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AI & RESPONSIBLE AI

Angela R. Troncoso García

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WHAT IS AI?

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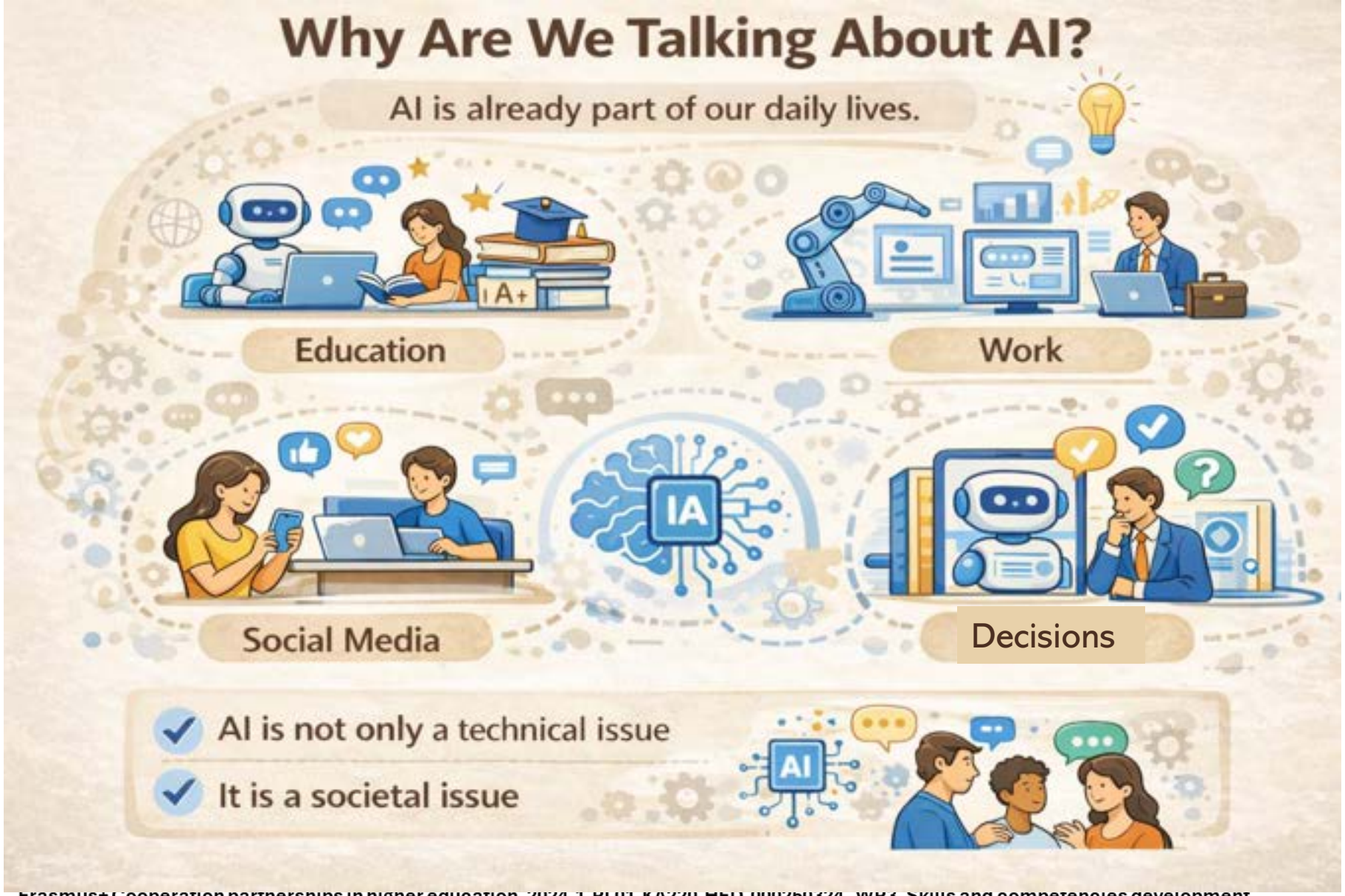
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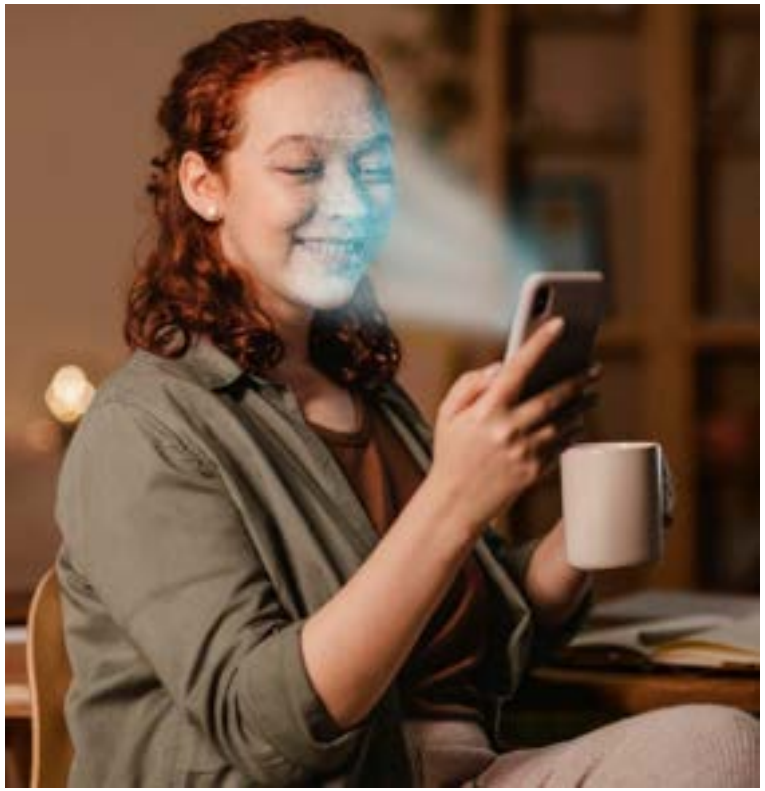
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AI Defines Your Reality

Artificial Intelligence is not a futuristic promise—it's the invisible infrastructure of today. You interact with it daily, often without noticing.





Recommendation Systems
Decides what you consume



Evaluation Tools
Automates academic assessments

Insight:
AI is not just a technical topic—it's a societal issue impacting education, work, and democracy itself.



Content Moderation
Filters public discourse



Generative AI
Redefines what is created

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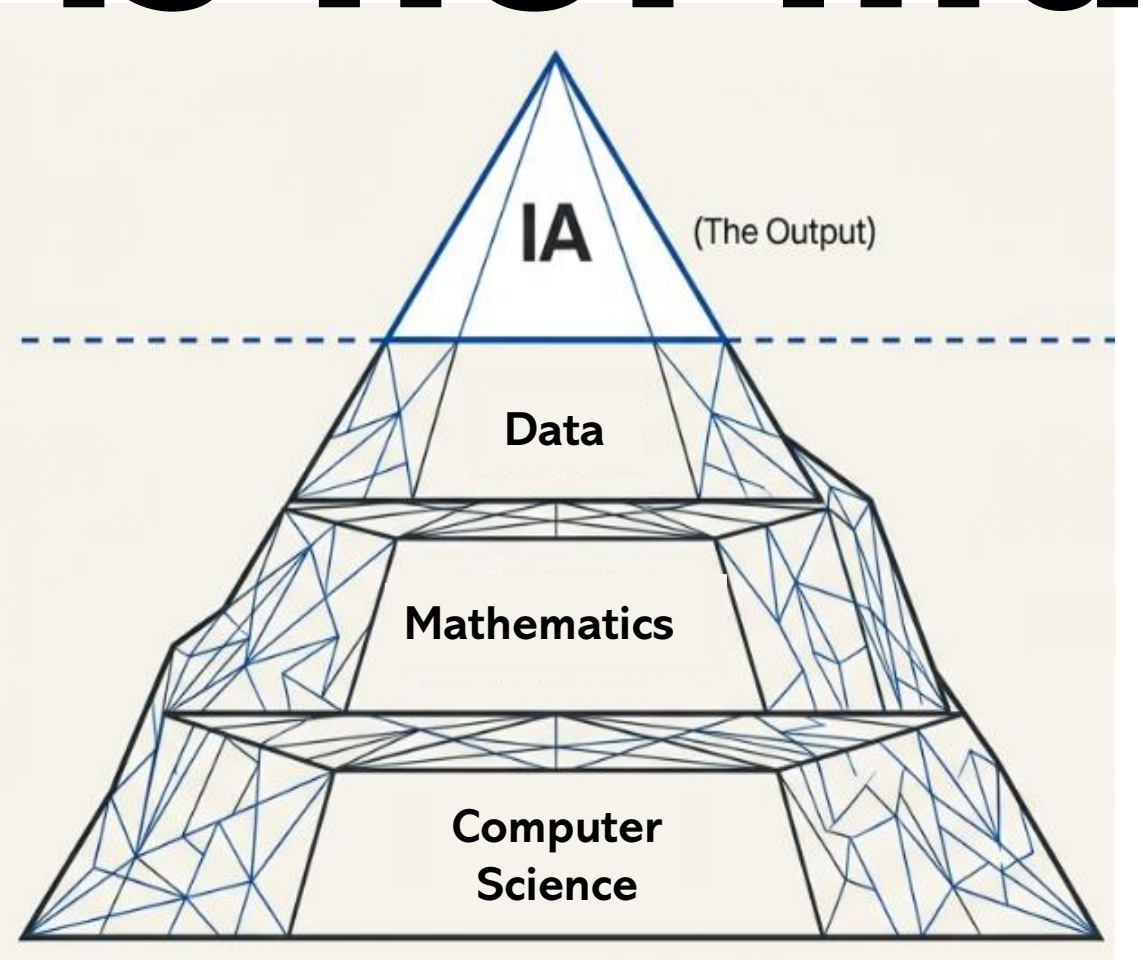
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AI is not magic



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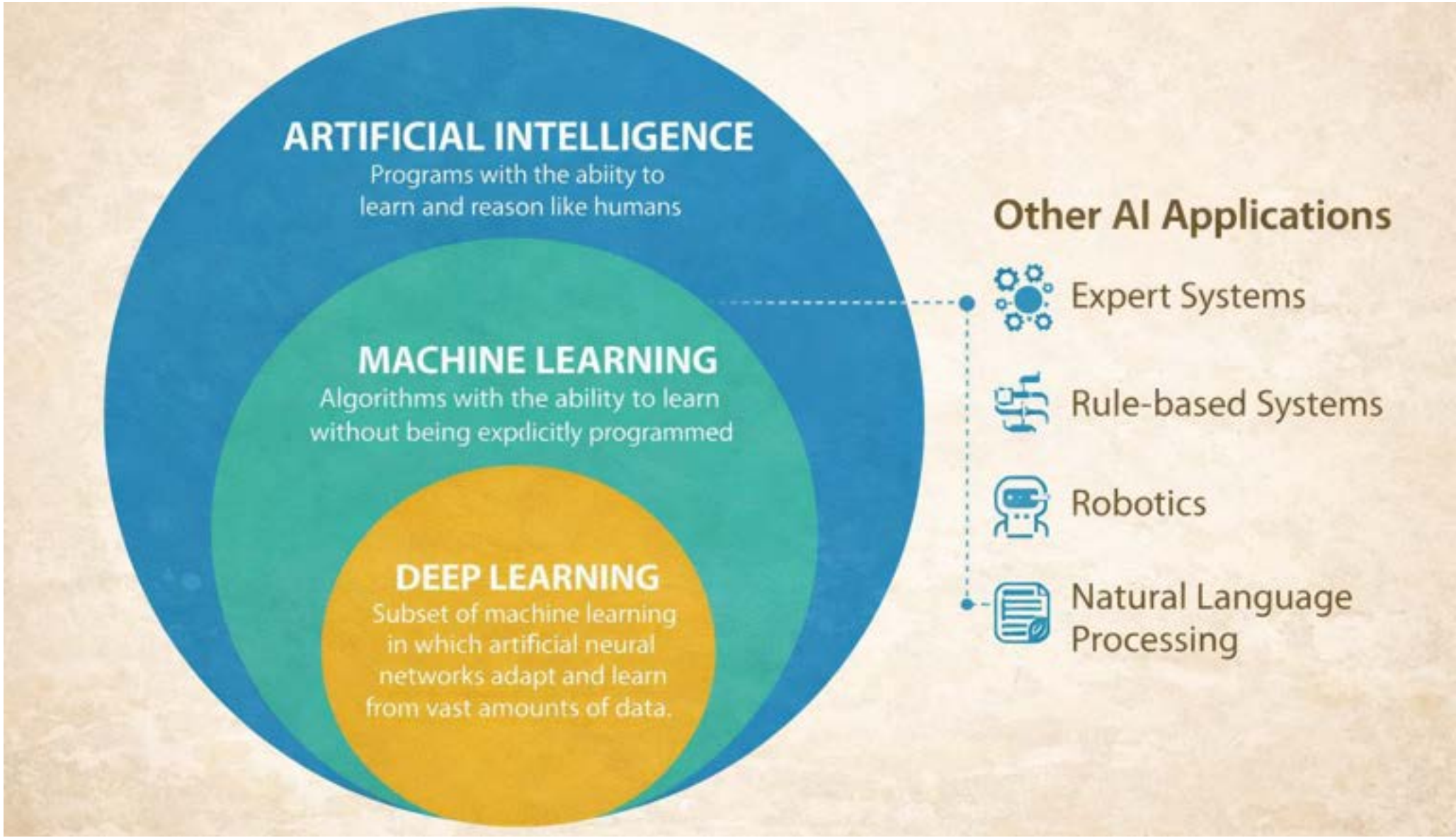
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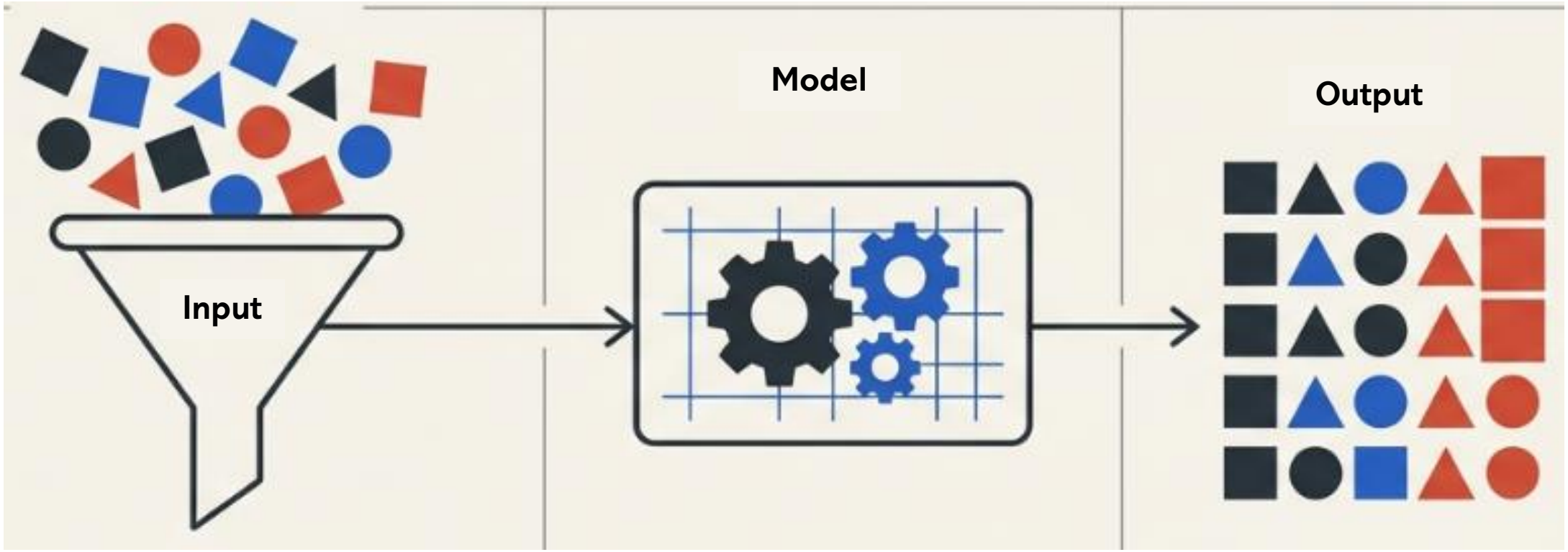
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How does it work?



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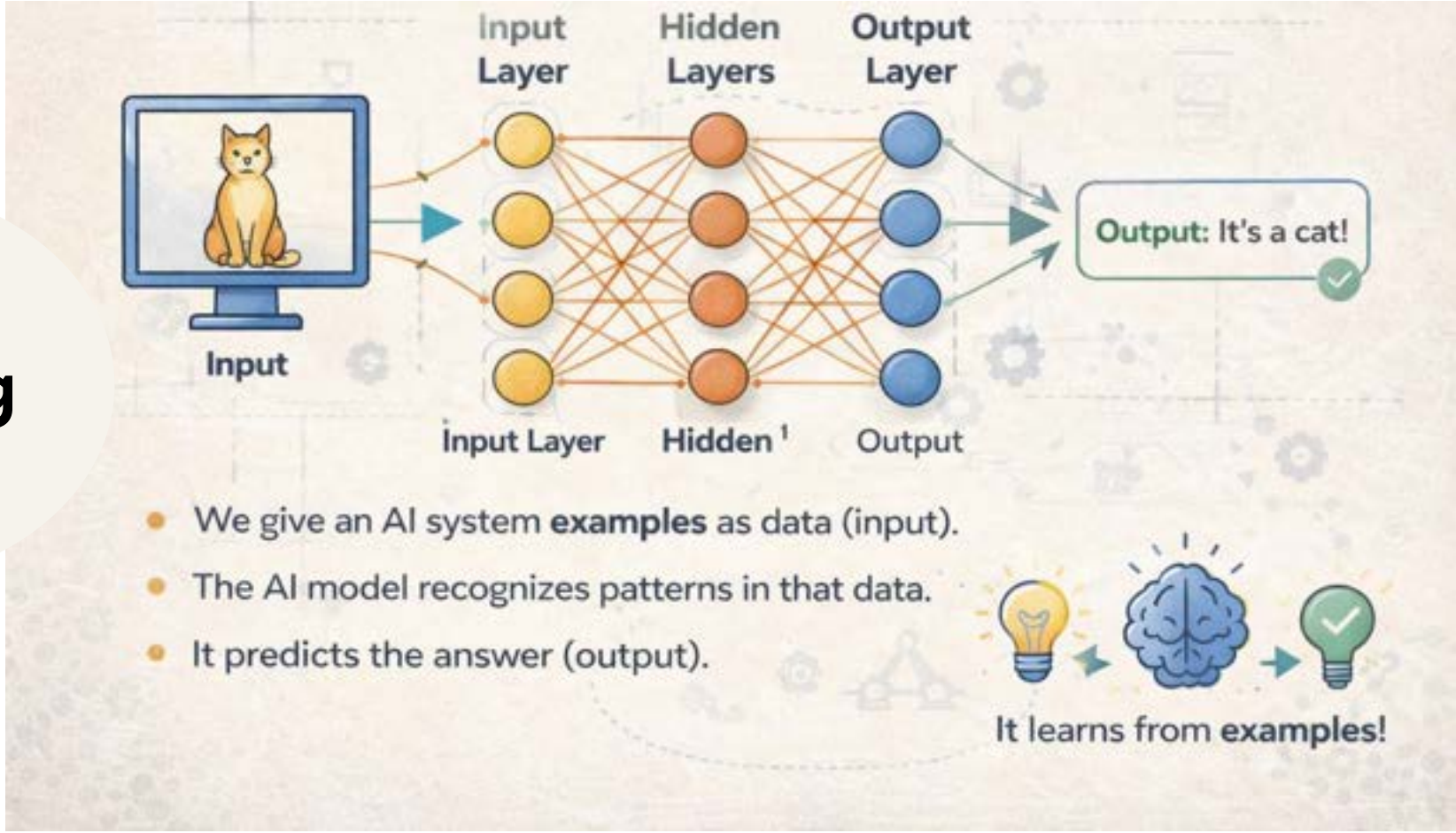
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How does it work?

Deep Learning Model



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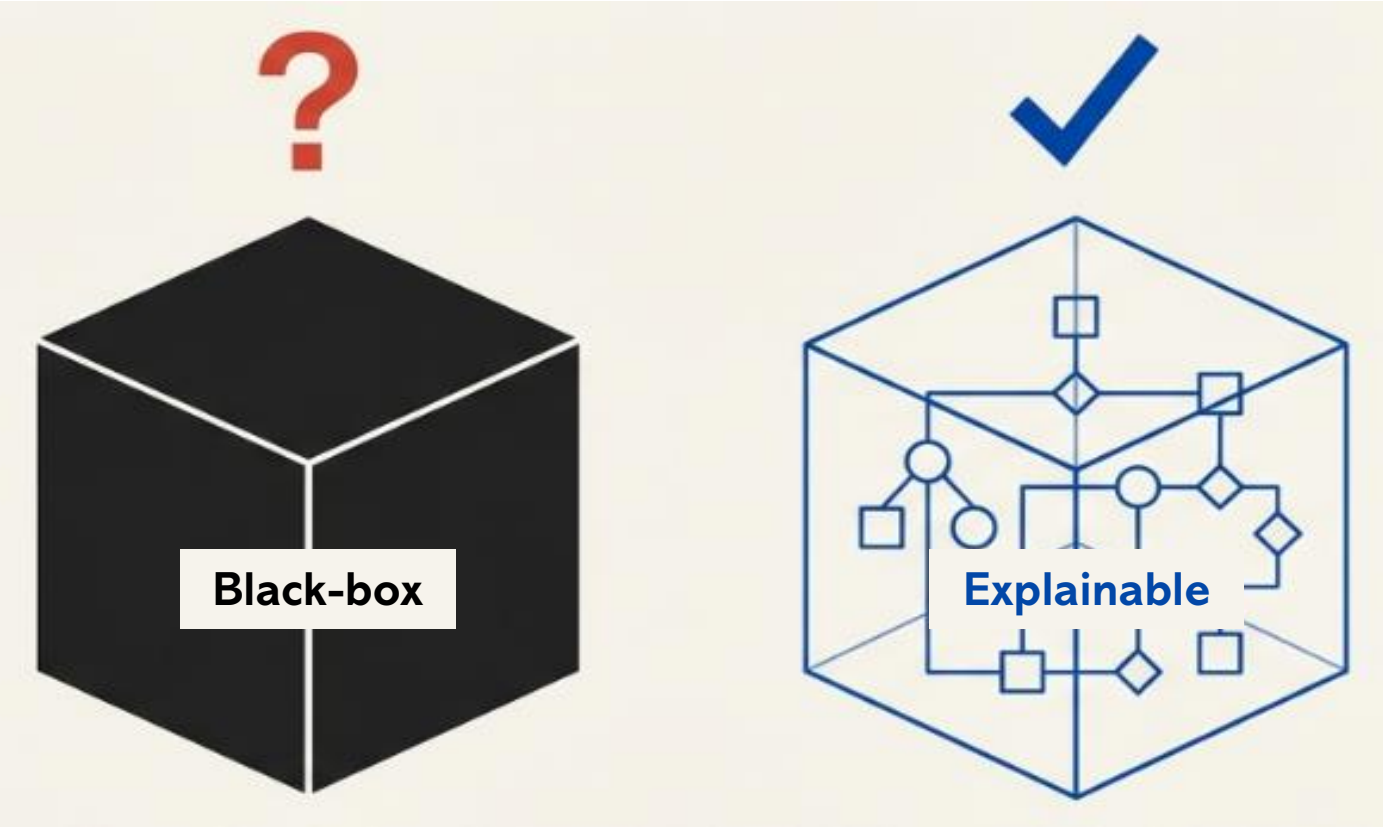
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What's behind AI?



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Pillar 1: Fairness & *Bias*

Algorithmic bias is not a 'glitch.'

It is often the result of historical data or flawed design assumptions.

Fairness does not happen by accident.

It must be actively designed, measured, and evaluated.



EXAMPLES

- **Recruitment:** AI systems that reject CVs based on historically discriminatory hiring patterns.
- **Finance:** Loan approval tools that unfairly penalize certain demographic groups.

Key Insight:

AI fairness is a social and ethical challenge, not just a technical one.

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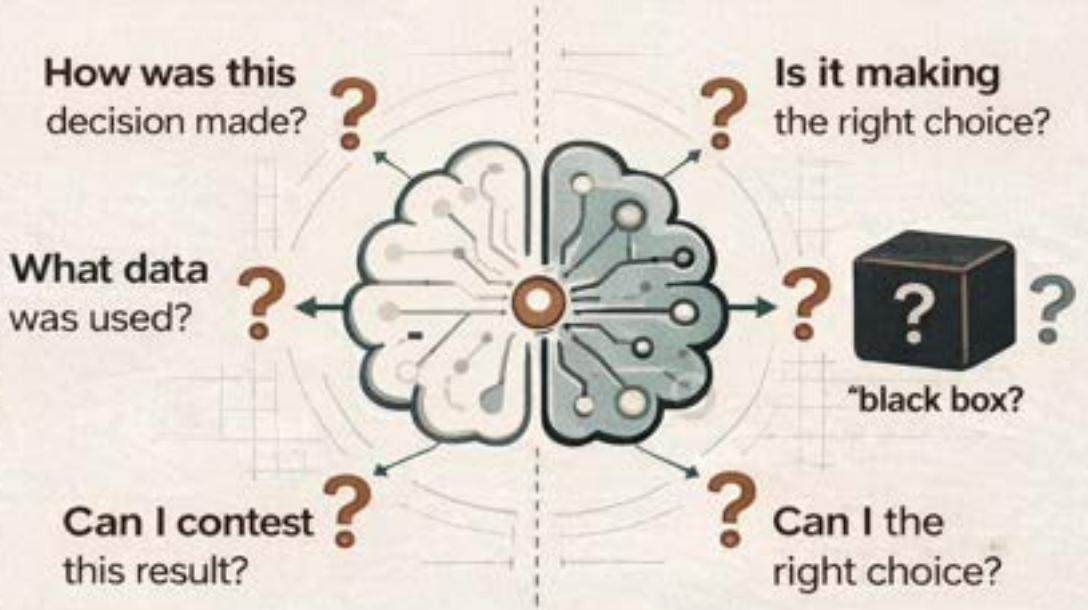
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Pillar 2: Transparency & Explainability

Many advanced AI systems are "black boxes"—their processes are not even clear to their creators.

Transparency allows us to **understand, question,** and ultimately trust AI-driven decisions.

What Role Should Explainability Have?



EXAMPLES

- **Healthcare:** AI tools that diagnose illnesses without providing any information to doctors about how conclusions are drawn.
- **Justice:** AI systems that recommend sentences without clear rationale for sentencing decisions.

Key Insight:

AI transparency encourages **responsible** use of AI, especially in critical contexts.

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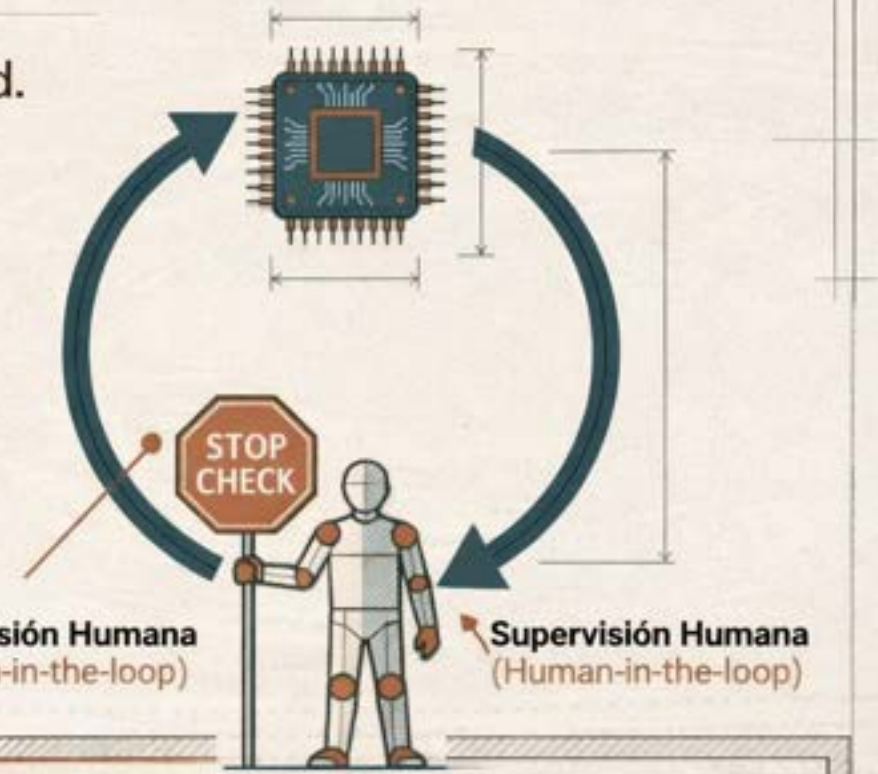
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Pillar 3: Accountability

An AI system cannot be prosecuted or jailed. Automation does not erase human **responsibility**; it raises it to be even more critical.



EXAMPLES

- Specially critical in high-risk sectors (medicine, justice, security)
- Humans retain final oversight

We must keep asking:

""Who is accountable for this decision?"

Key Insight:

Accountability remains essential in AI decision-making despite automation.

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Pillar 4: Data Protection & Privacy

AI is fueled by massive amounts of data—often personal data.

Misuse of this information can lead to surveillance, misuse, and loss of autonomy and intimacy.



EXAMPLES

- Massive datasets **collected without informed consent**
- Surveillance-driven or commercial misuse of personal data

Key Insight:

European values emphasize **robust data protection**, ensuring technological advancement is not achieved at the expense of privacy.

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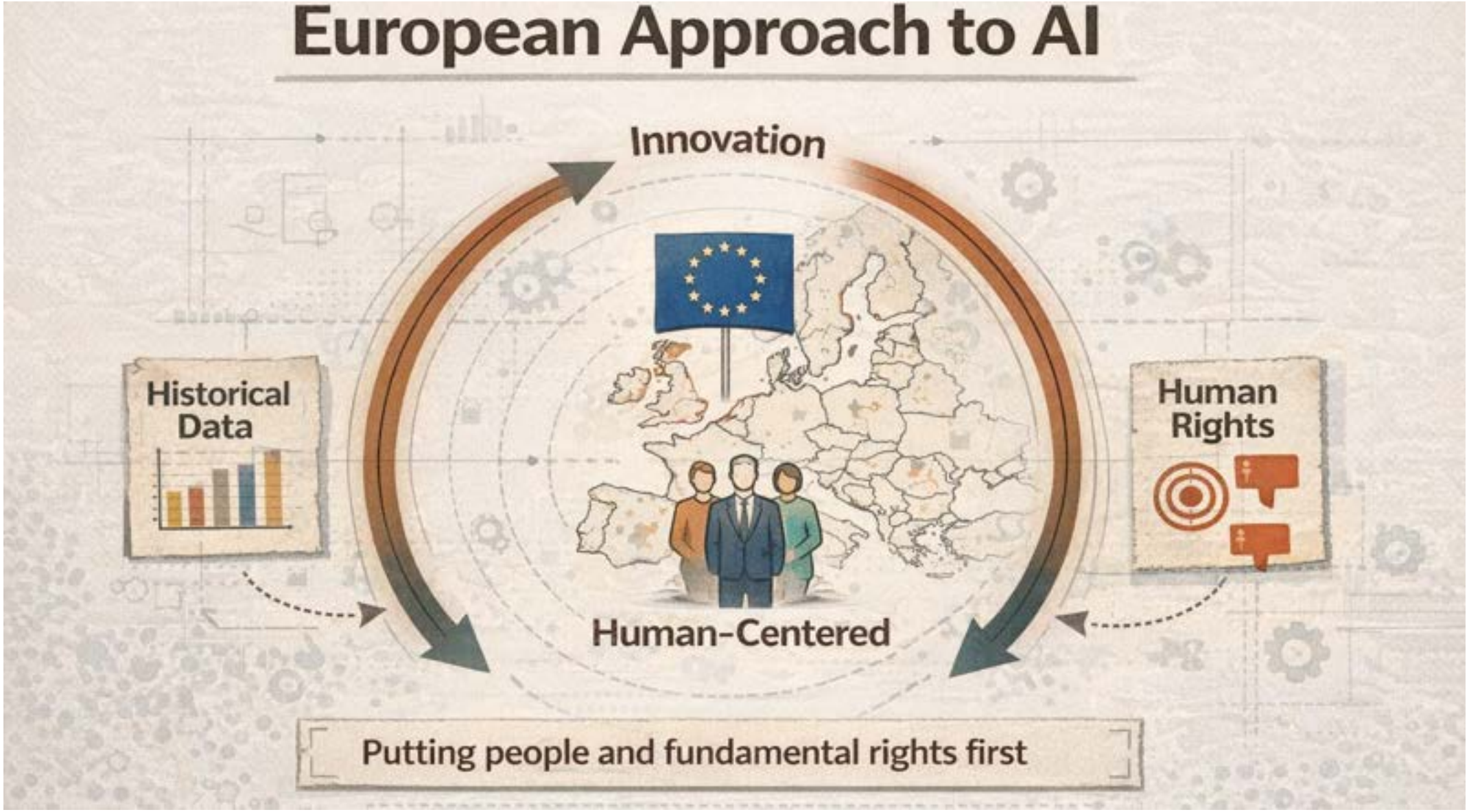
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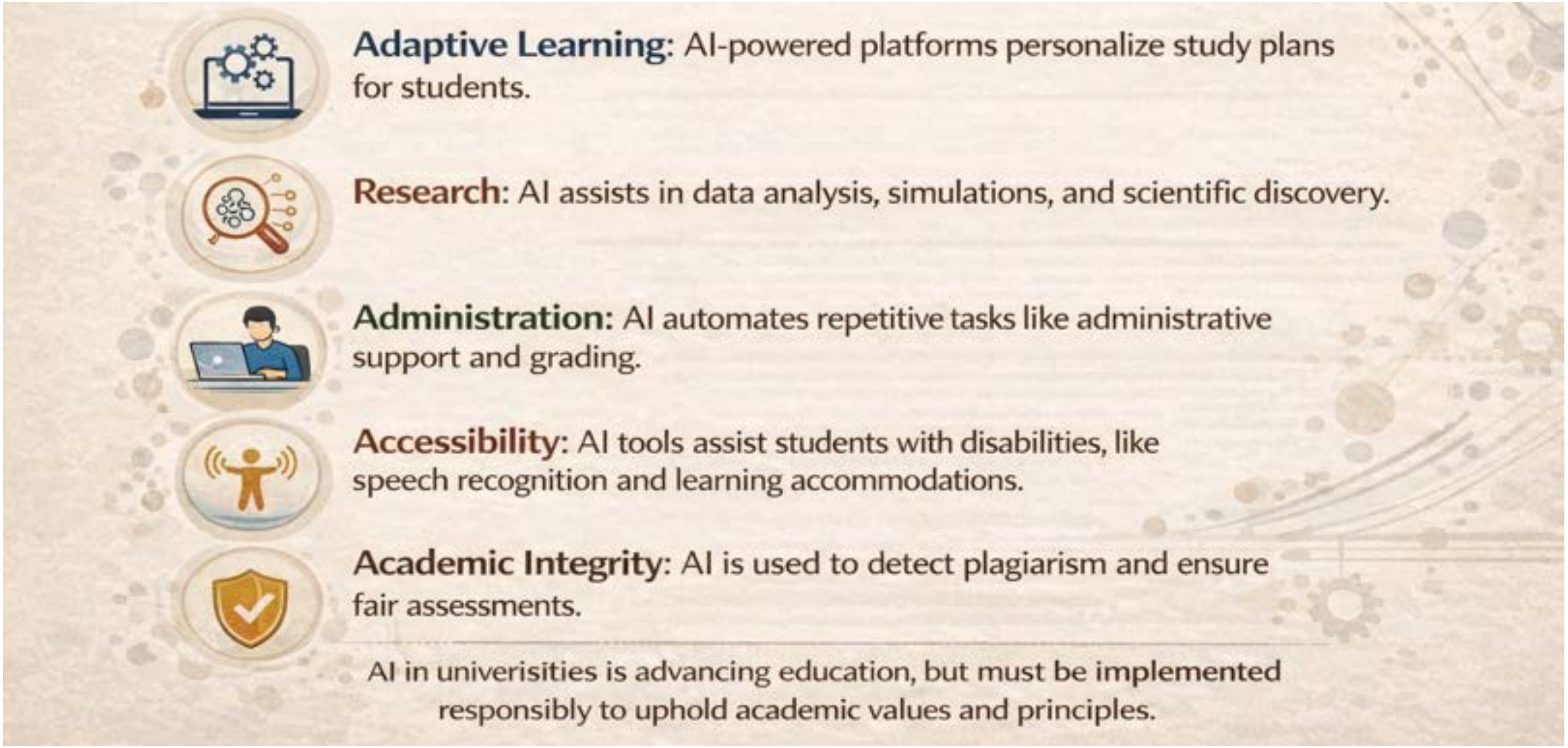
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What can AI do in universities?



