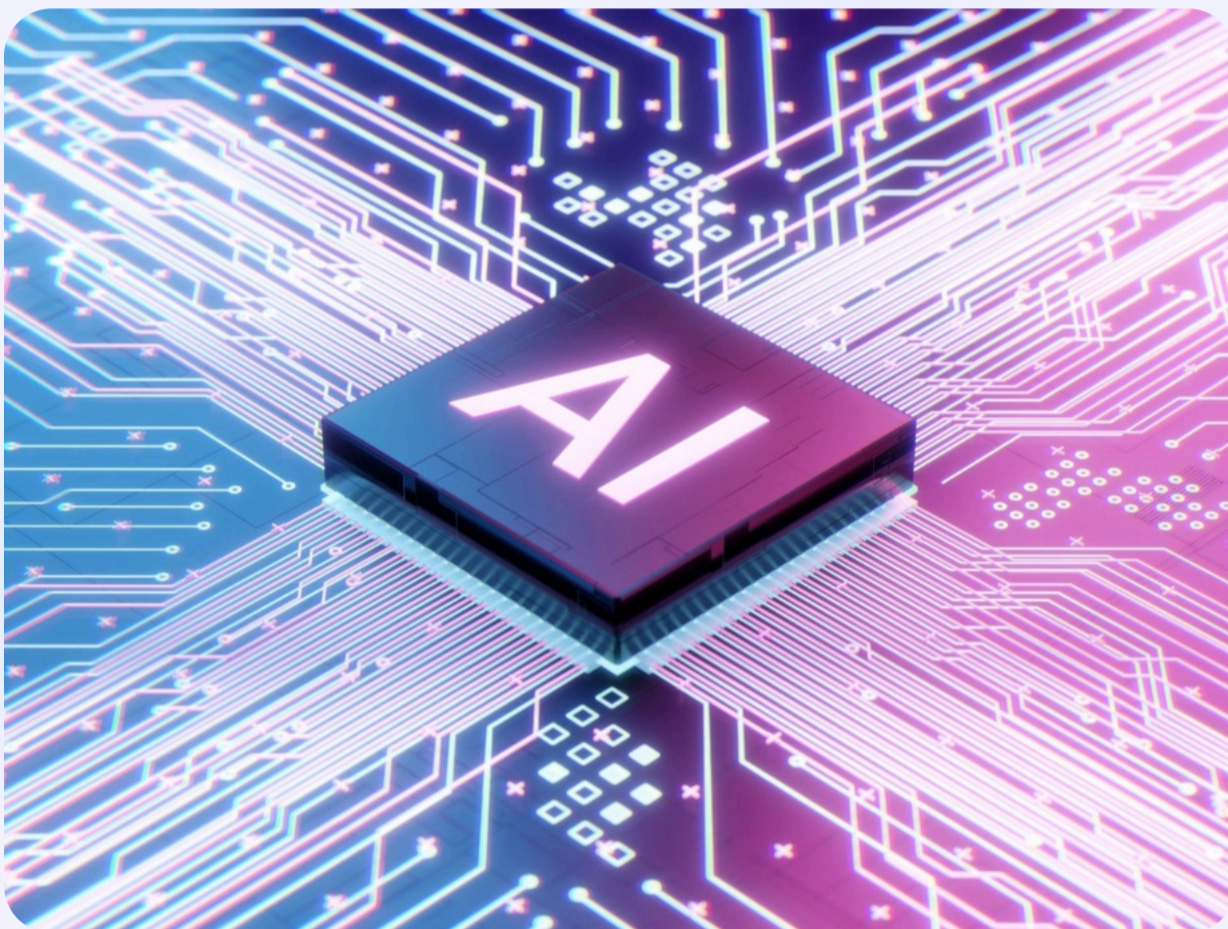
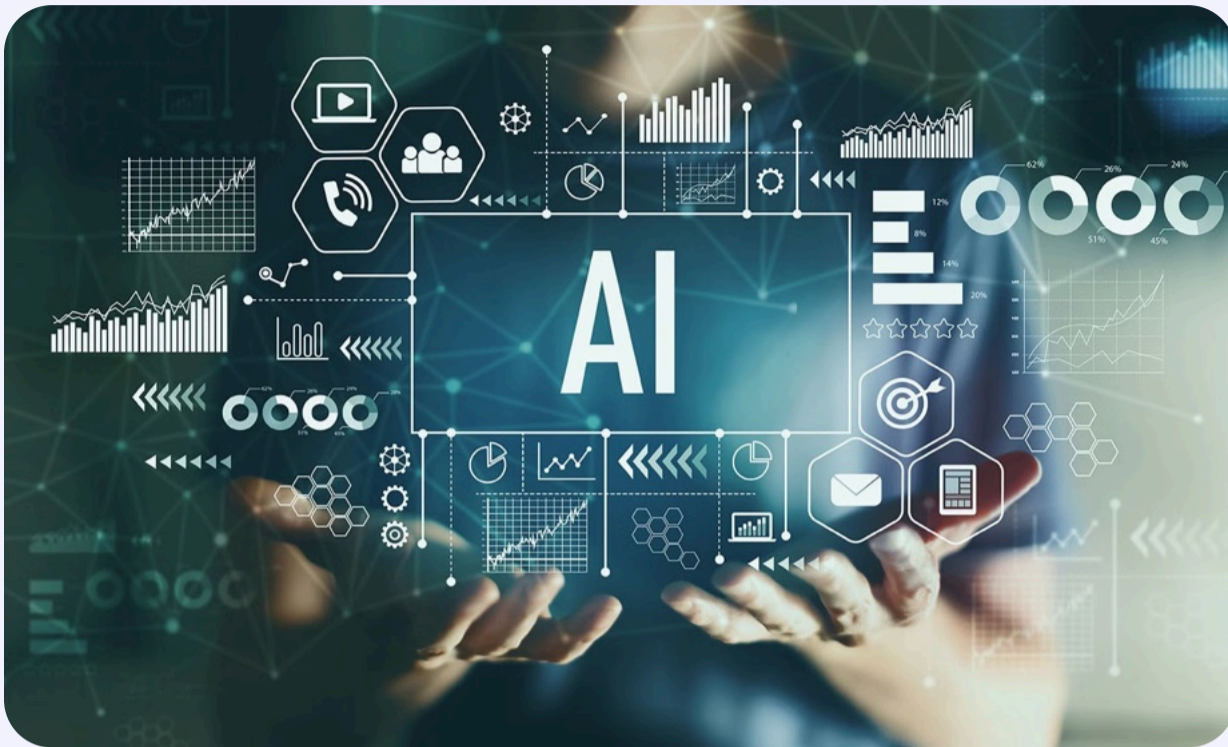


