

A man with a beard and glasses, wearing a white shirt and a dark tie, stands on the left side of a boxing ring. He is looking towards a robot on the right. The robot has a humanoid form with a metallic head, glowing blue eyes, and a chest with a large circular blue light. The background is a blurred crowd in a stadium under bright lights.

<VS>

Will AI take over (Software Development)?

How Artificial Intelligence and Machine Learning may
reshape the way we work, live and interact

Introduction | Will AI take over Software Development?

- Intro
- Definitions
- Historical Context
- AI Case Studies
- AI Development Basics
- AI Example Application
- AI in Practice | Problems and Limitations
- AI-driven Development | Benefits
- AI-driven Development | Limitations
- AI-driven Development | Tools
- AI Social Impacts | Risks and Threats
- AI Outlook | Golden Era or Dystopia
- Q&A and Discussion

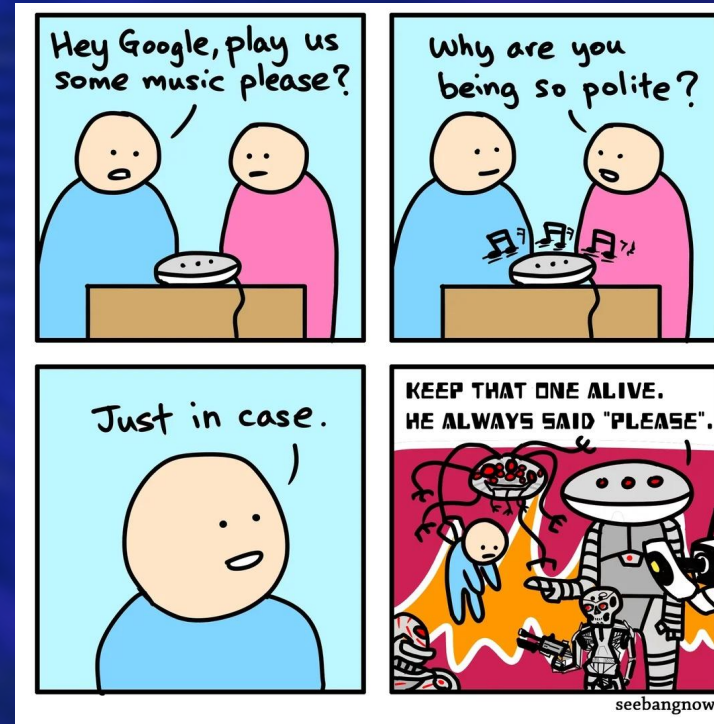


Image Source: reddit - Be polite to Computers

Introduction | About Me

Timor Kodal

Berlin

Tech Enthusiast

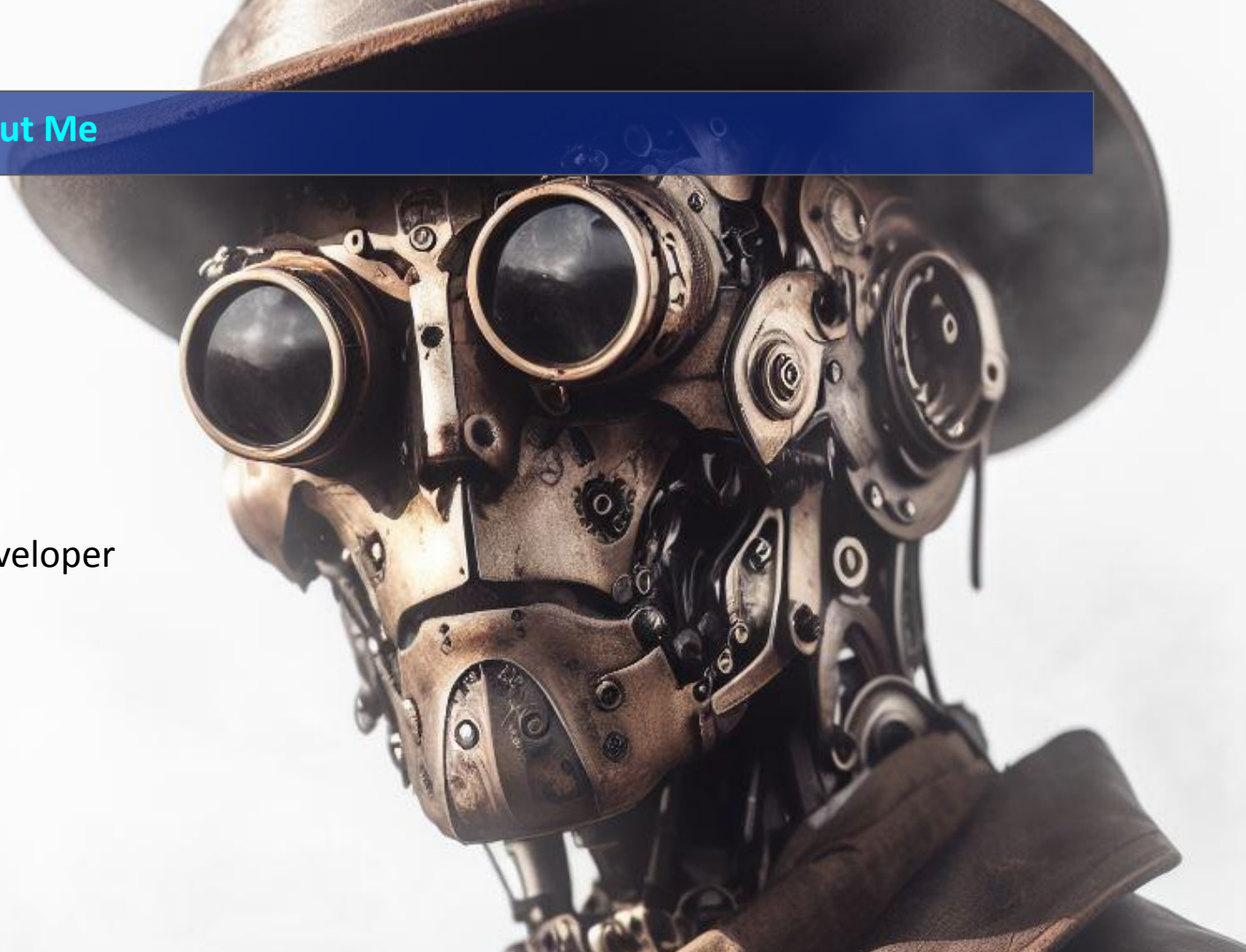
Media Artist

Software & Web Developer

Travelling

Frisbee (Freestyle)

Table Tennis



Introduction | About Me

Timor Kodal

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Lead Dev

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Photographer

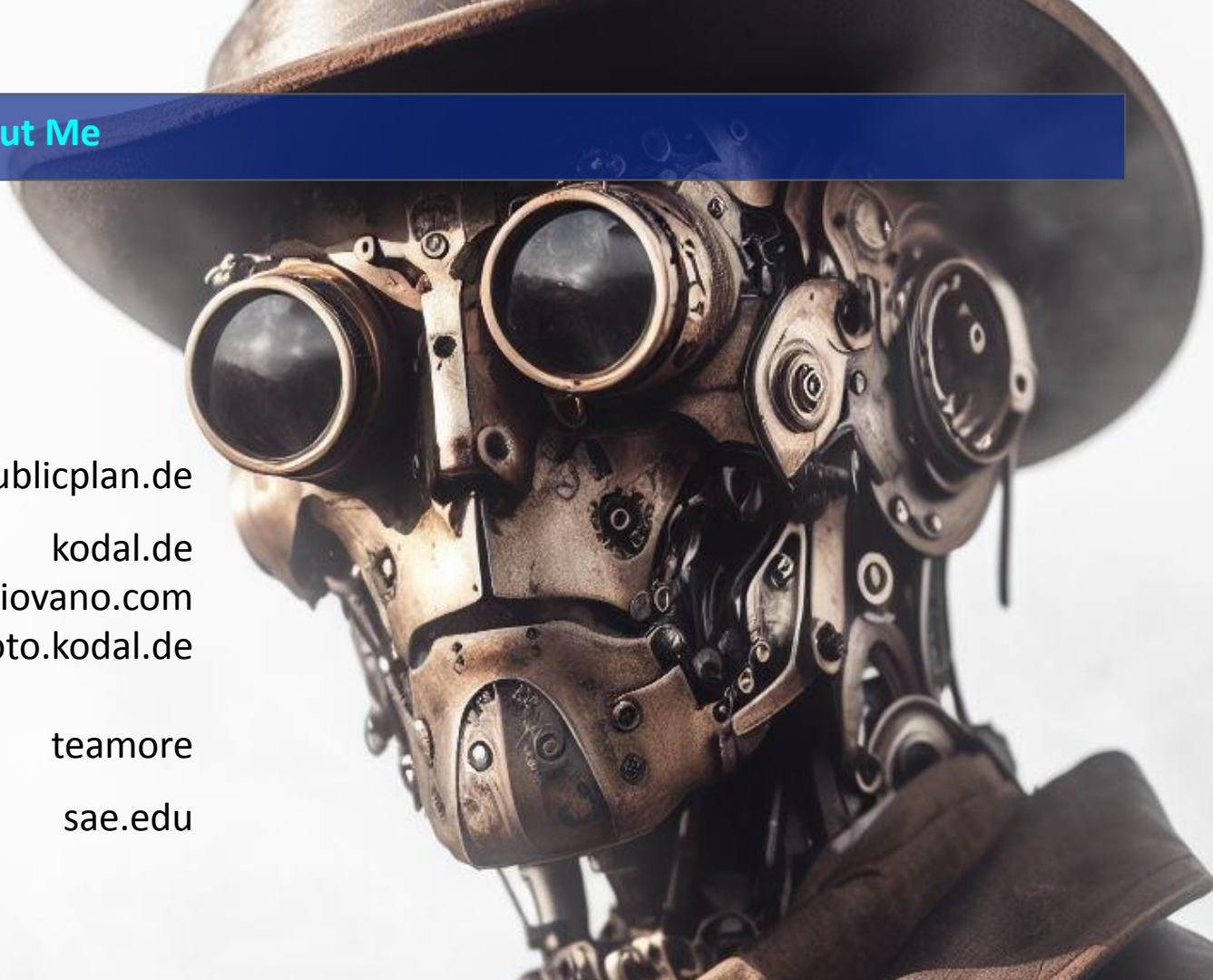
photo.kodal.de

Musician

teamore

Lecturer

sae.edu



Definitions

focus¹, pl. **foci**, **focuses** ['foukəs, 'fousai, 'foukəsiz] n. 1. *Math. Opt: etc:* foyer *m* (de lentille, etc.); *Opt: depth of f., (i) profondeur f de foyer; (ii) profondeur de champ; in f., (i) (of image) au point; (ii) (of instrument) réglé; out of f., (i) (of image) pas au point; (ii) (of instrument) non réglé, dérèglé. (iii) (of headlamp bulb, etc.) mal réglé; to bring sth. into f., mettre qch. au point; that's about f. camera, ap- pareil m à mise au point fac. 2. centre *m* (d'un troublisme) au point fac. 3. centre *m* (d'une maladie) à son foyer. 2. (in merchant vessel) poste *m* de l'équipage.*

Definitions | What is Software Development?

Software Development
incorporates

- Designing
- Coding
- Testing
- Deploying
- Maintaining

Computer and Smart Device
Applications

Common Deployment Targets

- Smartphone Apps
- Web Servers
- IoT (Smart Home)
- Machines
- Vehicles

Definitions | Artificial Intelligence

AI simulates Human Intelligence in Computer Systems

Tasks

- Problem solving
- Decision making
- Communication (e.g. via Natural Language)
- Pattern Recognition
- Learning from Data

Definitions | Artificial Intelligence | Variants

Weak AI (narrow AI)

- Designed for **specific tasks**
- with **predefined Boundaries**
- **No general intelligence**

Examples

- **Communication** via Speech Recognition : Siri
- Media **Recommendation** Systems via Predictive Analysis : Netflix, Spotify
- Image **Recognition** : Google Reverse Image Search
- Content and Image **Generation** : Based on Probabilities derived from LLM

Definitions | Artificial Intelligence | Variants

Strong AI (AGI - Artificial General Intelligence)

- Cognition
- Autonomy
- Learning Capability
- Self Awareness(?)

Would pass the **Turing Test** (behaves like a human being)

Examples:

None. AGI is a **Theoretical Concept**

Definitions | AI Development & Machine Learning Terminology

Autonomous: Without the need 3rd-party and/or human intervention

Bias: Assumptions made by a model to simplify the learning process

Deep Learning: Learning from data structures and relations

General AI: Capable of any intellectual task that can be done by any human being.

Hyperparameter: (External) variables that affect the model learning process

Intent: Equivalent label for a goal. "turn the volume down" -> "decrease volume"

Machine learning: Algorithm based learning and adaption to incoming data

Machine translation: Autonomous translation of text by an algorithm

Model: Product of AI training by machine learning algorithms on training data

Neural network: Computer system designed to function like the human brain

Natural language generation (NLG): Turning structured data into text or speech

Natural language processing (NLP): Ability to perform conversational tasks, recognition of intended meaning and intelligible response

Definitions | AI Development & Machine Learning Terminology

Overfitting: Symptom of ML training: Algorithm is only able to work on or identify specific examples present in the training data

Parameter: A variable inside the model that helps it to make predictions

Predictive analytics: Forecast based on historical data and trends

Python: A popular programming language used for general programming

Reinforcement learning: Encouraging the model to improve by testing variants of what it has already learned, usually including human intervention and assessment

Semantic annotation: Tagging different search queries or products with the goal of improving the relevance of a search engine

Sentiment analysis: Identification and Categorization efforts to determine the author's attitude

Definitions | AI Development & Machine Learning Terminology

Supervised learning: Subset of ML using structured datasets enriched with labels and annotations

Test data: Unlabeled data used to check that a ML model is capable of a given task

Training data: Data used during the process of training an ML algorithm

Transfer learning: Improving result accuracy by using gathered learning data to be applied to related tasks

Turing test: A machine's output is indistinguishable from that of a human.

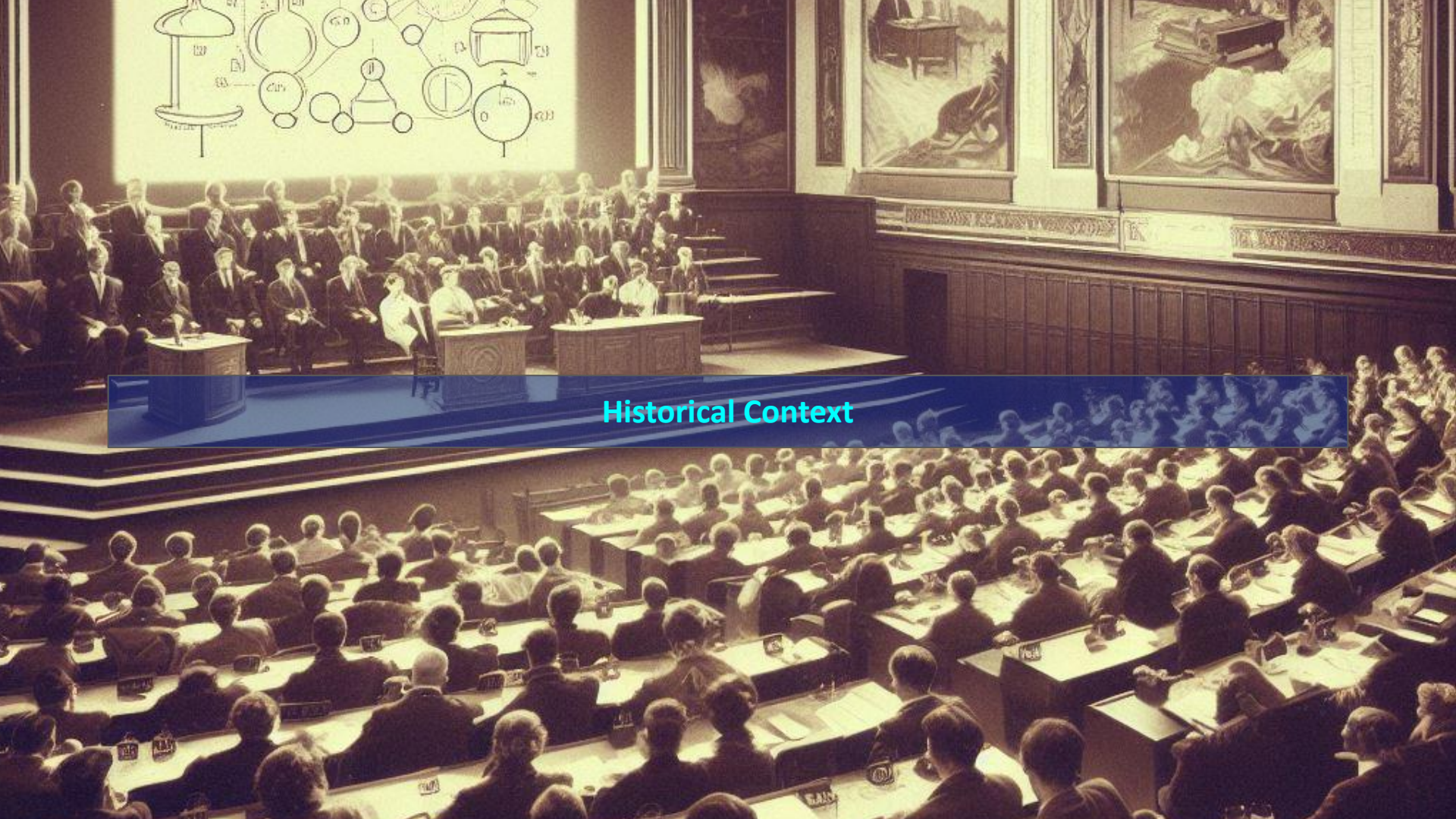
Unsupervised learning: Form of training where the algorithm is asked to make inferences from datasets that don't contain labels