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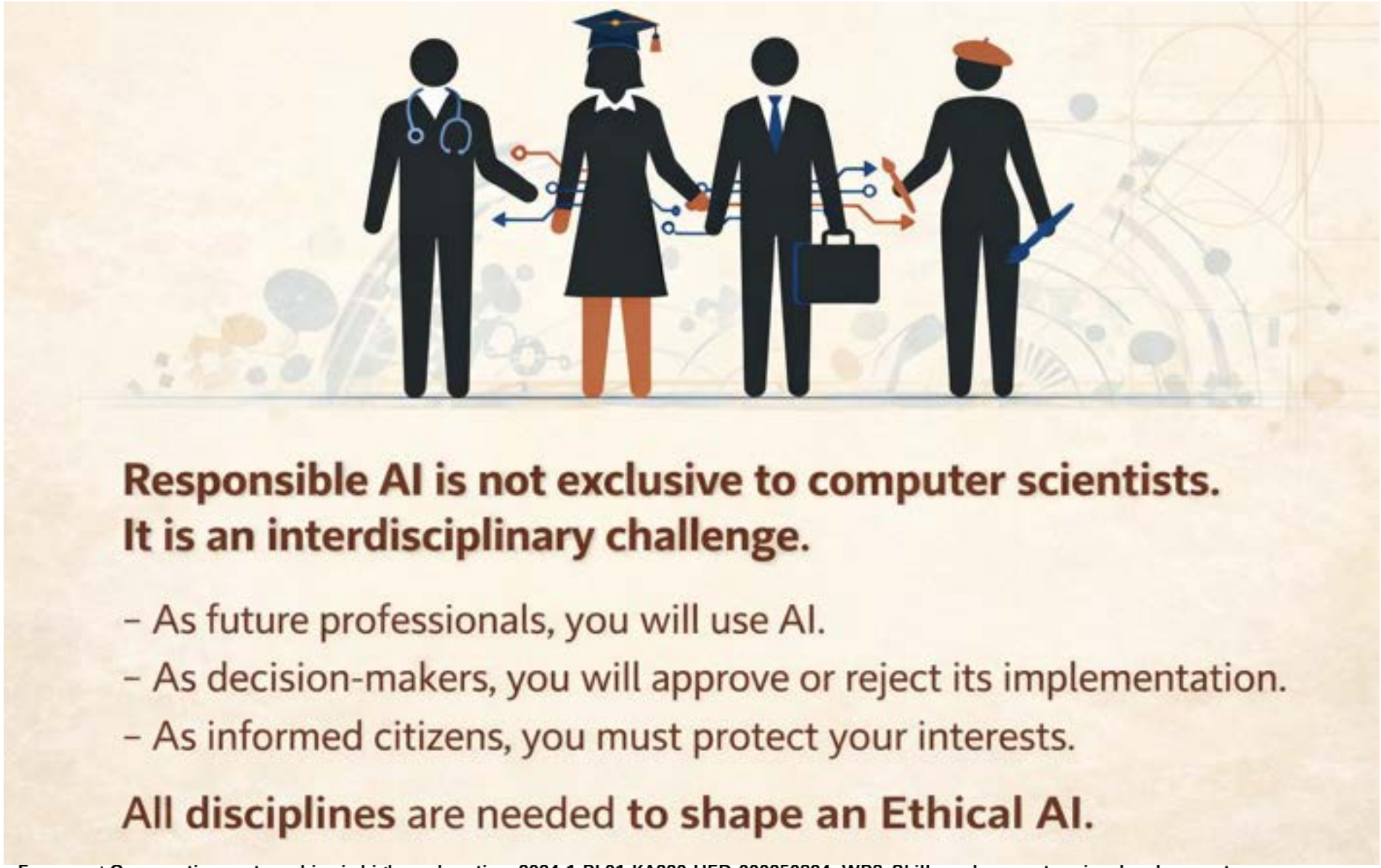
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Critical Questions for Evaluating Systems

When encountering a new AI tool, ask yourself these four questions:

1. Who benefits from this system?
2. Who could be harmed?
3. What data is being used?
4. Can decisions be explained or challenged?

All disciplines are needed to shape an Ethical AI.

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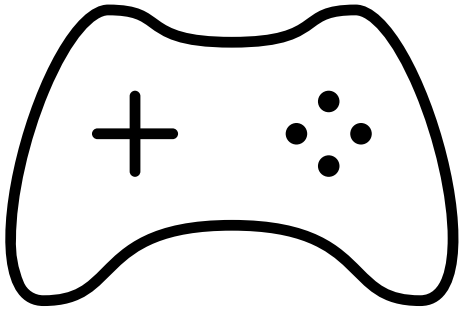
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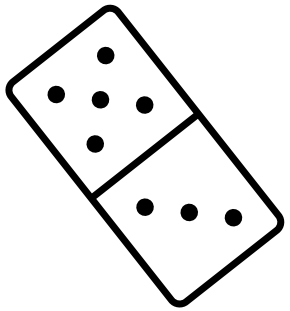
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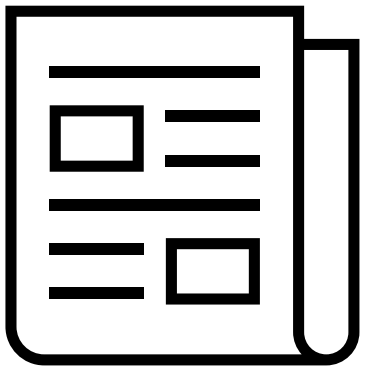
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Let’s play!

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Some of the following headlines are real news. Others are AI invented. Can you tell which is which?

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Real news or Fake AI News?

A hidden room with a TV, sofa, and Jacuzzi was found behind a bookshelf in a government building

A weather app warned of extreme heat during a snowstorm due to a misplaced decimal point.

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Real news or Fake AI News?

A smart fridge locked its owner out until they accepted a software update

Local police received calls reporting a lion in the fields — but it turned out to be a dog

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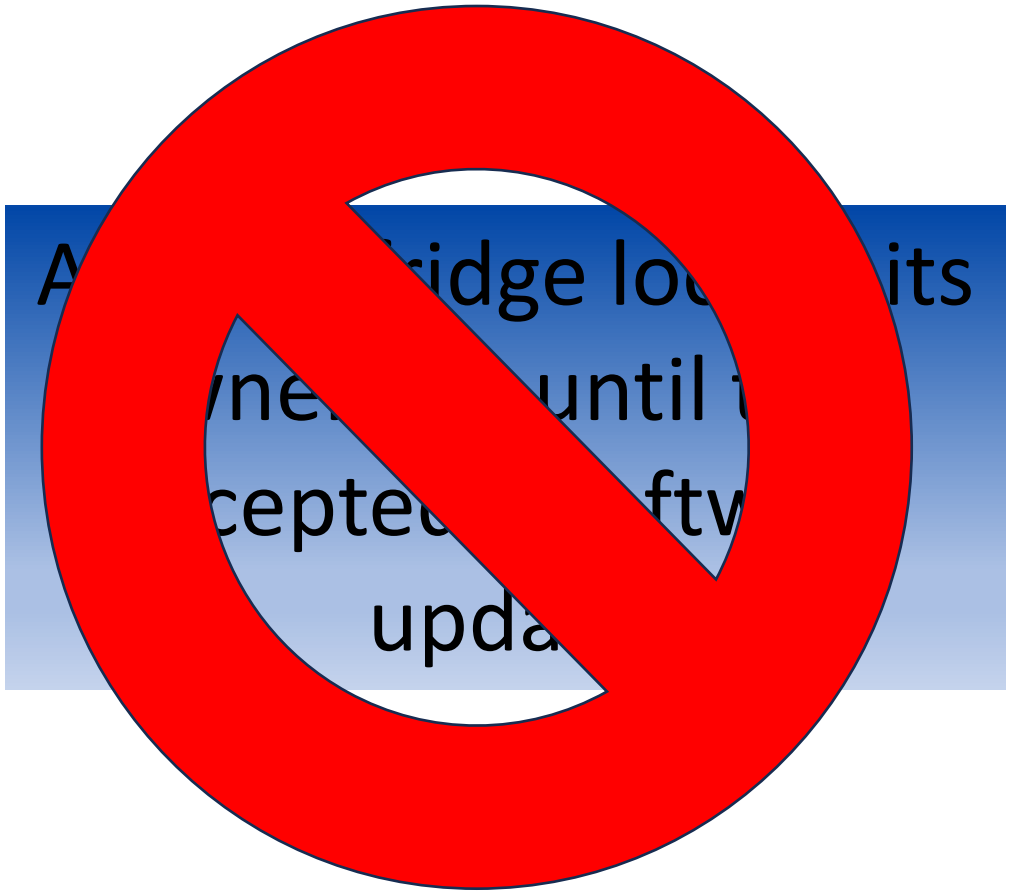
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Real news or Fake AI News?

Japan announced the introduction of compulsory voting in national elections to address declining voter turnout

Canada announced the creation of a national public holiday to commemorate the signing of the Paris Climate Agreement

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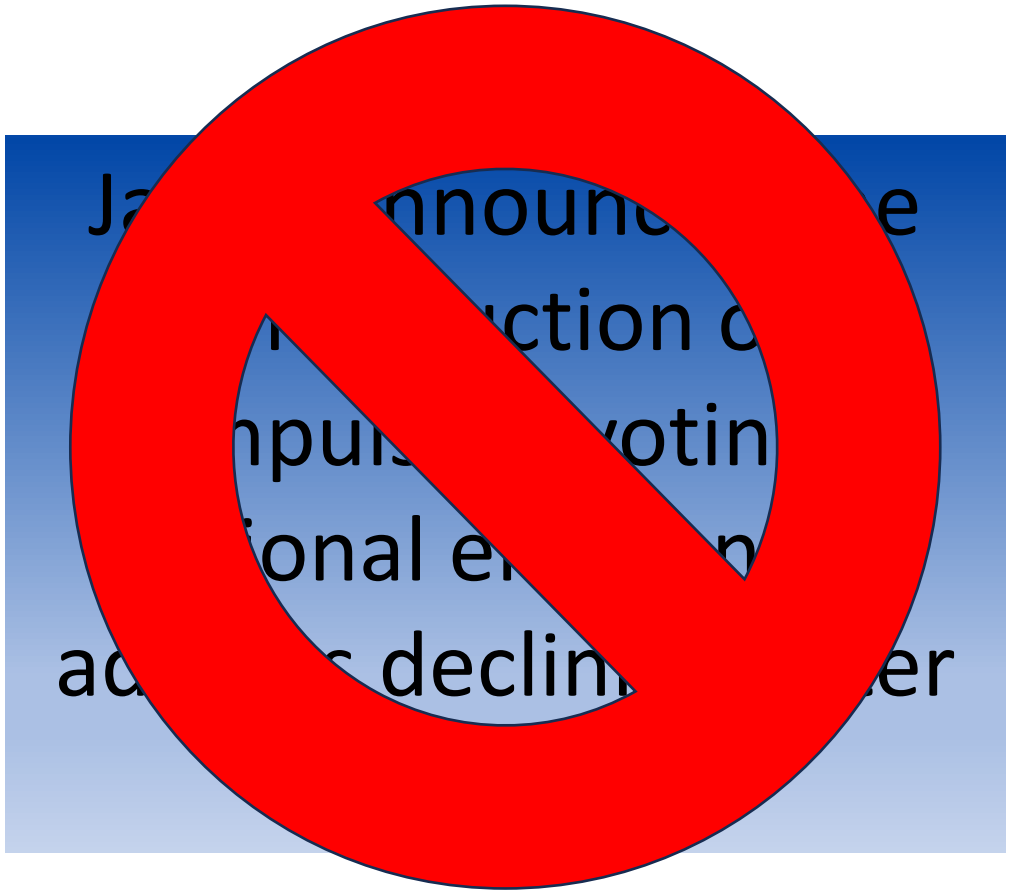
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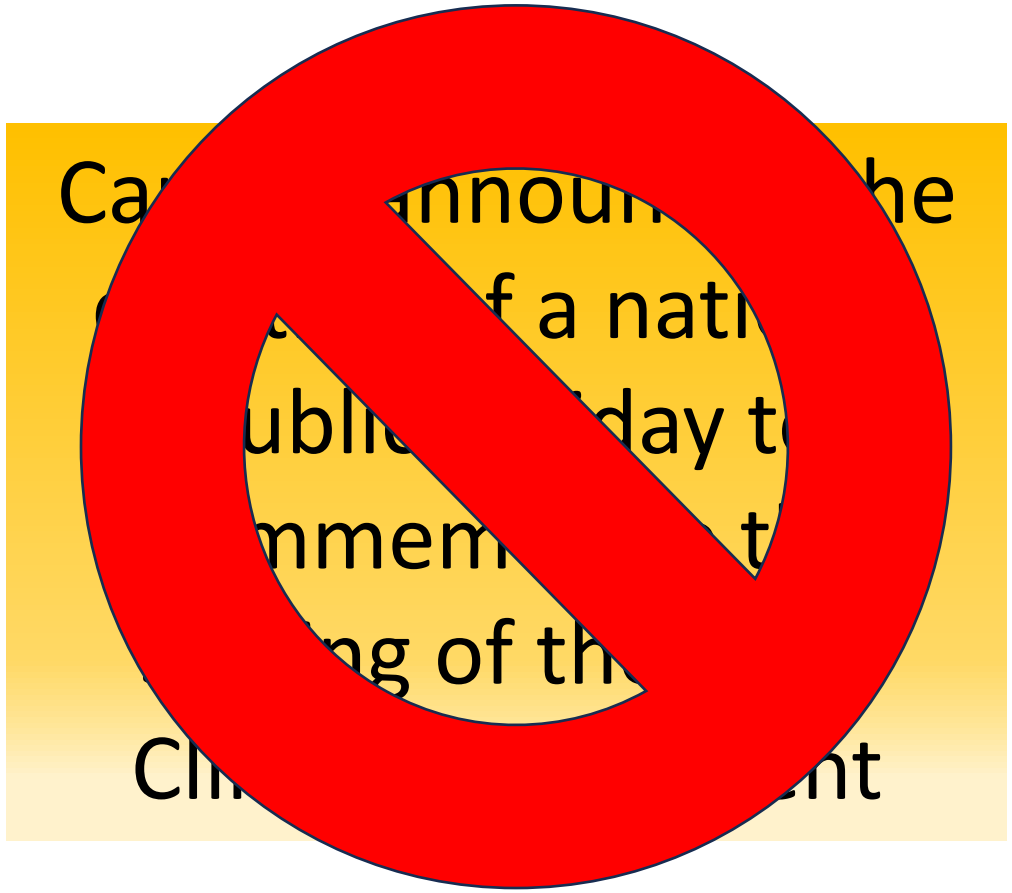
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Real news or Fake AI News?





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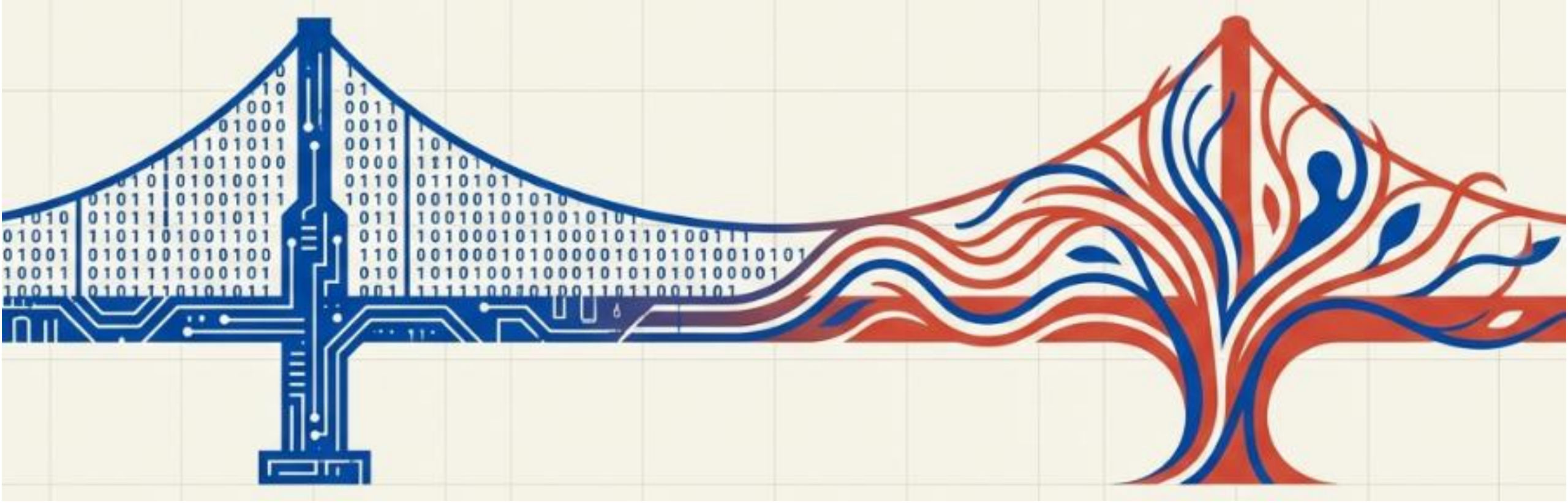
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AI does not replace responsibility: it amplifies it

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THANK YOU ALL

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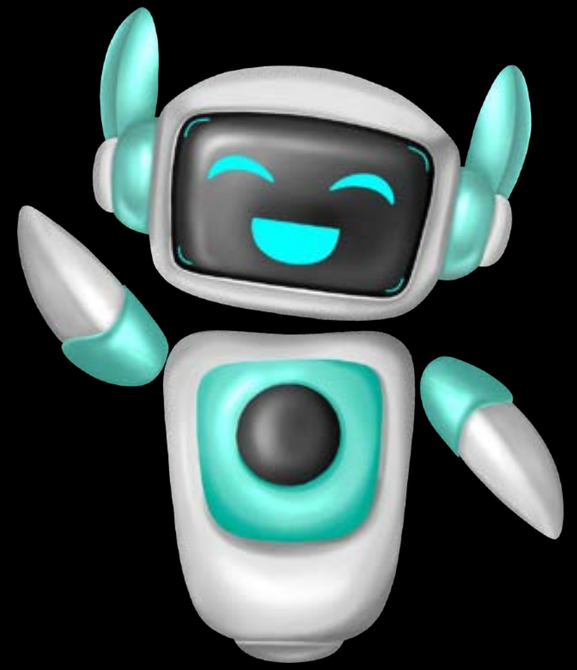
Legal aspects of AI, how they influence us and what they are for

Aleksandra Klich, PhD
University of Szczecin

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Legal Aspects of AI

How AI laws affect you as students



We will discuss:

- *where AI already affects your life*
- *what risks AI creates*
- *how the EU regulates AI*
- *what rights you have as users*

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BEFORE WE BEGIN...LET'S ANSWEAR

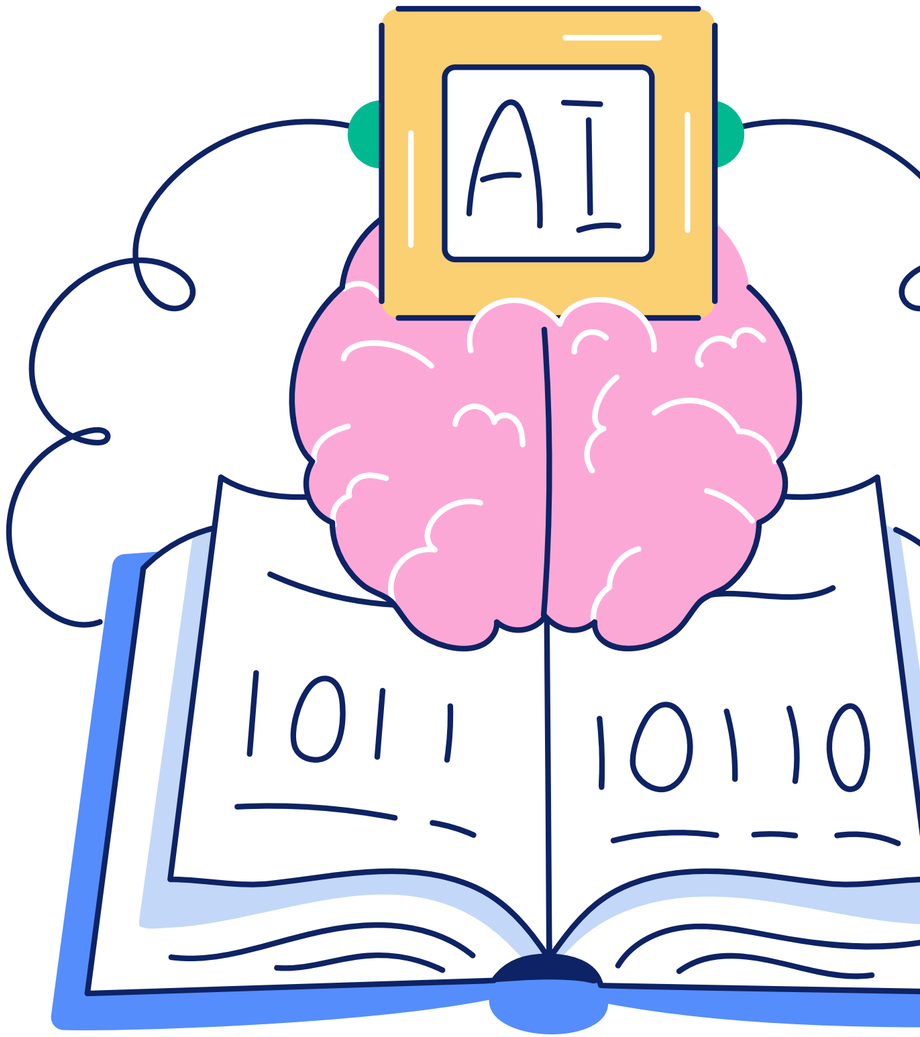
Raise your hand if:

you used ChatGPT this week

you saw AI-generated images online

you applied for a job online

you used a navigation app this week



Where Do You Already Meet AI?

AI is used in:



SOCIAL MEDIA ALGORITHMS



PLAGIARISM DETECTION



RECOMMENDATION SYSTEMS (NETFLIX, SPOTIFY)



NAVIGATION APPS



ONLINE RECRUITMENT TOOLS

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AI Myths vs Reality

Myths	Reality
AI is always objective	AI can contain bias
AI always makes better decisions than humans	AI can make mistakes
AI is neutral technology	AI reflects human choices
AI understands context like humans	AI analyzes patterns, not meaning

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Why Do We Need Laws for AI?



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AI can create problems such as:

- unfair decisions
- discrimination
- manipulation
- lack of transparency



Example from Student Life

AI in recruitment

Many companies use AI to analyze CVs.

The system may decide:

- who gets invited to an interview
- whose application is rejected



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The EU Artificial Intelligence Act



The EU created the AI Act

Goals:

- make AI safer
- protect fundamental rights
- increase transparency
- support trustworthy AI

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Risk Levels in the EU AI Act



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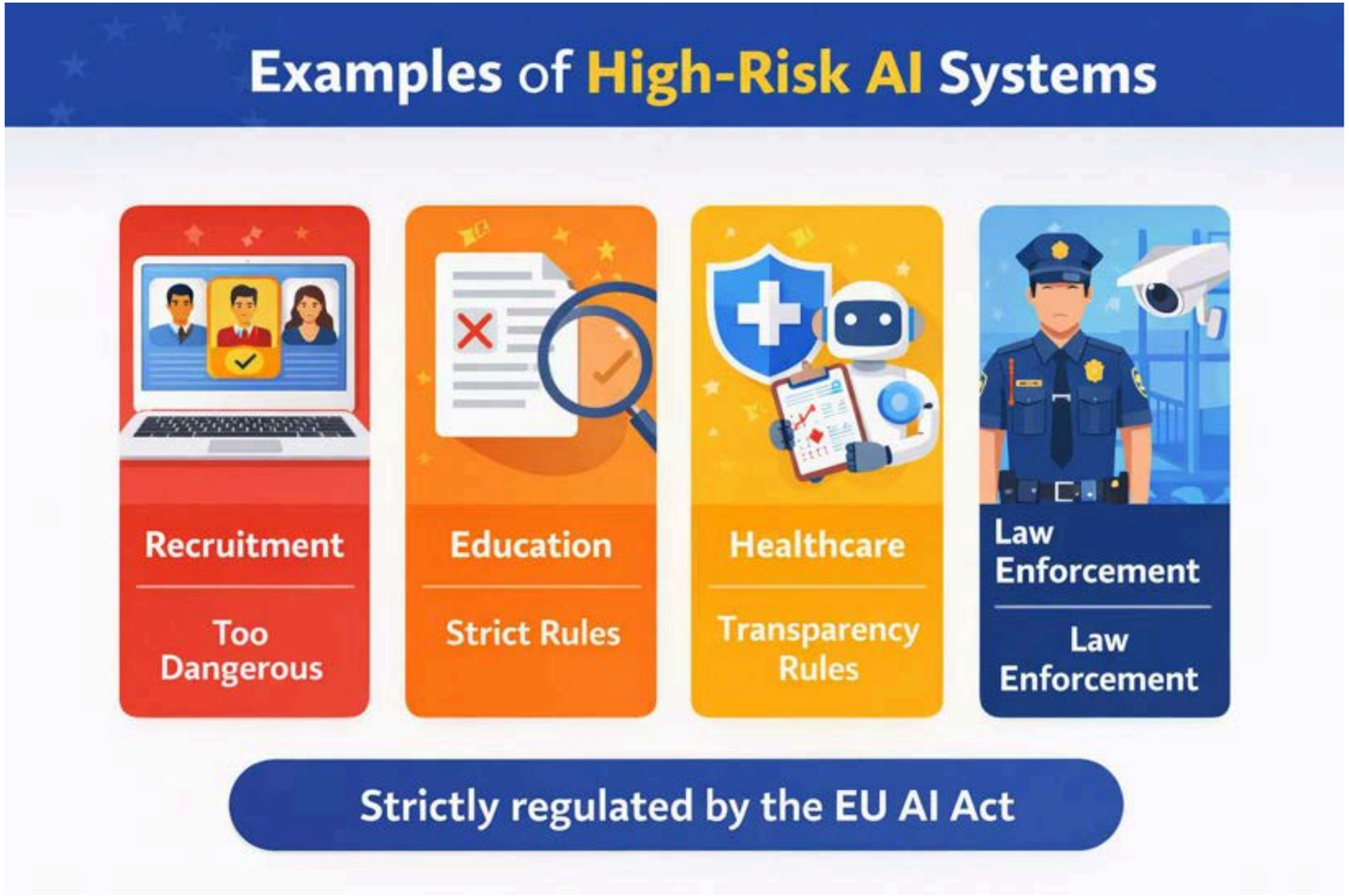
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AI Systems That Are Banned



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High-Risk AI Systems



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Real Example: AI in Recruitment

Many companies use AI to screen job applications.



The system may analyze:

- CV keywords
- education background
- work experience
- online profiles

Potential problems:

- bias in training data
- unfair rejection of candidates
- lack of transparency

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Real Example: TikTok

TikTok Algorithm

TikTok uses AI to decide which videos appear in your feed.

The system analyzes:

- **watch time**
- **likes and comments**
- **viewing behavior**

Result:

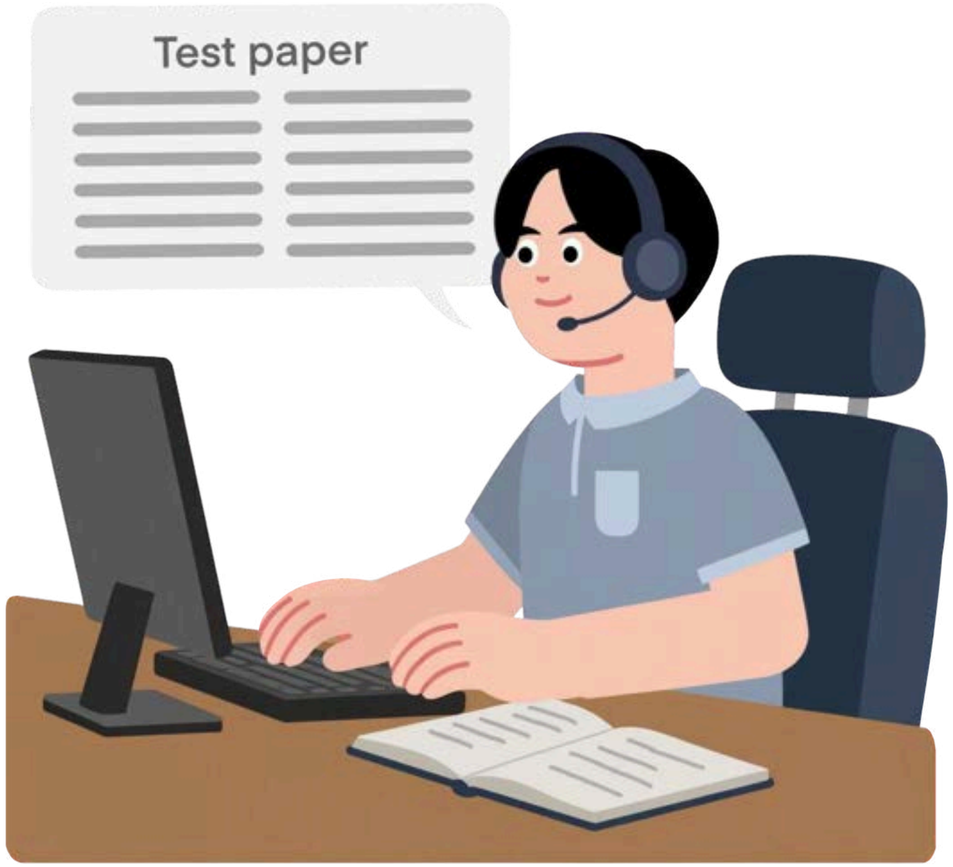
AI strongly influences what information you see.



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Real Example: AI in University Exams

Some universities use AI monitoring systems during online exams.



The system analyzes:

- **eye movements**
- **background noise**
- **unusual behavior**

Students may be flagged for “suspicious activity”.

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AI and Your Personal Data

Many AI systems use personal data.

Relevant law: GDPR

Your rights include:

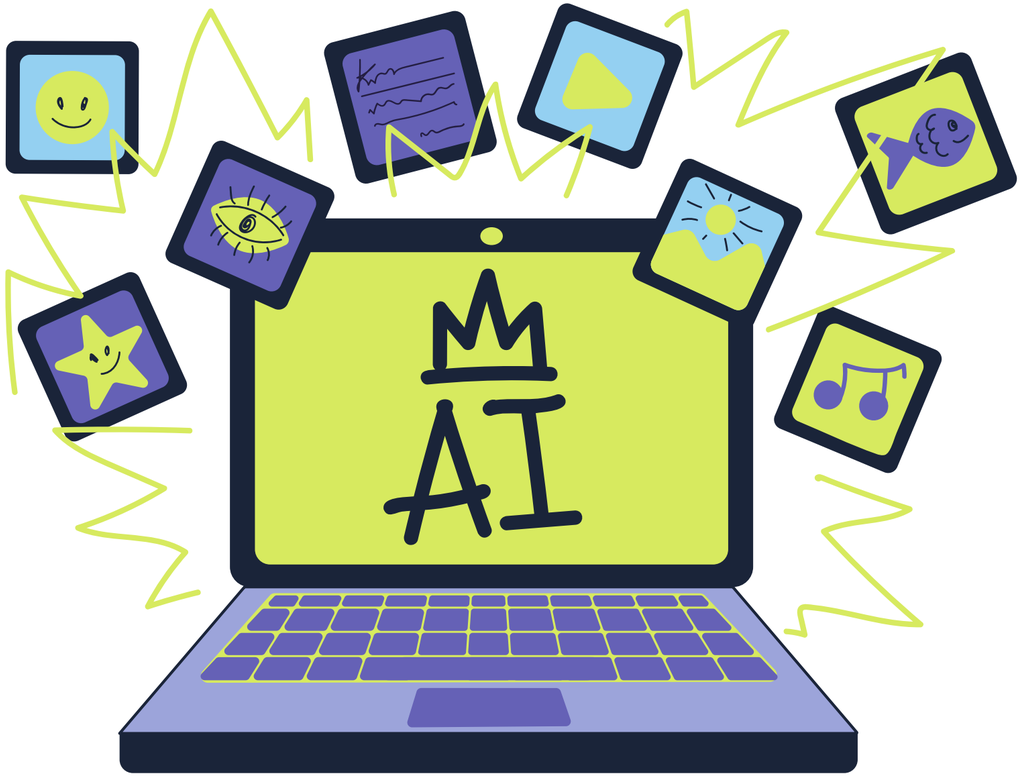
- **right to information**
- **right to access data**
- **protection from automated decisions**



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Deepfakes and AI Content

AI can generate realistic images, videos and voices.



