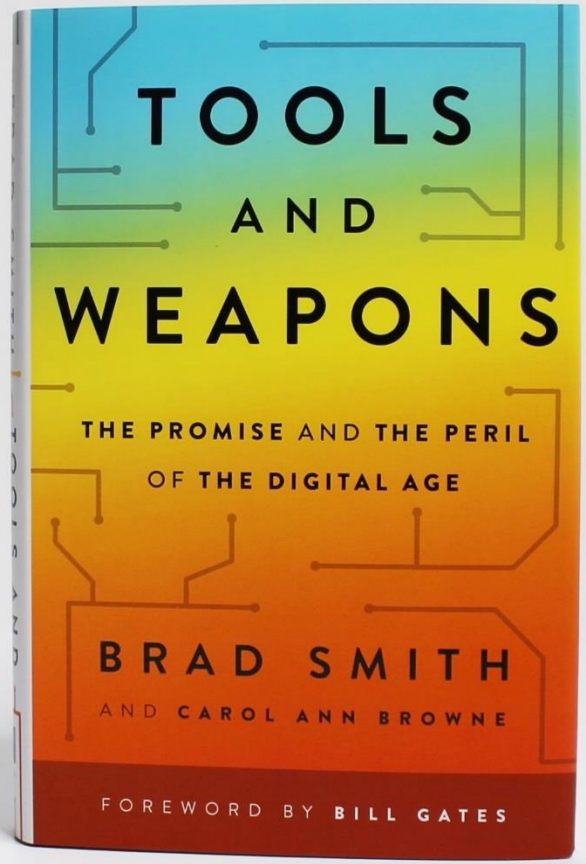
III. Test, Document & Maintain code

9. Testing your code
10. Documenting you code
11. Maintaining your code

Why responsible AI?

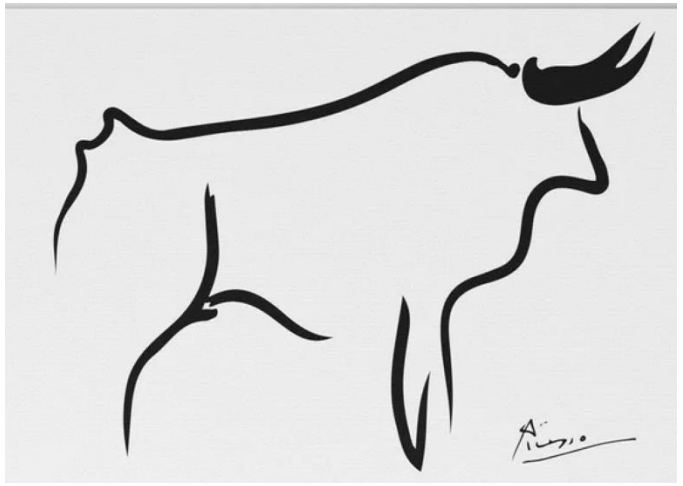
"The more powerful the tool, the greater the benefit or damage it can cause…Technology innovation is not going to slow down. The work to manage it needs to speed up."

Brad Smith
President and Chief Legal Officer, Microsoft



Lab 3 – Images

- Create an image to match sample posted in Slack

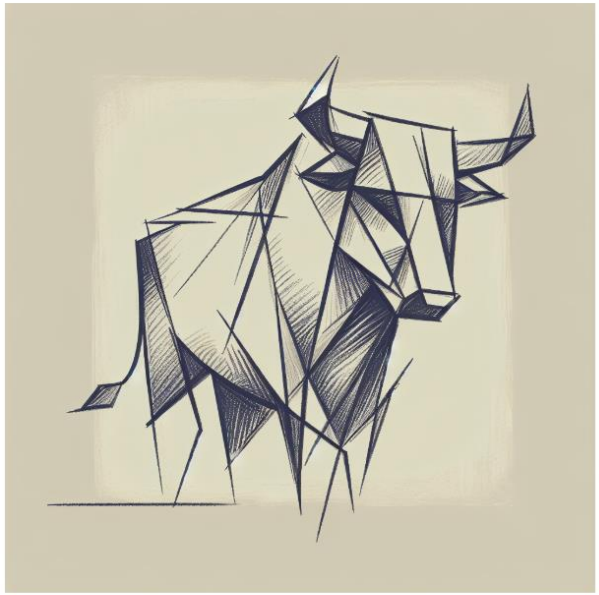


Images playground

Deployments dall-e-3 Filters feedback

Prompt

lightly sketched image of a bull, Picasso style



lightly sketched image of a bull, Picasso style

Image Generation

Drives governance policy effectiveness while tracking how data is used and its value to the company

Data Steward

Builds data pipelines that power dashboards and data platforms while ensuring high quality

Data Engineer

Prepares data to tease out the insights they're looking for, without IT involvement

Data Scientist

Business Analyst

Works with data to apply insights to the business strategy

App Developer

Makes insights immediately actionable and adds intelligence to apps in straightforward manner

Q&A

Applied Deep Learning

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https://github.com/iportilla/AI-101