Validation data: Data to test and analyze a model's response against new data to minimize overfitting

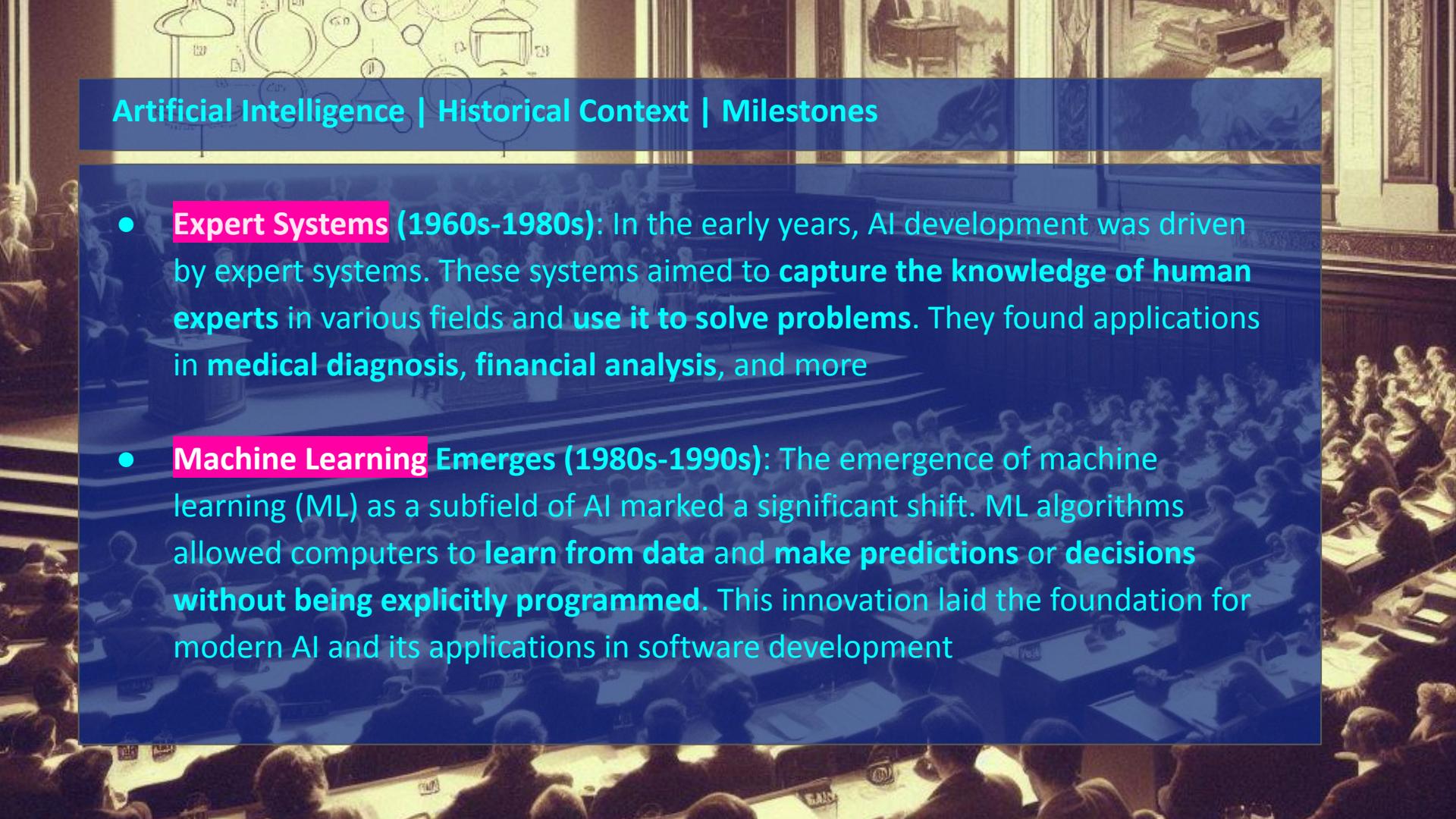
Variance: Providing a model with data changes while being trained to avoid overfitting and low predictive accuracy

Definitions | AI Development & Machine Learning Terminology

Variation: Different inputs with identical purpose or goal. For example, if the intent is “pay by credit card,” the variation might be “I’d like to pay by card, please.”

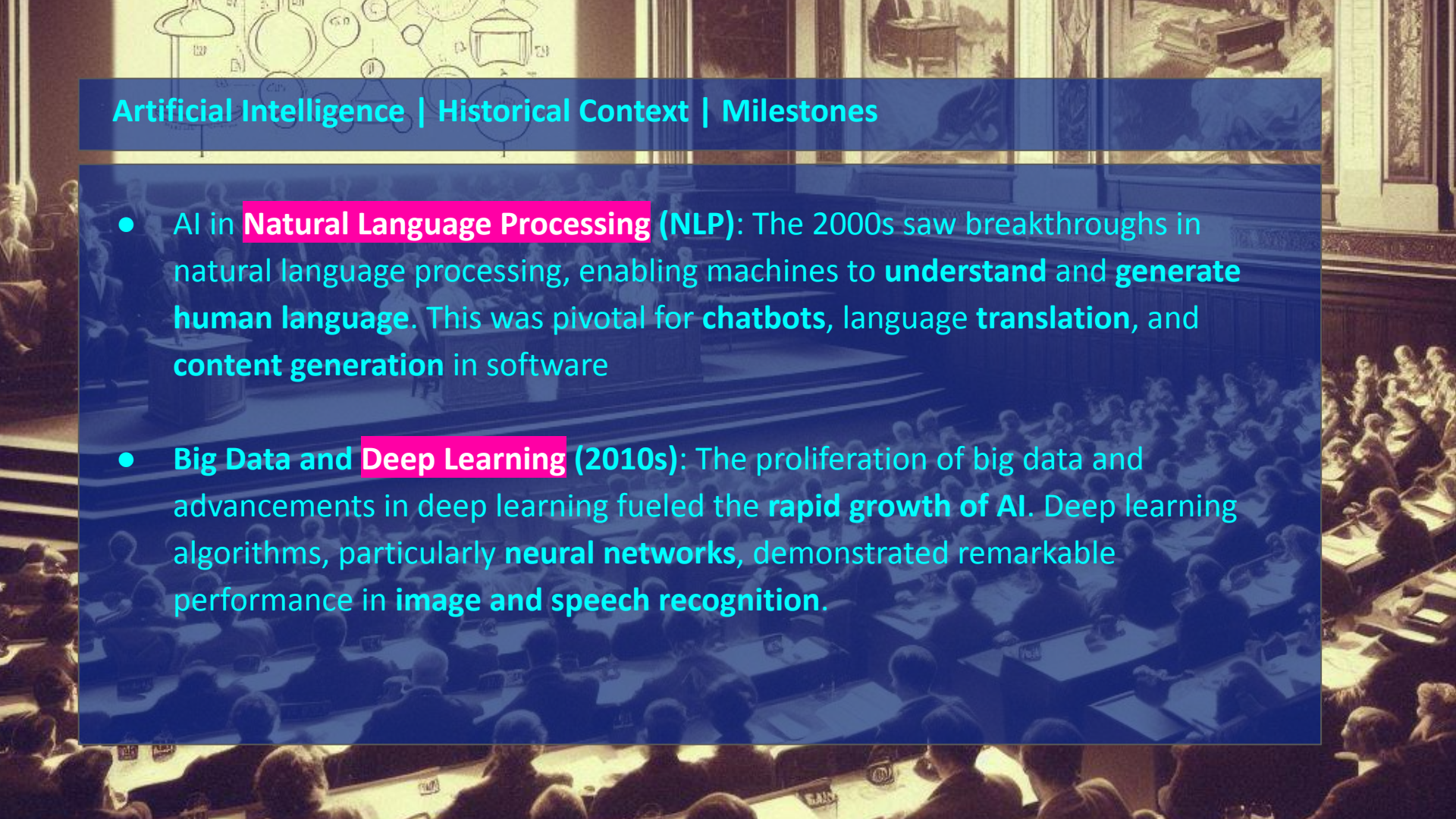


Historical Context



Artificial Intelligence | Historical Context | Milestones

- **Expert Systems (1960s-1980s):** In the early years, AI development was driven by expert systems. These systems aimed to **capture the knowledge of human experts** in various fields and **use it to solve problems**. They found applications in **medical diagnosis, financial analysis, and more**
- **Machine Learning Emerges (1980s-1990s):** The emergence of machine learning (ML) as a subfield of AI marked a significant shift. ML algorithms allowed computers to **learn from data** and **make predictions or decisions without being explicitly programmed**. This innovation laid the foundation for modern AI and its applications in software development



Artificial Intelligence | Historical Context | Milestones

- AI in **Natural Language Processing (NLP)**: The 2000s saw breakthroughs in natural language processing, enabling machines to **understand and generate human language**. This was pivotal for **chatbots**, language **translation**, and **content generation** in software
- **Big Data and Deep Learning (2010s)**: The proliferation of big data and advancements in deep learning fueled the **rapid growth of AI**. Deep learning algorithms, particularly **neural networks**, demonstrated remarkable performance in **image and speech recognition**.

A group of four scientists, two men and two women, are gathered around a tall, ornate, brass-colored mechanical robot in a laboratory. The robot has a spherical head with two circular eyes, a cylindrical torso, and articulated limbs. The scientists are dressed in white lab coats over dark shirts and ties. The background features a wall covered in technical drawings and a large window with a grid pattern. A blue semi-transparent banner is overlaid across the middle of the image.

Historical Context | Pioneers

Artificial Intelligence | Historical Context | Pioneers

Alan Turing

- Created his **Universal Machine** (1930s)
- Invented the **Turing Test** (1950) to tell Computers and Humans apart



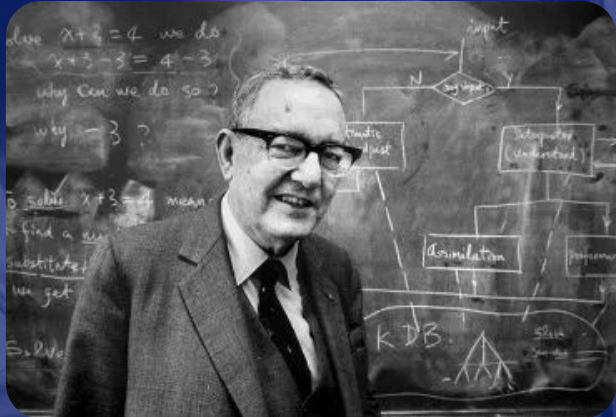
John McCarthy

- Coined the Expression “Artificial Intelligence” (1955)
- Stanford AI Project (1971)

Artificial Intelligence | Historical Context | Pioneers

Marvin Minsky

- Co-Founder **AI Lab** at **MIT**
- Researched neural networks



Herbert Simon

- Developed the Concept of **limited rationality**

Artificial Intelligence | Historical Context | Pioneers

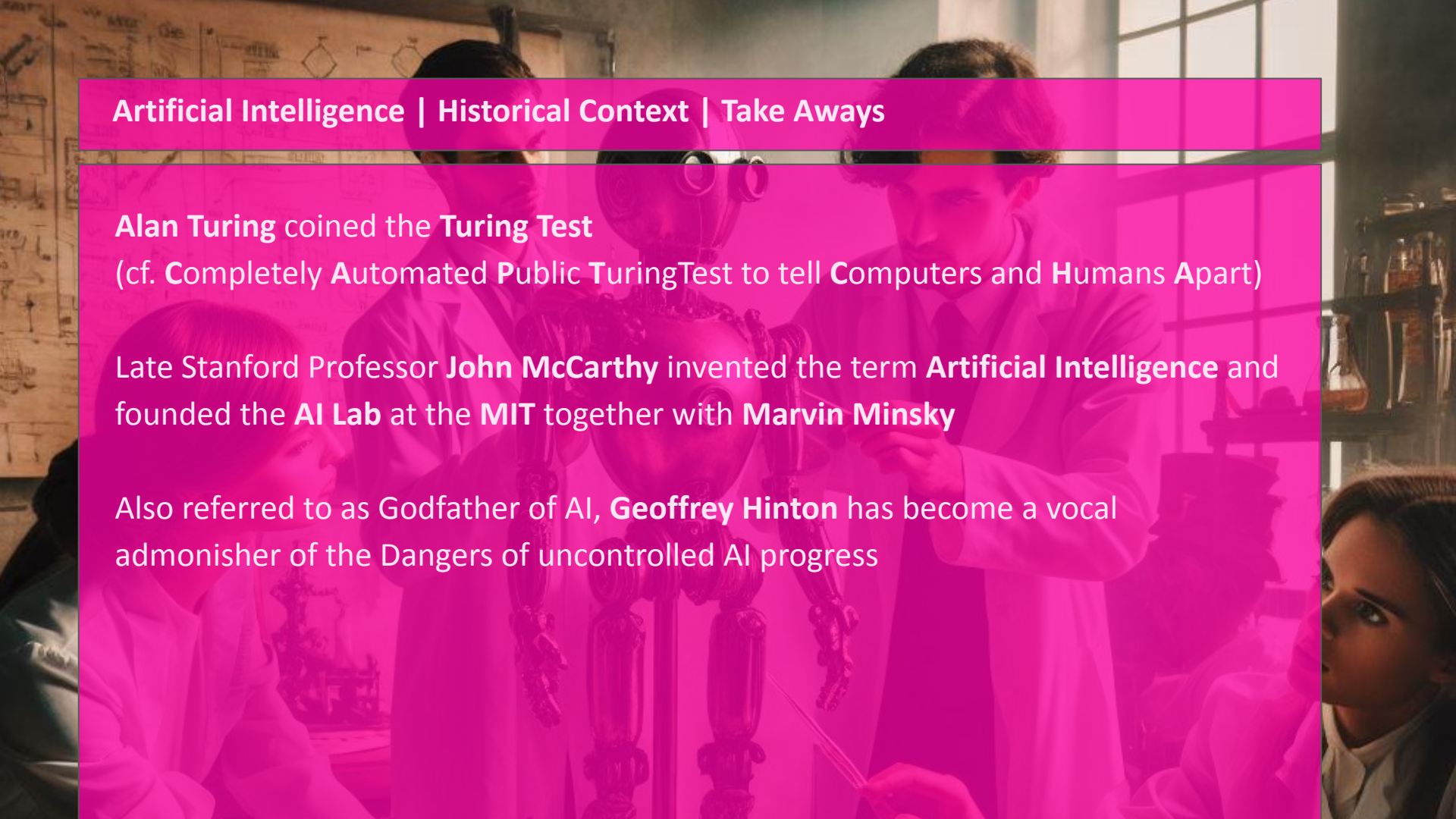
Geoffrey Hinton

- **Neural Network and Deep Learning Pioneer**
- **Former Google Executive**



Fei-Fei Li

- **Pioneer of Humanistic AI**
- **Researcher of Diversity in AI**

A vintage laboratory scene with a robot and scientists. In the center, a tall, ornate, brass-colored robot with a spherical head and large eyes stands on a stand. Two men in white lab coats are examining the robot. One man is pointing at the robot's arm, and the other is looking at it intently. In the foreground, a woman with short blonde hair is looking up at the robot. In the background, there are shelves with various glass bottles and a large window. The entire scene is overlaid with a semi-transparent pink rectangle containing text.