Integrating GenAI in HE Teaching and Learning



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2023: The Year of Artificial Intelligence

1 Microsoft: The pace of AI innovation in 2023 was astonishing

but even more impressive was the way people applied this technology to make a real difference in their careers, communities and countries!



2023: The year of AI



2023: The year of AI

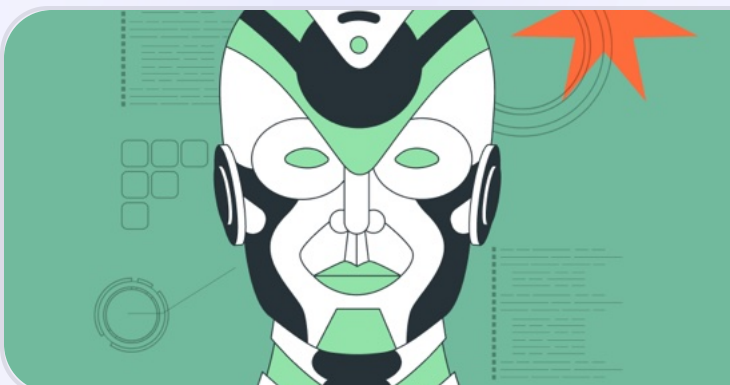
2023: The year of AI The pace of AI innovation in 2023 was astounding — but even more impressive was how people applied this technology t...

2 According to CNBC, research by [Writerbuddy.ai](https://writerbuddy.ai), an online content writing company shows:

September 2022–August 2023: **24 billion visits**

Top 50 AI tools , with an average monthly growth of 236.3 million hits.

ChatGPT : 14 billion visits, 60% traffic



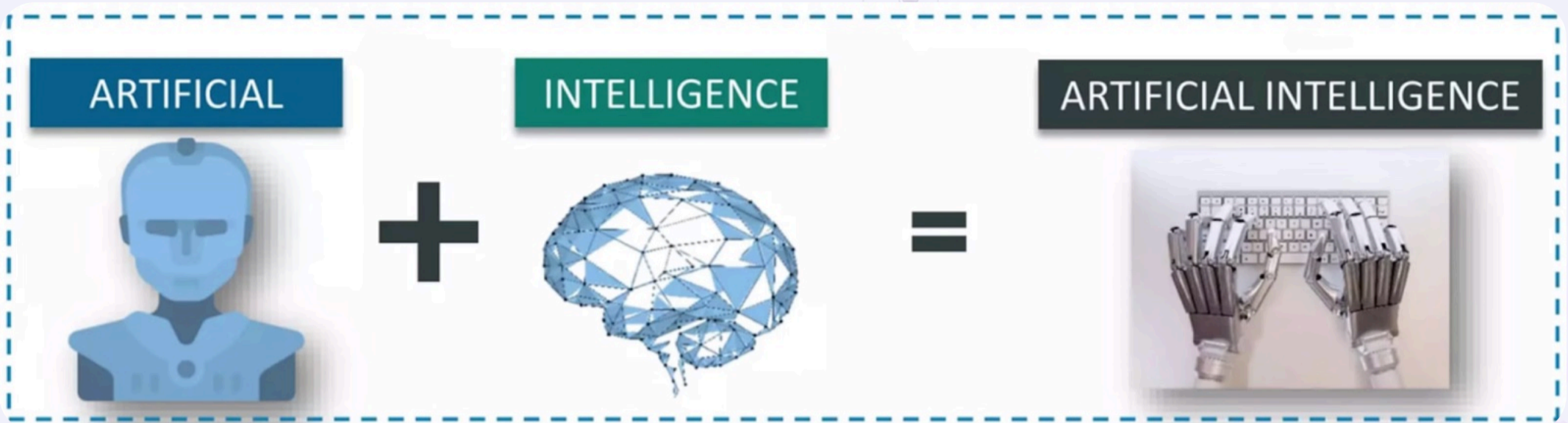
writerbuddy.ai



AI Industry Analysis: 50 Most Visited AI Tools and Their 24B...