Legal challenges:

- misinformation
- fraud
- manipulation

New laws require clear labelling of AI-generated content.

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Who Is Responsible When AI Makes a Mistake?



Possible responsible actors:

- the developer (who created the system)
- the provider/company offering the AI system
- the organization deploying it
- the user/operator using the system

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Legal Responsibility When Using AI



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Legal Responsibility When Using AI

Using AI does not remove legal responsibility.



A person using AI may still be responsible under:

- **Civil liability – if AI use causes damage**
- **Data protection law (GDPR) – when personal data is processed**
- **Academic and professional responsibility – misuse of AI tools**

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AI Has No Legal Personality

AI systems:

- **cannot be sued**
- **cannot be punished**
- **cannot bear legal responsibility**



➡ responsibility always lies with human or legal entities

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Why AI Law Matters for You?

As students and future professionals, you should:

- understand how algorithms affect decisions
- know your digital rights
- think critically about AI systems



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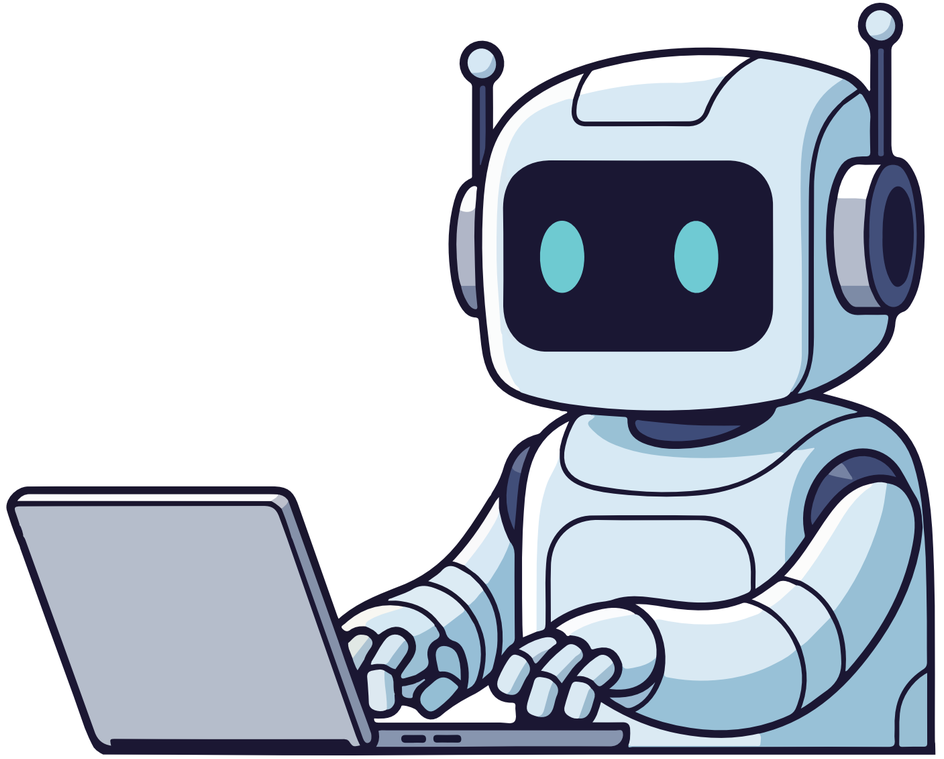
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AI at University – Where Do You See It?



Examples in student life:

- **plagiarism detection systems**
- **AI writing tools**
- **automated exam monitoring**
- **recommendation algorithms in learning platforms**

Where should universities draw the line?

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Think about these questions:

1. **Would you trust AI to decide who gets a job?**
2. **Should universities use AI to detect cheating?**
3. **Should AI be used by courts or police?**



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Thank you for your attention!



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AI tools for students

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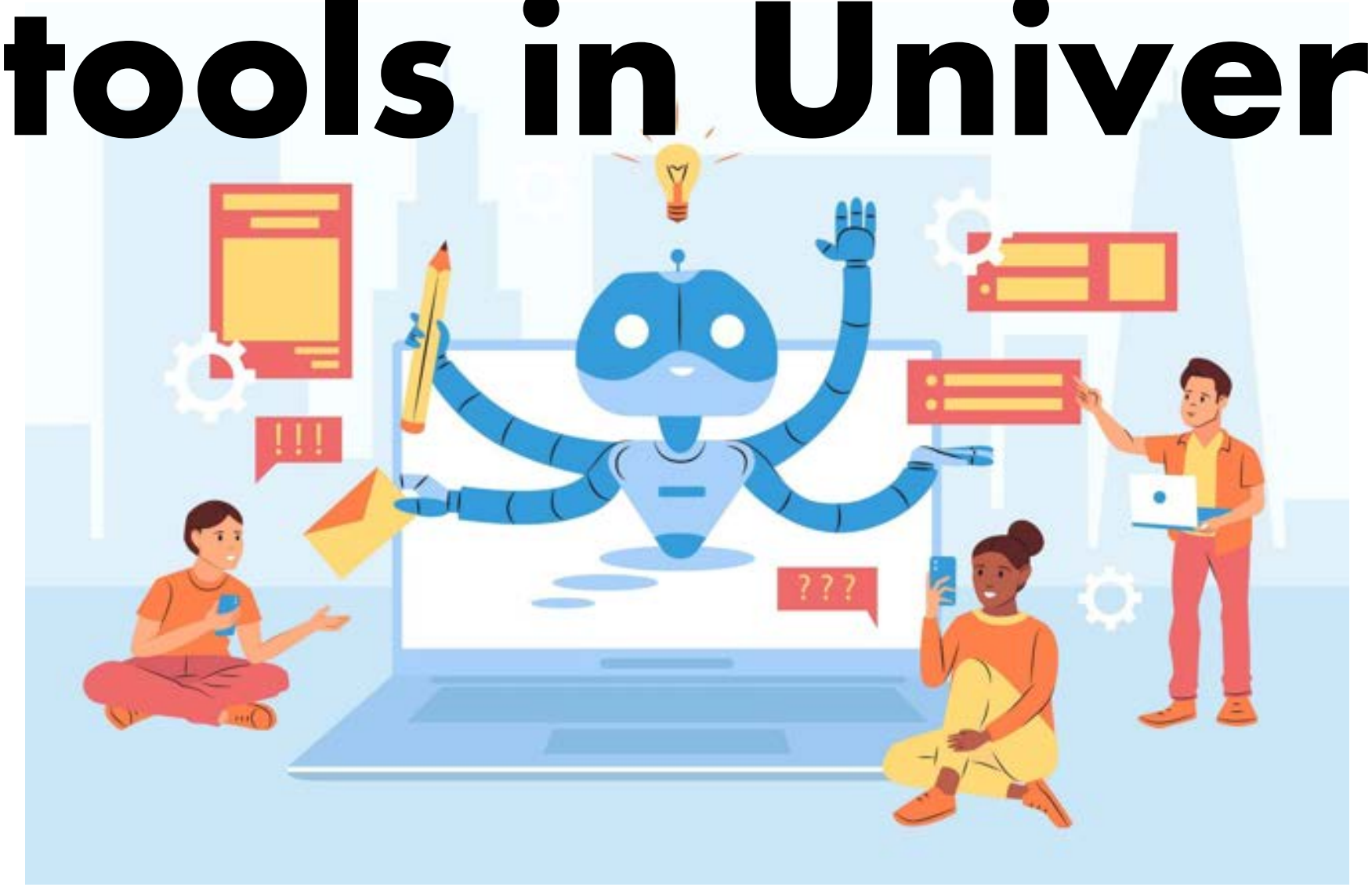
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AI tools in University



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Introduction

The field of Artificial Intelligence (AI) has transformed multiple sectors in recent years

The emergence of tools such as ChatGPT, Gemini, LLaMA, and others has accelerated this change

The education sector has not been immune to this technological and cultural impact

These tools have created new opportunities to personalize learning and improve efficiency in teaching



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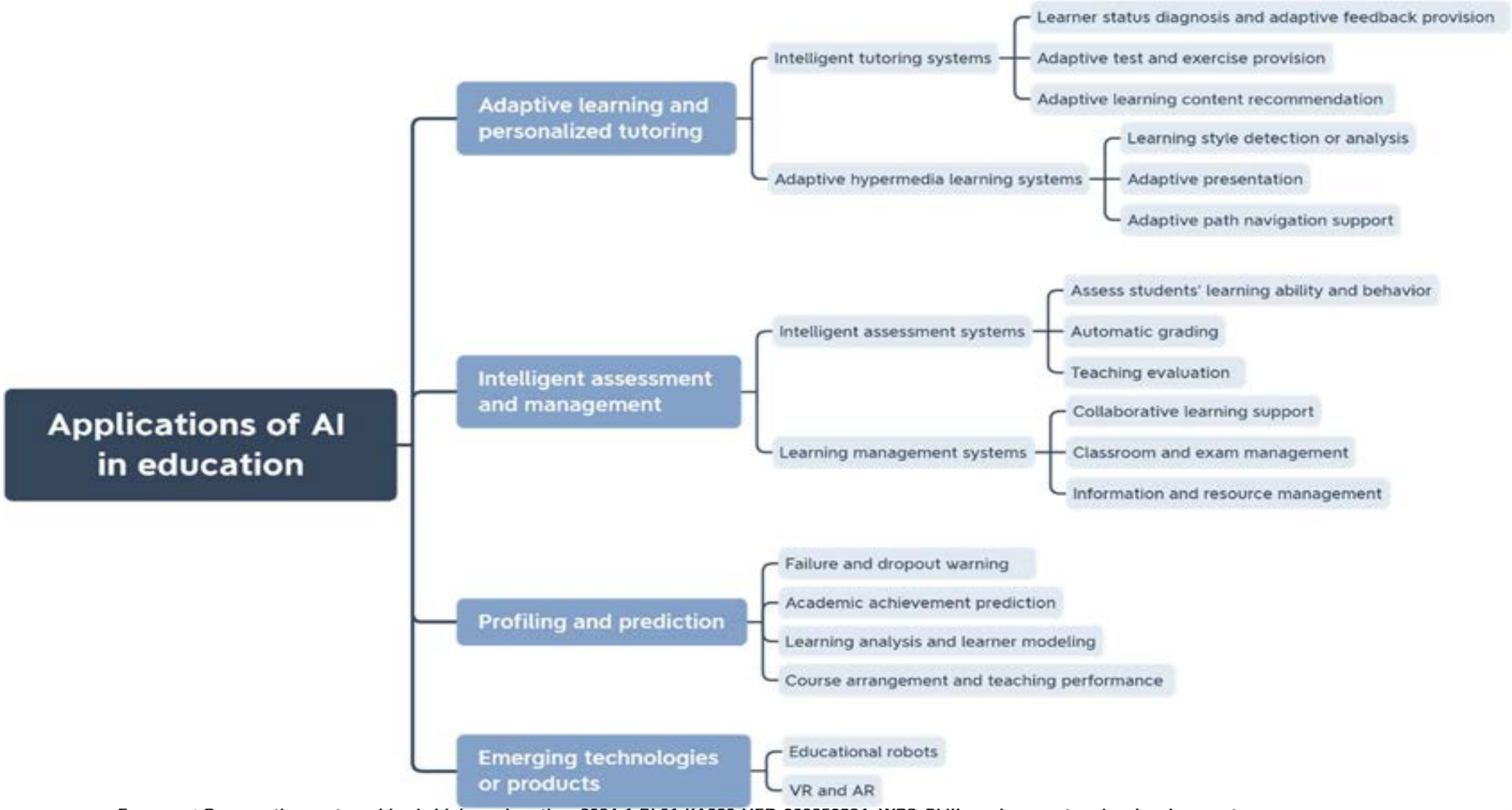
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Generative AI

Generative AI refers to systems capable of producing new content

This includes text, images, code, audio and multimedia

Models are trained on large datasets (LLMs) to learn underlying patterns

When used responsibly, they can enhance learning and innovation

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Human-like understanding	Statistical pattern prediction
	
Human-like understanding	Statistical pattern prediction

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Use of generative AI

AI generates responses based on patterns, not understanding

Outputs may contain errors, bias, or fabricated information

Prompts guide the system by clearly defining the task and context

The quality of the output depends on the data the model was trained on, the prompt and the data you provided

Human judgment remains essential at every stage

References and sources should always be verified independently

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For teachers...



Preparing lecture outlines and teaching materials	Generating examples, exercises, and case studies	Adapting content to different difficulty levels
Supporting assessment design and rubrics	Providing faster, formative feedback	Summarizing student submissions or discussions
Assisting with course planning and learning objectives	Supporting inclusive and accessible teaching	Reducing administrative workload

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For students...

Instant feedback	No need for direct contact with the instructor	Drafting and improving written assignments
Summarizing long or complex texts	Clarifying difficult concepts in simple terms	Generating ideas for essays or projects
Practicing exam questions and self-assessment	Translating and improving academic language	Organizing study plans and deadlines
Getting examples and step-by-step explanations	Support outside classroom hours	Personalized learning at the student's own pace



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But you need to be carefull

Submitting AI-generated work as their own	Copy-pasting answers without understanding them	Using AI to avoid studying or practicing
Relying on AI for final exam answers	Trusting outputs without verification	Using AI to bypass learning objectives
Replacing critical thinking with automation	Ignoring errors or hallucinations	Sharing personal or sensitive data with tools



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Good practices



Know when, how, and why AI is allowed to be used in your course	Use AI to support learning, not to replace it	Ask AI for explanations, not final answers
Always review, verify, and edit AI-generated content	Do not submit AI-generated work as your own	Protect your personal and academic data
Be aware of bias and limitations in AI outputs	Use AI as a learning assistant, not as an exam tool	Develop critical thinking and ethical awareness

Remember:

responsibility always lies with you

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Multimodal tools

ChatGPT

Gemini

Claude

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Specific tools

MAGIC SCHOOL



TeachMateAI

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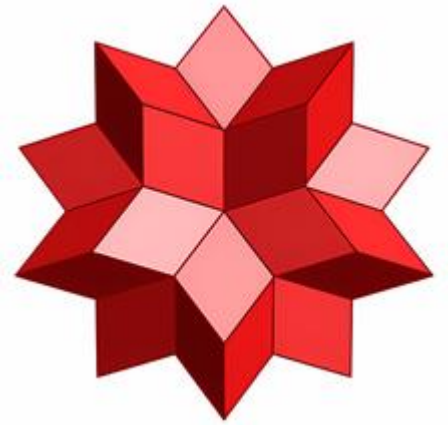
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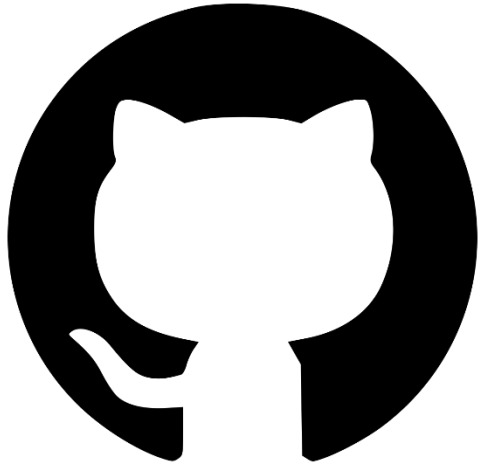
Plug-ins













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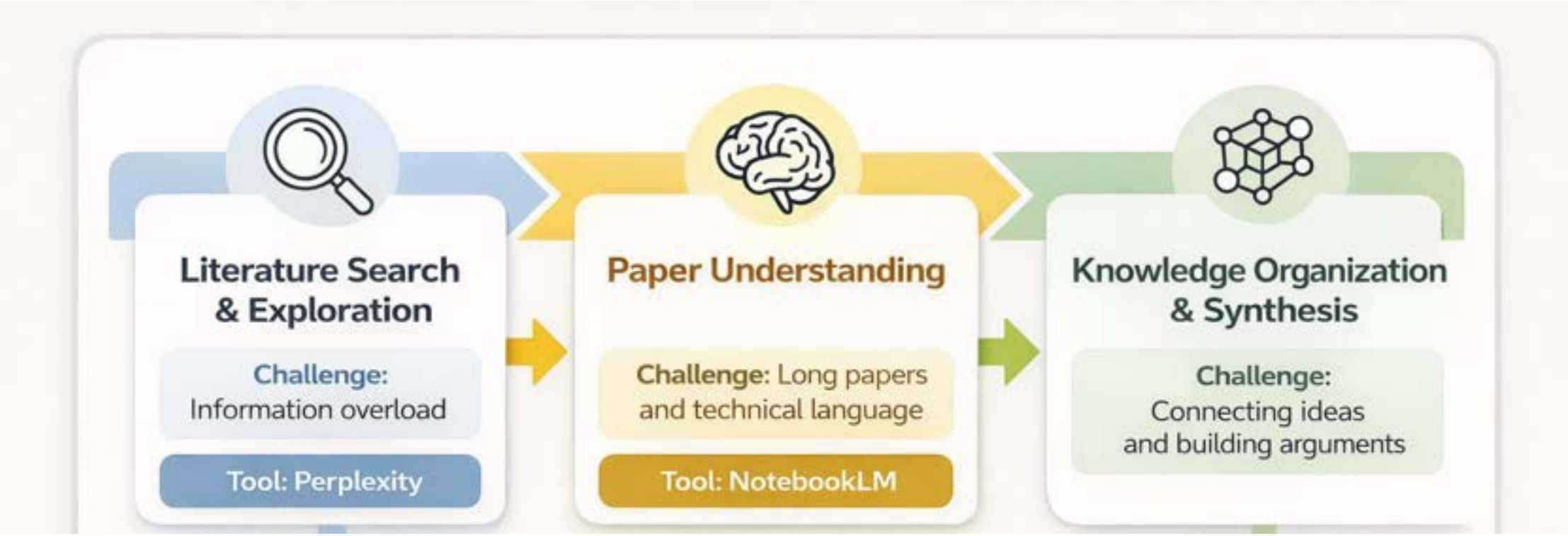
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AI as a research assistant



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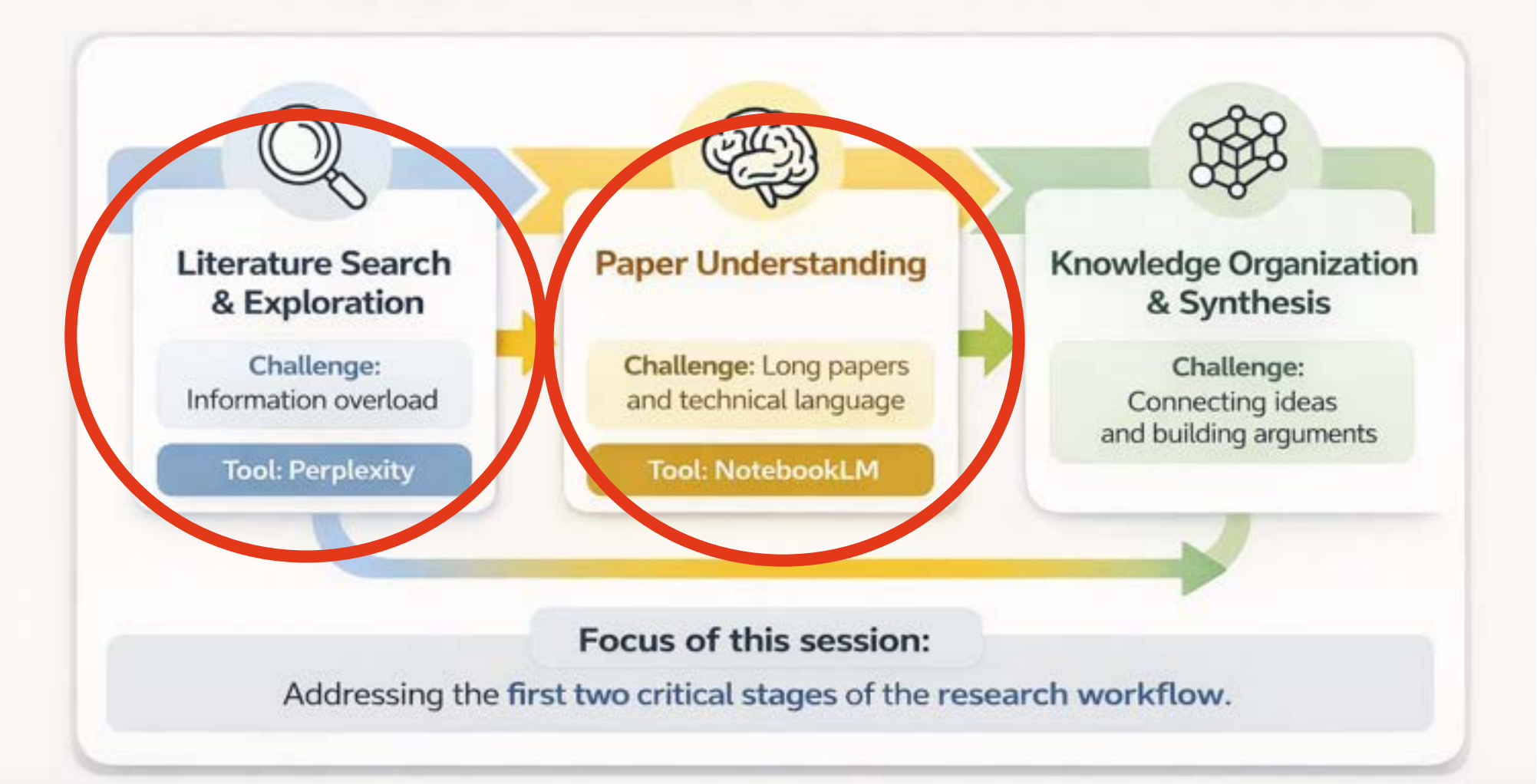
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AI tools today





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What is Perplexity?

AI-Powered Search Assistant

Perplexity

AI-Powered Search Assistant





1 Efficient search

Accelerates **search** and **exploration.**



2 Trustworthy answers

Provides **reliable, cited responses.**



3 Knowledge discovery

Helps **uncover topics** and gain a broader understanding.

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Perplexity: AI-Assisted Academic Search

What is Perplexity?

An AI-**powered search engine** that combines web search with large language models to generate structured **answers** with sources.



Why is it useful for researchers?

Efficient literature exploration
Quickly identify key papers, concepts, and debates.

Source-grounded answers
Responses include links to the original sources.

Research orientation
Helps understand the landscape of a topic before deep reading.

Traditional search (Google / databases)	vs.	Perplexity
Many links		✓ Synthesized answer + cited sources
Manual filtering		✓ Exploring unfamiliar topics
Research reading		✓ Finding starting references

When should you use it?

- ✓ **Early stages** of research
- ✓ Exploring unfamiliar topics
- ✓ Finding starting references

⚠ **Perplexity is not a substitute for academic databases.**

It is a tool for rapid exploration and orientation.

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Anatomy of a Good Prompt (Perplexity)

A well-structured prompt usually contains **three key elements:**

1 Topic

The main subject of the query.

Examples:

- AI in education
- Machine **learning** in healthcare
- Social media and mental health

2 Context

The **perspective** or domain of the request.

Examples:

- Academic research
- Higher education context
- Policy implications

3 Constraints

Conditions that **refine** the search results.

Examples:

- Publication year
- Type of sources (scholarly articles)
- Geographic focus

Prompt Template

Topic + Context + Constraints

Example:

✗ Vague prompt

✓ Well-structured → Impact of AI in higher education + academic research + sources published after 2021

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Perplexity

perplexity.ai

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Provide academic sources about the impact of artificial intelligence on teaching and learning in higher education published after 2020.

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Provide academic source

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Here are recent peer-reviewed academic sources (post-2020) on the impact of artificial intelligence on teaching and learning in higher education, with brief notes to help you decide what to read.

Systematic reviews and overviews

1. **"AI in higher education: a systematic literature review"** – Frontiers in Education, 2024

   Reviews AI uses in higher education, including impacts on learning processes, assessment, and research practices, and highlights ethical and implementation challenges. frontiersin

2. **"Artificial Intelligence in Higher Education: A Systematic Review of ..."** – IOSR Journal of Research & Method in Education, 2020–2025 sample

   Analyzes 30 empirical studies (2020–2025) focusing on AI's impact on learning outcomes and barriers to effective adoption (e.g., data quality, teacher readiness, ethics). iosrjournals

3. **"Using Artificial Intelligence for Higher Education: An Overview and ..."** – SAGE (Social Sciences journal), 2025

   Provides a bibliometric and thematic overview of AI in higher education, covering student performance, learning analytics, pedagogy, assessment, and student engagement as central clusters. journals.sagepub

Empirical studies on teaching and learning

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Example of how you might cite these (APA style)

- Frontiers in Education paper:
  Author(s). (2024). AI in higher education: A systematic literature review. *Frontiers in Education*. `frontiersin`
- Nature HSS
  Author(s). (
  The dynam

frontiersin
Frontiers | AI in higher education: a systematic literature review
IntroductionThe increasing reliance on technology within higher education necessitates a thorough examination of artificial intelligence's (AI) application i...

ntelligence on higher education:
lications. *Humanities and Social Sciences Co*

If you tell me yo , assessment, academic integrity, student percept is list further and format a tailored bibliography.

10 fuentes

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Modelo

Common Bad Prompts in Perplexity

Poorly formulated prompts often lead to vague or **unhelpful** results.

Too General

Prompts that are too broad give unfocused answers.

Bad example:

"Explain artificial intelligence."



Bad example:

"Explain artificial intelligence."

No Context

Without context, the system does not know what perspective you need.

Bad example:



"Tell me about climate change."



Better:

"Provide scholarly sources about climate change **policies** in the European Union.

No Constraints

Without constraints, results may be outdated or irrelevant.

Bad example:

"What research exists about machine learning in healthcare?"



Better:

"Provide recent peer-reviewed articles about machine learning in medical diagnosis published

Key Lesson: Good Prompts = Topic + Context + Constraints

Critical, **responsible**, and ethical use of AI will be an essential **skill** for the **future**.

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give sources about the importance of reciclyng

Se revisaron 10 fuentes >

Recycling is important because it protects the environment, saves energy and resources, supports the economy, and reduces health risks from poorly managed waste. Here are some reliable sources you can use: friendsoftheearth +5

Official organizations

- **US Environmental Protection Agency (EPA) – "Recycling Basics and Benefits"**

  Explains how recycling conserves natural resources, reduces greenhouse gas emissions (over 193 million metric tons of CO_2 equivalent saved in 2018), saves energy, and cuts pollution. epa
  https://www.epa.gov/recycle/recycling-basics-and-benefits

- **US EPA**

  Shows th... ...ges, and 5.5

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Modelo

Important Limitations of AI Search

AI search tools can be **very useful**, but **their results** must always be **critically evaluated.**

Hallucinated Sources

AI systems may **generate** fake or incorrect references



Always verify:

- Does the article actually exist?
- Is the source accessible?

Oversimplified Summaries

AI may **simplify** complex research and omit important details.

Important elements that may be lost:

- Research methods
- Experimental design
- Scientific results

Important **elements** that may be lost:

- Research methods
- Experimental design
- Scientific results

Bias and Source Quality

Not all sources suggested by AI have the same **academic credibllity.**

Students should check:

- ✓ Authors
- ✓ Journal or publisher
- ✓ Year of publication
- ✓ Whether the source is peer-reviewed



AI search is a starting point, not a final source of truth.
Always verify sources and read the original papers.

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Did you know?
Do you find it useful?



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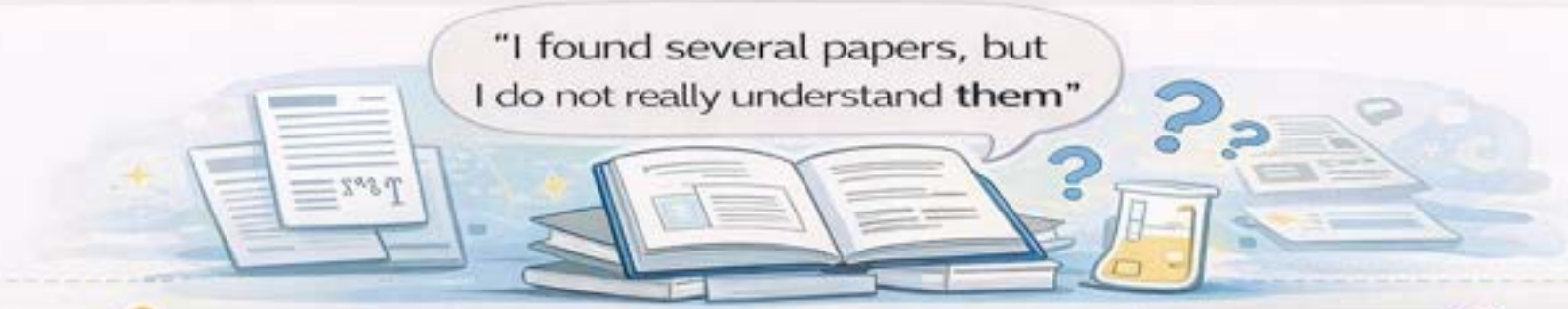
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After Identifying Sources...

Understanding the Material Can Be Challenging

The major challenge after collecting sources is **understanding the material.**



Technical Language



Academic articles are often written in **highly technical language.**

Complex Methodologies & Analyses



They frequently include complex **methodologies** and detailed analyses.

Specialized Terminology



Specialized terminology can make understanding difficult.



Tools like **NotebookLM** can assist in **interpreting** and **clarifying** complex academic texts.

Helping students better **understand the literature they collect.**

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What is NotebookLM?

NotebookLM is an **AI tool** designed to help users interact **directly with documents.**

- Students **upload materials** such as **research papers**, reports, lecture notes, etc.
- They can **then ask questions** about the **content** of their uploaded documents.





Ask Questions



Upload Materials



Get Answers citing documents

What sets NotebookLM apart?

- ✓ Responses are based **only** on the **documents provided** by the user, not on general knowledge from large datasets.
- ✓ It analyzes the **uploaded** sources to generate **grounded** answers.

What sets NotebookLM apart:

- ✓ Responses are based **only** on the documents **provided** by the user, not on general knowledge from large datasets.

NotebookLM is especially useful in **academic contexts**, where working with defined sources is essential.

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What NotebookLM Can Do

One of the main functions of **NotebookLM** is the ability to **summarize documents.**

Summarize Documents

Ask for a concise overview of the **main contributions** or findings,



Ask Questions About Documents

Make targeted questions to find specific information about the methodology and conclusions.



Cross-Reference Documents

Analyze and compare information across **multiple** documents.



Upload Materials

"**Summarize** the key contributions of this paper."

Example:

> **Summarize** the key contributions of this paper.

Ask Questions

"**What limitations** does the research identify?"

Example:

> What differences exist between these two studies?

Cross-Reference Documents

Analyze and compare information across **multiple** documents.

Helps **understand, analyze, and compare academic papers.**

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How NotebookLM Enhances Accessibility and Learning

It transforms **written materials** into alternative formats, making studying easier and more flexible.

Structured Summaries

It provides concise overviews of academic papers with the key points highlight.



Structured Summaries

It provides concise overviews of academic papers with the key points highlight.

Concept Maps About Documents

It creates visual representations highlighting the relationships between key ideas.



Concept Maps

It creates visual representations highlighting the relationships between key ideas.

Draft Slides Documents

Analyze and compare information across **multiple** documents.



Draft Slides

It generates slides outlining the main **concepts** and findings for presentations.

Key Idea: Multiple formats make studying easier and more adaptable to different learning styles.

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When Should Students Use NotebookLM?

AI is a powerful **tool**, but it should **never replace** the **intellectual effort** of the student.

Advance Research Skills

Students learn to critically interact with AI, developing an essential academic skill for research.



Students must **independently** develop their own argument and

Analyze Complex Material

AI helps break down difficult texts, aiding in understanding and analysis.



AI may provide **incorrect** references or outdated data that need to be checked.

Excel in the Digital Age

Responsibly using AI prepares students for modern academic and professional environments.



Learning to use AI responsibly is a powerful advantage in both academic and professional life.

Critical, **responsible,** and **ethical** use of **AI** will be an essential **skill** for the future.

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Example: Studying Course Material with NotebookLM

NotebookLM helps students **understand** and **review course content.**

1. Explaining Concepts



Upload: Slides, Notes.

Example Prompt:

"Explain the concept of **overfitting** using these **slides.**"

2. Comparing Concepts



Example Prompt:

"What are the differences between **supervised** and **unsupervised learning?**"

3. Exam Preparation



Identify Key Ideas

Create Study Guide.