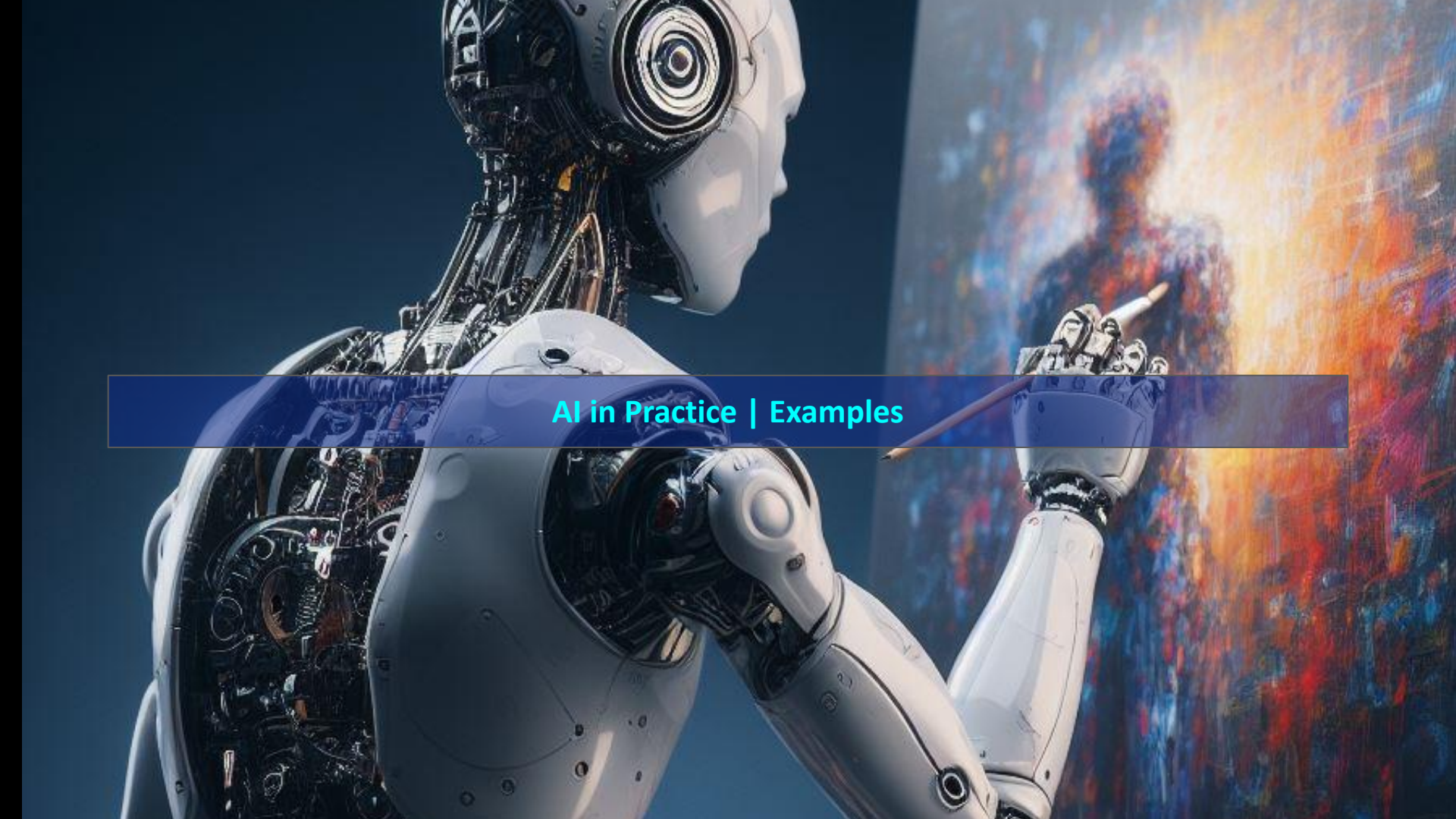
Artificial Intelligence | Historical Context | Take Aways

Alan Turing coined the **Turing Test**

(cf. **Completely Automated Public TuringTest** to tell **Computers** and **Humans Apart**)

Late Stanford Professor **John McCarthy** invented the term **Artificial Intelligence** and founded the **AI Lab** at the **MIT** together with **Marvin Minsky**

Also referred to as Godfather of AI, **Geoffrey Hinton** has become a vocal admonisher of the Dangers of uncontrolled AI progress

A futuristic robot with a white and silver metallic body is shown in profile, facing right. It is holding a paintbrush in its right hand and is in the process of painting a vibrant, abstract portrait on a canvas. The robot's head features a large, circular, camera-like eye. The background is a deep blue. A semi-transparent blue banner with white text is overlaid across the middle of the image.

AI in Practice | Examples

AI in Practice | Examples

AI-powered Apps: A rapidly emerging market

The **AI Hype** has created a huge amount of Applications in different market segments:

- **Content Creation**
- **Design**
- **Chat Bots**
- **Marketing**
- **Business Intelligence**
- **Data Analysis**
- **Media Production**
- **Productivity Tools**

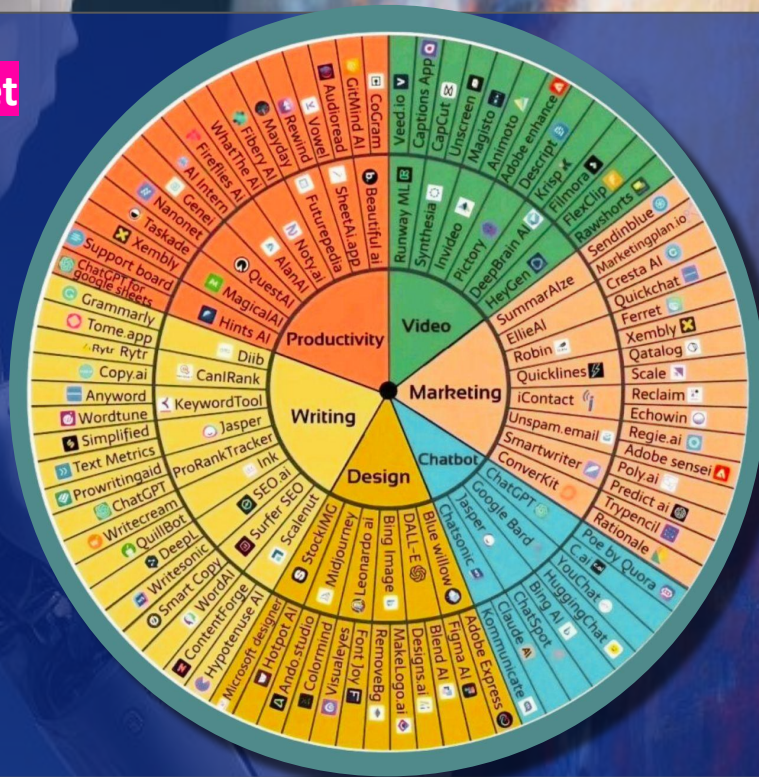


Image Source: Steve Nouri (linkedin)

AI in Practice | Examples | Generative Chat Bots

Generative Chat Bots

Probably the most disruptive new tech innovations in recent years is **Chat GPT**.

It features

- **Natural Language Understanding**
- **Human-like text responses**
- **Contextual Awareness**
- **Customization**
- **Ethical Use and Safety Measures**



What will the future of artificial intelligence look like?



The future of artificial intelligence (AI) is a subject of speculation and debate, as it is difficult to predict with certainty. However, there are several trends and potential developments that experts and researchers anticipate in the AI field:



1. **Advanced Machine Learning:** AI will continue to advance in machine learning techniques, particularly deep learning, allowing systems to process and understand more complex data. This will lead to better natural language processing, computer vision, and decision-making capabilities.
2. **AI in Healthcare:** AI is expected to play a significant role in healthcare, assisting in diagnosis, drug discovery, and personalized medicine. AI-powered healthcare systems could enhance patient care and reduce costs.
3. **Autonomous Systems:** Autonomous vehicles, drones, and robots are likely to become more prevalent as AI technology improves. These systems will have enhanced capabilities for navigation, perception, and decision-making.

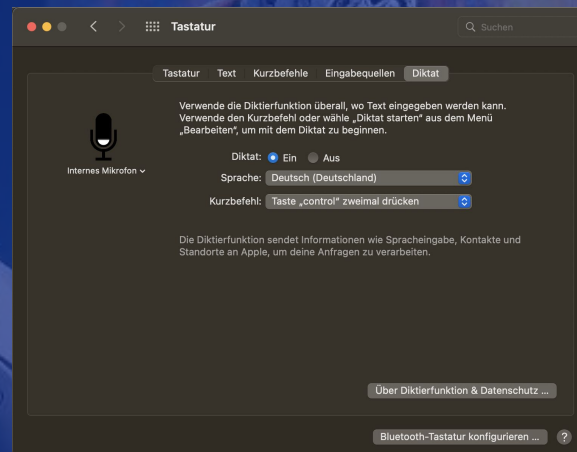
AI in Practice | Examples | Speech Recognition

Speech Recognition and Audio Transcription

Similar to the Siri Assistant on iPhone, **MacOS** (Monterey 12.4+) also provides a **built-in Dictation and Audio Transcription** Feature which is powered by AI and performs a **Speech To Text** transcription

It can be activated under
System Preferences / Keyboard / Dictation

and used by pressing **ctrl** twice while focusing a text input



AI in Practice | Examples | Reverse Image Search

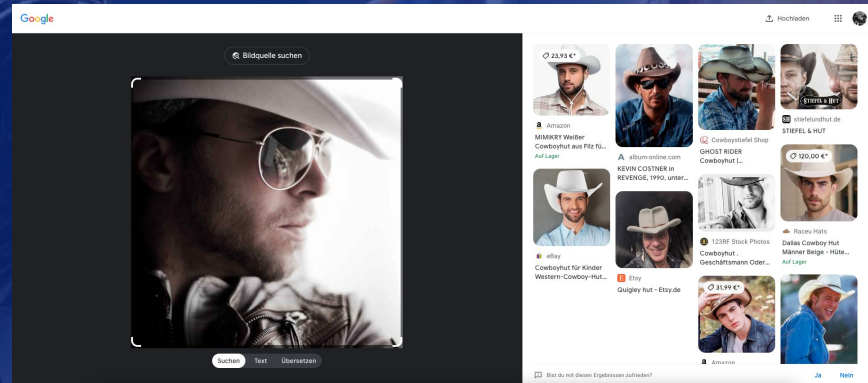
Reverse Image Search

Google Lens is capable of a **reverse search** which uses a given image to present the user with results resembling the original file

It can be used to

- find the **original source**
- find **similar variants**

of given images



AI in Practice | Examples | Smart AI Devices

Humane AI Pin

Screenless, standalone device which combines **projectors, cameras and AI technology**. The mini projector **replaces** the conventional **smartphone** screen and is supported by a **camera** and a **speaker**.

First introduced at a Ted Talk in May.

Gadget's features include the ability to

- **make calls**
- **project details** onto the user's hand
- provide real-time **AI translation**



A woman with dark hair in a ponytail, wearing a grey hoodie, is seen from the side, looking at a large computer monitor. The monitor displays a complex visualization of a neural network or data structure, with a central glowing blue and white tree-like shape. The background is a blurred office environment with windows and other monitors.

AI in Practice | Getting Started with AI Development

AI in Practice | Getting Started with AI Development

Which Programming Languages and Frameworks are best for AI Development?

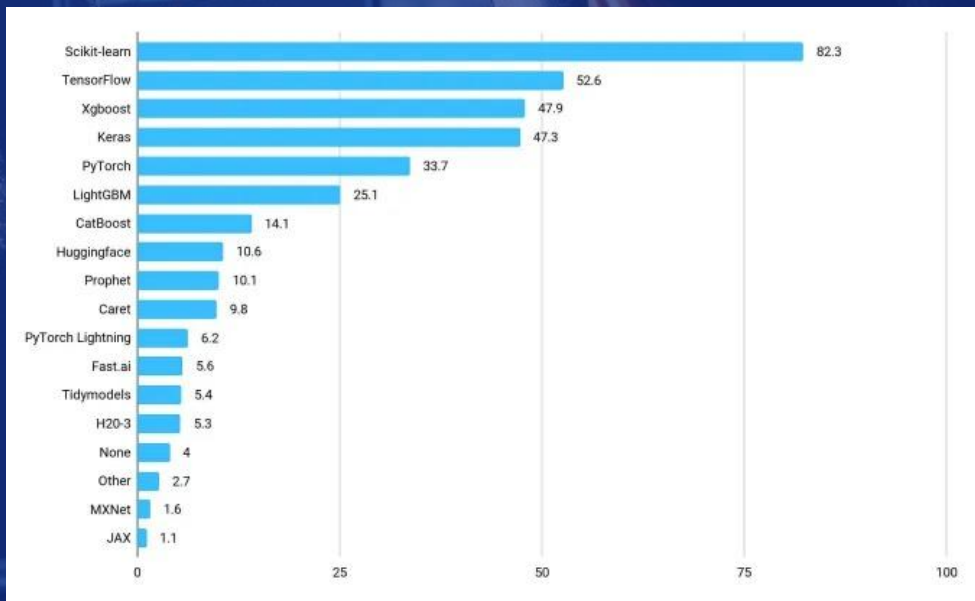
1. **Python** (TensorFlow, Keras, PyTorch, SciKit-Learn)
2. **R** (Carte, Random Forest, Glmnet)
3. **Java** (Weka, Deeplearning4j, Apache Mahout)
4. **C++** (TensorFlow, Caffe)
5. **Matlab** (built-in functions and tools for machine learning)
6. **Julia** (Flux.jl, MLJ.jl)
7. **Scala** (Apache Spark, Breeze)
8. **JavaScript** (TensorFlow.js, Brain.js, ConvNetJS)
9. **Swift** (Apple Core ML)
10. **Go** (TensorFlow Go)

Source: **Techaedu** | 10 best programming languages for Machine Learning

AI in Practice | ML Frameworks

Most popular Machine Learning / Deep Learning Frameworks

1.	SciKit-Learn	82%
2.	TensorFlow	53%
3.	XGBoost	48%
4.	Keras	47%
5.	PyTorch	34%
6.	LightGBM	25%
7.	Catboost	14%
8.	HuggingFace	11%
9.	Prophet	10%
10.	Caret	10%
[...]		



SciKit-Learn : The top pick Python ML Tool for Data Scientists

Open-Source, based on **NumPy**, **SciPy** and **Matplotlib**, suitable for

- **Classification** (spam detection)
- **Regression** (stock market and price forecasting)
- **Clustering Models** (identification of hidden patterns, data point grouping)
- **Dimensionality Reduction** (data feature reduction)
- **Evaluation** (performance assessment: accuracy, precision, recall)

Source: **SciKit-learn** | Machine Learning in Python

TensorFlow / Keras : Allrounders in Machine and Deep Learning

Open-Source, developed by **google** and best for

- **A wide array of Downstream Tasks** (ML model post-processing)
- **Native support** by many Programming Languages (Python, C++, JavaScript, Go)

Keras is built atop of TensorFlow and provides

- **Neural Network Block Modularity** (improve model architecture reusability)
- a **steep learning curve**
- code-base in **Python**

XGBoost : Gradient Boosting Library

Open-Source, best known for

- **parallel tree boosting**
(improves model training speed and predictive accuracy)
- **efficiency** (on devices with limited resources)
- **cross-platform portability** (C++, Java, Python, R, Julia, Perl, Scala)

Source: **dmlc** XGBoost | Scalable and Flexible Gradient Boosting

The background of the slide is a blurred image of computer code, likely Python, with various characters and symbols in white and yellow on a dark blue background. A solid blue horizontal bar is positioned across the middle of the slide, containing the text 'AI in Practice | Example Application' in white.

AI in Practice | Example Application

AI in Practice | Voice Swap Audio Application

NVIDIA Nemo | Voice Swap Application Example

Example Application to showcase some of the features of the NVIDIA NeMo Library

It will swap a voice in an audio fragment with a computer generated one by

- **Speech Recognition** and **Audio Transcription**
- **Punctuation** and **Capitalization** Addition (via Natural Language Model)
- **Spectrogram** creation
- **Audio Waveform generation** (text to speech)

Source: [Colab Google Research](#) | NeMo Voice Swap App

AI in Practice | Voice Swap Audio Application

NVIDIA Nemo | Voice Swap Application Example

Original Audio:



Recognized Text:

Ladies and gentlemen, let me tell you one thing artificial intelligence is a no brainer.