AI has been an omnipresent theme over the past year, pushing boundaries and redefining several industries in a short space of time

Definition of Artificial Intelligence



There is no clear consensus on the definition of AI. **John McCarthy** coined the phrase AI in **1956**, when he organised the first academic conference on the subject:

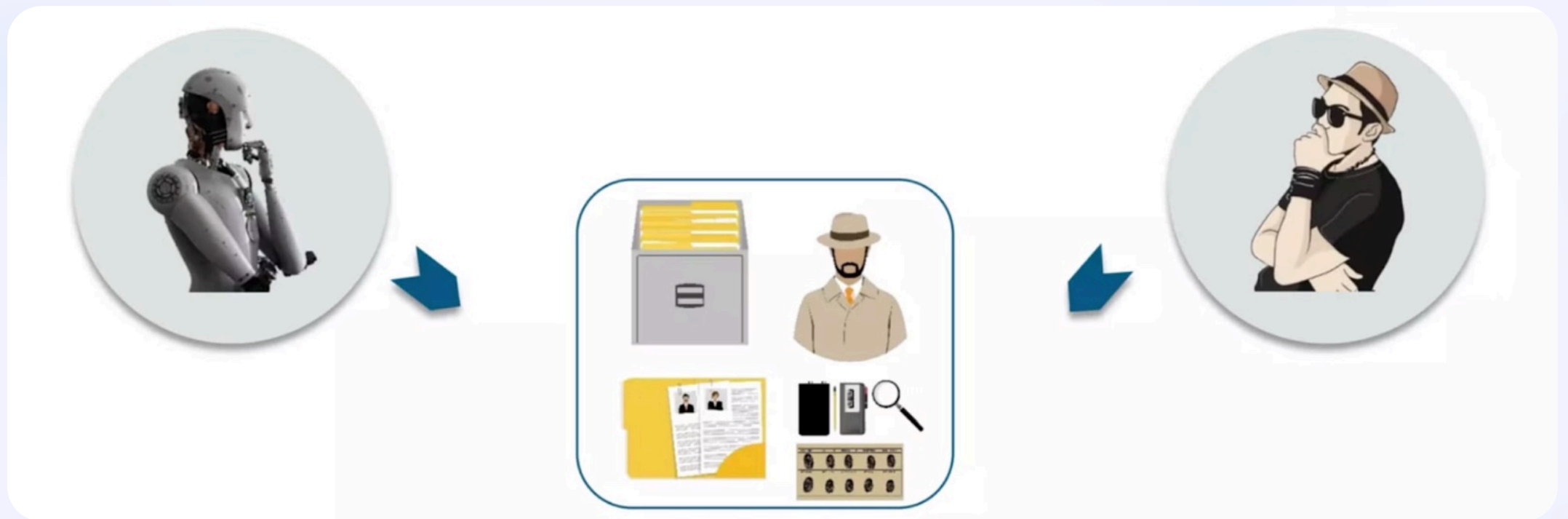
“It is the **science and engineering of building intelligent machines**, especially intelligent computer programs. It is related to the similar work of using computers to understand human intelligence, but AI need not be limited to methods that are biologically observable.”

<p>“The exciting new effort to make computers think ... <i>machines with minds</i>, in the full and literal sense” (Haugeland, 1985)</p> <p>“[The automation of] activities that we associate with human thinking, activities such as decision-making, problem solving, learning ...” (Bellman, 1978)</p>	<p>“The study of mental faculties through the use of computational models” (Charniak and McDermott, 1985)</p> <p>“The study of the computations that make it possible to perceive, reason, and act” (Winston, 1992)</p>				
<p>“The art of creating machines that perform functions that require intelligence when performed by people” (Kurzweil, 1990)</p> <p>“The study of how to make computers do things at which, at the moment, people are better” (Rich and Knight, 1991)</p>	<p>“A