Example Prompt:

"Create a list of key **concepts to review** for the **exam.**"

4. Understanding Difficult Sections



Simple Explanation

Example Prompts:

- Explain the **medhodology** in **simple terms.**"
- Explain this concept as if I **wore** a **begiinner.**"





NotebookLM helps students interact with **course materials, not just read them.**



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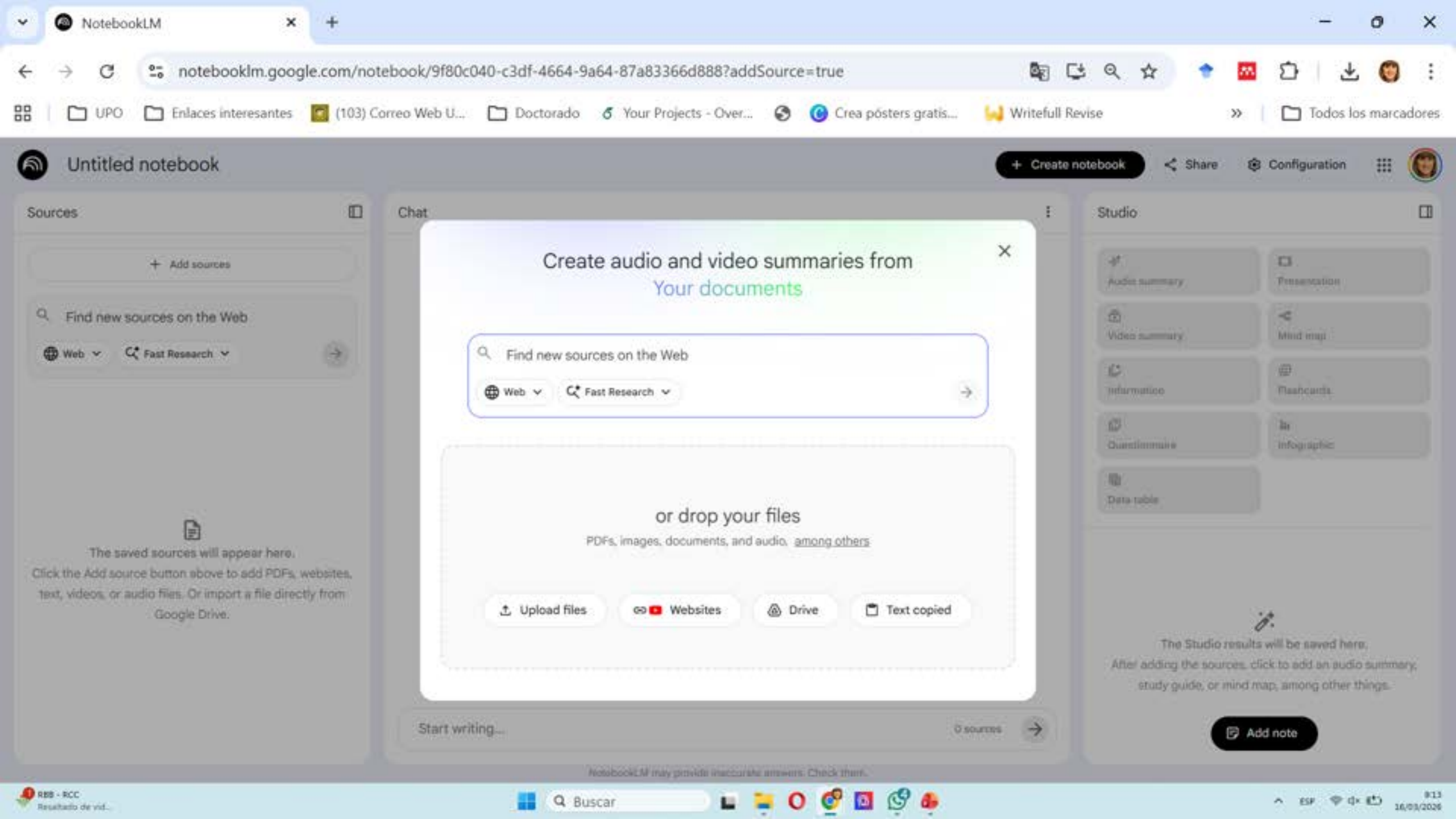
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Exponential and Log functions

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Exponential and Log functions - Precalculous

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Sources

+ Add sources

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Web | Fast Research

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- CH03_06.pptx
- Stewart_Precalc_8e_PPT_CH03_03.pptx
- Stewart_Precalc_8e_PPT_CH03_05.pptx
- Stewart_Precalc_8e_PPT_CH03_07.pptx

Chat

Exponential and Log functions - Precalculous

0 sources

This collection of educational materials for **Precalculus: Mathematics for Calculus** details the fundamental properties and analytical techniques of **polynomial functions** . The resources explain how to identify key elements such as **degree** , **leading coefficient** , and the **final behavior** of graphs, ensuring that students recognize their **smooth and continuous nature. Precise algebraic methods, including the Rational Zeros Theorem** , **synthetic division** , and **Descartes' Rule of Signs** , are presented for locating the roots of an equation. Furthermore, the content instructs on using the **Upper and Lower Bounds Theorem to constrain the search for real solutions on a Cartesian plane. Finally, graphical visualization** strategies and transformations are integrated to facilitate solving complex problems and representing power functions.

Save to a note

How do the degree and the leading coefficient influence the final behavior of the graph?

Empieza a escribir... 0 sources

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Sources

+ Add sources

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Web | Fast Research

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- Stewart_Precalc_8e_PPT_CH03_03.pptx
- Stewart_Precalc_8e_PPT_CH03_05.pptx
- Stewart_Precalc_8e_PPT_CH03_07.pptx

Chat

How do the degree and the leading coefficient influence the final behavior of the graph?

The **final behavior** of a polynomial function describes what happens to the values of the function (and) as$x$becomes very large in a positive direction ($x \to \infty$) the negative ($x \to -\infty$) 1 This behavior is determined exclusively by the **leading term** ($a_n x^n$), since for large values of$x$The other terms of the polynomial are insignificant in comparison. 2 .

The influence of the degree (n) and the leading coefficient (a_n) is divided into four fundamental cases:

1. Odd degree ($n$is odd)

In this case, the ends of the graph point in **opposite directions.** 3 .

- **Positive principal coefficient** ($a_n > 0$The function falls to the left and rises to the right. It is expressed as :$and \to \infty$when$x \to \infty$, and$and \to -\infty$when$x \to -\infty$ 4 5 .
- **Negative principal coefficient** ($a_n < 0$**The function rises to the left** and falls to the right. It is expressed as:$and \to -\infty$when$x \to \infty$, and$and \to \infty$when$x \to -\infty$ 6 7 .

2. Even degree (n(es par)

In this case, the ends of the graph point in the **same direction.** 7 .

- **Positive principal coefficient** ($a_n > 0$): Both ends of the graph rise. This is expressed as:

Empieza a escribir... 0 sources

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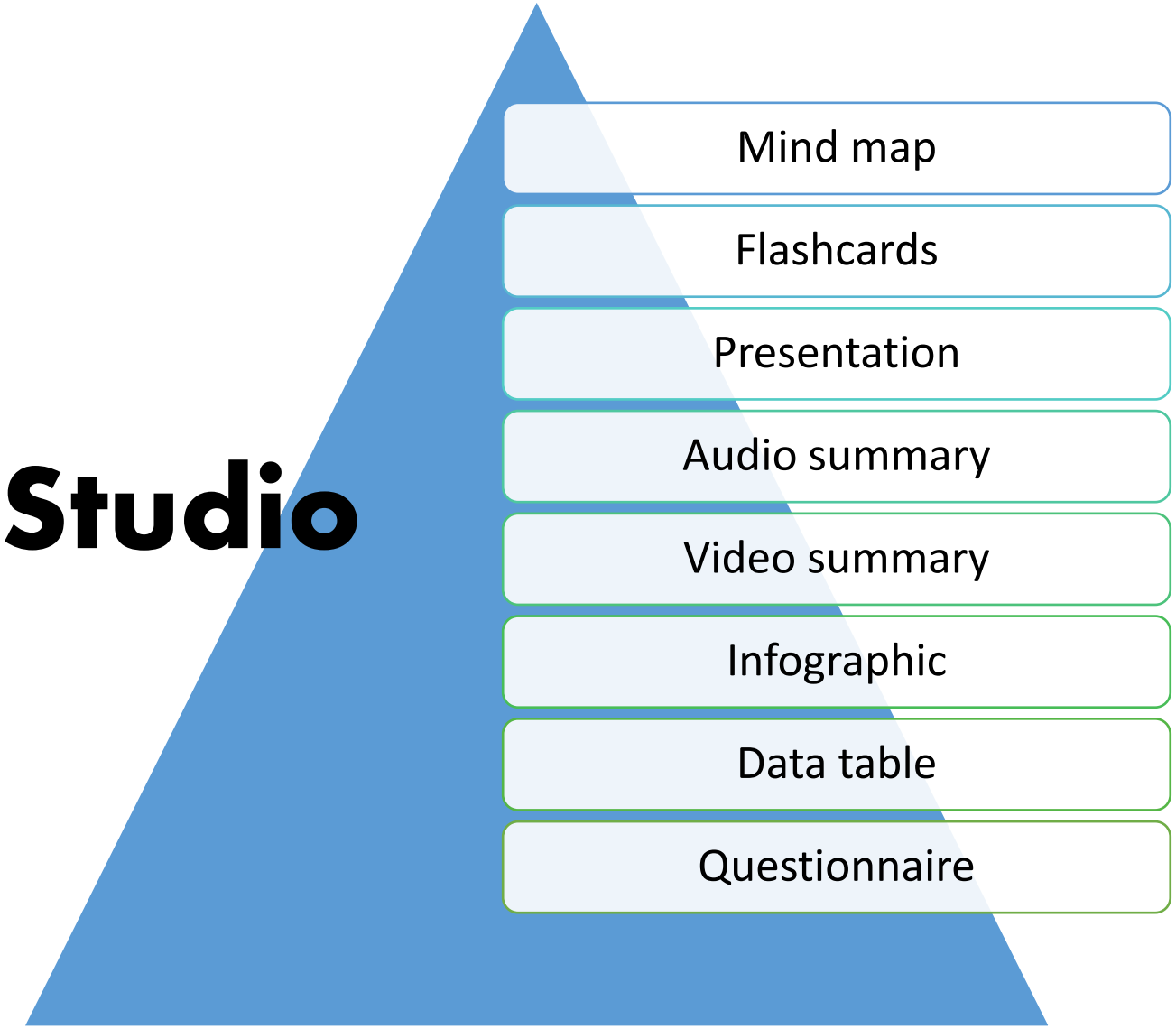
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Mind map

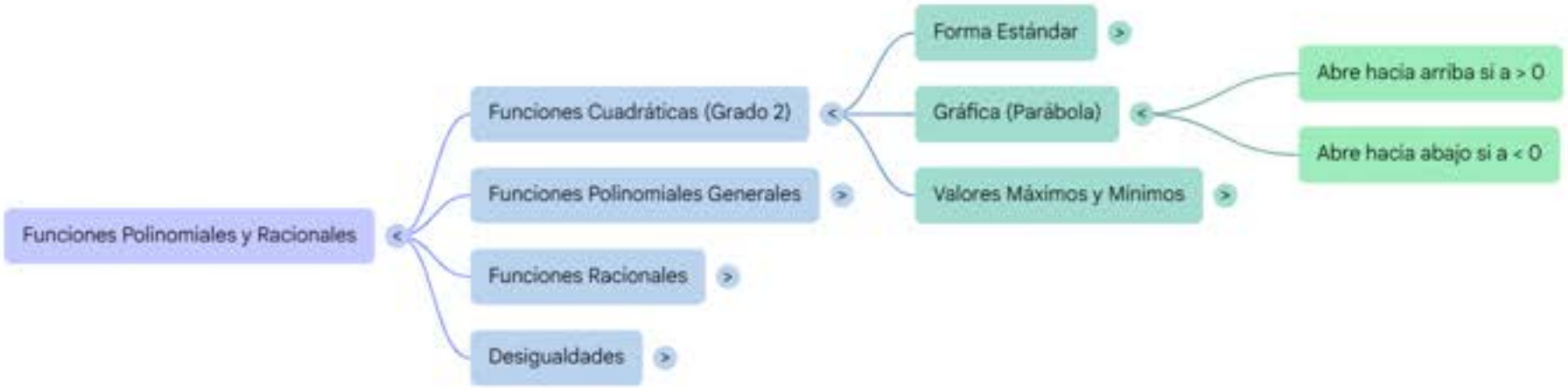
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Structures of Polynomial and Rational Functions

Based on 7 sources



Appropriate content | Inappropriate content

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Mind map

Exponential and Log functions - Precalculous

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Discuss what these sources say about Opens upwards if a > 0, in the broader context of Graph (Parabola).

The sources provided establish a direct relationship between the sign of the leading coefficient (a) and the orientation of the parabola, which has critical implications for the shape of the graph, its extreme values, and its final behavior.

The following details what the sources indicate regarding the fact that a parabola **opens upwards if** $a > 0$:

1. Orientation and shape of the graph

- **Opening definition:** A quadratic function expressed in its standard form $f(x) = a(x - h)^2 + k$ represents a parabola with vertex at (h, k) [1] The sources specify that **the parabola opens upwards if** $a > 0$, while opening downwards if $a < 0$ [1].
- **Visualization:** The graphs of functions where a is positive and shows a "U" shaped curve where the "arms" of the parabola extend infinitely to the top of the Cartesian plane [2] [...].

2. Existence of a minimum value

- **The vertex as the lowest point:** When a parabola opens upwards ($a > 0$), the vertex (h, k) represents the **minimum point** of the function [5]
- **Minimum value:** The minimum real value of the function is the coordinate and from the

Start writing... 7 sources

Studio

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Polynomial and Rational Functions:...
7 sources · 3 min ago

Generating audio summary...
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Polinomios Fichas

Based on 7 sources

4 / 75

¿Cuál es el grado del polinomio $P(x) = 3x^5 + 6x^4 - 2x^3 + x^2 + 7x - 6$?

Mira la respuesta

0 0

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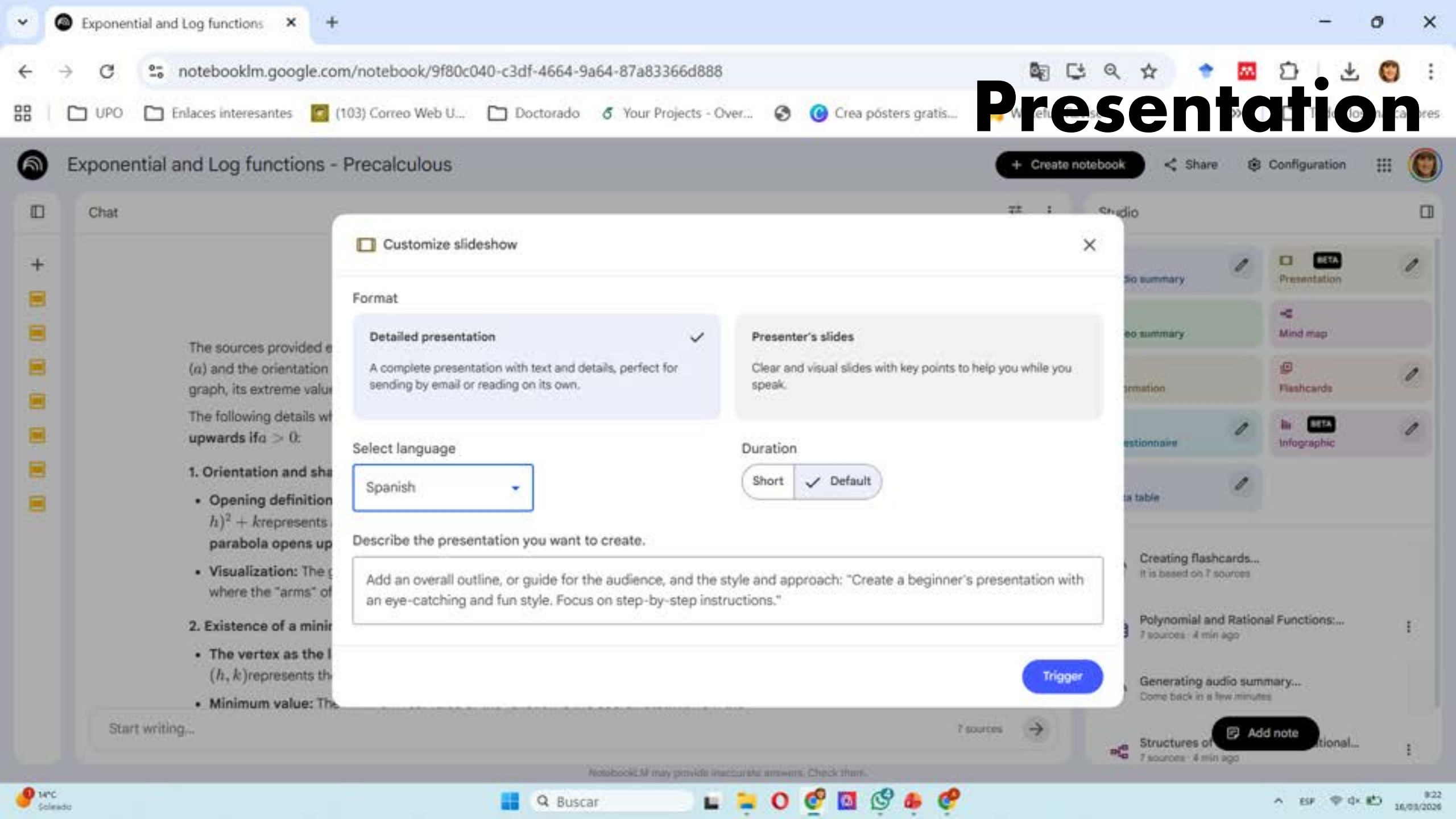
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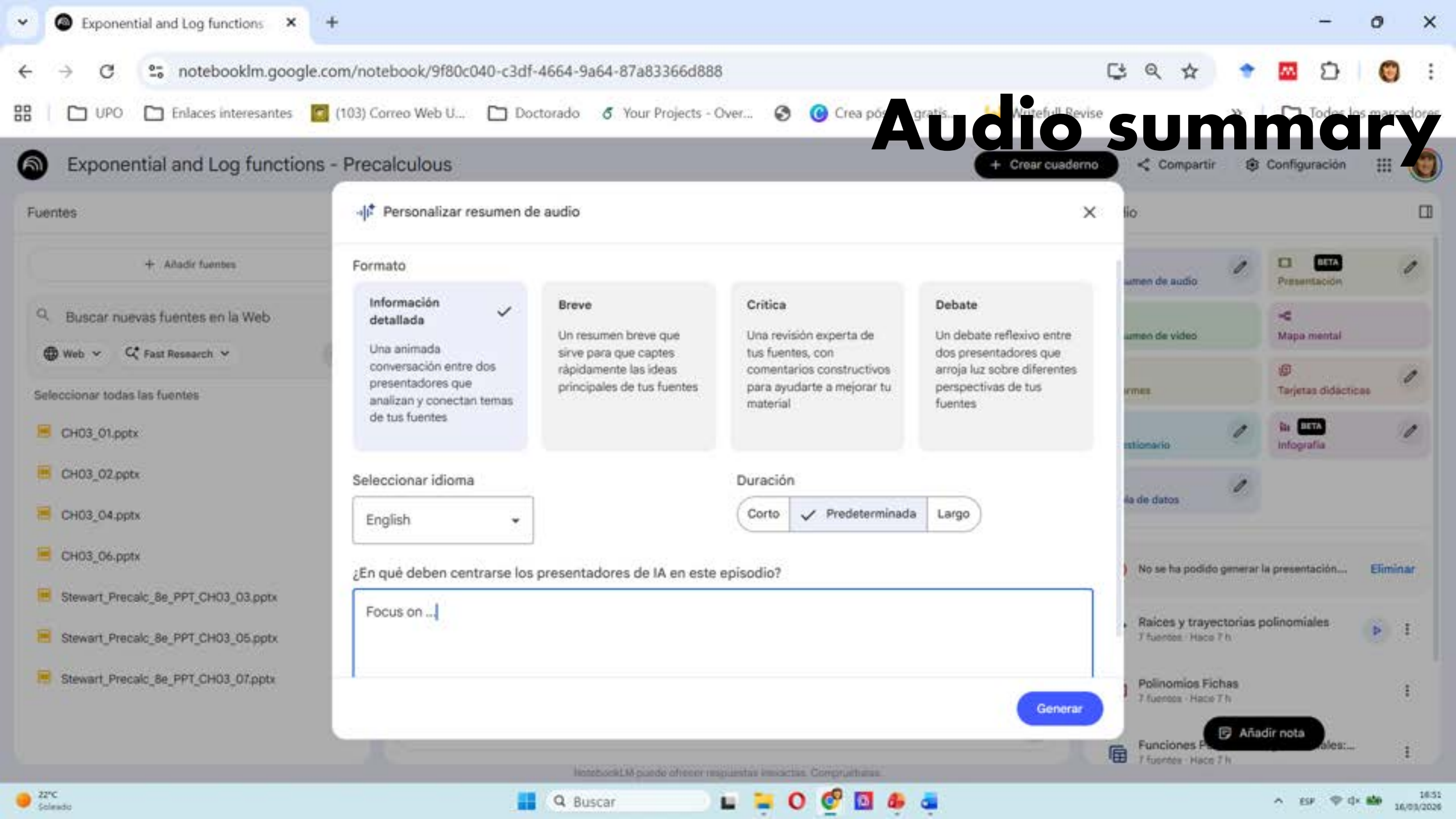
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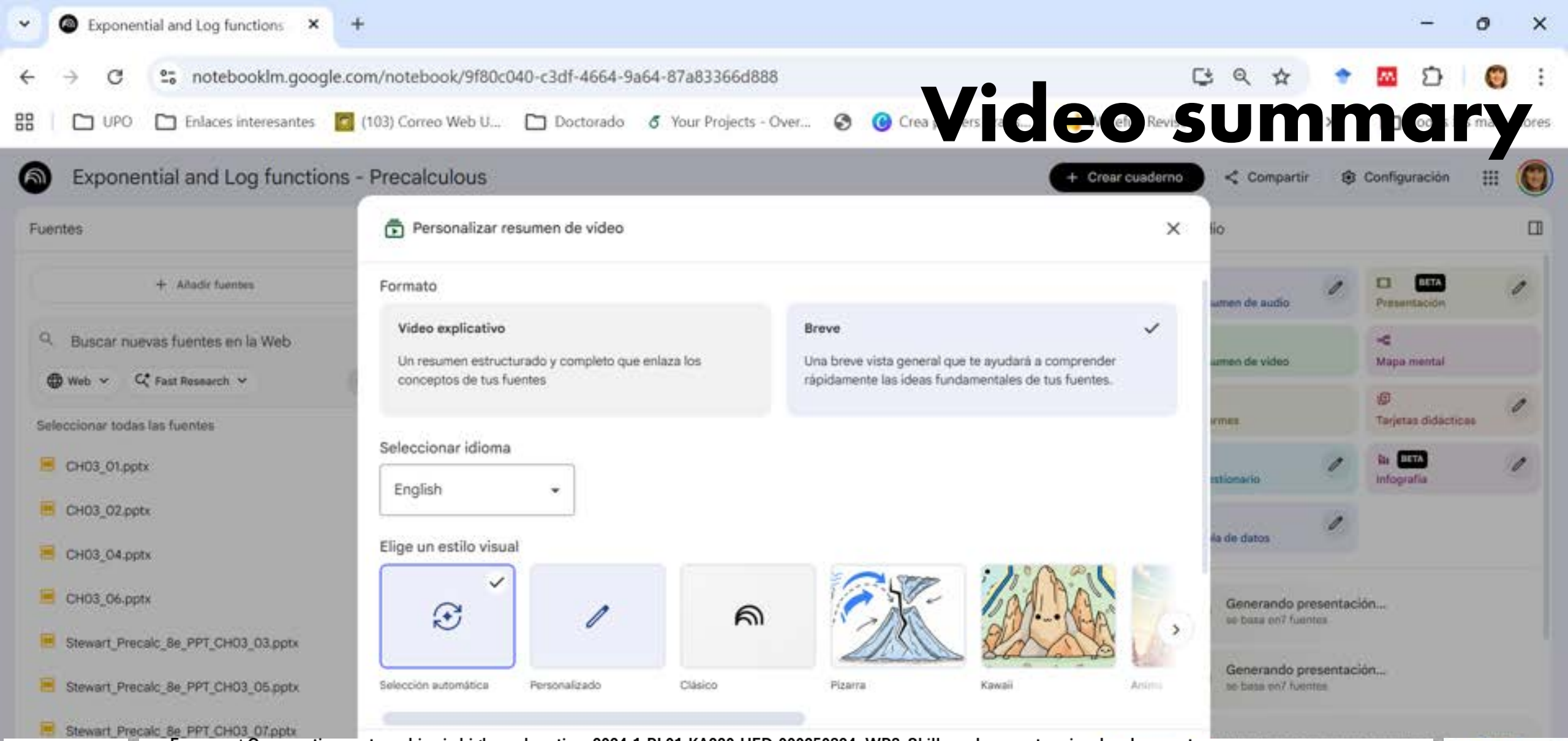
Presentation



Audio summary



Video summary



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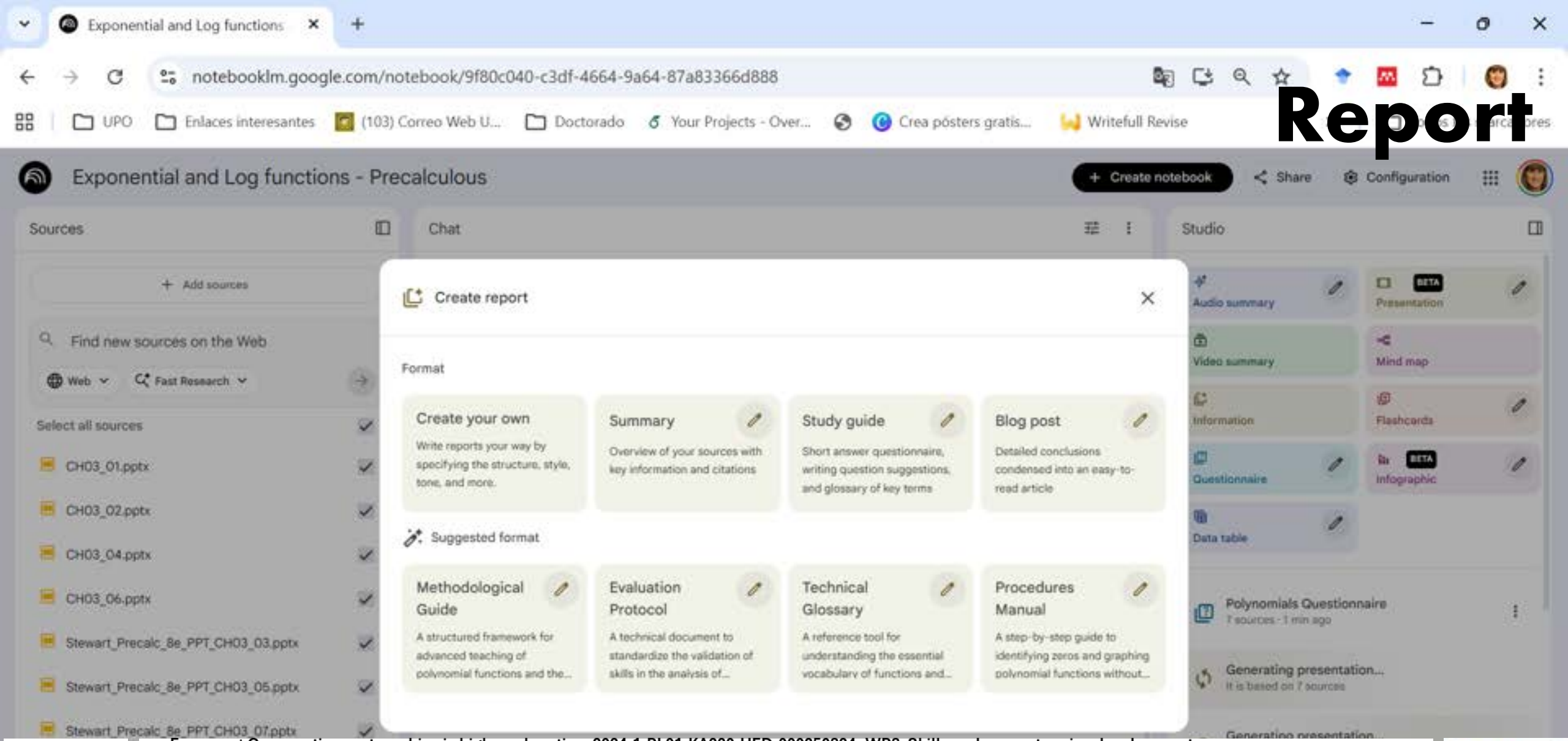
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Your Projects - Over...
Crea pósters gratis...

Data table

Funciones Polinomiales y Racionales: Propiedades y Ejemplos

Based on 7 sources

Polynomial Function	$P(x) = x^4(x-2)^3(x+1)^2$	9	1	-1(lot.2), 0(lot.4),2(lot.3)	$and \to \infty$ when$x \to \infty$; $and \to -\infty$ when$x \to -\infty$	Multiple local extremes (maximum of8)	[1]
Polynomial Function	$P(x) = x^3 - 2\,x^2 - 3\,times$	3	1	$x = 0, x = 3, x = -1$	$and \to \infty$ when$x \to \infty$;$and \to -\infty$ when$x \to -\infty$	At least one local maximum and minimum	[1]
Quadratic Function	$f(x) = 2\,x^2 - 12x + 13$	2	2	Interceptand: $(0, 13)$Intercepts$x$:$3 \pm \frac{\sqrt{10}}{2} \approx (1.42, 4.58)$	Open upwards ($f(x) \to \infty$when$x \to \pm\infty$)	Vertex:$(3, -5)$Minimum value:-5	[2]
Quadratic Function	$f(x) = 5\,times^2 - 30x + 49$	2	5	No real zeros are mentioned	Open upwards ($f(x) \to \infty$when$x \to \pm\infty$)	Vertex:$(3, 4)$Minimum value:4	[2]
Quadratic Function	$f(x) = -x^2 + x + 2$	2	-1	Intercepted$x$:$-1, 2$	Open downwards ($f(x) \to -\infty$when $x \to \pm\infty$)	Vertex:$(\frac{1}{2}, \frac{9}{4})$Maximum value:$\frac{9}{4}$	[2]
Rational Function	$r(x) = \frac{2x^2+7x-4}{x^2+x-2}$	$2/2$	Numerator:2; Denominator:1	Intercepted$x$:$\frac{1}{2}, -4$Interceptand:2	AV:$x = 1, x = -2$; A.H.: $and = 2$	not specified	[3]
Rational Function	$r(x) = \frac{x^2-4x-5}{x-3}$	$2/1$	Numerator:1; Denominator:1	Intercepted$x$:$-1, 5$Interceptand:$\frac{5}{3}$	AV:$x = 3$A. Oblique:$and = x - 1$	not specified	[3]
Rational Function (with hole)	$s(x) = \frac{x-3}{x^2-3x}$	$1/2$	Numerator:1; Denominator:1	It has no intercepts	AV:$x = 0$; A.H.:$and = 0$	Hole in$x = 3$	[3]
Rational Function	$f(x) = \frac{1}{x}$	Numerator:0;	Not applicable	Without intercepts$x$inand	AV:$x = 0$; A.H.:$and = 0$	It has no local extremes	[3]

Appropriate content | Inappropriate content

NotebookLM may provide inaccurate answers. Check them.
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16/03/2026

Questionnaire

Exponential and Log functions

notebooklm.google.com/notebook/9f80c040-c3df-4664-9a64-87a83366d888

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Polinomios Cuestionario

Based on 7 sources

¿Cuál es el grado y el coeficiente principal de la función polinomial $P(x) = 5x^4 - 2x^6 + 3x - 1$?

A. Grado 6, coeficiente principal -2

B. Grado 4, coeficiente principal 5

C. Grado 11, coeficiente principal 5

D. Grado 6, coeficiente principal 2

Pista

Siguiente

Busca el término que contiene la potencia más alta de x sin importar su posición en la expresión.

Appropriate content | Inappropriate content

NotebookLM may provide inaccurate answers. Check them.

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Did you know?
Do you find it useful?



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Responsible Use of AI in Academic Work

AI is a powerful tool, but it should never replace the intellectual effort of the student.

Assist Learning, Don't Replace It

Use AI to search, understand, and organize, not to do all the work.



⚠ Students must independently develop their own arguments and assignments.

Fact-Check and Verify Sources

Always verify AI-generated information by examining sources closely.



⚠ AI may provide incorrect references or outdated data that need to be checked.

Maintain Academic Integrity

Submitting AI-generated content as your own is unethical.



⚠ Submitting AI-generated content as your own is unethical.



Key Idea: Use AI as a tool to support your learning, not as shortcut to avoid academic effort.

> Example prompt:

> Explain *the methodology* section of this paper in simple terms.

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Any questions?



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Thank you very much

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AI TOOLS



Prof. Dr. Elif Akagün

Session 3

March 23, 2026

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WHAT IS AI?

Artificial Intelligence is a software that can think, learn, and assist like humans (to a degree).