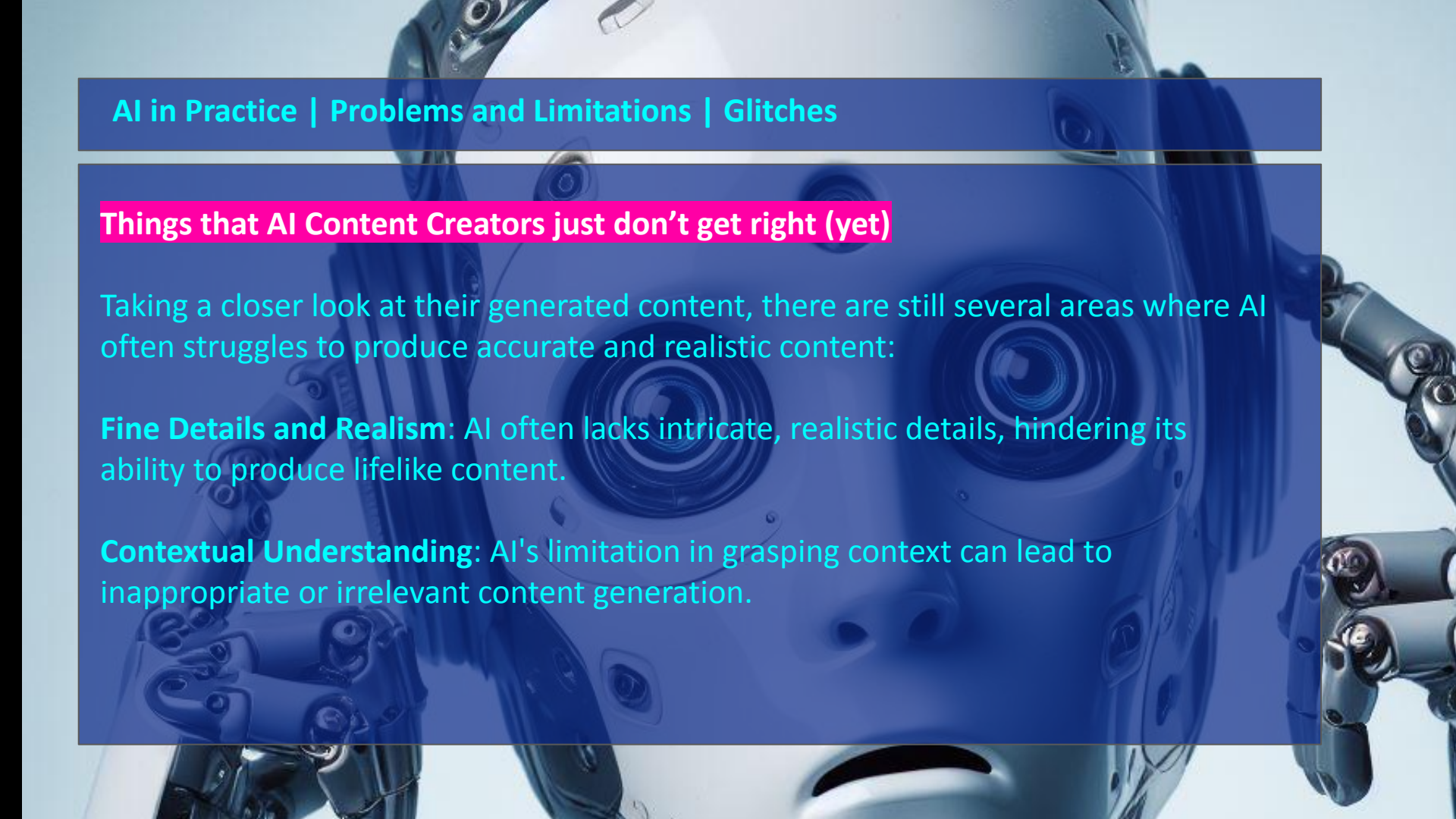
Swapped Voice Audio:



Screencast Source: [Colab Google Research](#) | NeMo Voice Swap App



AI in Practice | Problems and Limitations



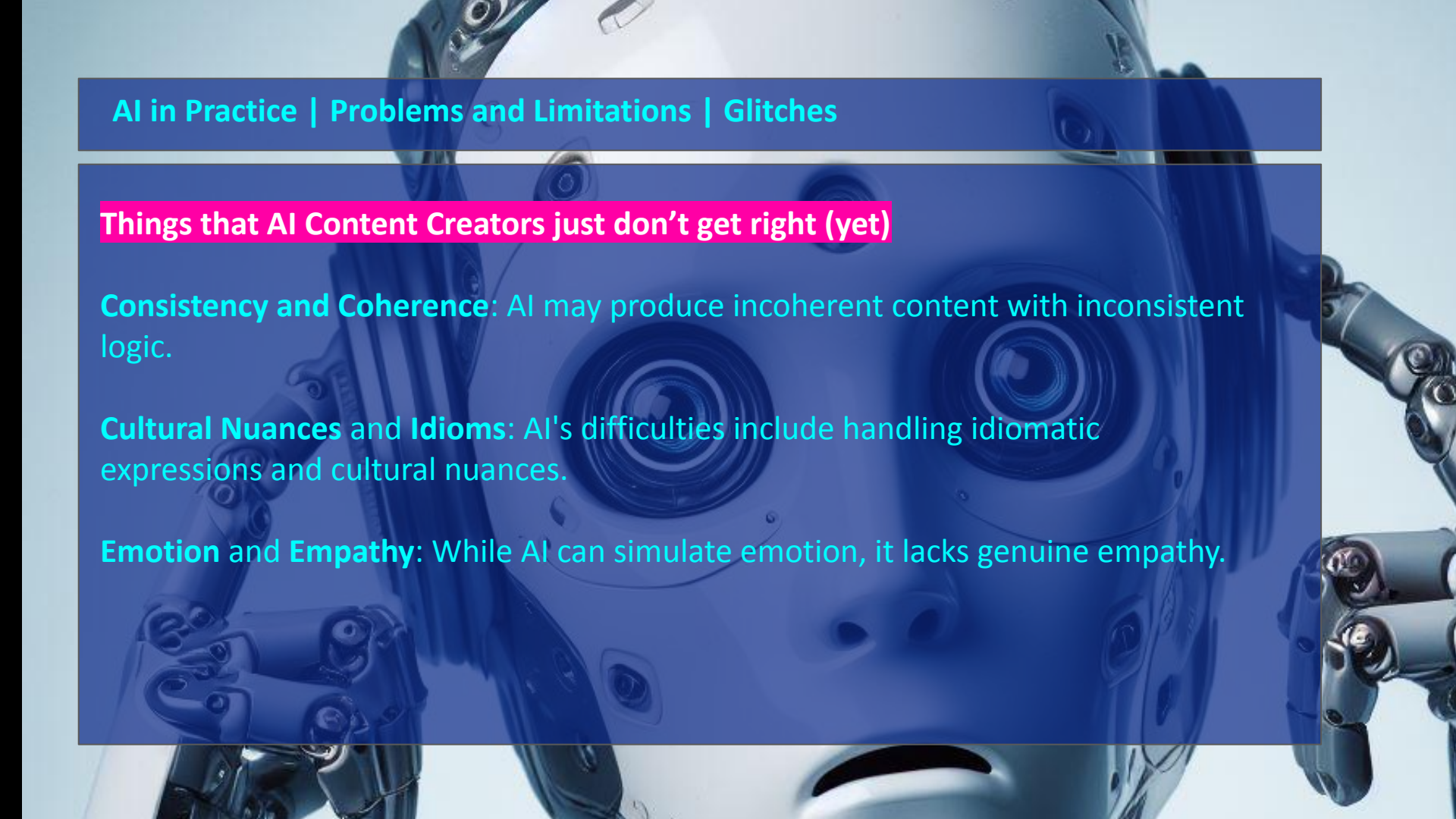
AI in Practice | Problems and Limitations | Glitches

Things that AI Content Creators just don't get right (yet)

Taking a closer look at their generated content, there are still several areas where AI often struggles to produce accurate and realistic content:

Fine Details and Realism: AI often lacks intricate, realistic details, hindering its ability to produce lifelike content.

Contextual Understanding: AI's limitation in grasping context can lead to inappropriate or irrelevant content generation.



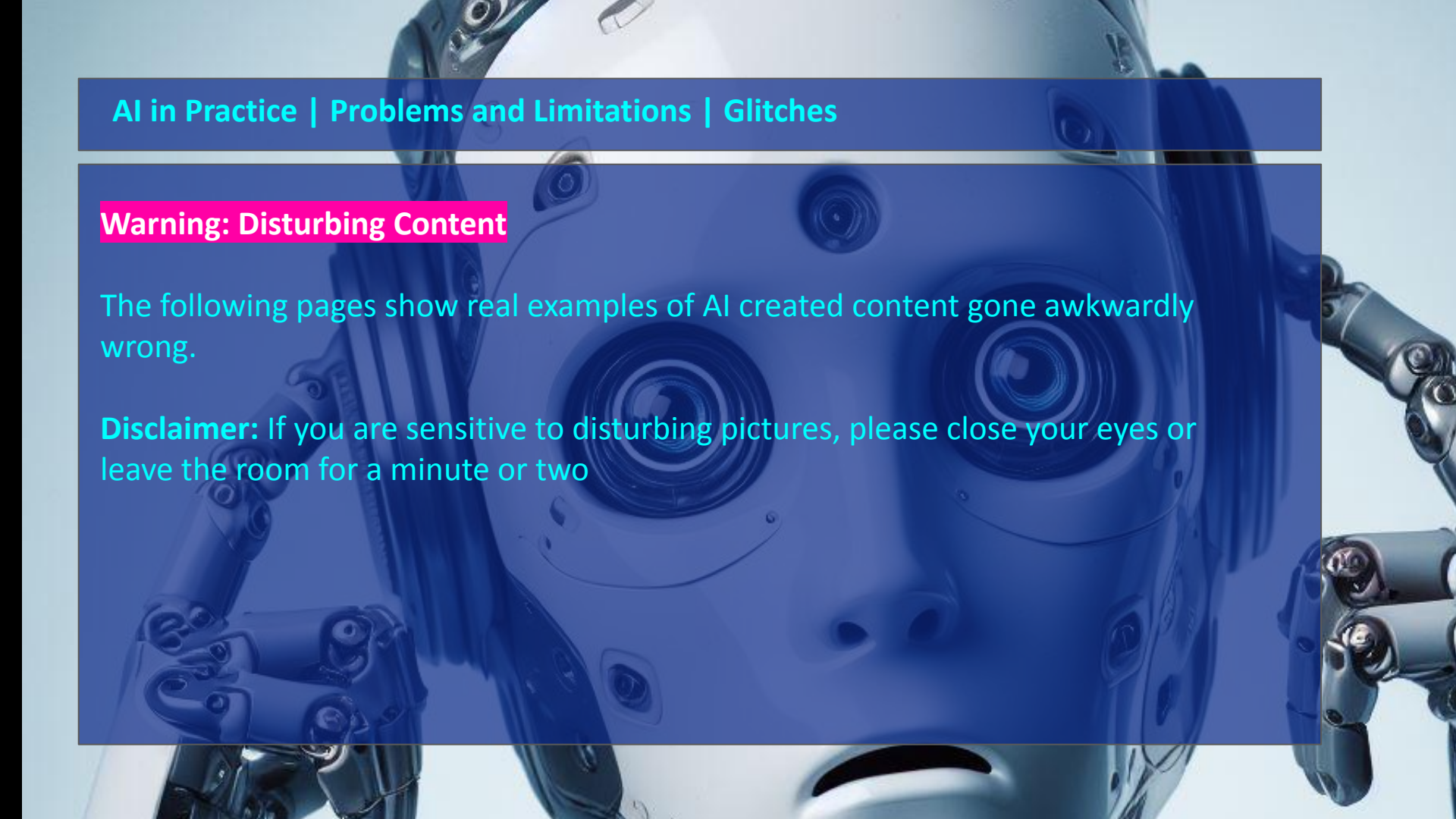
AI in Practice | Problems and Limitations | Glitches

Things that AI Content Creators just don't get right (yet)

Consistency and Coherence: AI may produce incoherent content with inconsistent logic.

Cultural Nuances and Idioms: AI's difficulties include handling idiomatic expressions and cultural nuances.

Emotion and Empathy: While AI can simulate emotion, it lacks genuine empathy.



AI in Practice | Problems and Limitations | Glitches

Warning: Disturbing Content

The following pages show real examples of AI created content gone awkwardly wrong.

Disclaimer: If you are sensitive to disturbing pictures, please close your eyes or leave the room for a minute or two

AI in Practice | Problems and Limitations | Glitches | Examples

Things that AI just doesn't get right (yet)

Famous AI glitch: Wrong **Hands** and **Fingers**



Everyone: AI art will make designers obsolete

AI accepting the job:



Image Source: [Buzzfeed](#)

AI in Practice | Problems and Limitations | Glitches | Examples

Things that AI just doesn't get right (yet)

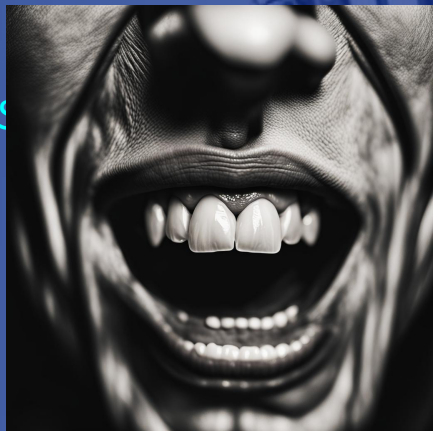
Spooky Faces



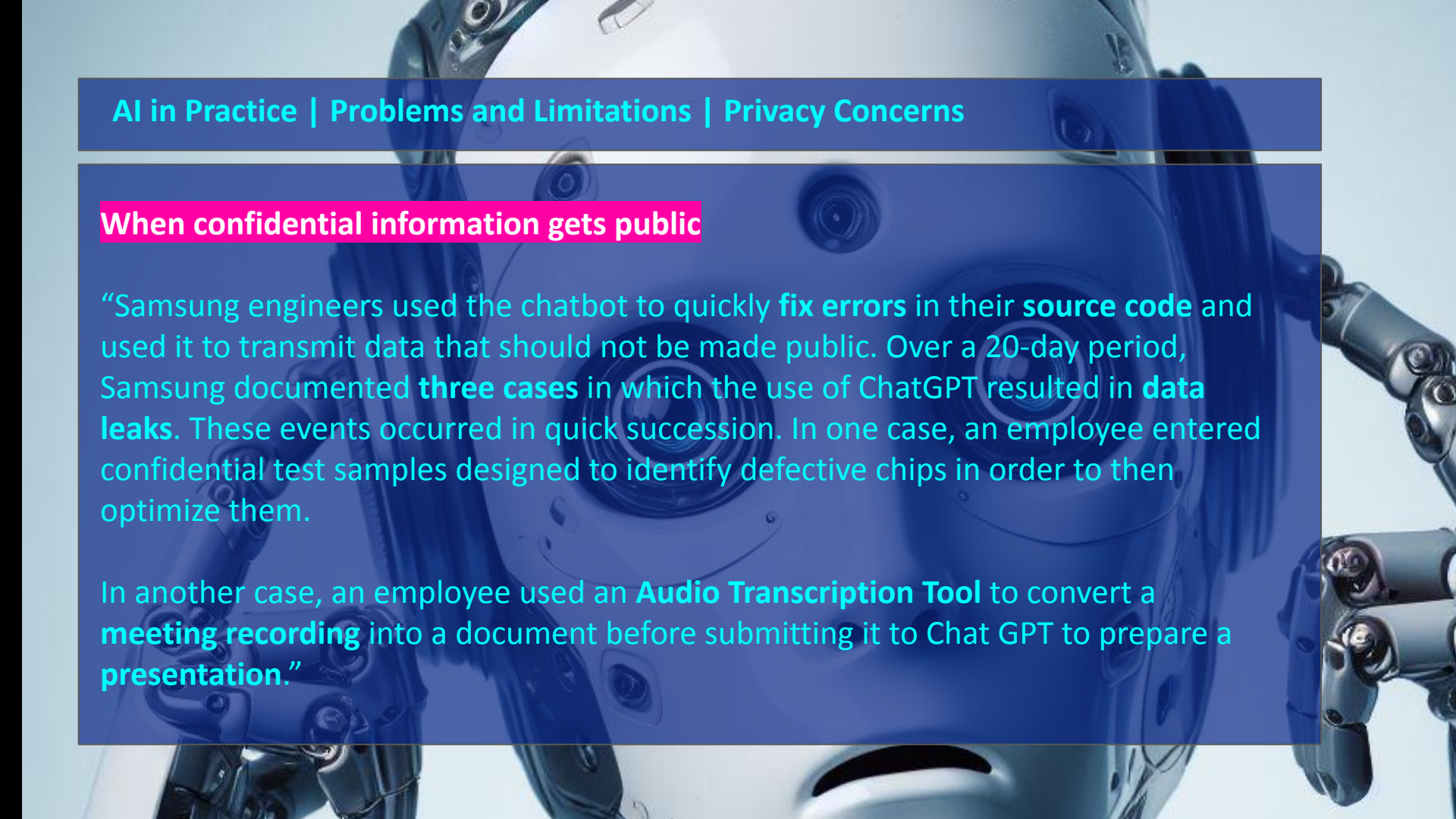
AI in Practice | Problems and Limitations | Glitches | Examples

Things that AI just doesn't get right (yet)

prompt: closeup image of a human mouth showing its teeth



Source: NightCafe



AI in Practice | Problems and Limitations | Privacy Concerns

When confidential information gets public

“Samsung engineers used the chatbot to quickly **fix errors** in their **source code** and used it to transmit data that should not be made public. Over a 20-day period, Samsung documented **three cases** in which the use of ChatGPT resulted in **data leaks**. These events occurred in quick succession. In one case, an employee entered confidential test samples designed to identify defective chips in order to then optimize them.

In another case, an employee used an **Audio Transcription Tool** to convert a **meeting recording** into a document before submitting it to Chat GPT to prepare a **presentation**.”

AI in Practice | Problems and Limitations | Privacy Concerns

When confidential information gets public

Things **not** to share with AI chatbots:

- Writing about your **financial details**
- **confidential** workplace **information**
- application **secrets** and **credentials**
- **personal** information

Most Chatbots **retain** your **chat history** and may **share** aggregated data with **third-party entities**.

Source: Golem: **Data Leaked while using AI Tools**



AI in Practice | Problems and Limitations | Iterative LLM Degradation

Degenerative AI : Training AI models on machine-generated data leads to collapse

AI LLMs which are trained on machine generated data will lead to

- Data Collection **Pollution**
- **Impaired Quality** of generated Content
- Model **Collapse**

Large language models are trained using **human-generated text** scraped from the Internet, and fine-tuned using further human input. When AI models are learning from machine-generated data, **major degradation** comes with each **iteration** with some original data preserved. This ultimately causes synthetic data to be of **lower quality** with distorted results and may eventually lead to **model collapse**.