field of study that seeks to explain and emulate intelligent behavior in terms of computational processes” (Schalkoff, 1990)</p> <p>“The branch of computer science that is concerned with the automation of intelligent behavior” (Luger and Stubblefield, 1993)</p>				
<p>Figure 1.1 Some definitions of AI. They are organized into four categories:</p> <table border="1"> <tr> <td>Systems that think like humans.</td> <td>Systems that think rationally.</td> </tr> <tr> <td>Systems that act like humans.</td> <td>Systems that act rationally.</td> </tr> </table>		Systems that think like humans.	Systems that think rationally.	Systems that act like humans.	Systems that act rationally.
Systems that think like humans.	Systems that think rationally.				
Systems that act like humans.	Systems that act rationally.				

📖 **Oxford English Dictionary**, we define AI simply as: “The capacity of computers or other machines to exhibit or simulate intelligent behaviour; the field of study concerned with this” (<https://www.oed.com/viewdictionaryentry/Entry/271625>)

What is the History of Artificial Intelligence?

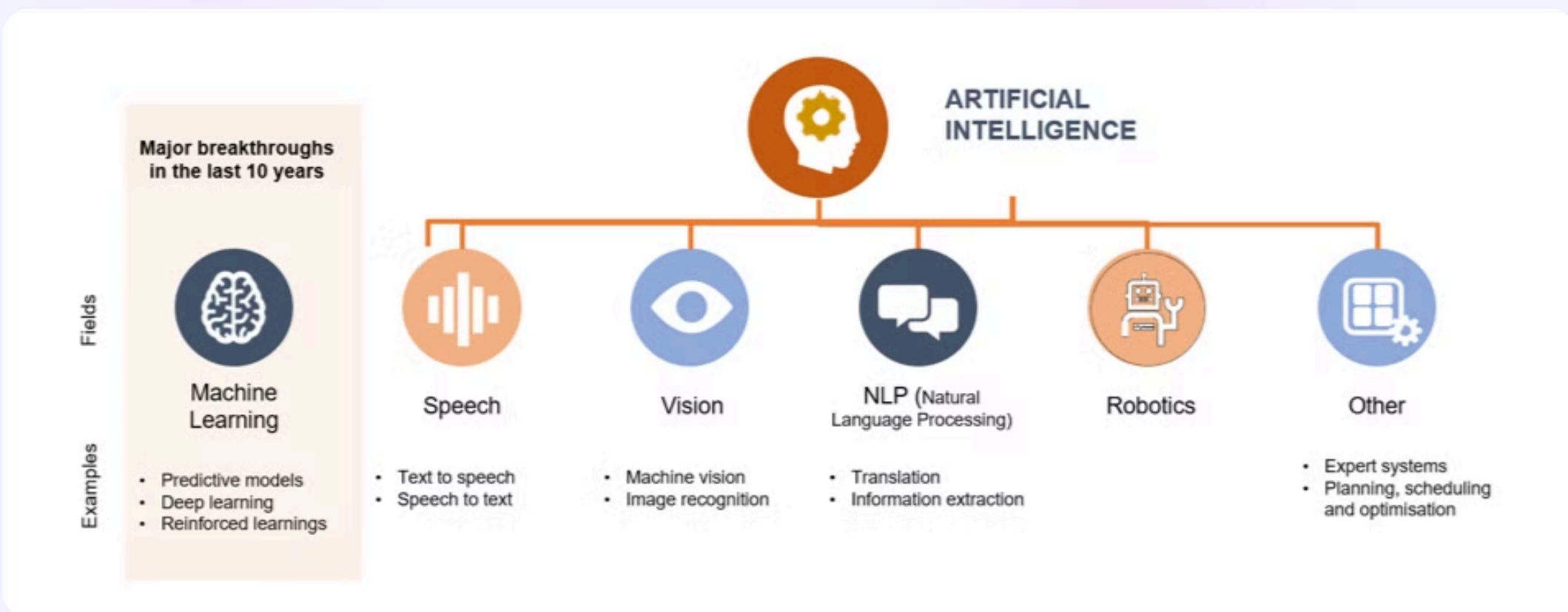
Alan Turing is considered the "father of computer science" and proposed the **Turing Test** in **1950** to measure the intelligence of machines, and to this day the specific test is used to experimentally determine whether a machine has **genuine cognitive abilities** and can think.