- AI is transforming education!
- Personalized learning
- Instant feedback
- 24/7 assistance
- AI is a cognitive tool — «like a calculator for thinking»

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WHAT CAN AI TOOLS DO

core abilities



1. **Explain Concepts** — Break down difficult topics "Explain photosynthesis like I'm 10"
2. **Help with Writing** — Essays, summaries, grammar fixes
3. **Brainstorm Ideas** — Projects, presentations, and creative writing
4. **Solve Problems** — Math explanations (step-by-step)
5. **Language Learning** — Translation, conversation practice

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POPULAR AI TOOLS FOR STUDENTS

1.CHAT-BASED AI

ChatGPT

Gemini

can be used for

- Assignment Help
- Explaining Course Material
- Practice Questions
- Mock Exams

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POPULAR AI TOOLS FOR STUDENTS

2. WRITING ASSISTANTS

grammarly

QuillBot

can be used for

- Fixing Grammar
- Improving Clarity
- Rewriting Sentences

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POPULAR AI TOOLS FOR STUDENTS

3.STUDY & NOTES TOOLS

Notion

OneNote

can be used to

- Organize notes
- Summarize lectures
- Create study plans

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POPULAR AI TOOLS FOR STUDENTS

4.CREATIVE AI TOOLS

DALL·E

Canva AI TOOLS

useful for

- Presentations
- Posters
- Visual Projects

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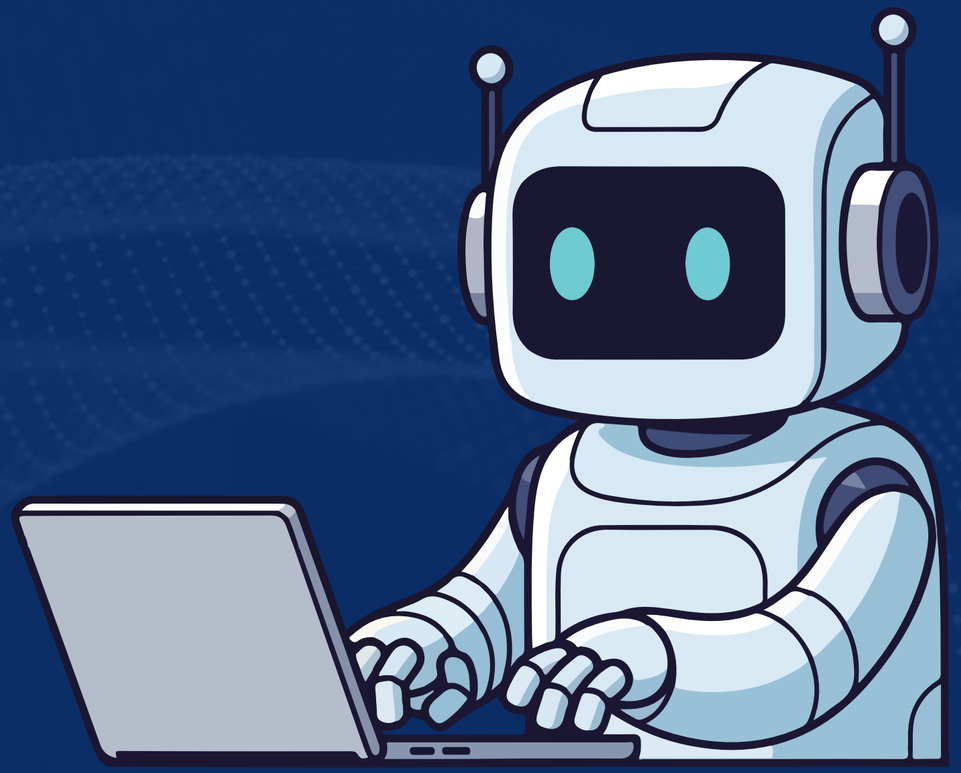
RESPONSIBLE USE OF AI

Don't:

- Copy AI answers directly
- Cheat on exams
- Submit AI work as your own

Do:

- Use AI to understand
- Check answers
- Edit and improve your own work



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PROMPT ENGINEERING BASICS

Better prompts → Better outputs

Good prompts are:

- **Specific**
- **Context-rich**
- **Goal-oriented**

Example:

- **“Explain economics” vs. “Explain supply and demand with a real-world example and graph description”**

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LIMITATIONS OF AI

KEEP IN MIND THAT

- AI is not perfect
- Can generate incorrect information
- Lacks true understanding
- May reflect bias in data
- You should always verify outputs

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RESPONSIBLE USE OF AI

AI is great to

- Learn concepts
- Improve drafts
- Explore ideas
- Ask better questions
- Cross-check information
- Combine AI with textbooks
- Reflect on what you learn

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DISCUSSION QUESTIONS

1. Should AI be allowed in exams? Why/Why not?
2. Does AI improve or weaken the learning experience?
3. Where should we draw the line?

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THANK YOU FOR YOUR ATTENTION



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AI Tools for Students
AI Study & Productivity Toolkit: Work Smarter, Not Harder

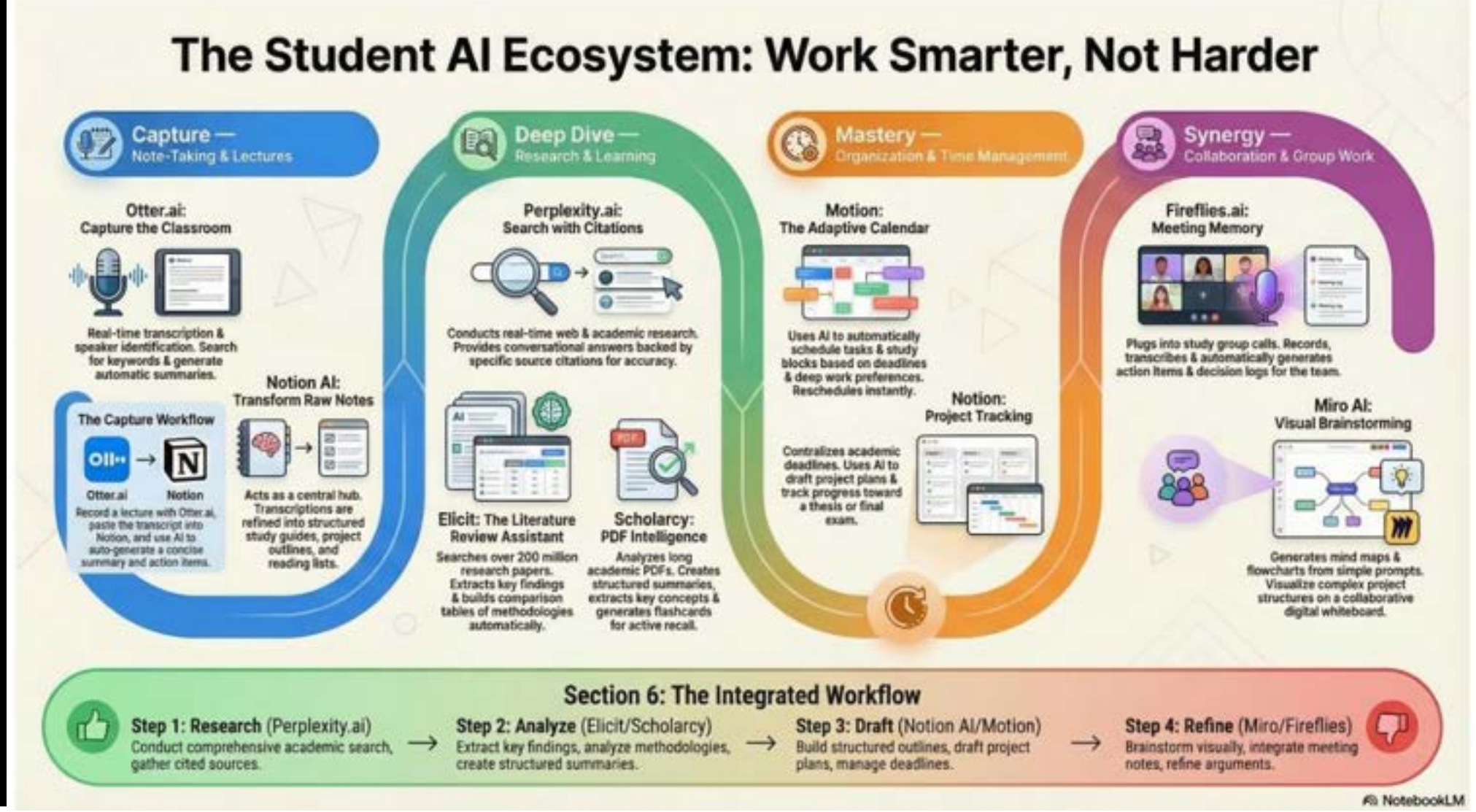
Dr. Hasibe Aysan

Ostim Technical University, Ankara, Türkiye

24 March 2026

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AI Study & Productivity Toolkit

Work Smarter, Not Harder

"How many hours do you spend on tasks AI could do in minutes?"

Master AI tools for learning

Note-taking, research, writing — a practical toolkit for every phase of study.

Build efficient study systems

Combine AI tools into workflows that save hours per week and improve output quality.

Manage projects & deadlines

AI calendar and task management tools that adapt to your workload automatically.

Learn ethically with AI

Use AI to deepen your understanding — not to shortcut the learning process itself.

Session flow: Note-taking → Research → Writing → Organization → Collaboration → Ethics

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AI Note-Taking & Lecture Tools

Capture everything — review in minutes

Otter.ai

Automatic transcription & speaker identification

- Records and transcribes lectures in real time
- Identifies multiple speakers automatically
- Generates AI summaries with action items
- Search inside transcriptions by keyword
- Syncs with Zoom, Google Meet, Teams
- Free tier: 300 minutes/month

Notion AI

Smart note organization with AI built in

- AI writes, edits, and summarizes inside notes
- Ask questions about your notes: 'Summarize Week 3'
- Auto-generate study guides from lecture notes
- Organize projects, databases, and reading lists
- AI fills in templates and creates outlines
- Works across web, desktop, and mobile

Workflow tip: Use Otter.ai to capture lectures → paste transcript into Notion AI → auto-generate a study summary in seconds.

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Research & Learning Tools

From web search to academic paper analysis

Perplexity.ai

AI-powered web research with citations

- Real-time web search with source citations
- Academic mode for peer-reviewed papers
- Follow-up questions in conversational style
- Summarizes multiple sources in one response

Elicit

Research assistant for academic papers

- Search 200M+ research papers by concept
- Extract key findings automatically
- Compare methodologies across papers
- Build literature review tables in minutes

Scholarcy

PDF summarizer for academic papers

- Upload any PDF — get a structured summary
- Extracts key concepts, contributions, findings
- Creates flashcards from papers automatically
- Identifies and links all references

Research workflow: Perplexity → find relevant papers → Elicit → compare findings → Scholarcy → deep-read key papers → Notion AI → write up notes

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Organization & Time Management

AI that adapts to your schedule automatically

Motion / Reclaim.ai

AI calendar management — auto-schedules your tasks

- Automatically schedules tasks based on deadlines and energy
- Reschedules meetings and tasks when plans change
- Blocks deep work time so it doesn't get eaten by meetings
- Syncs with Google Calendar, Outlook, and Zoom

Notion for Project Management

All-in-one workspace for students and teams

- Kanban boards, timelines, and checklists in one tool
- AI writes project plans from a single prompt
- Group project wikis with shared editing
- Templates for semester planning, thesis tracking

Practical Student Scenarios

1. Writing a research paper:	Perplexity (topic) → Elicit (literature) → Scholarcy (deep-read) → Notion AI (outline + draft)
2. Preparing for exams:	Otter.ai (lecture notes) → Notion AI (study guide) → Scholarcy flashcards → self-quiz
3. Managing multiple deadlines:	Add all deadlines to Motion → let it auto-schedule study blocks → Notion board tracks progress

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Collaboration & Group Work

AI-powered tools for study groups and team projects

Fireflies.ai

AI meeting assistant for groups

- Records and transcribes group meetings
- Auto-generates action items and summaries
- Searchable meeting archive — find any decision
- Integrates with Zoom, Meet, Teams, Webex

Miro AI

Visual brainstorming and mind mapping

- AI generates mind maps from a topic or prompt
- Real-time collaborative whiteboard
- AI summarizes brainstorming sessions
- Diagram and flowchart generation built in

Notion (Team Spaces)

Shared project workspace

- Shared wikis and knowledge bases for groups
- AI writes meeting agendas, project briefs
- Assign tasks and track deadlines together
- Comments and version history for drafts

Group project workflow

Kick-off meeting → Fireflies records & creates action items → Miro AI builds a project mind map → Notion tracks progress → Fireflies records every subsequent meeting automatically.

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Academic Integrity & Ethical AI Use

The golden rule: use AI to LEARN, not to CHEAT

✅ Ethical AI Use

- Use AI to understand difficult concepts
- Get feedback on drafts you wrote yourself
- Summarize sources, then read the original
- Use AI to brainstorm — then develop ideas yourself
- Disclose AI assistance where required

❌ Academic Misconduct

- Submitting AI-generated text as your own work
- Using AI to answer exam questions
- Bypassing the learning process entirely
- Not disclosing AI use when policies require it
- Fabricating citations from AI output

University policies vary — always check your institution's AI use policy before each assignment. When in doubt, ask your instructor.

AI is a productivity multiplier — but only if you're the one doing the thinking.

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Your AI Study System

Start today — build your toolkit one tool at a time

Step 1 **Otter.ai**

Install the app. Record your next lecture. Review the auto-summary after class.

Step 2 **Perplexity.ai**

Use it for your next research topic instead of a plain Google search. Check the cited sources.

Step 3 **Notion AI**

Create a workspace for your current course. Paste your lecture notes and ask AI to summarize.

Step 4 **Elicit**

Find 5 papers on your next essay topic. Use it to build a comparison table automatically.

Step 5 **Motion or Notion**

Add all your upcoming deadlines. Let the AI schedule your study blocks for the next 2 weeks.

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What is Claude?

A large language model built for safety and helpfulness

Definition

A large language model (LLM) trained to understand and generate human language — it reads, writes, reasons, and codes.

Made by Anthropic

Founded 2021 by former OpenAI researchers Dario & Daniela Amodei. Focused on AI safety research.

Core Values (HHH)

Helpful · Harmless · Honest
Trained with a written 'constitution' — not just human feedback.

How it generates text

Claude processes your input as 'tokens' and predicts the most likely next word — one at a time. It can handle up to 200,000 tokens (= 150,000 words) in a single conversation.

Constitutional AI

Unlike models trained only on human feedback, Claude is also trained with a set of written principles. It critiques and revises its own outputs during training — which is why it's consistent and transparent.

The result: a model that explains its reasoning, pushes back on harmful requests, and behaves reliably across topics.

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Claude's History

From research breakthrough to global product



Key Innovation: Constitutional AI — Claude is trained with written ethical principles, not just human ratings. This makes its behavior consistent, transparent, and predictable.

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What Can Claude Do?

Core capabilities across writing, reasoning, code, and more

Writing & Language

Essays, reports, summaries, emails, translations, style adaptation. Works fluently in dozens of languages.

Reading & Analysis

Upload a 100-page PDF and ask any question. Claude finds, synthesizes, and explains relevant content.

Reasoning & Math

Step-by-step problem solving, logic, statistics, word problems — from high school to graduate level.

Coding

Write, debug, and explain code in Python, JavaScript, SQL, Java, C++, and more. Also refactors and reviews.

Research Support

Break down complex topics, compare perspectives, synthesize arguments from multiple sources.

Agentic Tasks

With tools enabled: web search, file management, calendar, email — Claude can complete multi-step workflows.

Context window: up to 200,000 tokens (~150,000 words) — an entire novel in a single conversation.

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Real-World Use Cases

How students, researchers, and professionals use Claude today

For Students

- Explain complex topics ('like I'm 15')
- Get feedback on essays and drafts
- Create quizzes for exam prep
- Language learning & corrections
- Break down research papers

For Researchers

- Summarize 50-page papers in minutes
- Draft methodology / literature sections
- Analyze & interpret data tables
- Compare theoretical perspectives
- Find gaps in existing research

For Professionals

- Business emails & proposals
- Contract review in plain language
- Strategy & SWOT analysis
- Technical documentation
- Client communication drafts

Pro Tip: The more context you give Claude, the better the output. Specify your role, the audience, and what you've already tried.

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How to Access Claude

Free tier, paid plans, API, and integrations

Claude.ai (Web & App)

Free / Pro / Team

Free tier available

Sign up at claude.ai. Free access to Sonnet with limits. Pro plan unlocks Opus, more messages, and Projects.

Anthropic API

claude-sonnet-4-6

For developers

Build apps powered by Claude. Access Haiku (fast), Sonnet, Opus. Pay-per-token pricing with full tool access.

Claude Code

Developer

Terminal tool

Agentic coding assistant. Claude can run code, manage files, and work as a full developer inside your project.

Integrations (2025-26)

Beta

Embedded in your workflow

Claude in Chrome, Excel, PowerPoint, Gmail, Google Calendar. Cowork for desktop task automation.

Current models (2026): Haiku 4.5 (fast) · Sonnet 4.6 (recommended) · Opus 4.6 (most powerful)

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What Claude Cannot Do

Hard limits, technical weaknesses, and ethical boundaries

Hard Limits (by design)

- Weapons of mass destruction (bio, chem, nuclear)
- Sexual content involving minors — zero exceptions
- Functional malware or cyberweapons
- Undermining AI oversight or democratic processes

These are deliberate — Claude holds these lines even when presented with clever arguments for exceptions.

Technical Limitations

Hallucination
Can state false facts confidently — especially for citations and recent events. Always verify.

Knowledge cutoff
Without search tools, knowledge ends ~Aug 2025. It can't browse the internet by default.

No persistent memory

Each session starts fresh. It doesn't remember you unless explicitly told.

No image generation

Can analyze images, but cannot create them.

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Getting the Best Results

Practical prompt engineering for students

01 Be specific

Instead of 'explain AI', try: 'Explain transformer attention for a CS undergrad who knows Python but not ML.'

02 Give context

Tell Claude who you are, what the output is for, and who will read it. More context = better output.

03 Iterate

Don't expect perfection on the first try. Ask it to 'make it shorter', 'add examples', 'change tone'. It remembers the conversation.

04 Break it down

For complex tasks, ask Claude to tackle one piece at a time — outline first, then each section separately.

```
Prompt pattern:  "Act as a [role]. [Task]. Output should be [format]. Audience: [who]. Tone: [formal/casual]."
```

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Key Takeaways

What to remember about Claude

Claude is a safety-first AI

Built with Constitutional AI — it reasons about ethics, not just follows rules.

Multimodal & capable

Reads text, images, code. Context window of 200K tokens means it can handle very long documents.

Verify important facts

Claude can hallucinate. Treat it as a brilliant first draft, not a final source.

Prompt quality matters

Specific, contextual prompts get dramatically better results than vague ones.

Use it ethically

AI assists your thinking — don't outsource your judgment. Always cite AI use where required.

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Safeguarding Your Digital Life

Personal Data & Device Protection in the AI Era

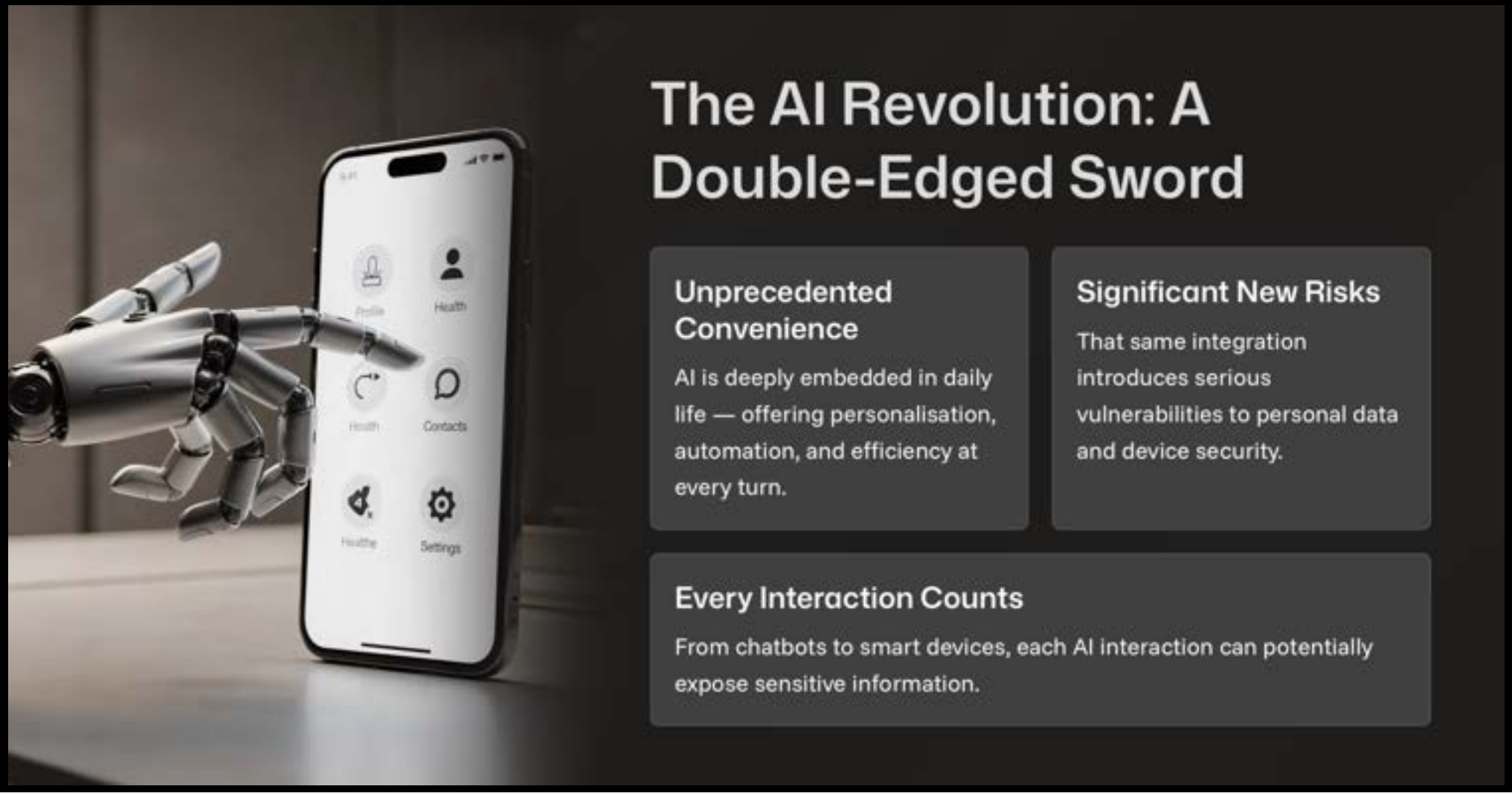
Dr Tymoteusz Miller

University of Szczecin

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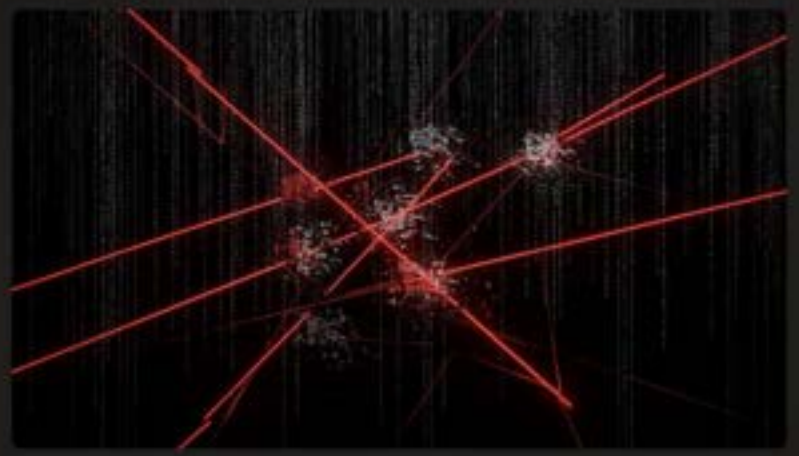
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The Growing Threat Landscape



Data Leakage

Sensitive PII and PHI can be inadvertently shared with AI services during routine interactions.

Profile Building

AI providers log user data over time, creating detailed profiles that can be exploited or sold.

Prompt Injection

Malicious actors manipulate AI systems to extract sensitive information from unsuspecting users.

Training Data Risks

Personal data used in AI training sets can cause compliance failures and biased model outputs.

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Real-World Risks: When Data Leaves Your Device

73%

Risk Unaware

of employees admit to pasting sensitive data into AI chatbots without realising the risk.

→ Health Data Exposure

A user asking an AI about medical conditions — "I have type 2 diabetes…" — inadvertently shares protected health information.

→ Financial Details at Risk

Pasting credit card numbers or financial records into AI prompts can lead to direct exposure of sensitive account data.

→ Compromised API Keys

Sharing API keys for debugging purposes can result in full account compromise and unauthorised system access.

All examples sourced from PiiBlock research into real-world AI prompt data leakage incidents.

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The Solution: Privacy-First AI



On-Device Processing

Keeping data and AI models local to your device ensures sensitive information never leaves your control.



Real-Time Anonymisation

Tools that detect and mask sensitive data *before* it is sent to AI services, preserving privacy by default.



Privacy Proxies

Middleware that scrubs PII from prompts, ensuring your identity is never exposed to AI providers.

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Innovative Solutions in Action



Sinaptic.AI

Browser extensions providing real-time PII detection and network interception, with all data processed entirely on-device.

Umbrai

An on-device AI privacy app that anonymises sensitive data and ensures full GDPR compliance for EU businesses.

PiiBlock / PrivacyShield

A free, open-source browser extension that masks personal data before it reaches AI chatbots — zero server-side processing.

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Decentralised & Self-Sovereign AI



A new generation of tools is placing AI control firmly back in the hands of the individual — removing reliance on centralised cloud providers entirely.

- **Vora Aegis:** Self-hosted AI with a security-first approach, keeping all secrets offline.
- **PIN AI:** Combines cryptographic security with private off-chain computation and on-device language models.
- **Thinkspan:** An end-to-end encrypted super app powering a private AI assistant with fully local data processing.

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Key Features of Modern Data Protection Tools

Local Processing

All sensitive data analysis occurs directly on the user's device — no cloud upload required.

Real-Time Detection & Masking

Instant identification and anonymisation of PII and PHI before any data is transmitted.

Visual Feedback

Sensitive data is highlighted in-context, actively educating users about what they are sharing.

Custom Rules & Control

Users can define their own exclusions, whitelist services, and manage data access granularly.

Compliance & Audit Trails

Built-in support for GDPR and other regulatory frameworks, with full logging for accountability.

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THE ROAD AHEAD

The Future is Private

The landscape is shifting decisively towards user-controlled, private AI interactions. Centralised data harvesting is no longer an inevitable trade-off.

On-device processing and robust anonymisation are the twin pillars of **digital sovereignty** — enabling individuals and organisations to harness the full power of AI without surrendering their personal data.

Adopting privacy-first tools is not a compromise on capability — it is an upgrade in control.

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AI generated content in students' work, when and how

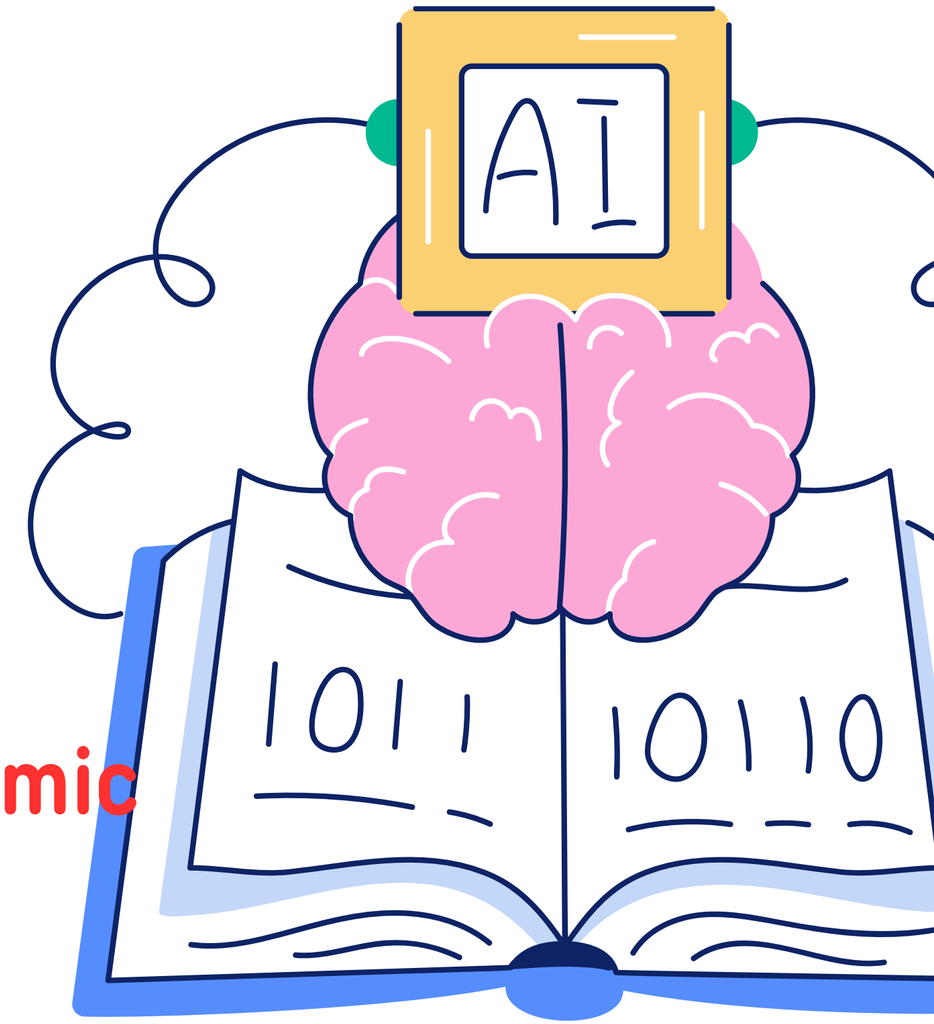
Aleksandra Klich, PhD
University of Szczecin

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WHY THIS TOPIC MATTERS?

Students use AI for:

- writing **essays**
- summarizing **texts**
- generating **ideas**
- translating **content**



But: misuse may lead to legal or academic consequences

What Is AI-Generated Content?



TEXTS (ESSAYS, REPORTS)



SUMMARIES



TRANSLATIONS



IMAGES AND PRESENTATIONS

created fully or partially by AI systems

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Key Legal Issue

Who is the author?

Student or AI?



Copyright and AI



Important rules:

- copyright protects human creativity
  - AI has **no legal personality**
  - AI **cannot be an author**

responsibility lies with the student

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Plagiarism and AI

Using AI may still be plagiarism if:

- you present AI-generated text **as your own**
- you **do not verify** the content
- you **copy** without attribution



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GDPR and AI Use

AI tools may process personal data.

Risks:

- **sharing personal data** with AI tools
- **uploading sensitive** information
- **lack of control over data** processing

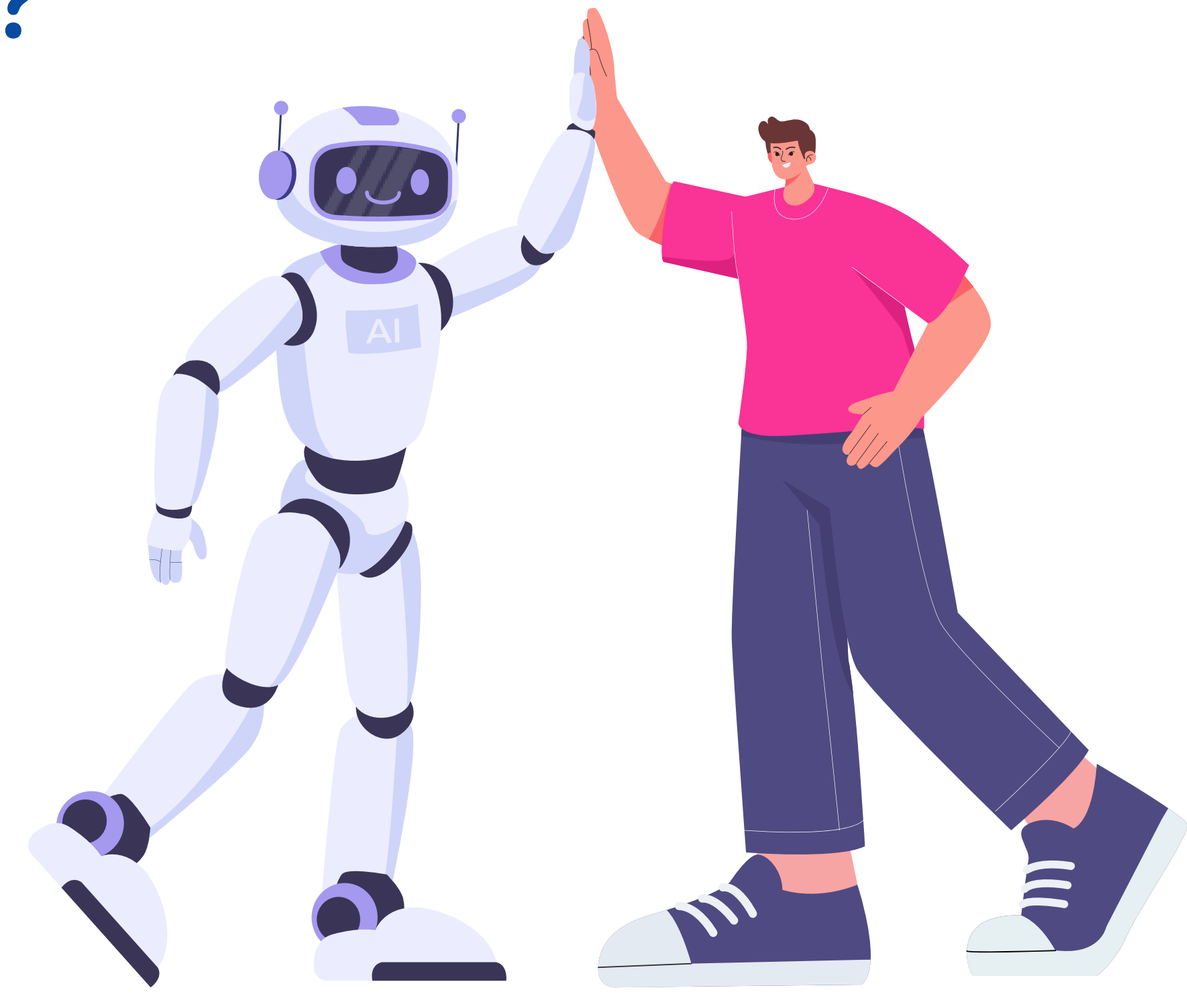


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When Is AI Use Acceptable?

AI can be used for:

- brainstorming ideas
- improving language
- summarizing materials
- structuring work



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When Is AI Use Problematic?

AI use **becomes risky when:**

- AI generates the entire assignment
- content is not verified
- sources are not checked
- use is not disclosed (if required)



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Legal Responsibility of Students

Students are responsible for:

- the **content** they submit
- **accuracy** of information
- **compliance** with academic rules
- respecting **intellectual property**



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Good Practices

- always **verify** AI-generated content
- **check** sources
- use AI as a **support tool**
- follow **university rules**
- be **transparent** about AI use



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Key Message

AI can support your work

but it cannot replace your responsibility



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QUIZ – CASE 1

A student uses ChatGPT to:

- generate ideas for an essay
- then writes the text independently

Legal or not?



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QUIZ – CASE 2

A student submits a fully AI-generated essay without editing or disclosure.

Legal or not?



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QUIZ – CASE 3

A student uses AI to summarize a book and submits the summary without checking it.



Legal or not?

QUIZ – CASE 4

A student uploads personal data of a client into an AI tool to generate legal advice.

Legal or not?



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Case Study: Disciplinary Proceedings

A student submits an AI-generated paper.