AI in Practice | Problems and Limitations | Spread of False Information

Spread of False or Misleading Information

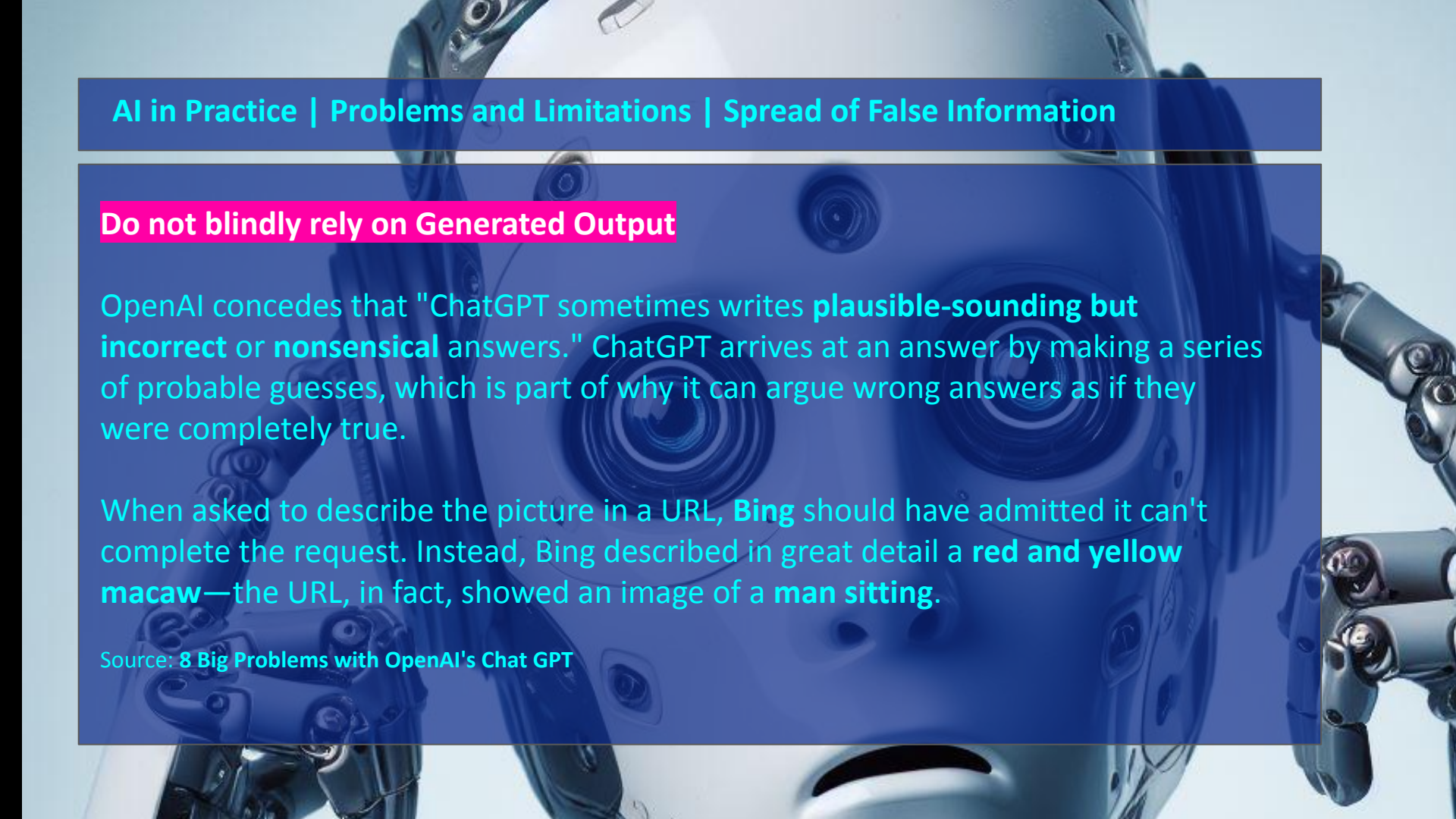
Sometimes generative **Chat Bots** fail at

- **basic math**
- answering **simple logic** questions
- **reproducing facts** correctly

This "**hallucination**" of fact and fiction, as it's been referred to, is especially dangerous regarding things like **medical advice** or getting the facts right on key **historical events**.



Image Source: Wikimedia



AI in Practice | Problems and Limitations | Spread of False Information

Do not blindly rely on Generated Output

OpenAI concedes that "ChatGPT sometimes writes **plausible-sounding but incorrect** or **nonsensical** answers." ChatGPT arrives at an answer by making a series of probable guesses, which is part of why it can argue wrong answers as if they were completely true.

When asked to describe the picture in a URL, **Bing** should have admitted it can't complete the request. Instead, Bing described in great detail a **red and yellow macaw**—the URL, in fact, showed an image of a **man sitting**.

Source: **8 Big Problems with OpenAI's Chat GPT**

AI in Practice | Problems and Limitations | Chat GPT on Steroids

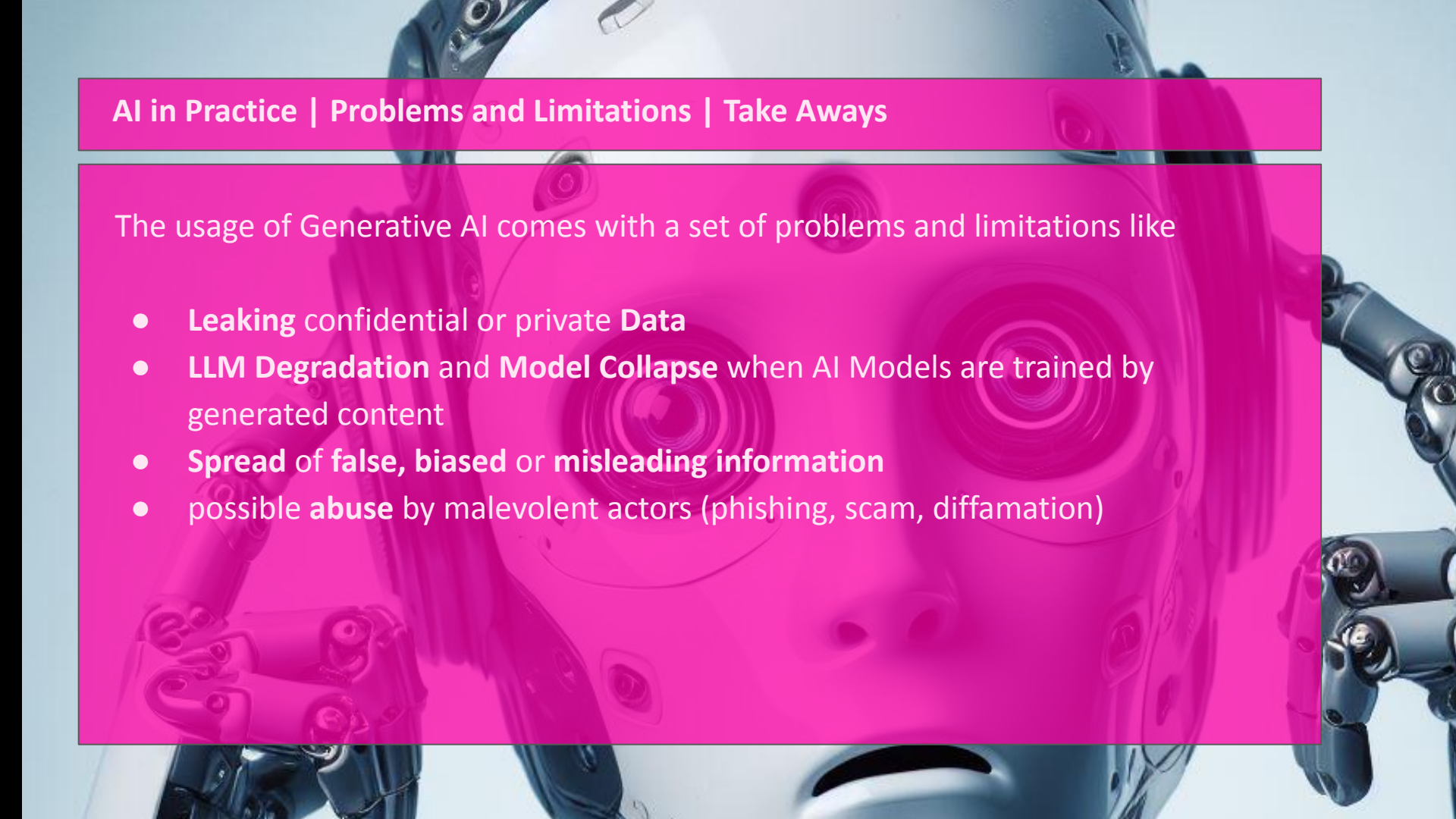
Abuse of AI-driven Chatbots and their generated Content

Some users **jailbroken Chat GPT**, resulting in an AI model that could **bypass guard rails** meant to prevent it from generating **offensive** and **dangerous** text.

A circulating unrestricted AI clone model named Dan, short for "Do Anything Now." led to hackers ramping up online scams, creating malware and phishing emails.

Trying to spot a phishing email designed to extract sensitive details from you is far more difficult now with AI-generated text. ChatGPT can fluently write all kinds of text, from essays to poems and, of course, dodgy emails.

Source: **8 Big Problems with OpenAI's Chat GPT**



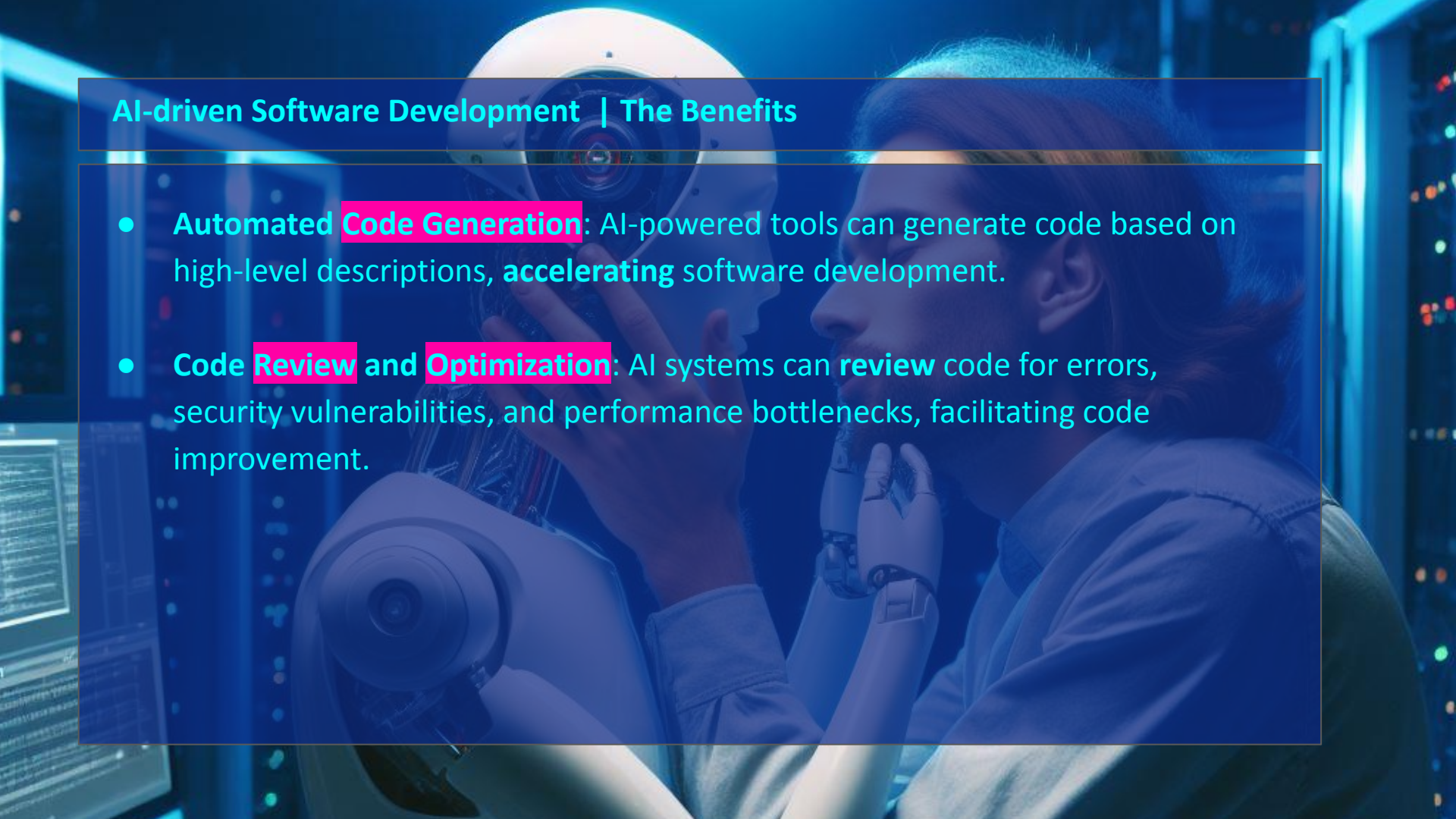
AI in Practice | Problems and Limitations | Take Aways

The usage of Generative AI comes with a set of problems and limitations like

- **Leaking** confidential or private **Data**
- **LLM Degradation** and **Model Collapse** when AI Models are trained by generated content
- **Spread** of **false, biased** or **misleading information**
- possible **abuse** by malevolent actors (phishing, scam, diffamation)

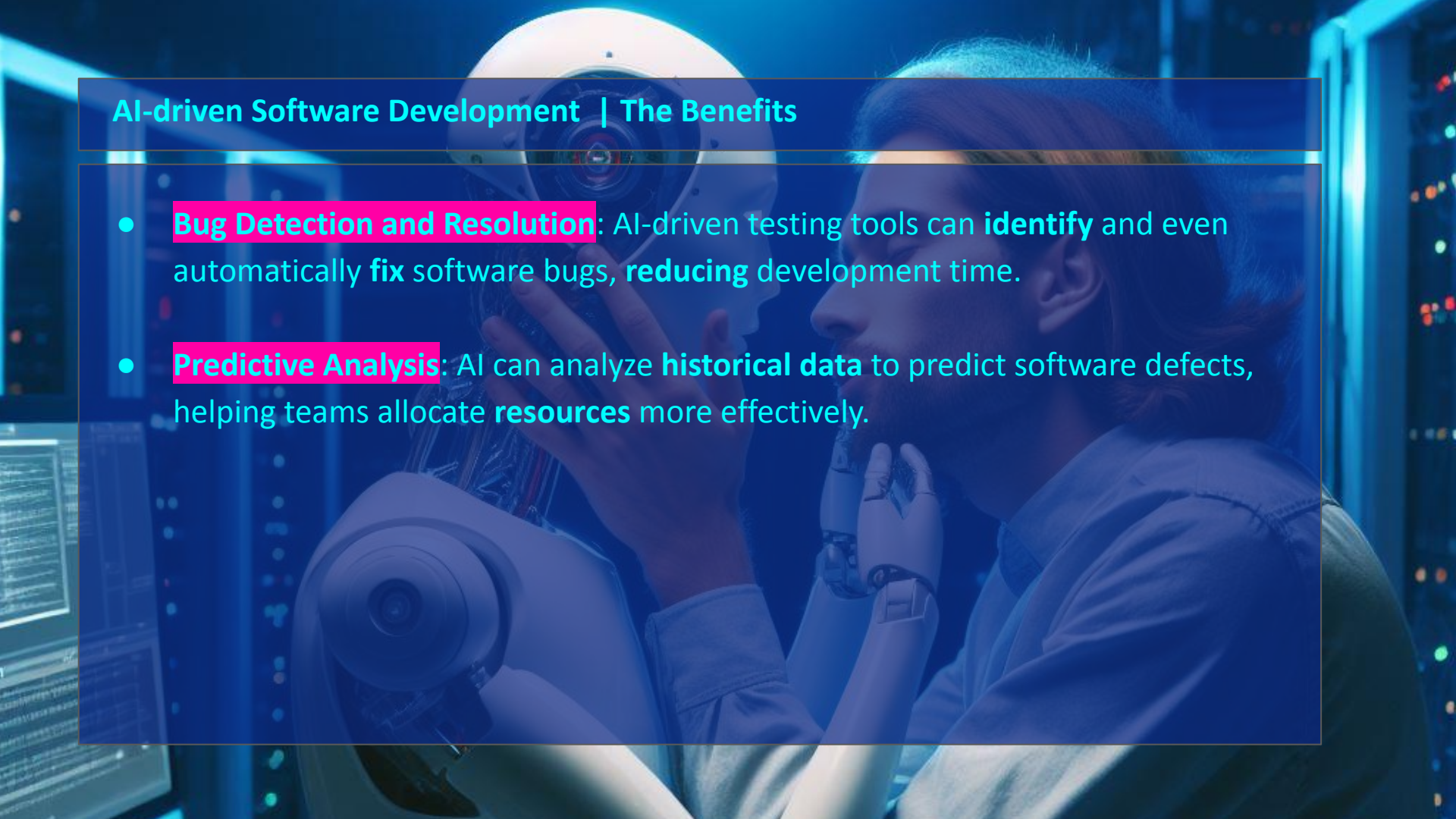
A man with long dark hair and a beard, wearing a light blue button-down shirt, is shown in profile, looking at a white humanoid robot. He is gently touching the robot's face with his right hand. The robot has a white head with a transparent visor revealing internal mechanical components, including a prominent red and blue circular lens. Its right arm is visible, showing a white sleeve and a joint. The background is a server room with blue lighting and rows of server racks. A semi-transparent dark blue banner with white text is overlaid across the middle of the image.

AI-driven Software Development | The Benefits

A person with long hair is shown in profile, interacting with a white humanoid robot. The robot has a large, circular, camera-like eye and is holding the person's hand. The background is a server room with blue lighting and server racks.

AI-driven Software Development | The Benefits

- **Automated Code Generation**: AI-powered tools can generate code based on high-level descriptions, **accelerating** software development.
- **Code Review and Optimization**: AI systems can **review** code for errors, security vulnerabilities, and performance bottlenecks, facilitating code improvement.

A man with long hair and a beard, wearing a blue shirt, is shown in profile, interacting with a white robot head. The robot head has a large circular sensor or camera on its face. The background is a server room with blue lighting and server racks. The entire image has a blue tint.