Turing said that if the interrogator couldn't distinguish between them simply by the answers given then we could call the computer intelligent as it "thinks" and answers like a person

Major breakthroughs in Artificial Intelligence in the last decade

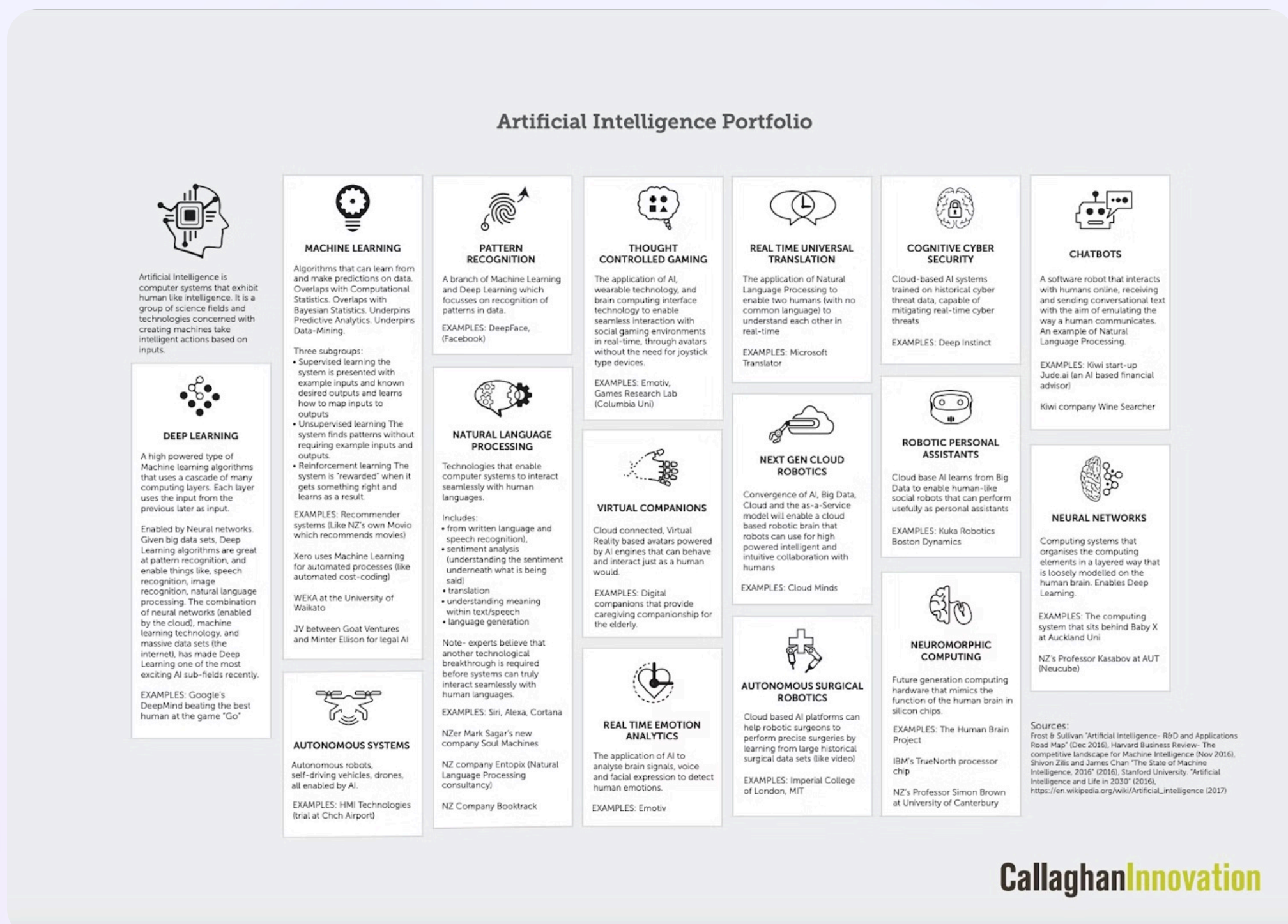
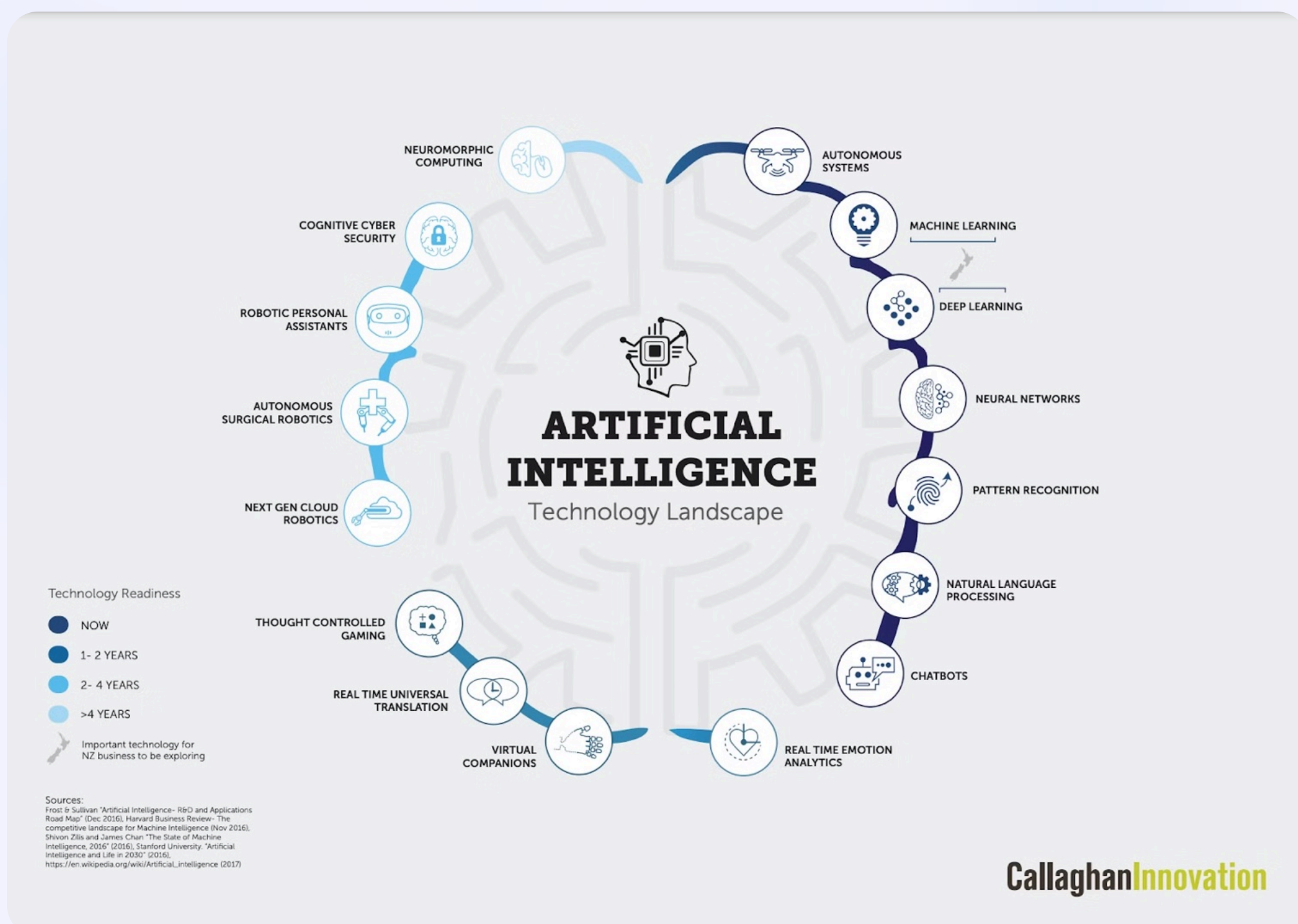
Various areas of AI: Artificial intelligence can be further defined by the application of learning that may be undertaken; machine learning and deep learning.