The university:

- detects unusual writing style
- checks AI detection tools
- initiates disciplinary proceedings

Possible consequences:

- failing the course
- disciplinary sanctions
- reputational damage

Legal or not?

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What Professors Can Detect

Professors may notice:

- sudden change in **writing style**
- **lack of** depth or critical thinking
- incorrect or **fabricated sources**
- overly generic **arguments**



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What Professors Cannot Detect

AI detection tools:

- are **not fully reliable**
- may produce **false results**
- cannot **prove authorship**

but responsibility still remains



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Legal Reality

AI tools:

- ✗ are not responsible
- ✗ cannot be punished
- ✗ cannot be accused



You are responsible

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Thank you for your attention!



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Green AI

Dr Tymoteusz Miller

University of Szczecin

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Green AI: Navigating the Environmental Impact of Artificial Intelligence

As artificial intelligence accelerates across every sector, its environmental cost is becoming impossible to ignore. This presentation examines AI's growing energy hunger, the e-waste crisis, the unique impact of generative AI, and what users and developers can do to build a more sustainable digital future.

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CHAPTER 1

The Unseen Footprint of AI

Behind every AI query, recommendation, and generated image lies a vast industrial infrastructure consuming water, electricity, and rare materials at scale. Before we can address AI's environmental cost, we must first make it visible.



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AI's Growing Thirst: Electricity Consumption

2x

Data Center Energy

Global data center electricity use is predicted to nearly double between 2022 and 2026, driven largely by AI workloads.

11x

AI Compute Demand

Global electricity demand for AI computing is expected to be 11 times higher in 2030 than it was in 2023.

2030

U.S. Data Centers

By 2030, U.S. data centers may consume more electricity than the entire energy-intensive goods production sector combined.

These projections underscore a structural challenge: AI's energy appetite is growing faster than the grid's capacity to supply it cleanly. Without intervention, the carbon footprint of AI risks undermining global climate commitments.

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The Scale of AI Models: From Billions to Trillions

Exponential Parameter Growth

The number of parameters in AI models has surged from **1.5 billion** in GPT-2 (2019) to an estimated **2 trillion** in LLaMA 4 (2025). Each parameter requires memory, compute, and energy — multiplied across billions of inference requests daily.

This explosion in model size directly correlates with dramatic increases in training energy costs, water usage for cooling, and the volume of specialized hardware required.

The Doubling Cadence

The computational effort required to train frontier AI models doubles approximately every **five months** — a pace far outstripping improvements in hardware efficiency. Even as individual chips become more efficient, the sheer scale of new models erases those efficiency gains entirely.



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AI's Insatiable Appetite

Every AI interaction — from a search query to a generated image — triggers energy-intensive compute cycles across distributed data centers. The infrastructure required is staggering in scale, and it is growing.



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The E-Waste Crisis: AI's Disposable Hardware

The World's Fastest-Growing Waste Stream

Electronic waste is already recognized globally as the **fastest-growing waste stream**, with tens of millions of metric tons generated annually. AI is accelerating this trend, as rapid model iteration drives equally rapid hardware replacement cycles — GPUs, TPUs, and custom accelerators become obsolete within years, sometimes months.

Unlike traditional electronics, AI-specific chips often contain rare earth materials that are extremely difficult and costly to recover through recycling.



Manufacturing Impact

Producing AI chips requires energy-intensive semiconductor fabrication, contributing significant carbon before a single inference is run.

Short Replacement Cycles

Competitive pressure accelerates hardware obsolescence, shrinking the operational lifespan of data center equipment.

Low Recycling Rates

Fewer than 20% of e-waste materials are formally recycled globally, leaving toxic compounds in landfills and waterways.

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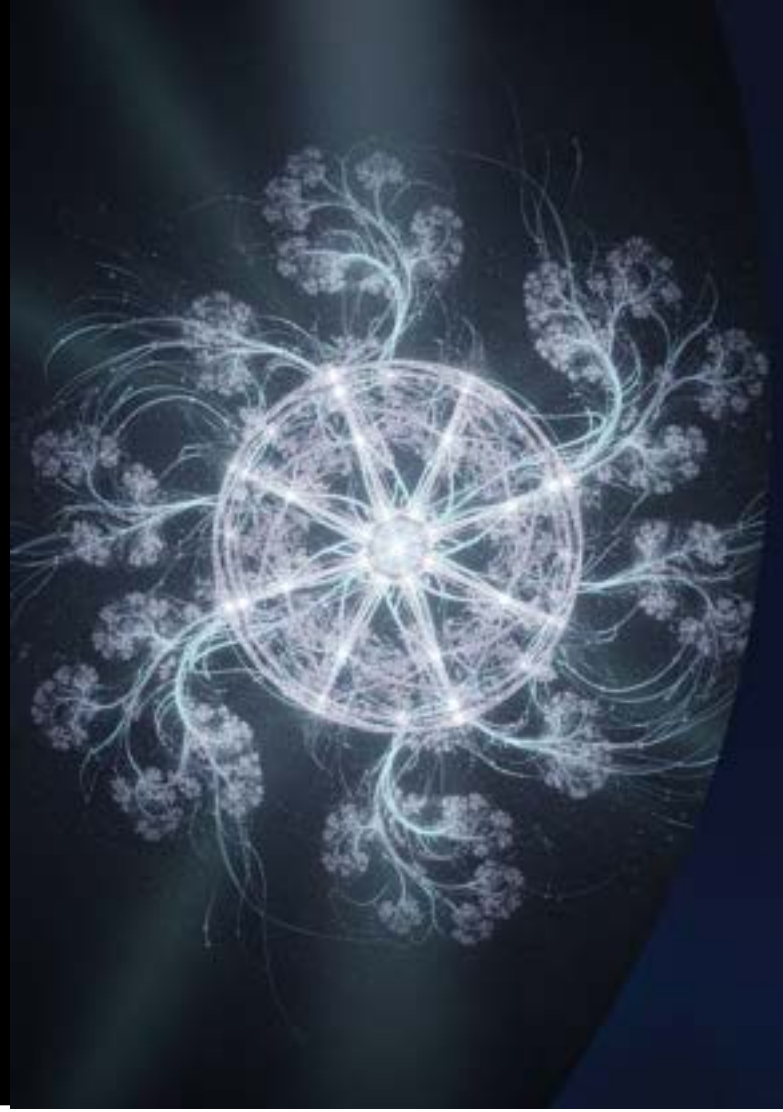
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CHAPTER 2

The Cost of Reasoning and Generative AI

Generative and reasoning AI models represent a qualitative leap in capability — and a corresponding leap in environmental cost. Understanding this new class of impact is essential for any honest sustainability assessment.

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Generative AI: A New Level of Impact



Training at Scale

Generative AI models are trained on datasets measured in petabytes, requiring weeks or months of continuous compute across thousands of specialized accelerators — each training run emitting carbon equivalent to dozens of transatlantic flights.



Reasoning Model Surge

Reasoning models have seen a staggering **320-fold increase** in usage in 2025 compared to 2024. Each "chain-of-thought" inference cycle consumes far more compute than a standard query, multiplying the per-request energy cost dramatically.



Advertising Integration

Image and video generation models are being integrated into digital advertising at an unprecedented pace, embedding high-energy AI inference into billions of daily impressions across global ad networks.

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Digital Waste: The Unstudied Problem

While physical waste is visible and measurable, **digital waste** — data stored without purpose, redundant synthetic content, and idle model weights — represents an emerging sustainability challenge that remains largely unquantified.

Dark Data

Vast quantities of stored data consume server energy and cooling resources without ever being accessed or serving a productive function. Estimates suggest over 50% of enterprise data falls into this category.

Synthetic Data Explosion

Generative AI enables the creation of synthetic data at unprecedented scale. Without governance, this accelerates the accumulation of digital waste, consuming storage and compute resources for content that may never be used.

Intergenerational Impact

The energy and infrastructure commitments made today to support digital waste will persist for decades. The environmental costs of today's data glut will be inherited by future generations.

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The Hidden Cost of Innovation

Every upgrade cycle, every new model iteration, every discarded device contributes to a growing environmental ledger that the AI industry has yet to fully account for. The true cost of innovation must include what we leave behind.



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CHAPTER 3

The Imperative for Green AI

Recognizing the problem is only the first step. The imperative for Green AI demands systemic change — in how we measure, report, design, and govern artificial intelligence systems across their entire lifecycle.



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Measuring What Matters: The Need for Transparency

A Transparency Deficit

Even as AI deployment has accelerated dramatically, **transparency about its environmental impacts has declined**. Major AI labs have reduced public reporting on training energy, water usage, and emissions — making independent verification nearly impossible.

Inconsistent measurement practices and fragmented accountability structures obscure the true scale of AI's footprint and prevent meaningful comparison between providers and models.

What Mandatory Transparency Must Cover

- **Inference consumption** — per-query energy use across deployment at scale
- **Compute locations** — grid carbon intensity of data center locations
- **Training benchmarks** — standardized reporting of training energy and emissions
- **Water usage** — cooling water consumption per model and facility

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The Sustainable AI Quotient (SAIQ)

The **Sustainable AI Quotient (SAIQ)** is an emerging metric framework designed to track how efficiently AI systems transform money, energy, and emissions into measurable performance outcomes — enabling decision-makers to balance financial viability, energy resilience, and environmental impact simultaneously.

Smarter Silicon

Invest in energy-efficient chip architectures — including neuromorphic and analog computing — that deliver more compute per watt.

Cleaner Data Centers

Transition data center power to verified renewable sources and optimize cooling infrastructure for water and energy efficiency.

Strategic AI Use

Deploy AI selectively where it delivers genuine value, avoiding unnecessary inference on low-value tasks that inflate the environmental cost-benefit ratio.

Governance-as-Code

Embed sustainability constraints directly into AI development pipelines — automated checks for energy budgets, model size thresholds, and emissions limits.

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Greenpeace's Call to Action: Limit Negative Impacts

Ecological Risk at the Forefront

Greenpeace has issued urgent calls for the tech industry to confront AI's ecological impact head-on — moving beyond narrow conversations about social risk and bias to address the physical, planetary costs of AI infrastructure.

Their position is clear: **AI must not be allowed to exacerbate the climate crisis**. The energy demanded by AI data centers must be met with clean power, not extensions of fossil fuel infrastructure. Water stressed regions must not bear the burden of cooling AI systems serving global consumers.

Greenpeace advocates for binding commitments, independent audits, and civil society participation in AI governance — ensuring ecological accountability is not left to voluntary corporate disclosures.



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Balancing Growth with Responsibility

The choice is not between AI progress and environmental protection. It is about designing systems, policies, and behaviors that allow both to coexist — and thrive together.

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CHAPTER 4

User and Developer Responsibility

Systemic change requires individual action. Whether you are an end user, a software developer, or an enterprise decision-maker, the choices you make in how you adopt, build, and consume AI have real and measurable environmental consequences.

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Optimizing AI Use: Responsible Consumption

1

Measure Your Footprint

Proactively request usage data and energy estimates from your AI suppliers. Prioritize vendors who offer transparent, verifiable reporting on inference energy and emissions per query.

2

Question AI's Necessity

Before deploying AI for a task, ask whether a simpler, lower-energy solution would suffice. Not every problem requires a large generative model — apply AI where it genuinely delivers irreplaceable value.

3

Exercise Your Rights

Users have the right to opt out of unnecessary generative AI integration in products and services. Push back on feature bloat that embeds high-energy AI into workflows that do not require it.

4

Advocate Internally

Champion sustainability criteria in AI procurement decisions within your organization, including energy source requirements and efficiency benchmarks for shortlisted providers.

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Greener Coding and Model Choices

Practical Developer Actions

Developers hold significant leverage over AI's environmental impact. The models chosen, the infrastructure selected, and the code written all directly determine the energy consumed at inference time — multiplied across millions of user interactions.



Right-Size Your Models

Choose the **smallest model** that meets your task's performance requirements. Larger is not always better — and the energy difference between a 7B and 70B parameter model is enormous at scale.



Leverage Pre-Trained Models

Utilize fine-tuning and transfer learning from pre-trained models instead of training from scratch. Reusing existing weights eliminates the enormous upfront training energy cost.



Green Coding Practices

Train development teams in **sustainable software engineering** — optimizing loops, reducing redundant computation, and designing inference pipelines for energy efficiency from day one.

Model Selection Checklist

- Does the provider publish energy consumption data?
- Is the data center powered by verified renewables?
- Is there a smaller model variant that meets requirements?
- Can quantization or pruning reduce inference cost?
- Is fine-tuning available instead of full training?
- Does the provider offer carbon-offset API tiers?

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The Future of AI: A Sustainable Path Forward

AI is a genuinely powerful technology with transformative potential — but **that potential does not come without cost**. Technological advances in chip efficiency and renewable energy are necessary, but they are not sufficient on their own.

1 Acknowledge the Cost

Recognize that AI's environmental footprint is real, large, and growing — and that honest accounting is the foundation of any credible sustainability strategy.

2 Demand Transparency

Push for mandatory, standardized reporting from AI providers on energy, water, and emissions — at the model, inference, and facility level.

3 Build Consciously

Embed sustainability into every phase of AI development — from architecture choices and training infrastructure to deployment decisions and end-of-life hardware planning.

4 Govern Proactively

Embrace Green AI policies that align AI's exponential growth trajectory with international climate commitments, before the environmental debt becomes irreversible.

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Your Role in a Sustainable AI Future

The scale of AI's environmental challenge can feel overwhelming — but individual and collective choices matter enormously at this critical juncture.

🌍 Understand

Educate yourself on the real environmental costs behind the AI services you use daily. Awareness is the first form of accountability.

📣 Advocate

Demand transparency from AI providers and policymakers. Support organizations and regulations that hold the tech industry to rigorous, enforceable environmental standards.

⚡ Act

Make conscious, deliberate choices as a user and developer. Minimize unnecessary AI consumption, select greener providers, and champion sustainable practices in every team and organization you are part of.

The future of AI does not have to be a future of environmental compromise. With the right choices — made now, by everyone in this ecosystem — Green AI can become the standard, not the exception.

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AI at the Workplaces

Dr. Hasibe Aysan

Ostim Technical University, Ankara, Türkiye

14 April 2026

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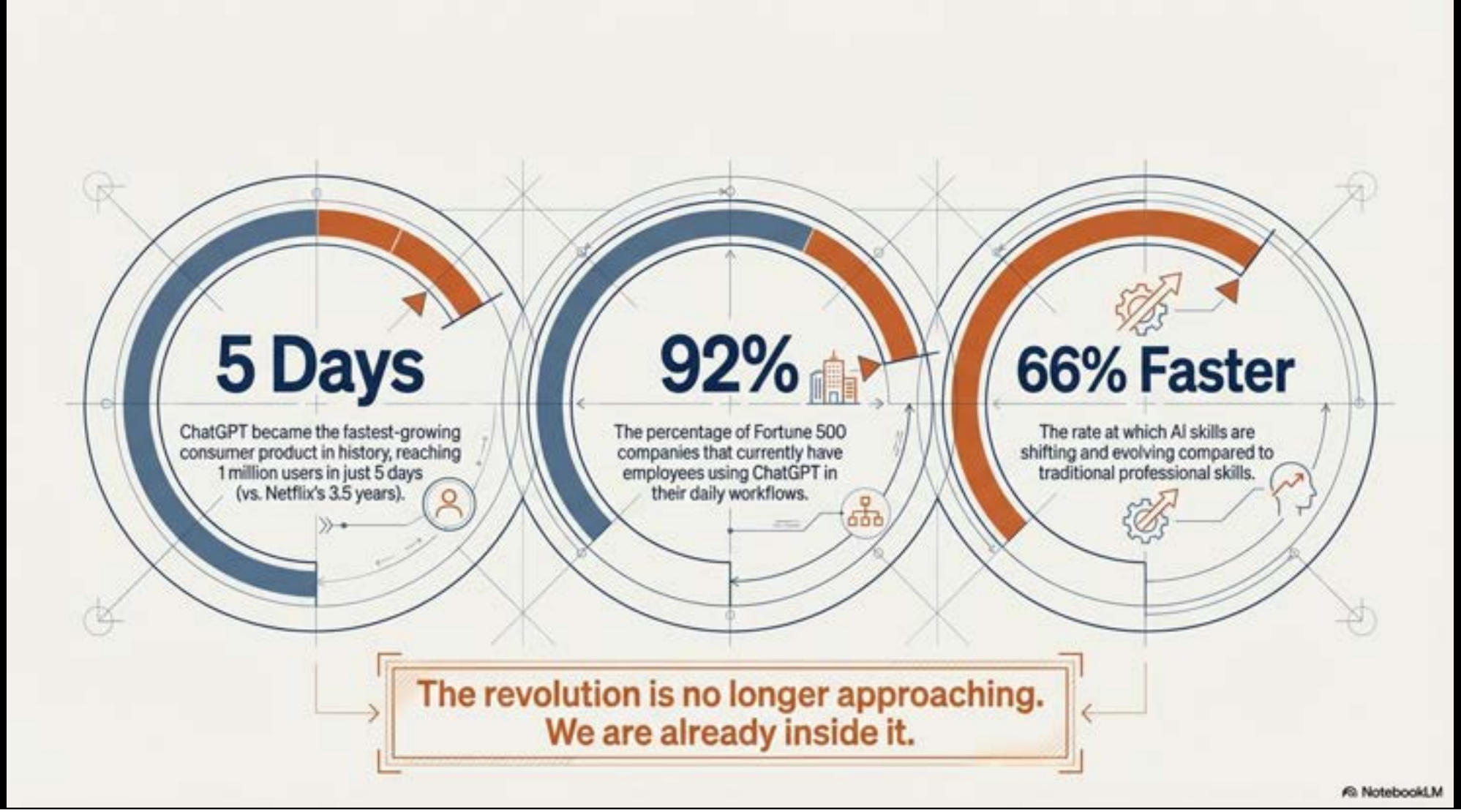
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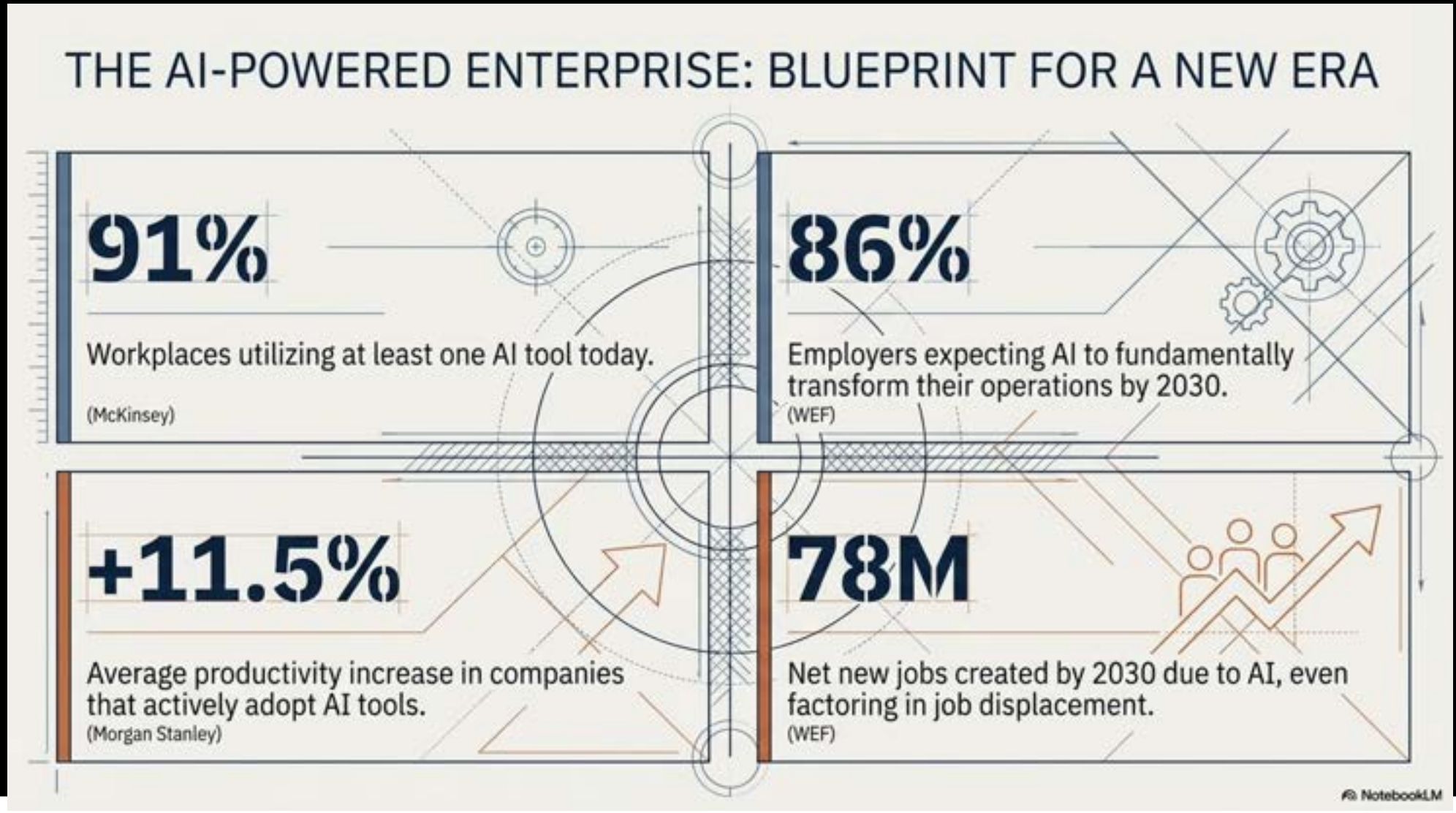
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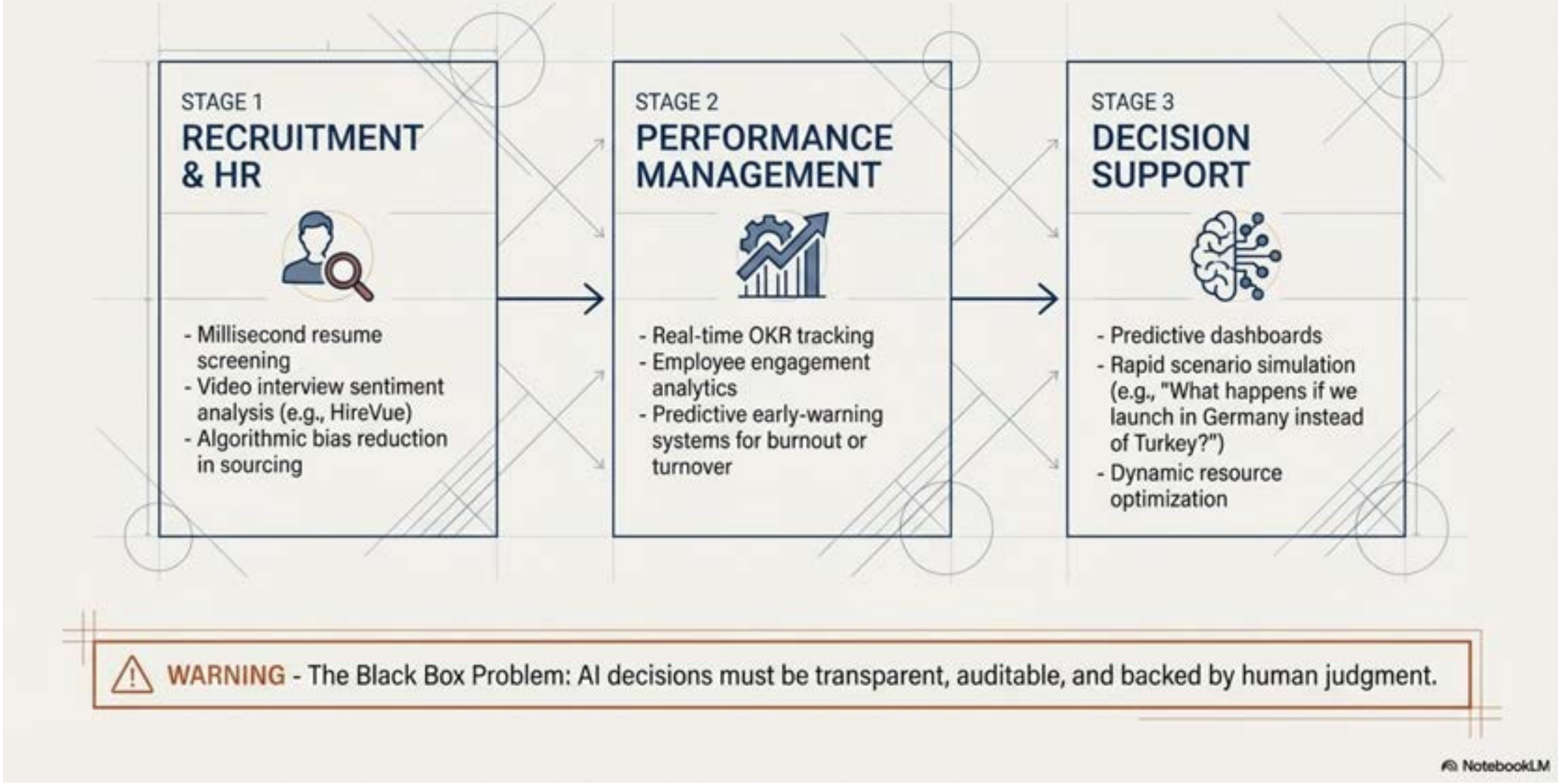
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AI-Powered Management: The Manager's Perspective

SECTION 04 • 8 min

Recruitment & Hiring

- Resume screening in seconds
- Video interview analysis (HireVue)
- Bias reduction algorithms
- Employer brand analytics

Performance Management

- Real-time OKR tracking
- Employee engagement analytics
- Personalized development plans
- Early warning systems

Decision Support

- Predictive analytics dashboards
- Scenario simulation
- Risk assessment models
- Resource optimization

⚠ ETHICAL NOTE: AI decisions must be transparent, auditable, and backed by human judgment. 'Black box' decisions create legal and ethical risk.

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AI Ethics: Key Concerns for Discussion

What managers and employees need to understand

Privacy & Surveillance

AI can monitor employee behavior. Where's the line? GDPR compliance is mandatory.

Algorithmic Bias

Bias in training data transfers to AI decisions. Diversity auditing is essential.

Job Displacement

Some roles will transform while new ones emerge. Continuous learning is the only security.

Transparency

Employees have the right to know what data AI uses to make decisions about them.

Discussion: "If an AI system decided to fire you, would you accept the decision? Why or why not?"

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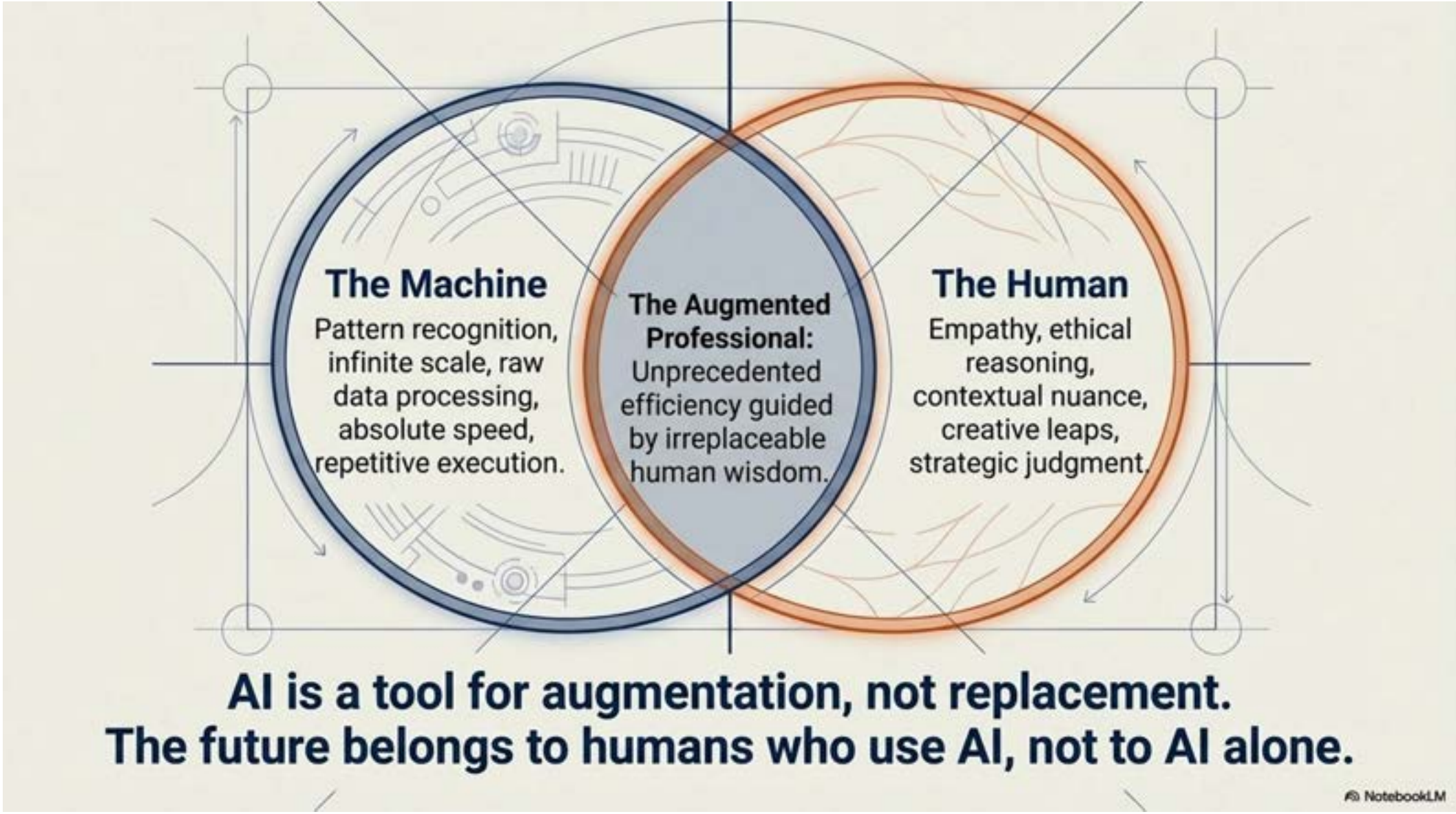
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THE REALITY

59%

59% of the global workforce requires reskilling by 2030 (Over 1 billion people).

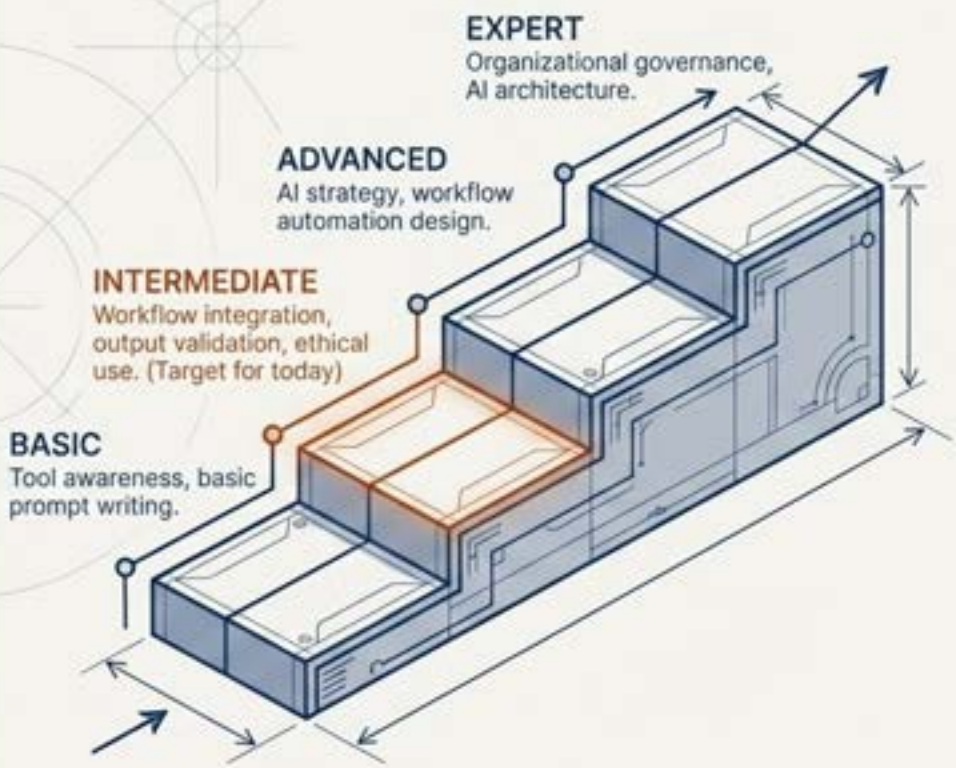
63%

63% of employers report that the skills gap is actively hindering growth.

39%

39% of core job skills will fundamentally change in the next 5 years.

THE AI LITERACY STAIRCASE



NotebookLM

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Future Skills & Career Readiness

SECTION 05 • 10 min

THE SKILLS GAP — BY THE NUMBERS

59% of global workforce needs reskilling by 2030

63% of employers say skills gaps block business growth

39% of core job skills will change by 2030

77% of companies plan to reskill employees for AI

Source: WEF Future of Jobs Report 2025

AI LITERACY FRAMEWORK

FOUNDATIONAL

AI awareness, prompt writing, basic tool usage

INTERMEDIATE

Integrate AI into workflows, validate outputs, ethical use

ADVANCED

AI strategy, automation design, model evaluation

EXPERT

AI governance, architecture design, org transformation

✅ Career Readiness Checklist → see next slide

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This Week

- Open a free ChatGPT or Claude account.
- Execute exactly one real-world task using AI (draft an email, summarize a PDF).
- Explore the free 'AI for Everyone' course on Coursera.

This Month

- Integrate one AI tool into a daily habit.
- Add 'AI Tools' to your LinkedIn skills profile (algorithms favor this).
- Define your personal ethical boundaries for AI use.

This Year

- Complete a formal AI certification.
- Build a small portfolio project using AI automation.
- Mentor a colleague or peer on AI tips.