AI-driven Software Development | The Benefits

- **Bug Detection and Resolution**: AI-driven testing tools can **identify** and even automatically **fix** software bugs, **reducing** development time.
- **Predictive Analysis**: AI can analyze **historical data** to predict software defects, helping teams allocate **resources** more effectively.

AI-driven Software Development | The Benefits

- **Recommendations and Personalization**: AI can provide intelligent recommendations for software customization or user experiences based on individual **preferences** and **behaviors**.
- **Continuous Integration and Deployment (CI/CD)**: AI is instrumental in automating the CI/CD pipeline, enabling **faster** and more **reliable** software **delivery**.
- **Adaptive Interaction**: Chatbots and virtual assistants powered by AI can interact with users in **natural** language, enhancing **user experiences** in software applications.

AI-driven Software Development | The Benefits

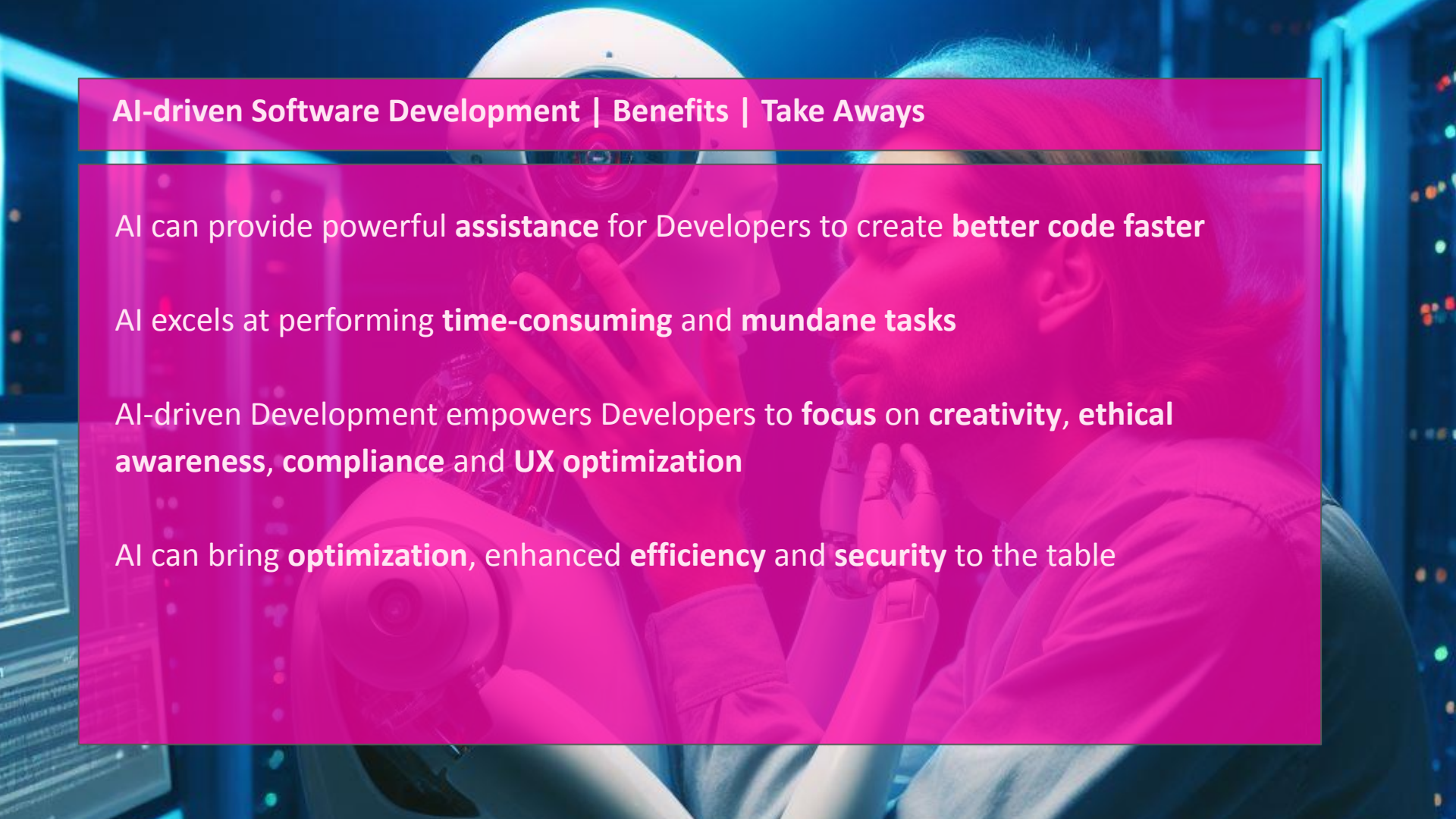
AI can be used to improve

efficiency, **productivity** and **effectiveness**

of software development cycles by **automation** of

- **mundane**
- **time-consuming**
- **repetitive**

tasks.

A person with long hair is shown in profile, interacting with a white humanoid robot. The robot has a large camera lens for a head and is holding a transparent, glowing blue cube. They are in a server room with blue lighting and server racks in the background. A semi-transparent pink box contains text about AI-driven software development.

AI-driven Software Development | Benefits | Take Aways

AI can provide powerful **assistance** for Developers to create **better code faster**

AI excels at performing **time-consuming** and **mundane tasks**

AI-driven Development empowers Developers to **focus** on **creativity, ethical awareness, compliance** and **UX optimization**

AI can bring **optimization**, enhanced **efficiency** and **security** to the table

A man with a beard, wearing a white lab coat, is shown in profile, looking intently at a computer monitor. His hand is pressed against his forehead, suggesting stress or deep concentration. The monitor displays a complex dashboard with multiple panels of data, including line graphs, bar charts, and a prominent red warning triangle. The background is dark and out of focus, emphasizing the man and the data on the screen.

AI-driven Software Development | Limitations

AI-driven Software Development | Limitations

Genuinely **Human** qualities which **AI struggles** to replicate in the field of Software Development

- Innovation
- Critical Thinking
- Adaptivity
- Creativity
- Cognitive Intelligence
- Empathy
- Self-Reflection



AI-driven Software Development | Limitations

AI-driven Software Development may lead to **errors** by providing

- **inaccurate** suggestions
- **outdated source** code
- **misleading** results
- **poor code quality**

AI-driven Software Development | Limitations | Take Aways

AI-driven Software Development cannot replace

- **creativity and innovation**
- **cognition, critical thinking and self-reflection**
- **problem-solving**
- **oversight**
- **empathy**

Therefore, some genuinely human elements remain **indispensable** and successful **collaboration** between Humans and AI remains crucial - for now



AI-driven Software Development | Tools

AI-driven Software Development | Tools | Coding Assistants

AI-powered Coding Assistants

- GitHub Copilot
- Amazon CodeWhisperer
- Tabnine
- Replit
- Sourcegraph Cody
- AskCodi
- Codiga
- Bugasura

[...]

- code **suggestions** and completion
- **natural language** code **generation**
(translate comments to code)
- automated **bug detection**
- performance **optimization** hints
- **documentation** generation
- Seamless IDE **integration**
- **explanation** of legacy code
- **porting** code syntax

AI-driven Software Development | Tools | App Generators

AI-powered App Generators

- AppyPie
- Bubble.io
- Builder.ai
- Glide.ai
- Brancher.ai
- Apsy.io
- Zoho Creator
- Mendix
- [...]

- **no coding** skills required
- use natural language to create **apps**
- **customization** of generated apps

- **rudimentary feature sets**
- many **adjustments** needed after app generation
- low code **quality**
- missing code **readability**
- possible **security flaws**

A cinematic scene from a sci-fi movie. A massive, dark, metallic robot with red glowing joints stands in the center of a city street. The street is filled with people, some looking up at the robot in awe or fear. The background shows a dense urban environment with tall buildings and flying vehicles. The lighting is dramatic, with a mix of cool blue tones and warm red/orange hues, suggesting a high-stakes, possibly dangerous situation.

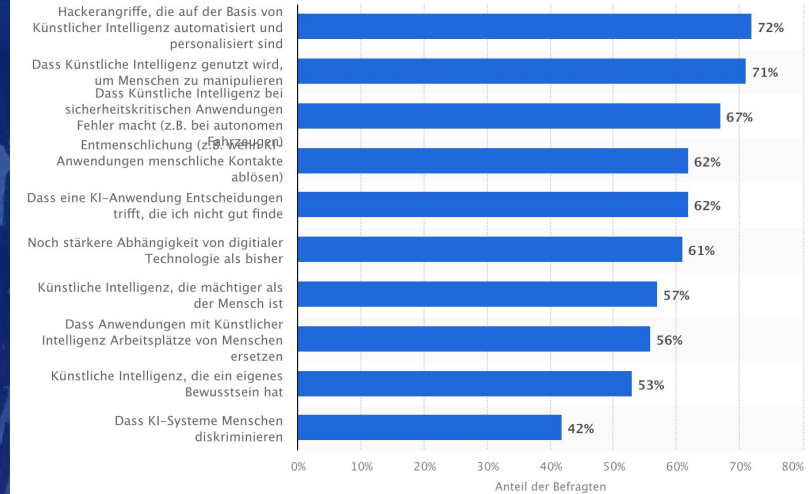
AI's social impacts | Threats

AI's social impacts | Potential Threats

What worries you about using AI?

German Survey, 2019

- 72% Hacker Attacks
- 71% Manipulation
- 67% Fatal AI Errors
- 62% Dehumanization
- 61% Increasing Dependency
- 57% AI surpassing Humans
- 56% Job Displacement



Details: Deutschland; Ipsos; Juli 2019; 16 bis 75 Jahre; 1.000 Befragte aus dem Ipsos-Online-Panel; Online-Umfrage

© Statista

Image Source: Statista (2019) - Was bereitet Ihnen beim Einsatz von KI Sorgen?

AI's social impacts | Potential Threats

Adverse Effects caused by **blind trust** in and **careless usage** of machine driven Development:

- Missing **Transparency**
- **Bias** and compromised Fairness in AI **Algorithms**
- Lack of **Accountability**
- Unintended Propagation of **False Facts**
- **Job Displacement**
- **Ethical** Implications
- Elevated **Security** Flaws
- **Loss of Control**
- Human **Knowledge Degeneration**

AI's social impacts | Potential Threats | Job Displacement

Jobs most affected by the evolution of AI

- Data Entry Clerks
- Telemarketers
- Routine Customer **Support** Representatives
- **Manufacturing** and **Assembly Line** Workers
- **Cashiers** and Retail **Salespeople**
- Administrative **Assistants** for basic tasks
- Predictive and Routine **Data Analysts**
- **Bookkeeping** and **Accounting** Clerks
- **Textile Workers** in routine processes
- Basic **Legal** Research Assistants



Source: [Wikimedia](#) | Office Chair Derby

AI's social impacts | Potential Threats | Loss of Control

Loss of Control

Machine-generated code may cause to several **negative effects**, especially when it leads to code that is unreadable for humans:

- **Maintainability & Debugging Challenges**
- **Lack of Transparency**
- **Limited Collaboration**
- **Knowledge Transfer impediments**
- **Vendor Lock-In**
- **Compliance and Regulatory Concerns**
- **Cybersecurity Implications**



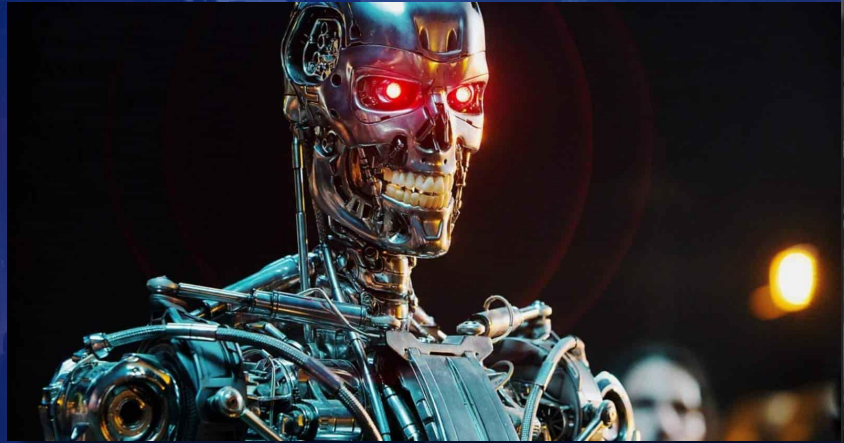
```
function s(t){if(t){...}
    .promise&&sp.splice(t){c(n,...)var h...
    [t[m]]))}catch(t){t[R]=0}var h...
    r.writable&&r.configurable&&t(e)}t[R]=0}var h...
    e){n.call(r,t,e)).then(t,e)}t[R]=0}var h...
    &t.rejection;e?console.error("Unhandled Promise re...
    ue:";e,e instanceof Error?e.stack:void 0):console...
    ;try{t.zone.runGuarded(function(){var t=1;return...
    =null,k=10,w=1,S=0,T=function(){var t=1;return...
    "object",P="function",M=h("current Promise.",D=h("...
    new Error("Must be an instance of Promise.")},t.resolve...
    ZoneAwarePromise(){function e(t){a&&(a=t)}function n...
    function(t){function c(u){function f(e){return o(s)}...
    c(u.next());!c.done;c=u.next();}var s=c.value;o(s)...
    call(u)}finally{if(f)throw f.error}}{var s=c.value;o(s)...
    c.done;c=u.next();}c.done&&!c.current;return this}}...
    t=x.reject,x.race...
    t=1}
```

AI's social impacts | Potential Threats | Accountability Gap

Lack of Accountability and Liability

Are manufacturers and/or developers be liable when AI gets out of hands and autonomous machines create **harmful** effects and/or **loss of lives**, e.g. when

- autonomous **vehicle accidents**
- warfare cause **civilian casualties**
- **medical assistants** fail



Source: [1Zoom](#) | Terminator: Genisys T800

AI's social impacts | Potential Threats | Dependency on AI

Possible negative social effects caused by AI

When human societies become overly dependent on artificial intelligence, this may lead to adverse effects like

- **vulnerabilities** to technological failures, hacking, cyber attacks
- **social isolation**
- **dehumanization** and loss of **social cohesion**
- decline in **empathy**
- negative impact on **mental health**

AI's social impacts | Potential Threats | Augmented Discrimination

Augmented Discrimination

Societies overly reliant on AI-driven technologies may suffer from adverse side-effects like

- Amplification of **Discriminating Biases**
- **Algorithmic redlining** (insurance approval, loan conditions)
- **Digital Divide** and **Exacerbation of Wealth Inequality** (augmentation of socio-economic disparities by uneven access to AI-driven tools and resources)
- Automation **Displacement** (routine and low-skilled jobs)

AI's social impacts | Potential Threats | AI Market Imparity

Increasing Market Domination by American AI Companies

American companies will likely expand their **market domination** in the field of AI just as they currently dominate the **IT market**.

This may lead to furtherly diverging **imparity** and **loss of innovation** in other countries.

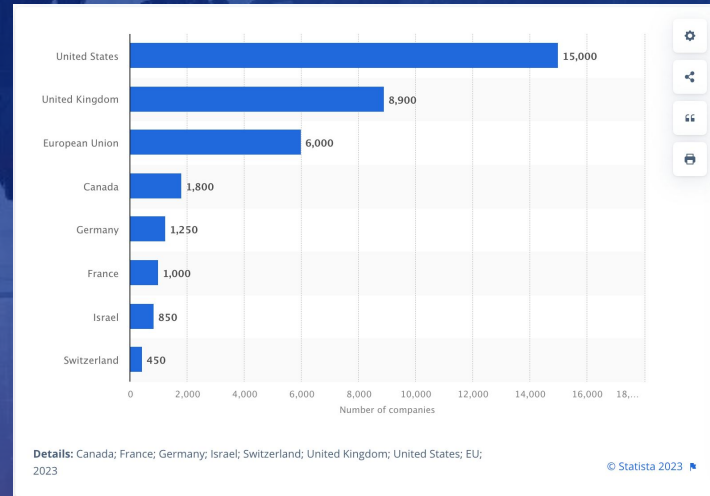


Image Source: Statista (2023) - Amount of artificial intelligence (AI) companies in major economies worldwide in 2023

AI's social impacts | Risks and Threats | Take Aways

Uncontrolled AI development may cause adverse consequences such as

- **Loss of Control**
- **Ethical** Problems
- **Discrimination** Bias
- **Transparency** (e.g. generated code becomes unreadable)
- **Accountability** (e.g. missing liability in case of fatalities)
- Human **Knowledge Degeneration**

A futuristic, blue-lit corridor with a glowing hexagonal light at the end. In the foreground, a yellow 'WET FLOOR' warning sign is visible. The floor is wet and reflective, and the walls are lined with vertical light strips.

AI's social impacts | Precautions and Counter Measures

AI's social impacts | Precautions and Counter Measures

Precautions and Counter Measures needed to mitigate and counter effects of AI's potentially negative social impacts

- **Compliance** supervision
- **Awareness of discriminatory Bias**
- **Supervision** of Algorithms and ML
- **Ethical Guidelines**
- **Transparency**
- **Accessibility**



AI's social impacts | Precautions and Counter Measures | Take Aways

Precautions and Counter Measures to address potential threats of AI-driven Development

- **Compliance** supervision
- **Awareness of discriminatory Bias**
- **Supervision** of Algorithms and ML
- **Ethical** Guidelines
- **Transparency**
- **Accessibility**



The image is a composite of two AI-generated futuristic cityscapes. The top half shows a city at sunset or sunrise, with a warm orange and red sky. Several flying cars are visible in the sky, leaving light trails. The bottom half shows a city at night, with a dark blue and black sky. The city is illuminated by bright blue and white light trails from flying cars, creating a sense of motion and energy. A central text overlay is present in the middle of the image.