Source: [AI & Automation: An Overview](#)

“Technology readiness” of artificial intelligence by Callaghan Innovation

By gathering together several studies and analyses (Frost & Sullivan, Harvard Business Review, Stanford University), Callaghan Innovation has translated into a graphical map the “technology readiness” of artificial intelligence based on both the time span of development and as being “field operational”, i.e. the scope where certain technologies can best express their potential. More specifically, the following infographic aims to demystify the topic. It does this by differentiating between AI technologies that are ready to be used right now versus AI technologies that will be ready in the future.



Source: <http://www.callaghaninnovation.govt.nz/blog/ai-demystified>

Introduction to Generative AI in Higher Education

Generative AI (GenAI) is revolutionizing higher education by creating new content based on patterns learned from existing datasets.

Unlike traditional AI, GenAI can generate **text, images, music, code, and other data**, making it a powerful tool for creative and educational purposes.

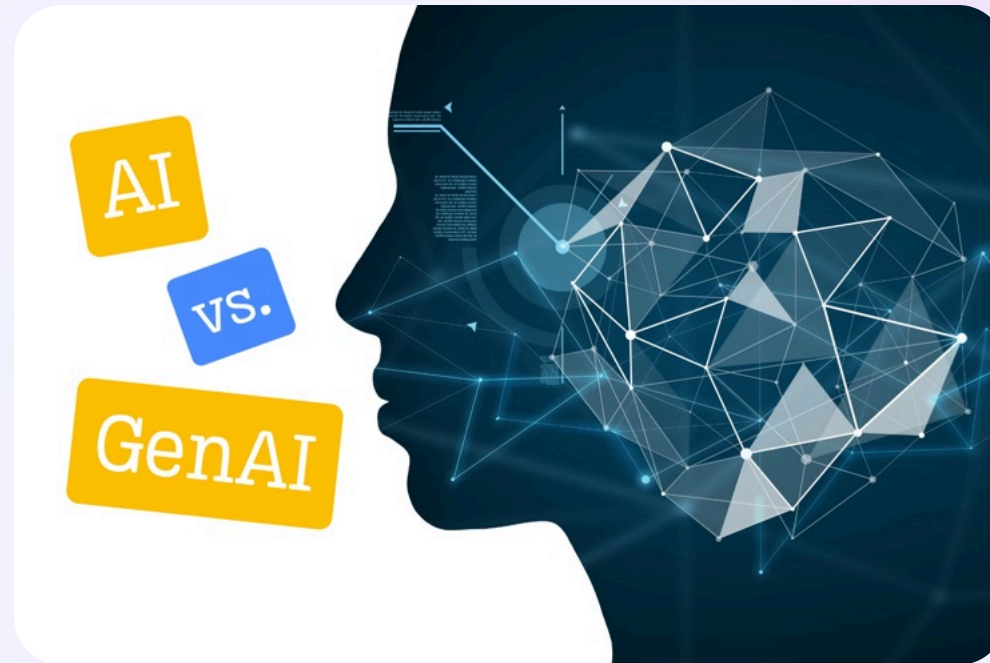
Popular GenAI tools like **ChatGPT, MS Copilot, Gemini, Claude, Jasper, DALL-E, and Midjourney** are transforming teaching and learning methods.

|

- ❗ In the educational context, GenAI can generate **multimedia content, summarize or translate text, explain complex concepts, and provide personalized learning experiences**. However, its implementation requires careful consideration of ethical implications, particularly regarding academic integrity and equity. Higher education institutions must develop **clear guidelines** for acceptable use and ensure equal access to GenAI tools while addressing potential biases.



GenAI vs Traditional AI in Higher Education



Purpose

Traditional AI focuses on **automation tasks** like detecting plagiarism and analyzing student performance.

GenAI, on the other hand, excels in **creativity and content generation**, such as writing essays and generating illustrations.

Input and Output

Traditional AI requires **structured inputs** to produce **outputs matching specific patterns**.

GenAI models work with **complex, unstructured inputs** and generate **diverse outputs**, like creating a poem based on keywords.

Model Architecture

GenAI models, like GPT-4, use large-scale transformer architectures trained on diverse datasets, enabling them to generate contextually rich and semantically coherent responses.

Types of AIED Systems

AI has been adopted relatively slowly in educational settings: 1) learner-facing AIED systems, 2) educator-facing AIED systems, and 3) AIED systems for institutional support.

Examples of **learner-facing AIED systems**: are referred to as **intelligent online tutors or intelligent tutoring systems (ITS)** (Miwa, Terai, Kanzaki, & Nakaike, 2014) or **intelligent software agents** (Schiaffino, Garcia, & Amandi, 2008), or **intelligent assistants** (Casamayor, Amandi, & Campo, 2009).

Examples of **educator-facing AIED systems**: include tools for automated grading, feedback recommendation, assessment of student understanding, intervention suggestions, engagement monitoring, and academic integrity support. In **collaborative learning contexts**, some systems offer educators summaries of each group member's individual progress and the nature of their contributions to the group's work (Chou, Huang, & Lin, 2011).

Examples of **AIED systems for institutional support**: In addition to marketing purposes, higher education institutions benefit from AI tools that provide **accurate predictions of students' academic performance**, supporting more **informed admission decisions** and enhanced educational services. AIED systems can also assist in **course planning**, helping to optimize course combinations to meet the needs of students, instructors, and departmental requirements. Additionally, these systems can identify **at-risk students** early in their academic journey or predict undergraduate attrition rates more broadly.

Baker and Smith (2019) divide AI tools used in education into three groups:

① AI Tools for the learner

Software that students use to learn and practice their skills. These systems respond to the **students' individual and evolving needs** e.g., by adapting learning content based on each student's interaction and background knowledge and skills (e.g. duolingo software)

② AI Tools for the HE teacher

Software designed to reduce workloads and make results more efficient in specific **automation tasks** such as management, evaluation, feedback and plagiarism detection.

③ AI Tools for HE Institutions

AI tools that provide **information for administrators and managers** at the institutional level, for example, help track "leakage" across schools or colleges