Curated Free Resources:

Google AI Essentials | Microsoft AI Skills | DeepLearning.AI | Elements of AI (University of Helsinki)

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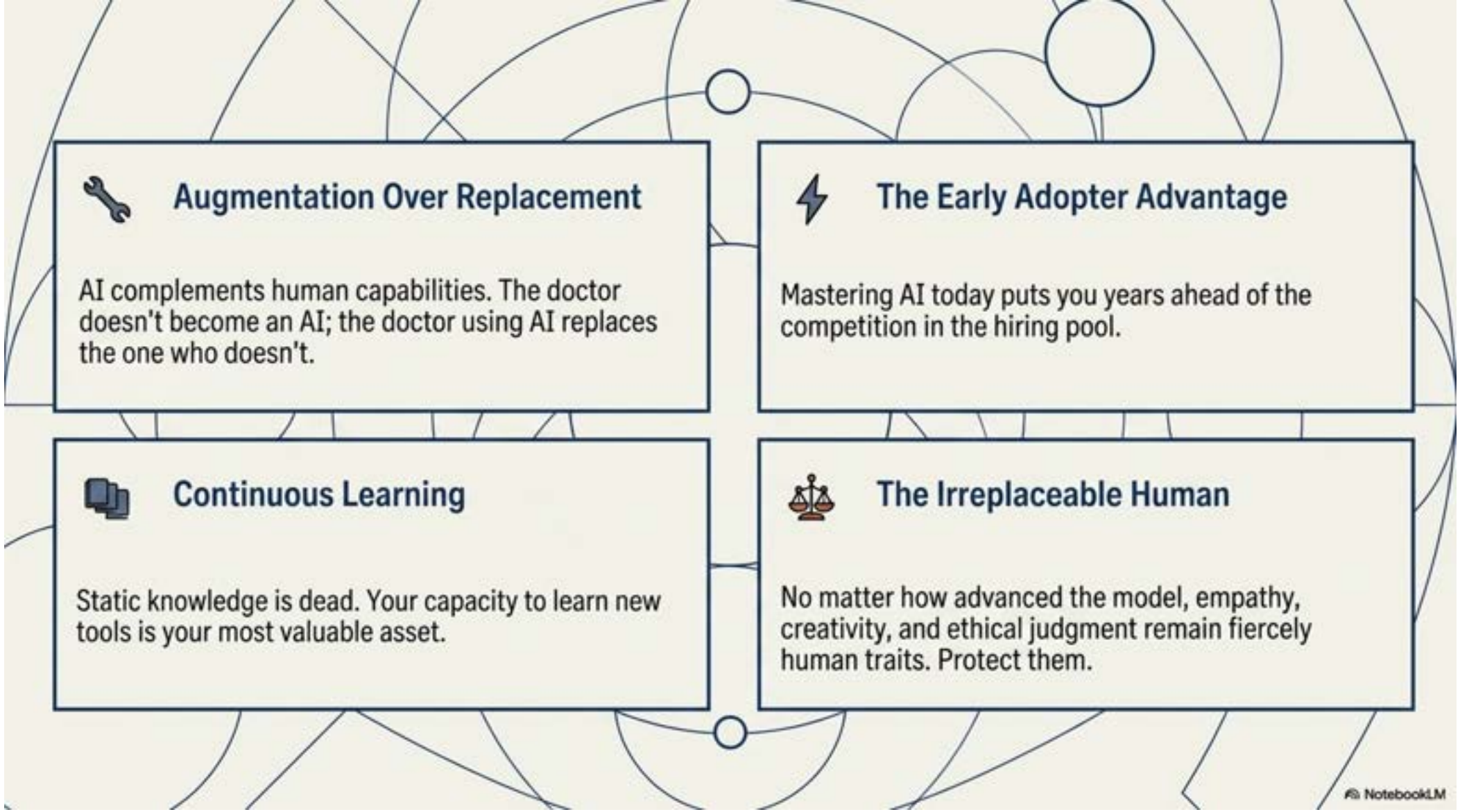
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Case Study Spotlight

Real-world AI impact

JPMorgan Chase

COIN program reviews 12,000 commercial credit agreements in seconds — a task that previously took 360,000 hours/year of lawyer time.

360,000 hrs saved

Amazon

AI-powered demand forecasting reduced inventory costs by 25%, while recommendation engines drive 35% of total revenue.

35% revenue from AI

Mayo Clinic

AI detects irregular heart rhythms from normal ECGs, identifying patients at risk of heart failure up to 10 years in advance.

10-year early detection

Netflix

AI-driven content recommendations and production decisions save an estimated $1 billion annually in customer retention.

$1B saved per year

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AI Tools Every Employee Should Know

SECTION 03 • 10 min

📋 FOR DAILY PRODUCTIVITY

ChatGPT / Claude
Writing, research, coding, summarizing — FREE

Microsoft Copilot
Word, Excel, Teams integration — WORK

Notion AI
Smart note-taking & organization — FREE

Grammarly
Grammar, tone & writing quality — FREE

Otter.ai
Meeting transcription & summaries — FREE

🎯 FOR CAREER DEVELOPMENT

LinkedIn AI Features
Profile optimization, job matching — FREE

Coursera / edX AI
Personalized learning paths — FREE

Kickresume
AI-powered CV & cover letter builder — FREE

GitHub Copilot
AI coding assistant for developers — STUDENT

Beautiful.ai
AI-powered presentation design — FREE

⚡ TIP: Just 1–2 hours of weekly AI practice creates a significant competitive edge within 6 months.

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THE 2026 AI WORKPLACE ECOSYSTEM: A STRATEGIC BLUEPRINT

CORE TECHNOLOGIES

Agentic AI: The Decision-Maker

Unlike traditional AI that only analyzes. AI agents automate complex, high-value workflows in finance, HR, and IT by making autonomous decisions and interacting with other agents.

Natural Language Processing (NLP)

The foundational tech for understanding and processing human language, powering everything from real-time customer support bots to sentiment analysis in marketing.

Robotic Process Automation (RPA)

The workhorse of efficiency. RPA automates repetitive, high-volume digital tasks like invoice processing, form filling, and report generation to eliminate "boring" work.

GOVERNANCE PILLAR

The 5 Ps Governance Framework

A comprehensive model for CAIOs focusing on People (interdisciplinary teams), Priorities (risk triaging), Processes (audit trails), Platforms (monitoring), and Progress (maturity metrics).

7% GLOBAL TURNOVER PENALTY

The cost of non-compliance under the EU AI Act for "unacceptable risk" violations, making governance a matter of business continuity rather than just a "nice-to-have".

EU AI Act Risk Tiers

- **Unacceptable Risk (Banned)**
  Examples: Social scoring, exploitative ai, real-time public biometrics
- **High-Risk (Strictly Regulated)**
  Examples: Firing-CV screening, critical infrastructure, credit scoring
- **Transparency Risk (Clear Disclosure)**
  Examples: Chatbots, deepfakes (AI generated content), emotion recognition
- **Minimal/No Risk (No Mandatory Req.)**
  Examples: Spam filters, AI-enabled video games, inventory systems

WORKFORCE PILLAR

44% SKILLS DISRUPTION BY 2027

According to the World Economic Forum, nearly half of current workforce skills will be disrupted, making AI and data literacy the chief requirements for future employees.

The Rise of the AI Generalist

As agents handle specialized mid-tier work, demand is surging for generalists who can oversee AI "collaborators" and align their outputs with high-level business goals.

The 3-Layer AI Literacy Framework

- **Strategic** (Oversight & Accountability)
  For co. Bieprwaring fuelists to manage the AI lifecycle, including regulatory compliance and escalation.
- **Applied** (Decision & Action)
  Focus: Equipping teams to caree AI outputs, assess risk, and eagiment AI results with human reasoning.
- **Foundational** (Nouraness & Understanding)
  Focus: Universal baseline of AI concerns, rates of data, ana adlical hadianacs for all employees.

KEY PRODUCTIVITY TOOLS

Microsoft Copilot

The primary workplace integration topl, embedding AI directly into Word, Excel, Teams, and Gmail for seamless document and workflow assistance.

Otter.ai

An essential meeting tool that provides automatic real-time transcription, speaker identification, and AI generated summaries with action items.

Fireflies.ai

An AI meeting assistant specifically for groups that records, transcribes, and creates a searchable archive of all project decisions.

Perplexity.ai

A research-focused engine that provides real-time web search with source citations, effectively replacing standard search for academic and business data.

AI IS A PRODUCTIVITY MULTIPLIER, NOT A REPLACEMENT.

The future of work belongs to those who treat AI as a collaborative partner to expand what people are able to do.

NotebookLM

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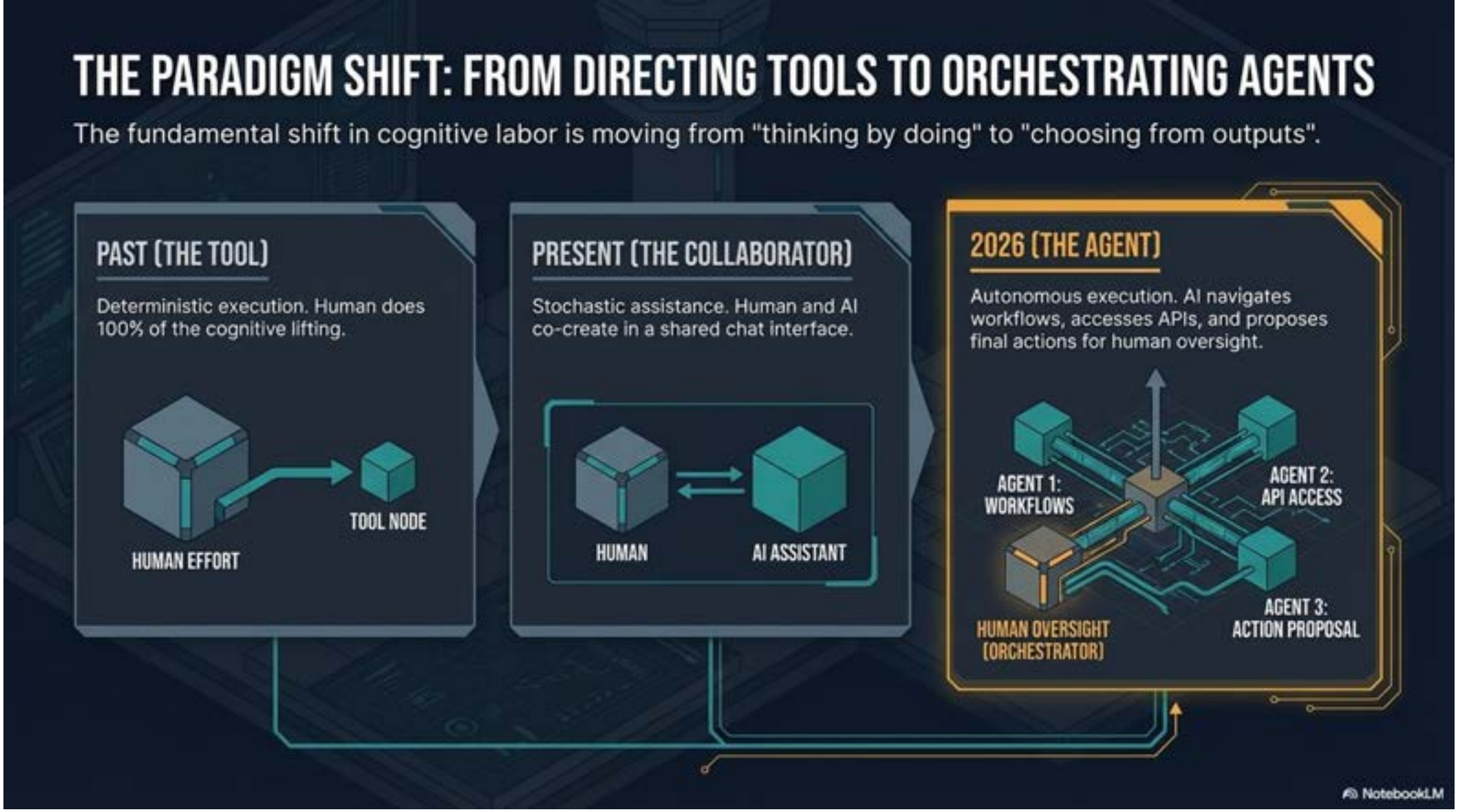
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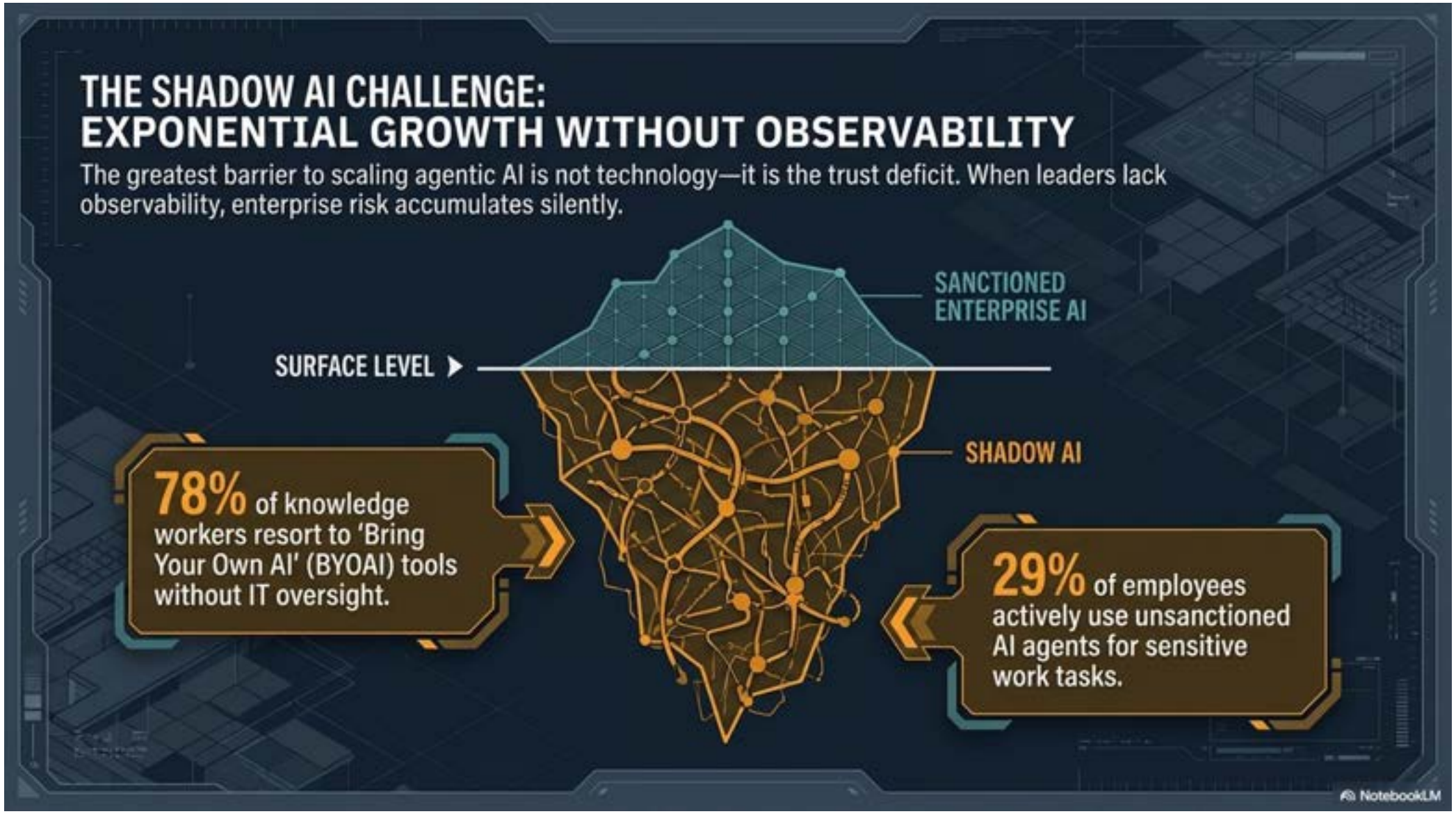
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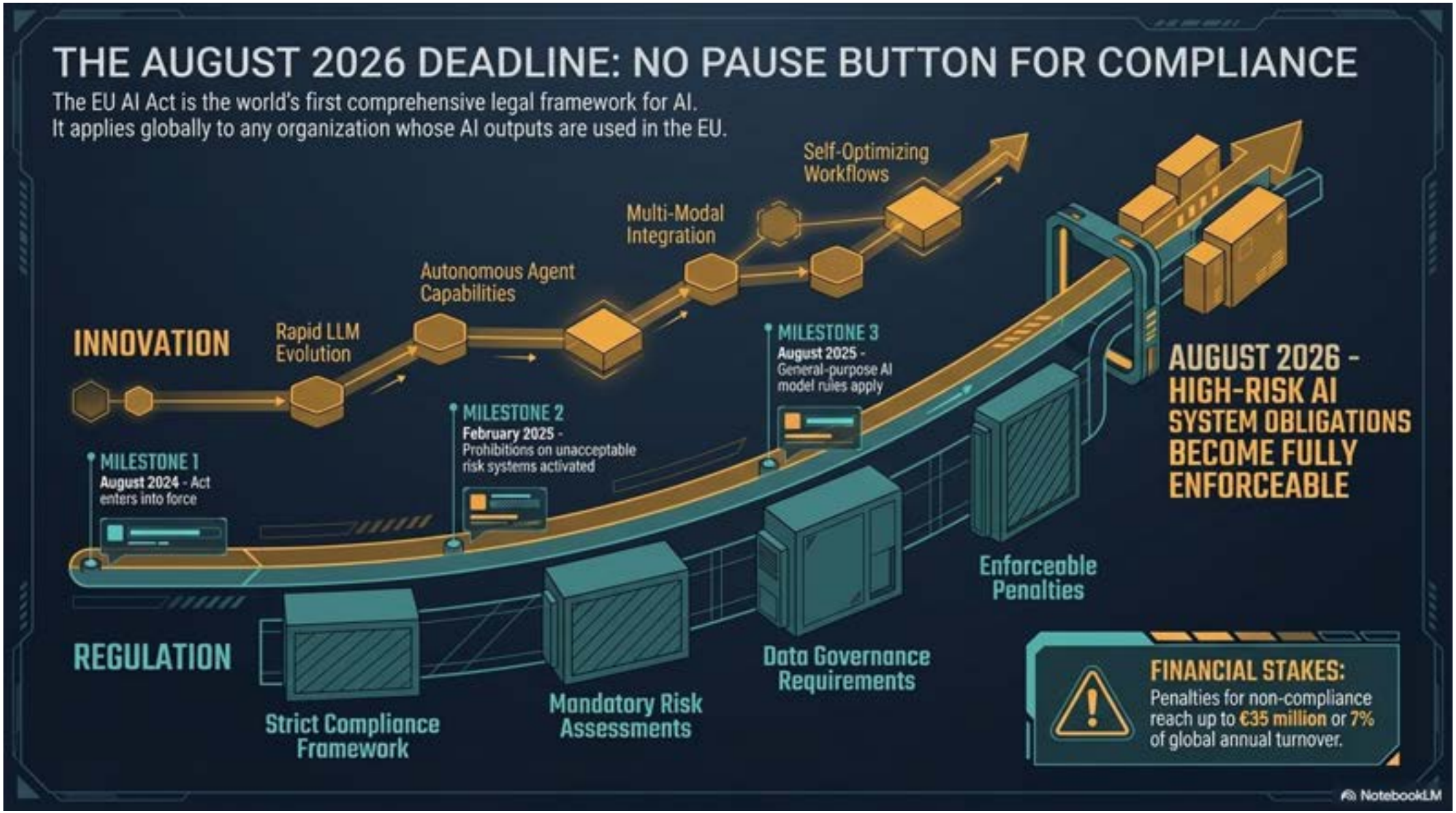
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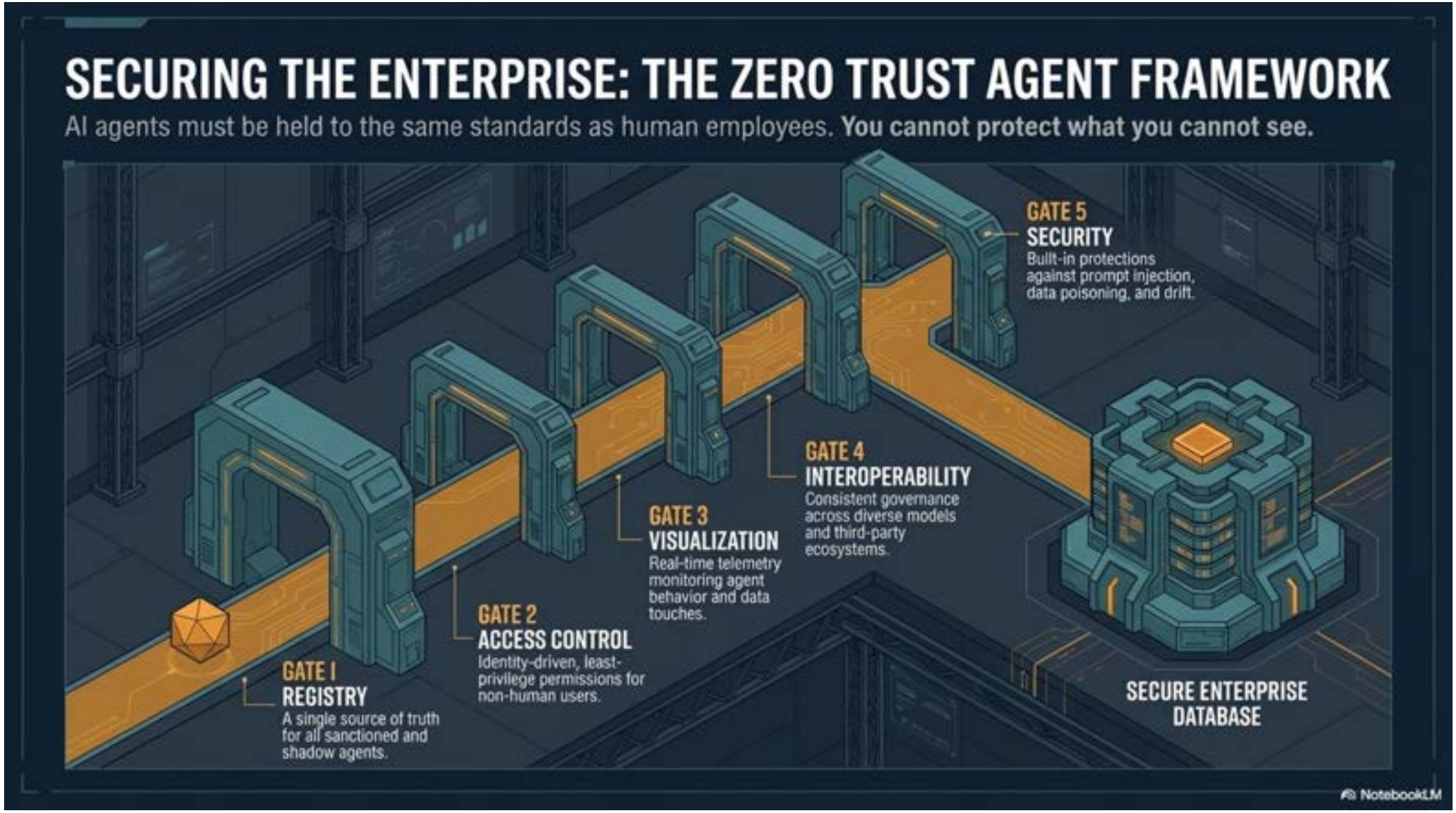
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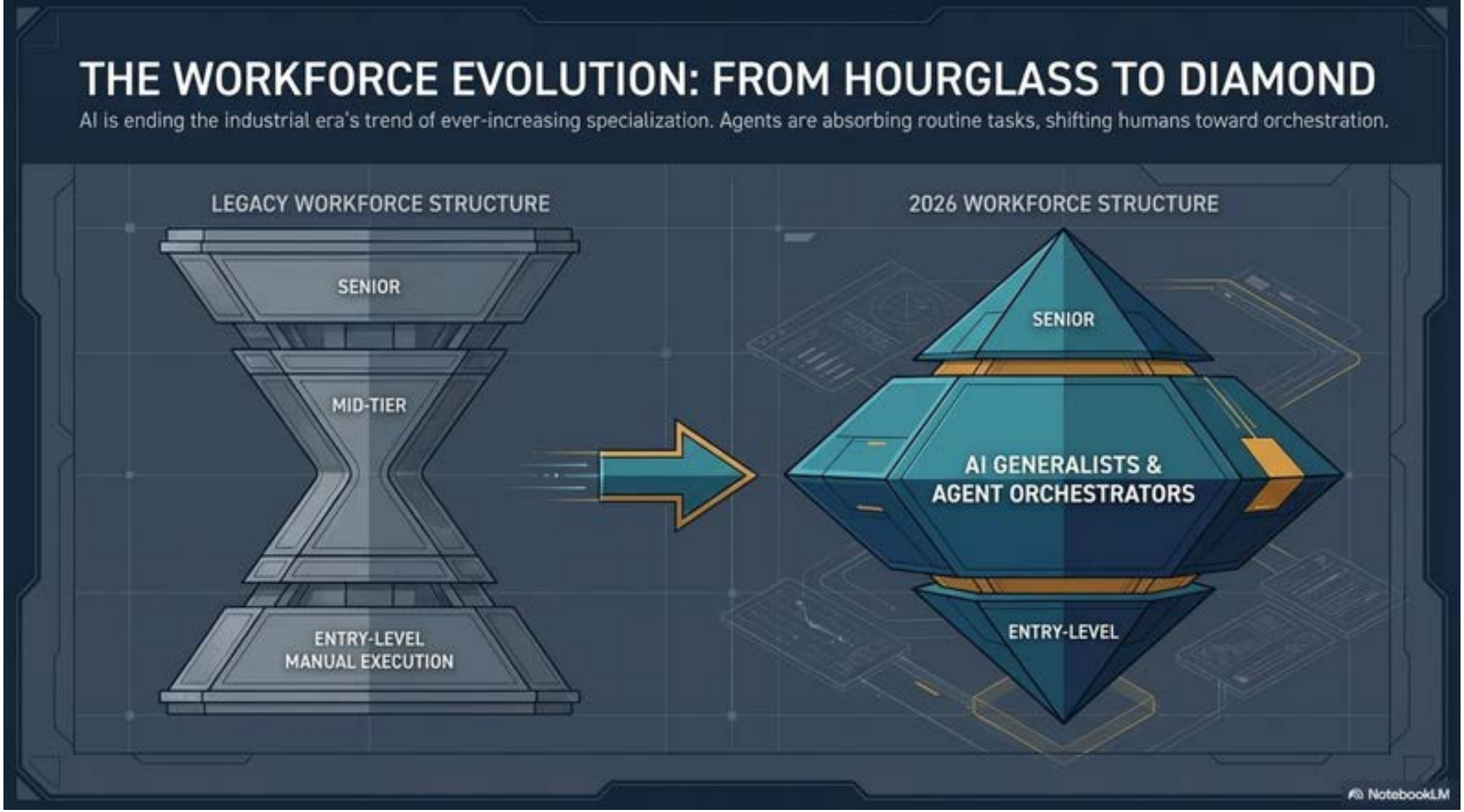
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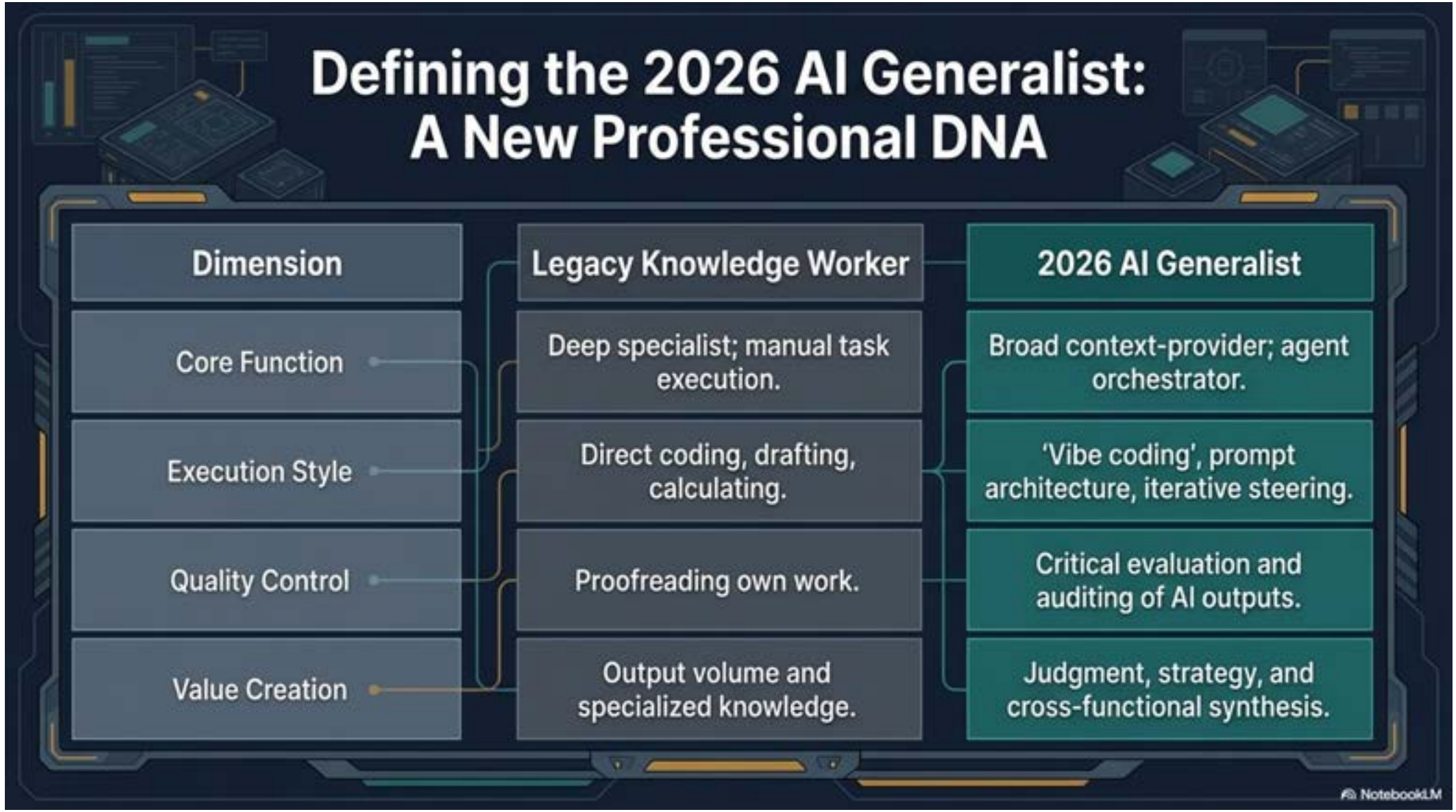
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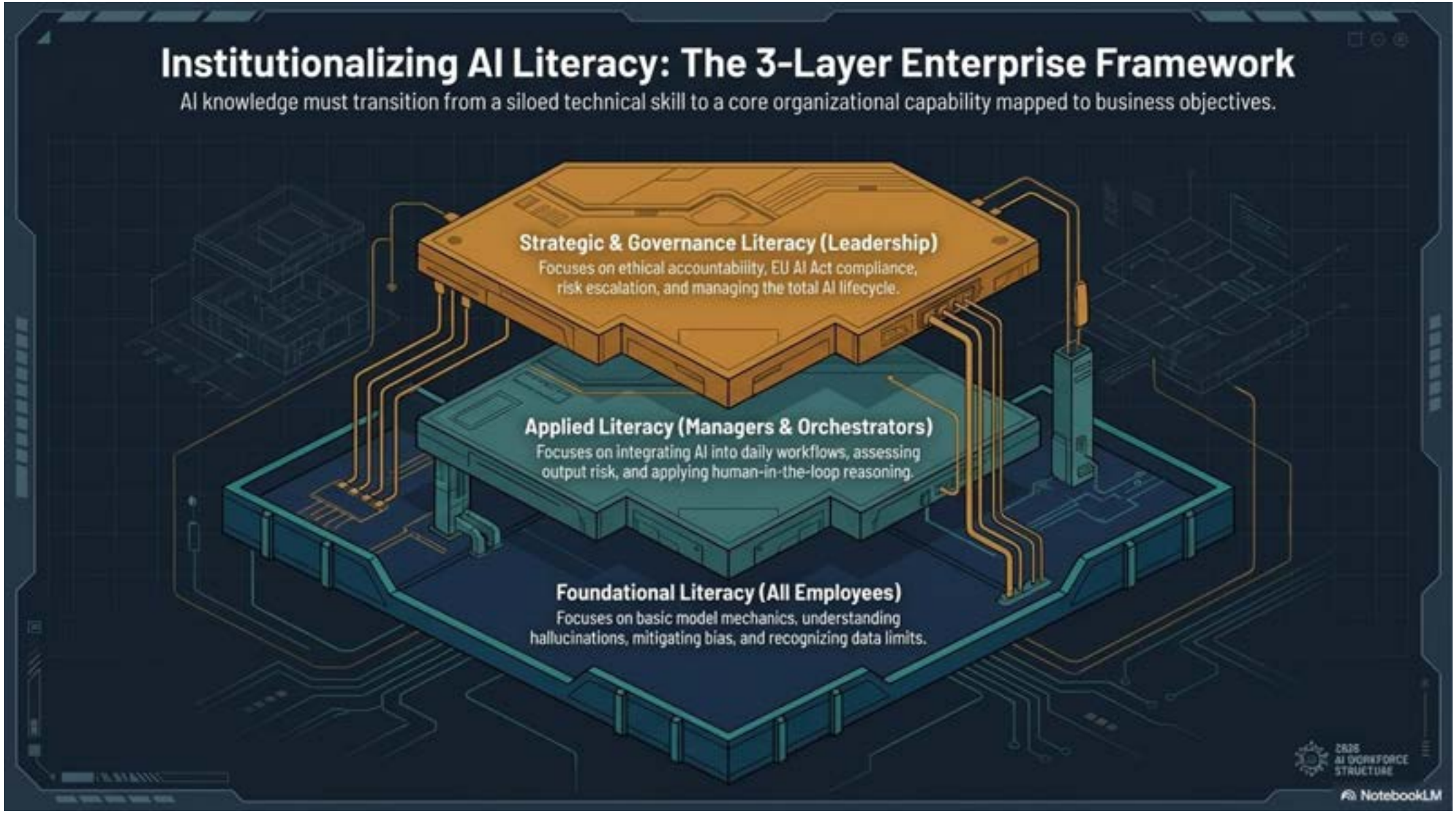
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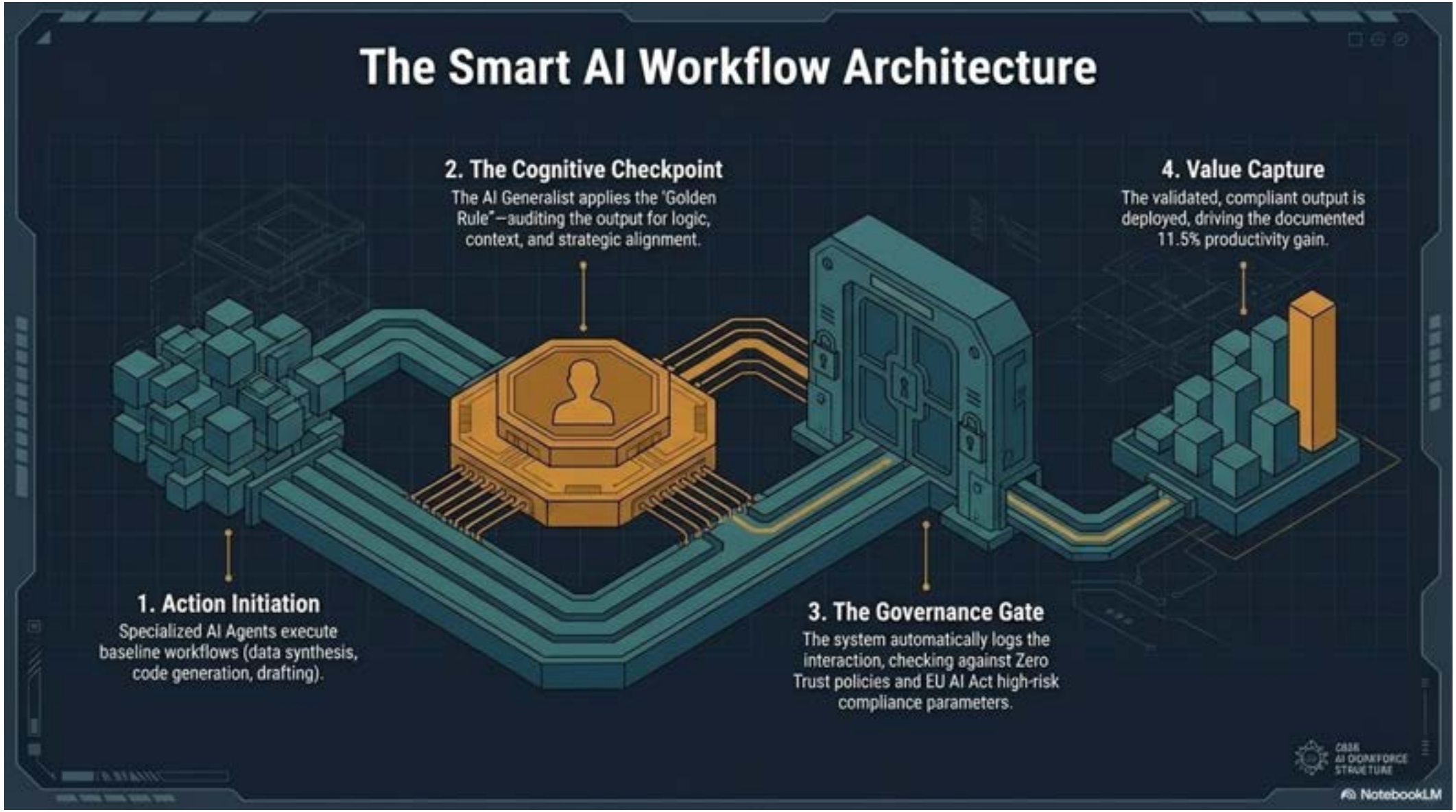
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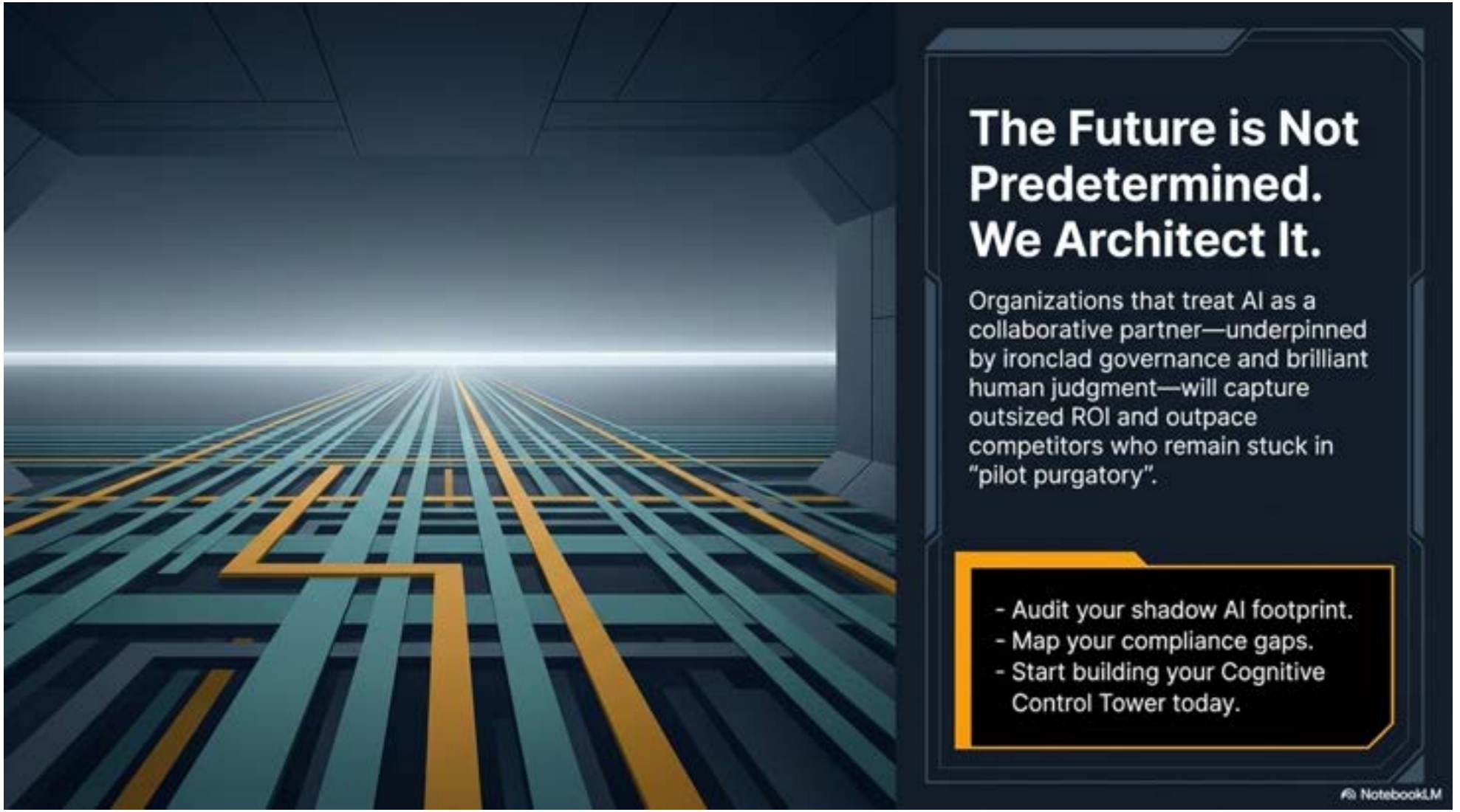
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ARTIFICIAL INTELLIGENCEIN MARKETING