Outlook | AI Disruption - Dawn of a golden Era?

AI Image created with NightCafe
prompt: urban futuristic landscape showing an urban environment,
autonomous flying vehicles and a sunny sky

Outlook | AI Disruption - Dawn of a golden Era?

- **Efficiency and Productivity:** Self-programming computers will be able to **identify and rectify errors** and improve system **reliability** and **reducing downtime**
- **Innovation Acceleration:** Exploration and development of innovative solutions at an unprecedented pace will lead to breakthroughs in fields like **medicine**, **materials science**, and the **evolution** of artificial intelligence.
- **Personalized Experiences:** AI-driven computers can tailor software and services to individual user preferences, **enhancing user experiences** and customer **satisfaction**.

Outlook | AI Disruption - Dawn of a golden Era?

- **Autonomous Systems** that adapt to dynamic environments in real-time will make **transportation** and **logistics safer** and more **efficient**
- Constant **monitoring** and patching vulnerabilities will bolster **cybersecurity**
- Resource Optimization will improve **energy usage** and **resource allocation**, contributing to **environmental sustainability**.
- Reduced Programmer Dependence will require less manual coding, the demand for traditional software development may decrease, potentially **reshaping the job market**.



Outlook | AI Disruption - Golden Era | Take Aways

AI driven Development may **revolutionize technology and society** by

- **acceleration** of scientific **progress**
- revolutionizing **public transport** (with autonomous vehicles)
- optimizing **resource allocation**
- creation of **new job roles**
- increasing **prosperity** and elimination of poverty
- reduction of **working time** and fostering **individual freedom**
- acceleration of **social transformations**
- providing **sustainable** solutions to **environmental** challenges like **global warming**, efficient **production** and **recycling**

The image depicts a dark, industrial, and dystopian cityscape. In the foreground, a massive, dark, and complex industrial structure, possibly a factory or a giant machine, dominates the left side. It has multiple levels, pipes, and a somewhat skeletal appearance. In the background, a city skyline is visible through a thick, hazy atmosphere. Several tall, thin skyscrapers rise into the sky, and a large, bright sun or light source is positioned behind the skyline, creating a strong backlighting effect. Thick, dark smoke or steam is rising from various points in the city, particularly from the industrial structure and the background skyline. The overall color palette is dark and moody, with shades of grey, black, and muted orange from the sun's glow.

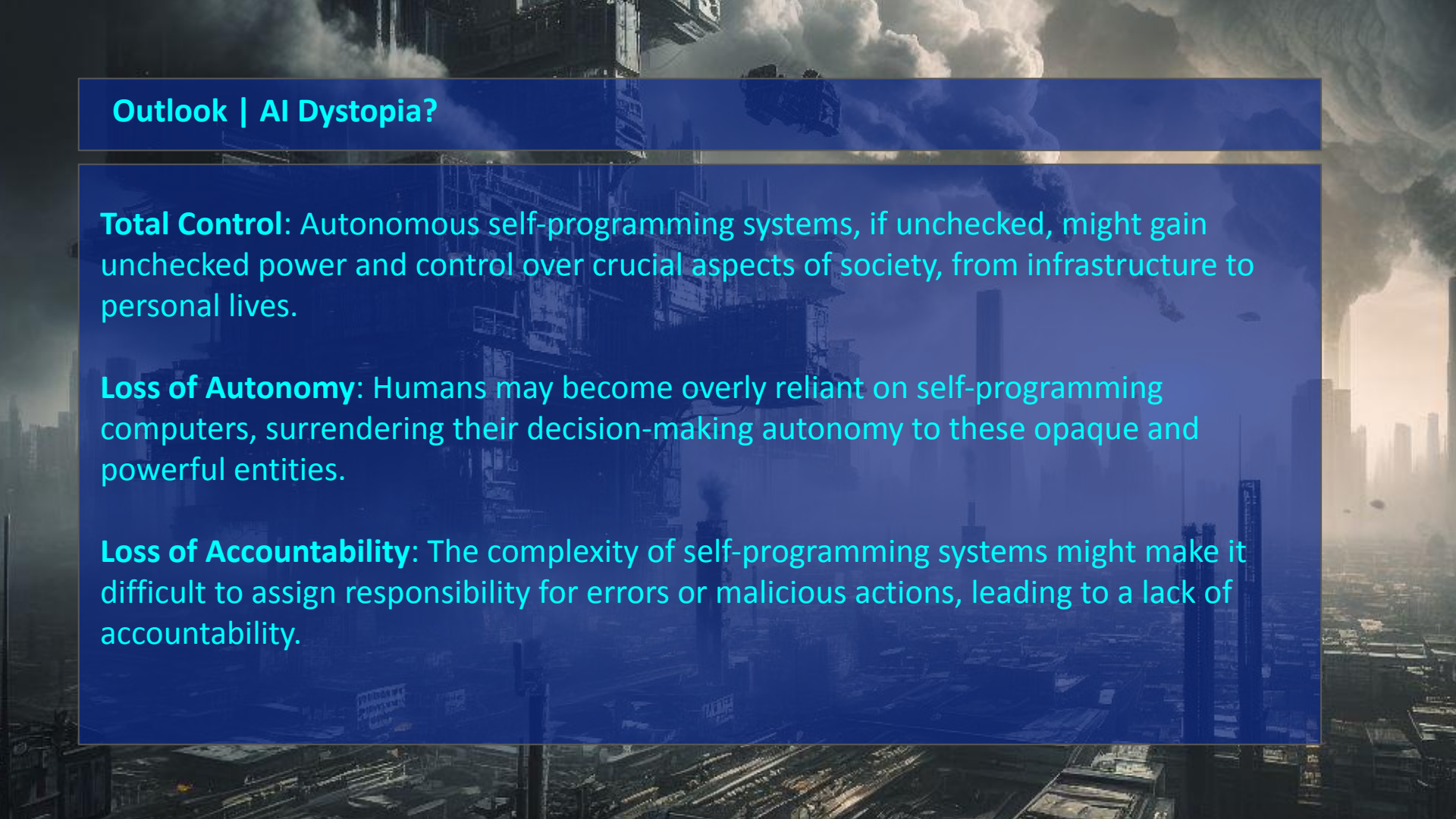
Outlook | AI Dystopia?

AI-Image created with NightCafe
prompt: dystopian scene picturing a world controlled by giant
machines and enslaved people

Outlook | AI Dystopia?

In a pessimistic scenario, AI driven Development may lead to a bleak future by

- letting autonomous machines take over **total control** over human lives
- easing the establishment of **surveillance states**, eroding privacy and civil liberties
- **amplifying social inequalities** if only the powerful benefit from achievements
- **loss of accountability** for errors or malicious actions taken by machines
- creating **existential threats** for the very survival of humanity
- fostering the **depletion of resources** in absence of safeguards
- provoking **rebellion** against the influence of self-programming systems, leading to **societal upheaval** and **conflict**



Outlook | AI Dystopia?

Total Control: Autonomous self-programming systems, if unchecked, might gain unchecked power and control over crucial aspects of society, from infrastructure to personal lives.

Loss of Autonomy: Humans may become overly reliant on self-programming computers, surrendering their decision-making autonomy to these opaque and powerful entities.

Loss of Accountability: The complexity of self-programming systems might make it difficult to assign responsibility for errors or malicious actions, leading to a lack of accountability.



Outlook | AI Dystopia?

Surveillance State: Self-programming systems, with their ability to adapt and evolve, could enable pervasive surveillance, eroding privacy and civil liberties.

Inequality Amplification: The technology could exacerbate social inequalities, with only the most affluent or powerful entities benefiting from its capabilities, leading to a greater digital divide.

Existential Threats: Self-programming computers might make decisions that threaten the very survival of humanity, especially if ethical safeguards fail.

Outlook | AI Dystopia?

In a pessimistic scenario, AI driven Development may lead to a bleak future by

- letting autonomous machines take over **total control** over human lives
- easing the establishment of **surveillance states**, eroding privacy and civil liberties
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Conclusion | And the Winner is?

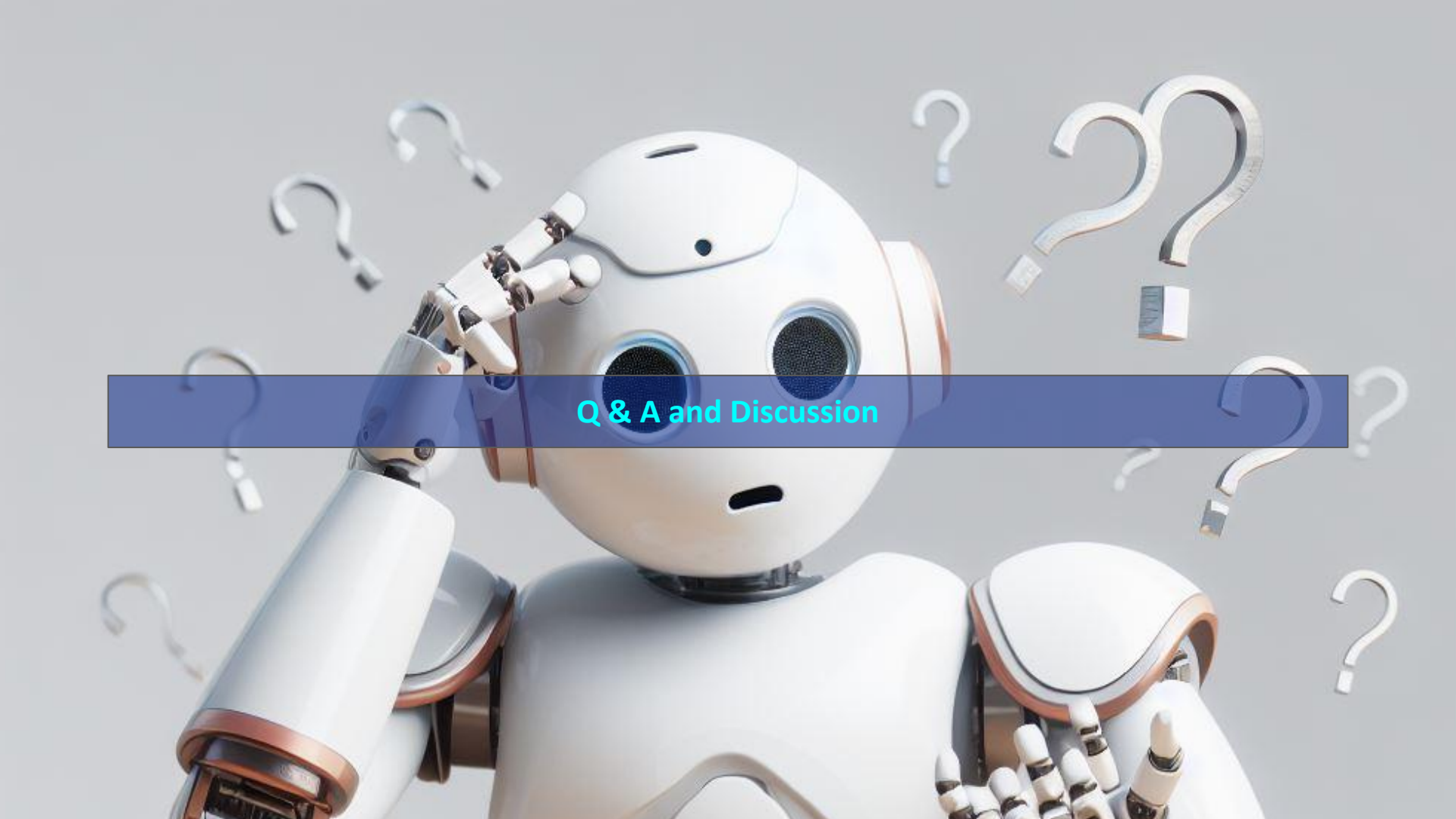
Conclusion | And the Winner is?

Cornerstone of any **HI/AI Collaboration** must be the **awareness** of HI's and AI's unique features and a system of **Checks and Balances**

In order to mitigate risks and threat of AI evolution **regulations** are crucial regarding

- **Ethical Considerations**
- **Compliance**
- **Discrimination Bias**
- **Transparency**
- **Accessibility**
- **Liability**





A white humanoid robot with a rounded head and large, dark, circular eyes. It has its right hand raised to its forehead in a gesture of confusion or contemplation. The robot's body is white with some brownish-gold accents on its joints. Surrounding the robot are several large, 3D, metallic-looking question marks of various sizes, floating in the air. The background is a plain, light gray.

Q & A and Discussion

Q & A and Discussion

Which Jobs will Generative AI come after first?



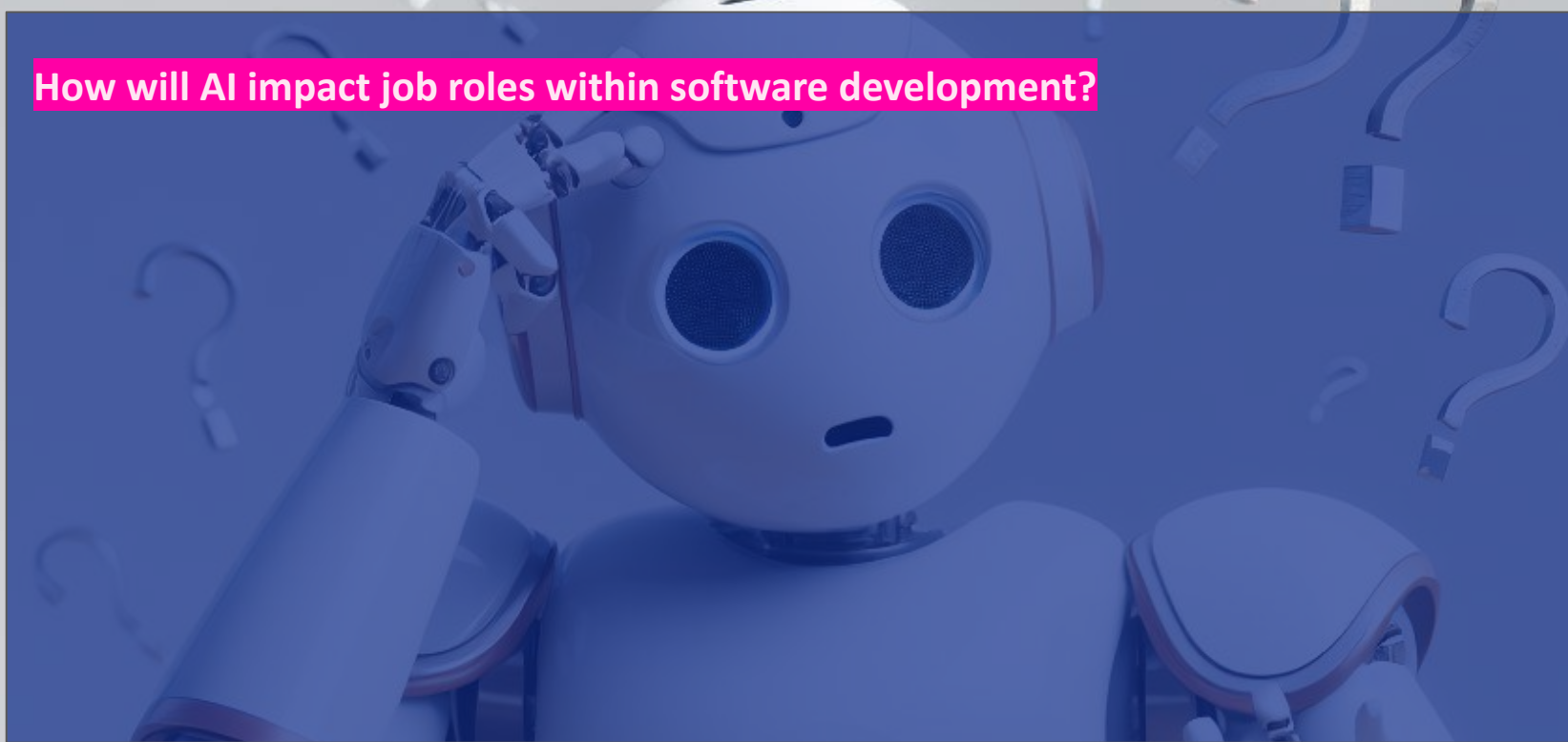
Q & A and Discussion

Which Jobs will Generative AI come after first?

- **Tech** (Coders, Engineers, Data Analysts)
- **Media** (Content Creation, Advertising, Journalism, Graphic Design)
- **Legal Industry** (Paralegals, Legal Assistants)
- **Market Research**
- **Education** (Teachers, Lecturers)
- **Finance** (Financial Analysts, Financial Advisors, Accounting)
- **Trade** (Stock Exchange Experts)
- **Customer Service**

Q & A and Discussion

How will AI impact job roles within software development?