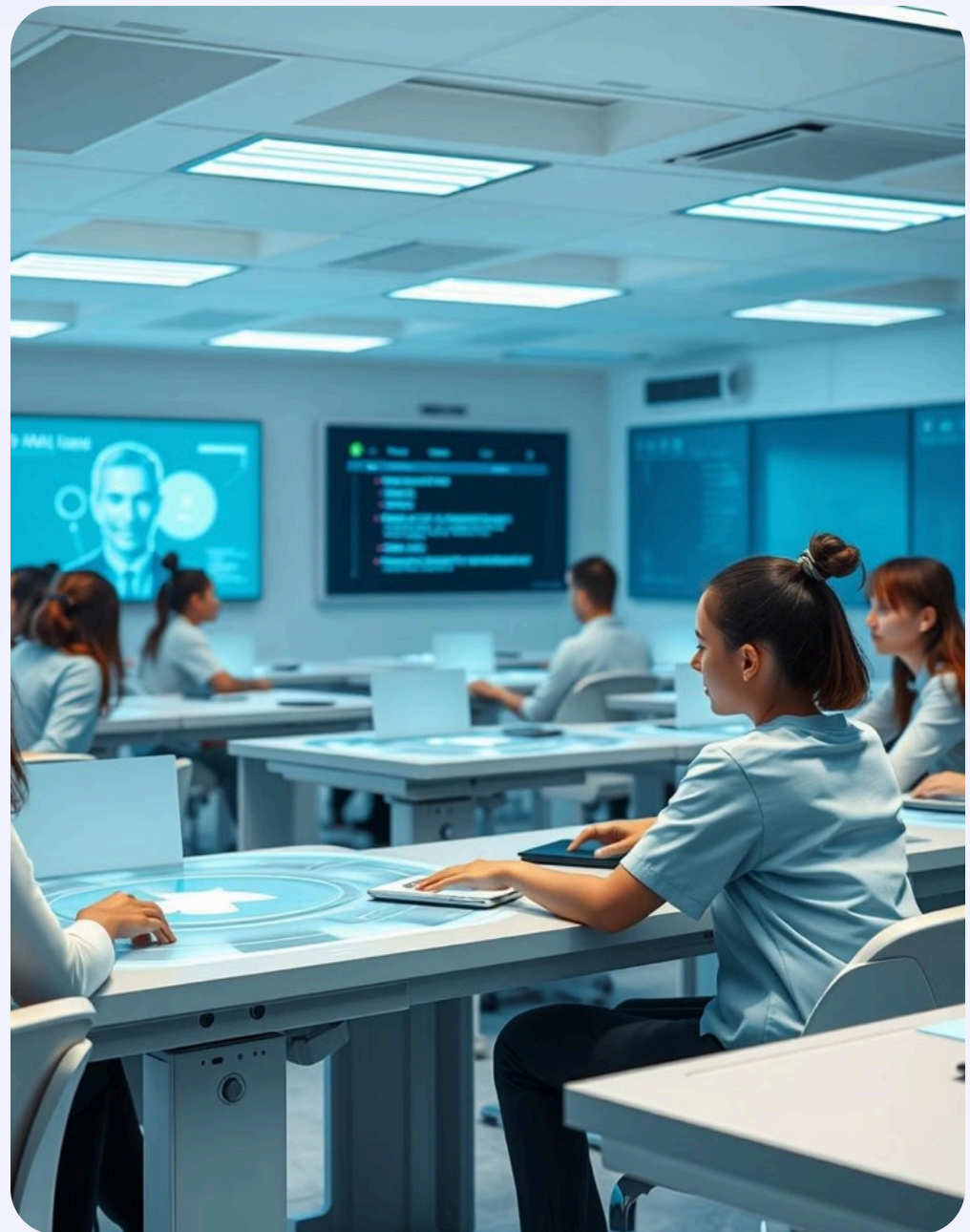
AI in HE Teaching



The three roles that have been assigned to AI in teaching are:

- providing adaptive teaching strategies,
- enhancing teachers' ability to teach, and
- supporting teacher professional development.
- providing adaptive teaching strategies,
- enhancing teachers' ability to teach, and
- supporting teacher professional development.

AI in HE Students Learning



The application of AI to student learning can be classified into four main roles:

- assigning tasks based on individual competence,
- providing human-machine conversations,
- analysing student work for feedback,
- increasing adaptability and interactivity in digital environments.

AI Literacy for HE teachers and students

"Generative AI opens new horizons and challenges for education, but we urgently need to take action to ensure that new AI technologies are integrated into education on our terms," said Stefania Giannini, UNESCO's Assistant Director-General for Education. "It is our duty to prioritize safety, inclusion, diversity, transparency and quality." (Source:

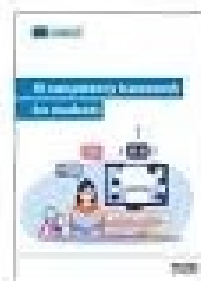
<https://www.weforum.org/stories/2023/06/unesco-new-roadmap-ai-education/>)

There has been a growing push to establish AI literacy frameworks as AI technologies rapidly advance and become embedded in everyday life. Various organizations, educational institutions, and governments are working to create structured approaches to AI literacy that can be adapted across different levels of expertise and age groups.

These efforts often aim to make AI concepts accessible to non-experts, focusing on practical applications, ethical awareness, and critical thinking about AI systems. For example, some frameworks target K-12 students, introducing foundational concepts like algorithms, machine learning, and data privacy in simple terms. Others focus on higher education and workforce training, covering deeper aspects like AI ethics, transparency, accountability, and the impact of automation on jobs.

Projects such as the [MIT Media Lab's "AI Literacy" initiatives](#), [UNESCO's recommendations on AI in education](#), all contribute to these frameworks. Each of these efforts seeks to balance technical understanding with ethical implications, empowering people to navigate an AI-centric world with confidence and awareness. This diversity in AI literacy efforts reflects a broader commitment to ensuring that all individuals—not just developers or specialists—are prepared to use and critically assess AI in ways that benefit society.

Developing AI competencies for students and educators of higher education institutions



[AI competency framework for students - UNESCO Digital Library](#) <https://unesdoc.unesco.org/ark:/48223/pf0000391105>

[AI competency framework for teachers - UNESCO Digital Library](#) <https://unesdoc.unesco.org/ark:/48223/pf0000391104>



Key Capabilities of AI in Higher Education

AI tools provide multiple modes of engagement, representation, and expression (Delisio & Butaki, 2019). There is a big variety of AI tools that can dramatically change the way we teach and learn in higher education. See examples below;

- 1 Natural Language Understanding**

GenAI tools like **ChatGPT** and **Gemini** can process complex queries, interpret context, and provide personalized feedback, enhancing the learning experience.
- 2 Multimodal Content Generation**

Tools such as **DALL-E** and **Midjourney** can create images, audio, and video from text inputs, supporting interdisciplinary applications across various fields.
- 3 Contextual Adaptability**

GenAI tools can adapt to different contexts, providing relevant information based on user needs, such as generating case studies or simulating scenarios for specific courses.
- 4 Automated Summarization and Paraphrasing**

GenAI tools like **ChatGPT** and **Claude** can summarize large volumes of text, making it easier to process research articles, textbooks, or lecture transcripts.
- 5 Personalised Learning**

Personalised learning materials use technology to tailor the educational content to the individual needs and preferences of learners.