REAL-WORLDAPPLICATIONS&
INSIGHTS FROM GLOBAL BRANDS

Prof.Dr.Elif AKAGÜN
OSTIM TECHNICAL UNIVERSITY

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INTRODUCTION TO AI IN MARKETING

Artificial Intelligence in marketing refers to the use of machine learning, natural language processing, and data analytics to automatedecisions, personalize customer experiences, and optimize campaigns. Today, AI adoption in marketing is accelerating at an unprecedented pace over 80% of industry leaders now integrate AI tools into their strategies.

From predictive analytics to chatbots and content generation, AI is fundamentally transforming how brands connect with audiences, enabling real-time personalization at scale and data-driven decision making that was impossible just years ago.

EXPLORE AI APPLICATIONS

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A BRIEF HISTORY OF AIIN MARKETING

01

1950s-1990s: Early Automation Rule-basedsystemsand basicdataprocessing emerge,laying groundworkformarketing automationandcustomer databases.

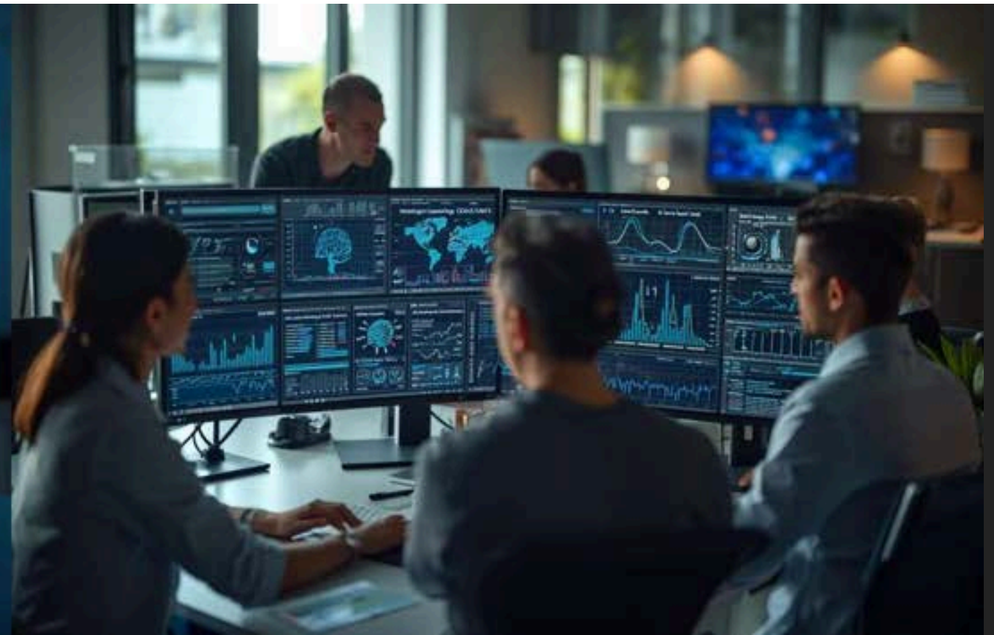
02

2000s-2010s:Machine LearningEra Breakthroughalgorithms enablepredictive analytics, recommendationengines, andprogrammatic advertising at scale.

03

2015-Present: NLP & ComputerVision Deeplearningpowers chatbots, sentiment analysis,visualsearch, and generative AI for content creation.





"AIistransforming marketing from art to science."

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BenefitsofAIin Marketing

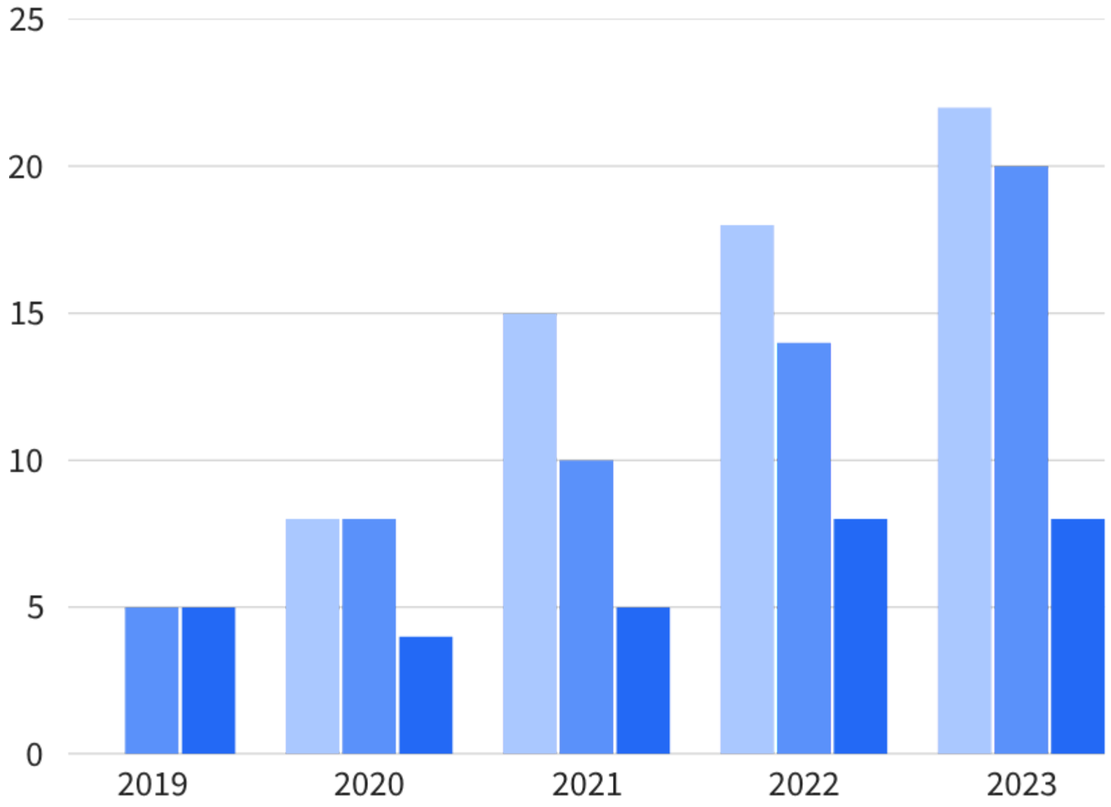
AI transforms marketing by enabling brands to deliver the right message to the right person at the right time, driving measurable results.

AI BENEFITS SUMMARY

01 Enhanced Personalization: AI analyzes customer behavior and preferencesto delivertailoredcontent, recommendations,andexperiences that resonate with individual users.

02 Increased Efficiency & Automation: AI automatesrepetitivetaskslikeemail campaigns, adoptimization, and content creation, freeing marketers to focus on strategy.

03 Data-Driven Decisions & Scalability:AIprocessesvast datasets in real-time, enabling smarter decisions and campaigns that adapt and scale across markets.



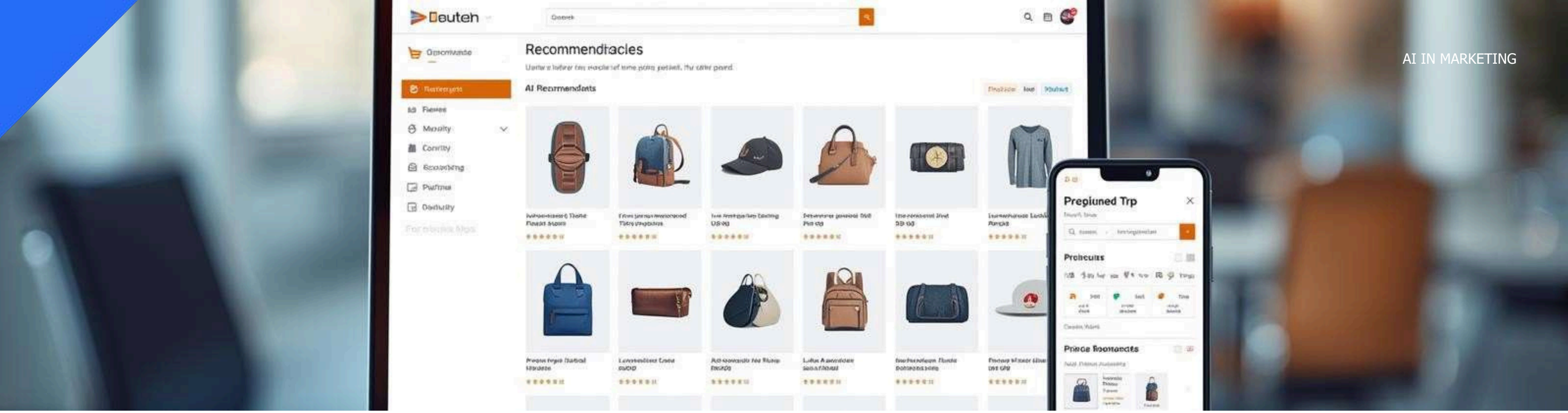
MEASURABLE RESULTS ACHIEVED

The data speaks for itself: AI-powered marketing delivers transformative results across industries. Netflix achieved 75% of content views driven by AI recommendations. Amazon's recommendation engine accounts for 35% of total revenue. Starbucks saw a 30% increase in automated customer query handling. Sephora reported 20% higher campaign success rates. H&M experienced 25% increase in online conversions. KLM reduced call center load by 40%. Adidas achieved 15-20% lift in email open rates.

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VIEWFULLREPORT



PERSONALIZEDMARKETING

AMAZON'S RECOMMENDATION ENGINE

Amazon's AI-powered recommendation engine uses sophisticated machine learning algorithms to analyze customer browsing history, purchase patterns, and behavioral data in real-time. This personalization technology drives 35% of Amazon's total revenue, delivering highly relevant product suggestions that dramatically increase conversion rates. The system continuously learns from millions of customer interactions, creating an ever-improving shopping experience that builds loyalty and drives repeat purchases.

35 % REVENUE DRIVEN BY AI

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PERSONALIZED STREAMING SUGGESTIONS –NETFLIX

Netflix leverages deep learning algorithms to analyze user viewing patterns and predict content preferences with remarkable accuracy. The platform's AI recommendation engine processes billions of data points including watch history, ratings, browsing behavior, and even time of day to deliver hyper-personalized suggestions. This sophisticated system drives 75% of all content viewed on the platform, significantly reducing subscriber churn while dramatically increasing user engagement and satisfaction.

75% AI-DRIVEN VIEWS

COCA-COLA



AI-DRIVEN CONTENT CREATION

Generative AI Technology

Coca-Cola leverages generative AI

for automated copywriting and visual content creation. Their AI systems generate ad variations, test creative concepts, and optimize messaging across global markets,

enabling faster campaign rollouts with higher engagement rates

Key Results & Benefits

Implementation has delivered 50% faster campaign production cycles and 25% higher engagement rates. Benefits include significant cost efficiency through automated content generation, enhanced creative experimentation, and the ability to scale personalized messaging

across diverse audiences.

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AUTOMATED AD GENERATION

01

Programmatic advertising with real-timebidding algorithmsthat automatically purchaseadspace andoptimize placementacross digital channels.

02

Dynamicadcreatives automatically tailoredperaudience segment,delivering personalized messagingbasedon userbehaviorand preferences.

03

Significantly improvedROIonad spendthrough precisiontargeting, scalability,and reducedmanual interventionin campaign management.





"AI enables us to reach theright athlete with the right message at

the right moment."



SOCIAL MEDIA MANAGEMENT

STARBUCKS' AI CHATBOT

Starbucks revolutionized customer engagement with their NLP-powered chatbot, enabling seamless social media interactions and order facilitation. The AI technology processes natural language queries to understand customer intent, handle common questions, and guide users through the ordering process. This implementation achieved a remarkable 30% increase in customer queries handled automatically, providing 24/7 customer service while strengthening brand engagement and loyalty.

30% AUTOMATED QUERY HANDLING

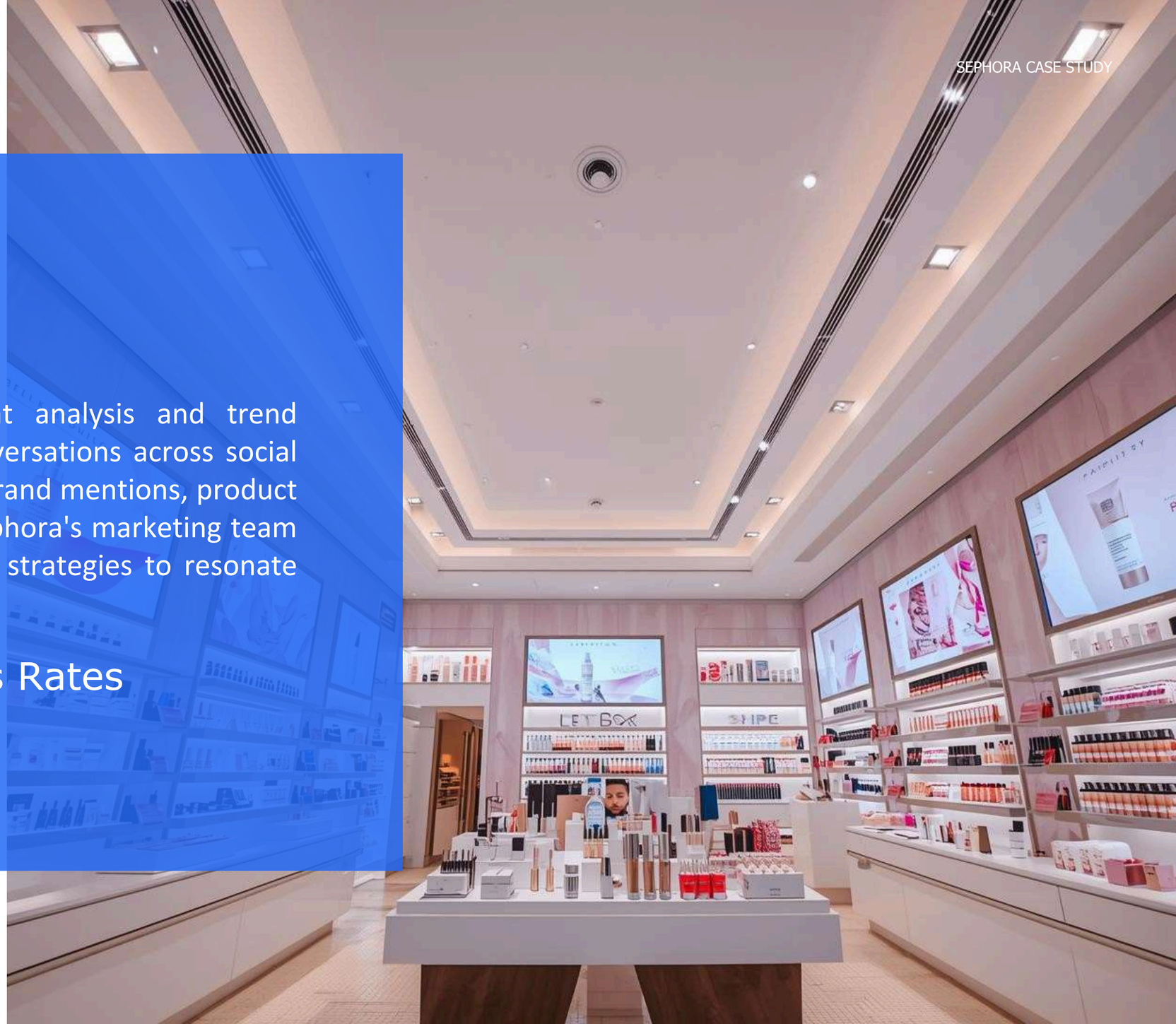
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SOCIALMEDIA ANALYTICS

Sephora leverages AI-powered sentiment analysis and trend prediction tools to monitor customer conversations across social platforms. By analyzing real-time data on brand mentions, product feedback, and emerging beauty trends, Sephora's marketing team can rapidly adjust campaigns and content strategies to resonate with their audience.

Increase in Campaign Success Rates

20%



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AI-POWEREDAUDIENCE TARGETING

SPOTIFY CASE STUDY

TRADITIONAL

BASIC SEGMENTS

Broad demographic targetingbasedonage, gender,andlocation. Limitedpersonalization with staticaudience segments andgeneralized messaging approaches.

AI TARGETING

+40% AD RELEVANCE

Behavioral and preference-based micro-segmentation using machine learning algorithmsthatanalyze listeninghabits,moodpatterns, andcontextualdataforprecise targeting.

RESULTS

+25% RETENTION

Higherengagementrates, optimizedadspend, increased userretention, andbetter conversion through personalizedaudio adsthat matchlistener contextand preferences.

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AIEMAIL MARKETING

ADIDAS

01

Predictive Analytics AIdeterminesoptimal sendtimesforeach customerbasedon engagementpatterns and behavior history

02

Dynamic Content Automatedemail campaignswith personalizedproduct recommendations and tailoredmessaging

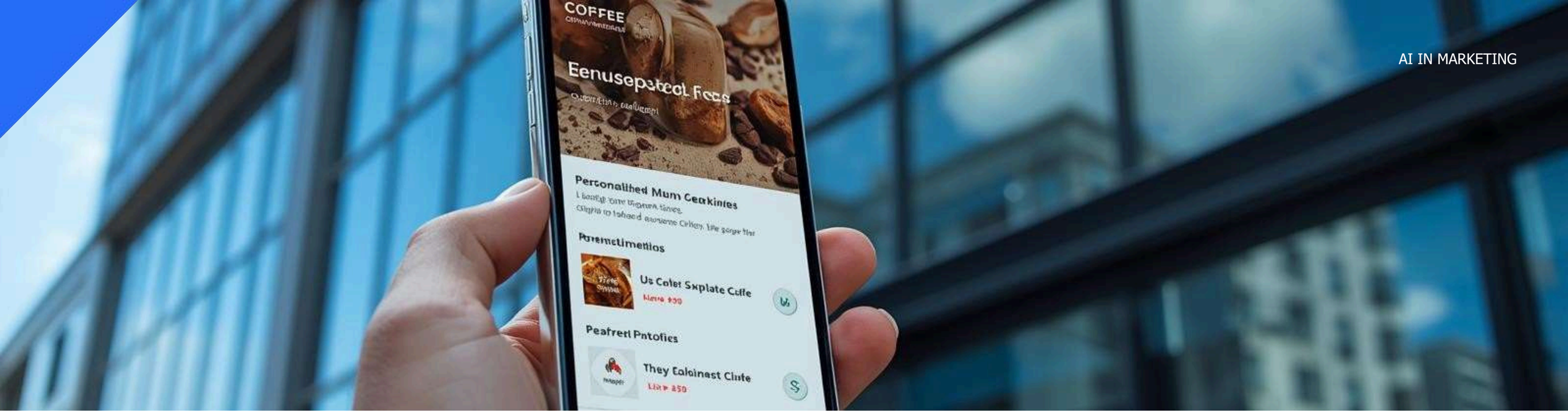
03

Proven Results 15%-20%liftinopen ratesandclick-through ratesdrivingincreased sales and retention





"AI-poweredemail personalization transformscustomer engagementinto measurable revenue."



AI-ASSISTEDAPP DEVELOPMENT

STARBUCKS MOBILE APP

Starbucks leverages AI to deliver personalized offers and predictive ordering through its mobile app. The AI analyzes purchase history, location data, and time of day to suggest relevant products and promotions. AI-driven UX adjustments optimize push notifications and interface elements based on user behavior patterns. This intelligent approach has significantly increased app engagement and driven measurable sales growth, creating a seamless and personalized customer experience.

ENHANCED USER EXPERIENCE

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AI-GENERATEDVISUALCONTENT
CANVA'S DESIGN TOOLS

Canva leverages generative AI to revolutionize design workflows for marketers. Their Magic Design and Magic Edit tools use AI to automatically generate layouts, remove backgrounds, and enhance images instantly. Text-to-image generation allows marketers to create custom visuals from simple prompts. Results show significantly faster content creation tasks that took hours now take minutes. Benefits include democratized design accessibility for non- designers and a major creativity boost for marketing teams.

EXPLORE CANVA AI FEATURES

AIVIDEO CREATION

L'ORÉAL

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01

AI-powered automatedvideo editingtoolsthat analyzefootageand createpolished marketingcontent withminimalhuman intervention.

02

Personalized video adsdynamically generatedbasedon individualuser profiles,preferences, andbrowsing behaviorfortargeted campaigns.

03

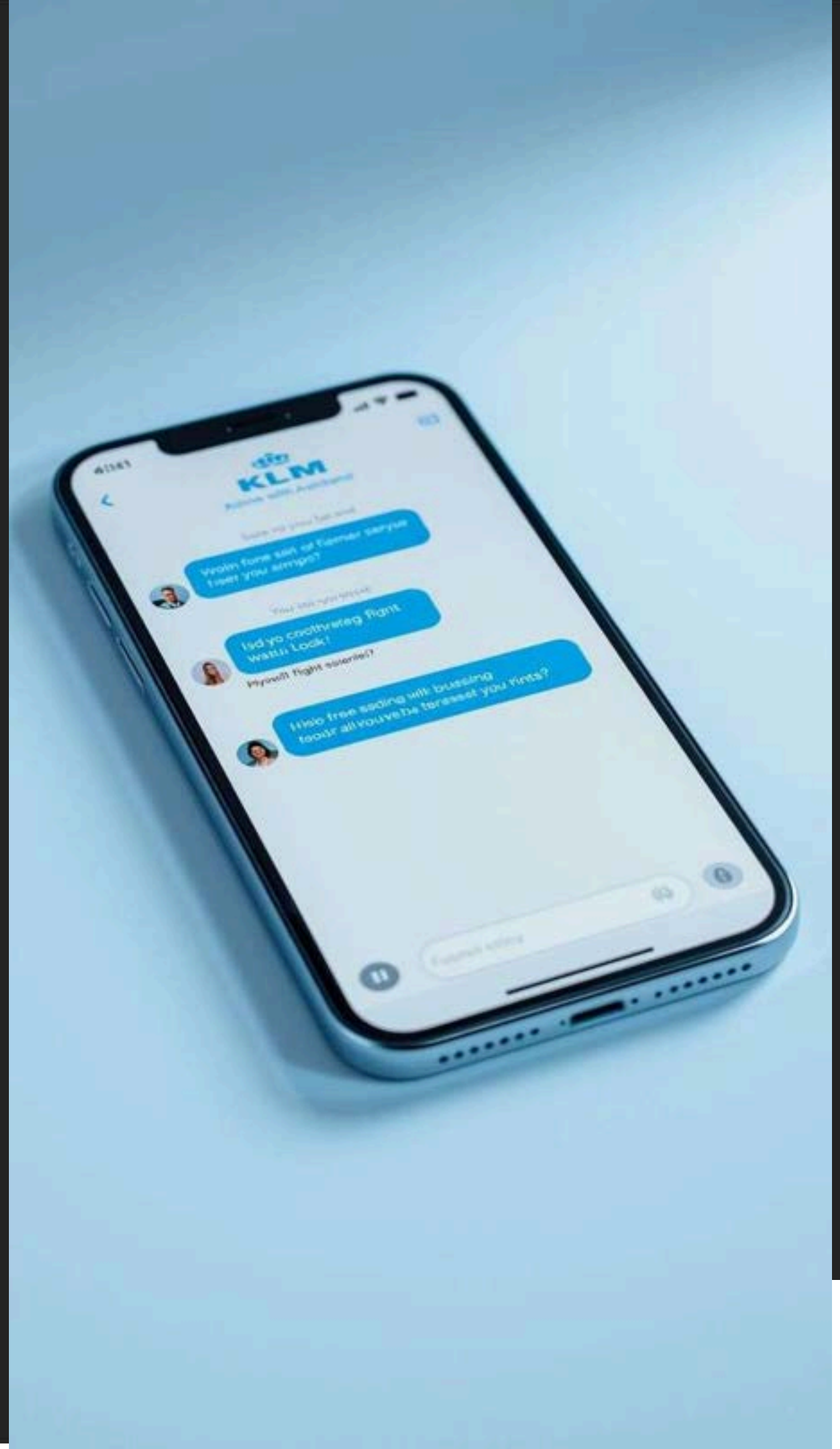
Results: Higher video engagement rates withcost-effective production, enabling scalable personalized content atreduced costs.





"AI enables beauty brands to create thousands of personalized video experiences."

CHATBOTS



KLM ROYAL DUTCH AIRLINES

NLP-Powered Multilingual Chatbots

KLM's AI chatbot "BlueBot" uses advanced Natural Language Processing to handle customer inquiries in multiple languages. The system manages booking support, flight status updates, and travel queries automatically, providing instant responses 24/7 across social media and messaging platforms.

Measurable Impact & Results

The implementation achieved a remarkable 40% reduction in call center load, enabling human agents to focus on complex issues. Customers receive faster response times and consistent service quality, significantly improving satisfaction scores and operational efficiency.

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OPPORTUNITY

H&M's AI-powered virtual assistants deliver personalized product recommendations to online shoppers, analyzing browsing behavior, purchase history, and style preferences to suggest relevant items in real-time, transforming the digital shopping experience.

Increase in Online Conversion Rates

25%



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REAL-TIME MARKETING

WITH AI – UNILEVER'S CAMPAIGNS



Dynamic Campaign Optimization



Unilever leverages real-time data analytics and automated content adjustments to optimize marketing campaigns during live events. Their AI systems continuously monitor consumer engagement, social media trends, and market signals to dynamically adjust messaging, creative assets, and targeting parameters. This agile approach has delivered measurable results: higher engagement rates during product launches and significant sales uplift during promotional periods. The technology enables Unilever to respond instantly tomarket conditions, maximizing campaign effectiveness while reducing wasted ad spend.

With great power comes great responsibility. AI in marketing demandsourcommitmenttoprivacy, fairness, and transparency.

Ethical Considerations in AI Marketing

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FUTURE TRENDS

INAI MARKETING

01

Hyper-Personalization via AI: Real-timeindividual customerjourneys poweredbydeep learning,delivering uniqueexperiencesat scale.

02

AI-PoweredVoice& Visual Search: Natural languageand image recognition transforminghow consumersdiscover productsand services.

03

AdvancedPredictive Analytics: AI forecasting customer behavior, market trends,and campaign performance with unprecedented accuracy.





"The future of marketing is AI and AR/VR integration creating immersive brand experiences."

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CHALLENGES & OPPORTUNITIES AHEAD



- Balancing Automation with Human Creativity: While AI excels at data processing andoptimization, the most successful campaigns blend algorithmic efficiency with human intuition, storytelling, and emotional intelligence. Brands must find the sweet spot where AI handles repetitive tasks while creatives focus on strategy and innovation.
- Data Privacy Regulations Impact: GDPR, CCPA, and emerging global regulations require marketers to rethink data collection practices. AI systems must be designed with privacy-by-design principles, ensuring compliance while still deliveringpersonalizedexperiences.
- Continuous AI Model Training: AI models require ongoing refinement as consumer behaviors evolve. Organizations must invest in data infrastructure, talent, and processes to keep their AI systems accurate, unbiased, and effective over time.



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QUESTIONS? LET'S DISCUSS THE FUTURE OF AI IN MARKETING TOGETHER.