Q & A and Discussion

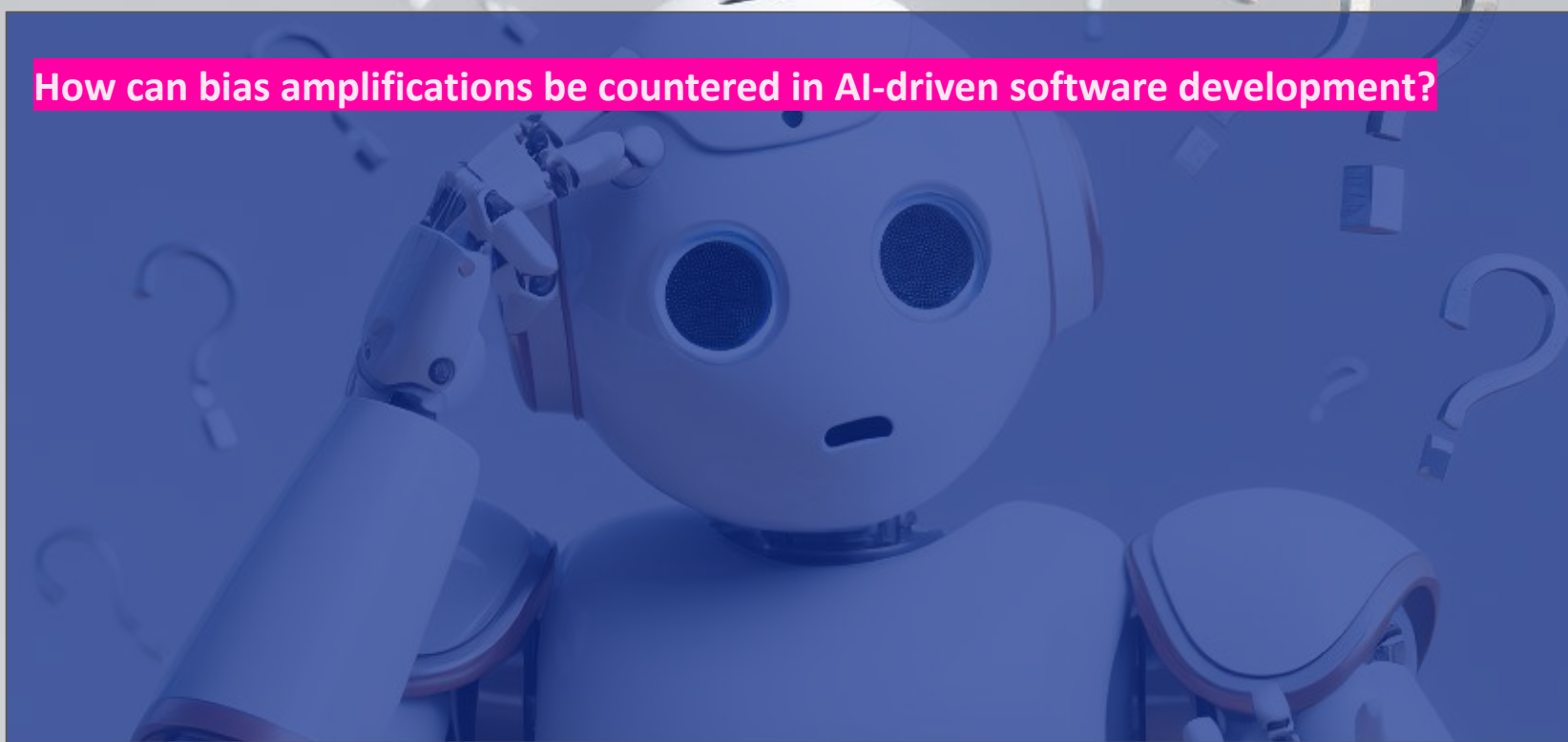
How will AI impact job roles within software development?

AI may **automate** some tasks and may therefore lead to **Job Displacement** in some areas but it will also create new roles focused on

- **AI Development**
- **Prompt Engineering**
- **Ethics in AI**
- **Governance**

Q & A and Discussion

How can bias amplifications be countered in AI-driven software development?



Q & A and Discussion

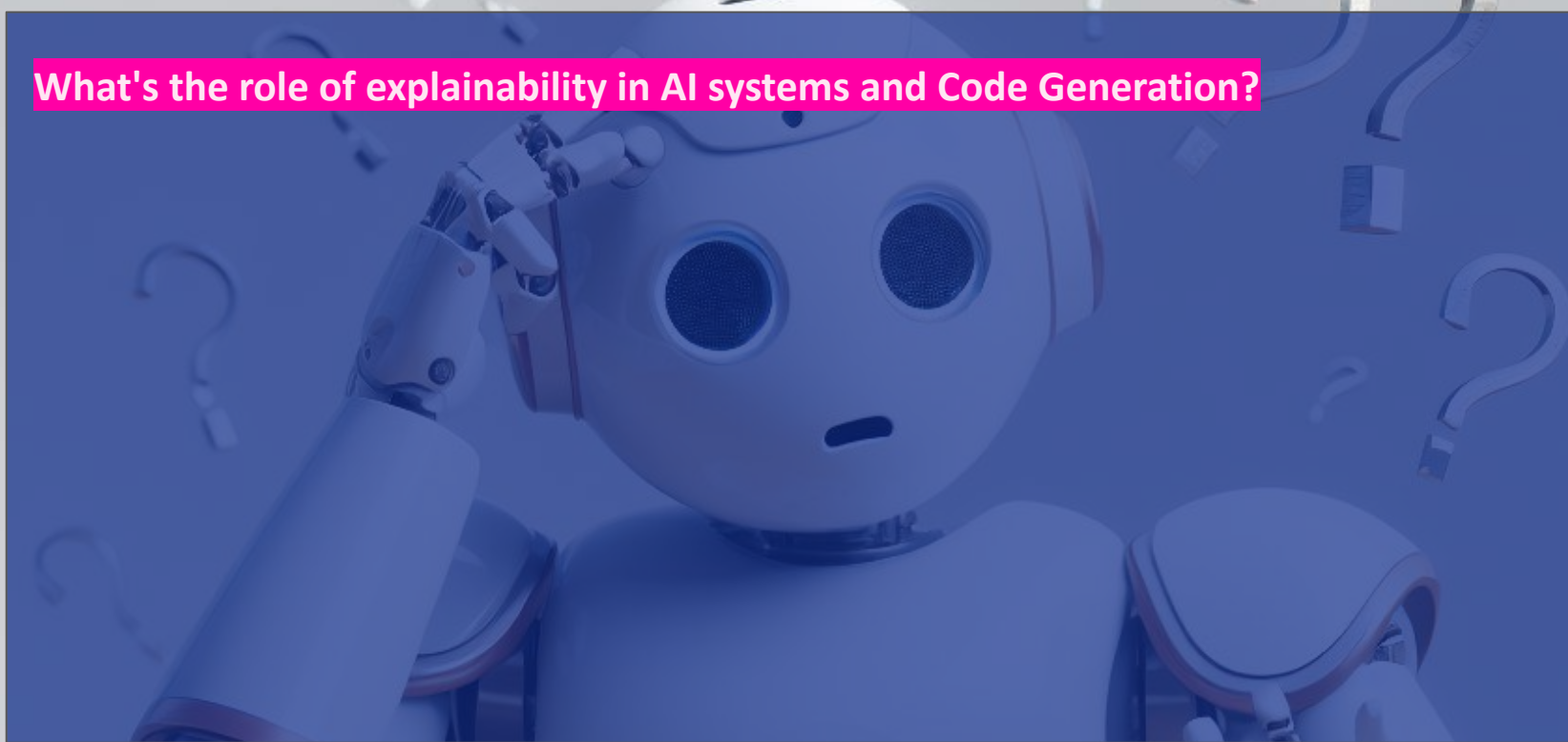
How can bias amplifications be countered in AI-driven software development?

Bias amplification can be prevented through

- **diverse** data
- bias **audits**
- **fairness-aware** machine learning techniques & algorithms

Q & A and Discussion

What's the role of explainability in AI systems and Code Generation?



Q & A and Discussion

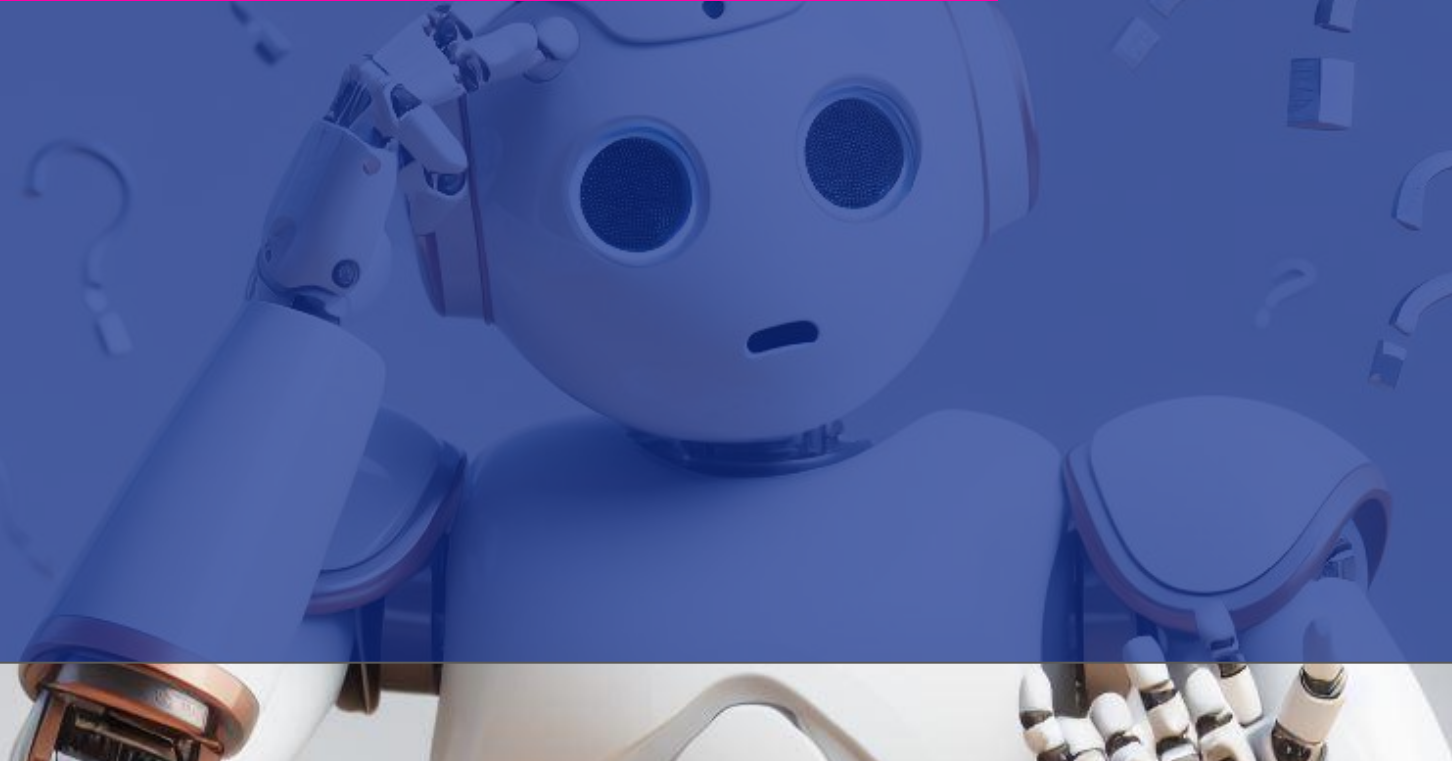
What's the role of explainability in AI systems and Code Generation?

Explainability and **Oversight** must be put in place to ensure that generated code and AI-driven decisions remain

- transparent
- responsible
- reproducible
- reliable
- rational
- balanced and unbiased

Q & A and Discussion

What can we expect from "AI-augmented development"?



Q & A and Discussion

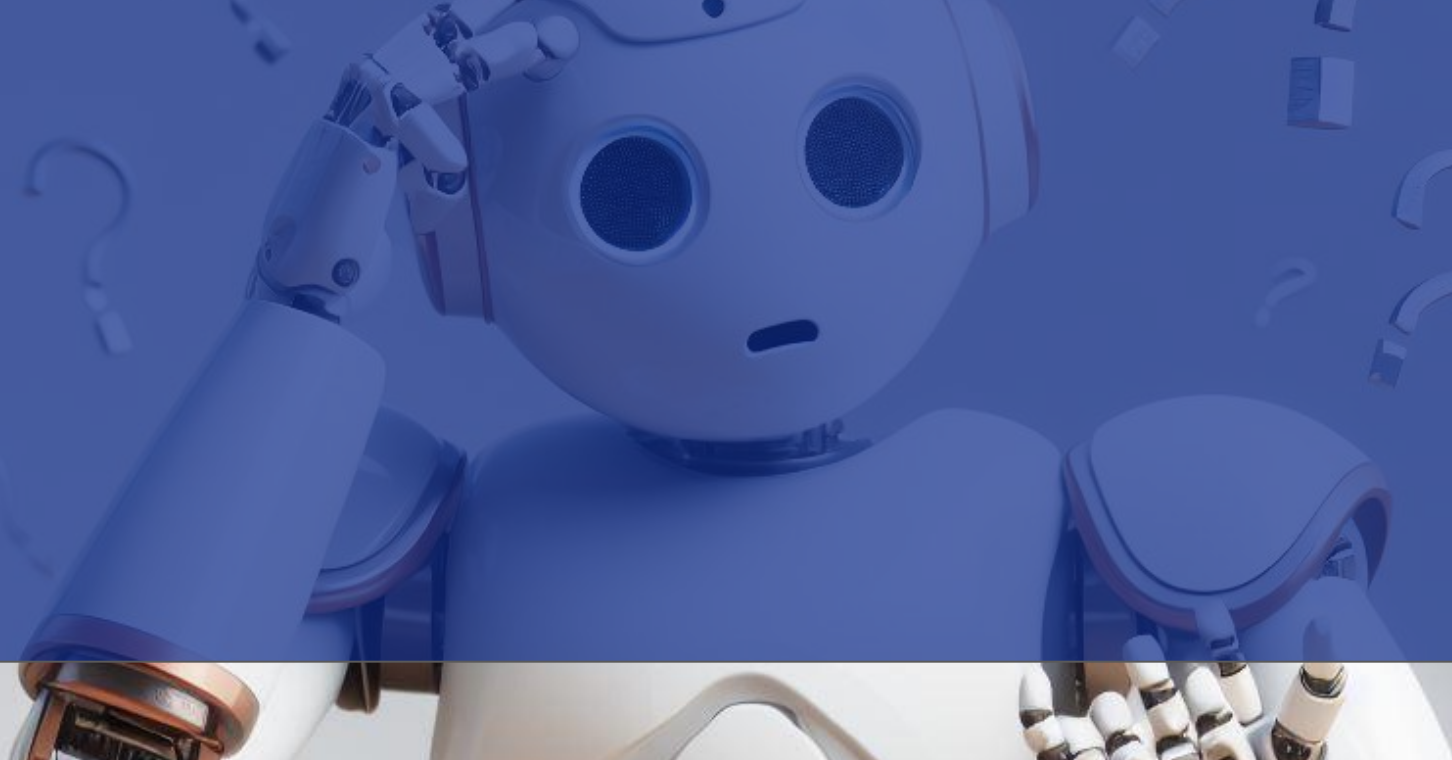
What can we expect from "AI-augmented development"?

AI-augmented development is the idea of AI

- automating **routine** and **scaffolding** tasks
- providing **suggestions**
- performing **code completions** and **corrections**
- optimizing **bug prediction, detection** and **elimination**
- enhancing **rapid prototyping**

Q & A and Discussion

What are the benefits of "AI-augmented development"?



Q & A and Discussion

What are the benefits of "AI-augmented development"?

Developers are enabled to put an additional **focus** on

- **creative aspects** of software development
- enhancing **user experience**
- **oversight** and **decision-making**
- **security, confidentiality, data integrity** and **privacy protection**



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For the **visually impaired** there is a text-only version available: sae.kodal.de/ai-dev-text-only.pdf

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Parts of this Presentation have been created with support of **ChatGPT3.5**

Further Readings and References

Further Readings and References

- **Business Insider** | ChatGPT may be coming for our jobs [...]
- **ZTM** | The State Of AI Tools And Coding: 2023 Edition
- **Techaedu** | 10 Best Programming Languages For Machine Learning
- **Analytics Insight** | Python vs Javascript for AI: Which one should you choose?
- **Tech Business News** | Will AI take over the world?
- **Makeuseof** | 8 Big Problems with Chat GPT
- **Cosmos Magazine** | Training AI models on machine-generated data leads to model collapse
- **Allganize AI** | How John McCarty shaped the Future of AI
- **UBS** | Herbert Simon [...] Predicted the Future of Machines and the Importance of Data
- **IEEE.org** | Computer Vision Leader Fei-Fei Li on Why AI Needs Diversity
- **Connected World** | ChatGPT: The Most Disruptive Tech of the Century?
- **Cambridge Core** | Bridging the accountability gap of artificial intelligence

A close-up, low-angle shot of a steampunk robot. The robot has a brass or copper-colored body with intricate mechanical details, including gears and rivets. It wears a tall, dark top hat and a light-colored bow tie. Its eyes are large, circular, and glowing with a green light. The robot's right hand is raised to its forehead in a gesture of contemplation or surprise. The background is a warm, golden-yellow light, suggesting a sunset or sunrise. A blue horizontal bar is overlaid across the middle of the image, containing the text "Thank You!".

Thank You!