 - GenAI tools like **Brisk** offer instructional materials that include interactive exercises, multimedia resources, and customized lesson plans. These resources are tailored to accommodate each learner's unique pace and learning style, providing a personalized and engaging educational experience.
 - **Quizlet** : Uses also AI to generate customized study sets, flashcards, and quizzes based on student needs and progress. Quizlet's "Learn" mode creates a personalized study plan for each user.
- 6 Evaluation & Performance**
 - *Efficient and Objective Progress Tracking*: Enables quick, unbiased assessments of students' progress, allowing for real-time updates on their learning trajectory.
 - *High-Accuracy Performance Predictions*: Provides predictive insights into students' future performance, helping identify potential areas of struggle or strength with a high level of accuracy.
 - *Instant, Actionable Feedback*: Offers immediate feedback on aspects like grammar, vocabulary, and sentence structure, empowering students to self-correct and enhance their skills in real time.

GenAI tools like **Grammarly** offer real-time feedback on grammar, sentence structure, and vocabulary, making it ideal for language learning and writing skill development.

Turnitin with AI capabilities is well known for plagiarism detection and also offers formative feedback tools that guide students in improving their writing, including grammar and structure.
- 7 Accessibility and Inclusivity**
 - *Support for Dyslexia or Other Learning Challenges*

AI tools like **Read&Write by Texthelp** and **ClaroRead** provide support specifically for dyslexic students, offering features such as text-to-speech, word prediction, and visual tracking aids. These tools help make reading and writing more manageable by breaking down language and providing alternate learning methods.
 - *Voice-to-Text for Mobility Impairments or Typing Difficulties*

Tools like **Google Speech-to-Text** and **Otter.ai** offer accurate voice-to-text capabilities, making it easier for students with mobility impairments or those who find typing challenging. These tools allow learners to dictate notes, essays, or responses, making classroom participation and assignments more accessible.
 - *Screen Readers for Visual Impairments*

Microsoft Seeing AI: Free app that narrates the world for visually impaired individuals Uses computer vision and AI to: a) describe people, text, documents, b) recognize currency, c) read handwriting Identify colors and objects. Similar to this AI tool are: **Google Lookout**, **GPT-4 Vision (OpenAI)**, **VoiceOver (by Apple)**, etc. These AI tools go beyond traditional screen readers by a) providing contextual understanding, b) describing complex visual scenes, c) offering more interactive and intelligent descriptions, d) using machine learning to improve accuracy over time.

Overall, these AI tools make digital content accessible by reading text aloud. These tools help students with visual impairments navigate educational materials and access online learning resources.
 - *Real-Time Captioning for Hearing Impairments*

Microsoft Translator and **Google Meet's Live Captioning** offer real-time captioning, which is essential for students who are deaf or hard of hearing. These tools convert spoken language into text in real-time, making lectures and discussions more inclusive.
- 8 Strengthening various skills**
 - *Linguistic skills*

AI tools like **ELSA Speak AI** can enhance pronunciation as it focuses on English pronunciation providing detailed accent improvement feedback. Similarly, **Quillbot** is an advanced AI writing tool designed to transform and elevate linguistic capabilities as it enhances written communication, reduces writing complexity and helps learners and professionals refine their writing skills.
 - *Presentation skills*

AI tools like **Beautiful.ai** can develop presentation skills by offering AI-powered design capabilities. These tools automatically format slides and provide smart, professional templates.
 - *Coding skills*

AI tools like **GitHub Copilot** is an AI-powered coding assistant that generates code snippets and provides intelligent auto-completion across multiple programming languages. It helps developers write code faster by suggesting contextually relevant code in real-time. The tool learns from vast programming repositories, offering smart, adaptive coding support for programmers of all skill levels.
 - *Creative skills*

AI tools like **DALL-E** harnesses AI to generate unique, creative images from textual descriptions, transforming abstract concepts into visual art. It enables users to create stunning, original visual designs by interpreting complex prompts and generating imaginative imagery. The tool revolutionizes visual creativity by bridging language and visual representation through advanced machine learning.
 - *Research skills*

AI tools like **Consensus** is an AI-driven research platform that transforms academic research exploration by generating concise summaries of scholarly papers. It provides evidence-based insights by analyzing and synthesizing complex academic literature across various disciplines. The tool empowers researchers and professionals to quickly understand key findings and research trends with intelligent, AI-powered summarization.

Automating Routine Administrative Tasks



1

Grading and Feedback Generation

Two main roles have been assigned to AI in assessment: [providing automatic marking](#) and [predicting students' performance](#).

GenAI tools can assist in grading assignments, particularly for objective assessments.

For subjective assignments, they can help generate preliminary feedback that instructors can customize. Tools like [Gradescope](#) (with AI features) can offer detailed, focused feedback and can grade various types of assignments such as grade projects, worksheets, quizzes, bubble sheets, and exams.

2

Automating Summaries and Meeting Notes

GenAI tools can summarize long documents, meeting minutes, or research articles, saving time for faculty members engaged in committee work or literature reviews. Tools like [Otter.ai](#) can provide detailed, contextual summaries and real-time transcription while [Motion \(with AI features\)](#) can manage meeting notes.

3

Creating Automated Communication

Chatbots and virtual assistants can respond to routine student inquiries, providing information about deadlines, course policies, or assignment instructions. Tools like [ChatGPT](#) can provide varied, context-aware communications, [Claude](#) can respond with tailored messaging, and [GitHub Copilot](#) gives automating technical communication.

📄 PROMPT EXAMPLE 1: "Grading and Feedback Generation"

A prompt example for AI-powered grading: "Analyze this [assignment type] for demonstration of key concepts:

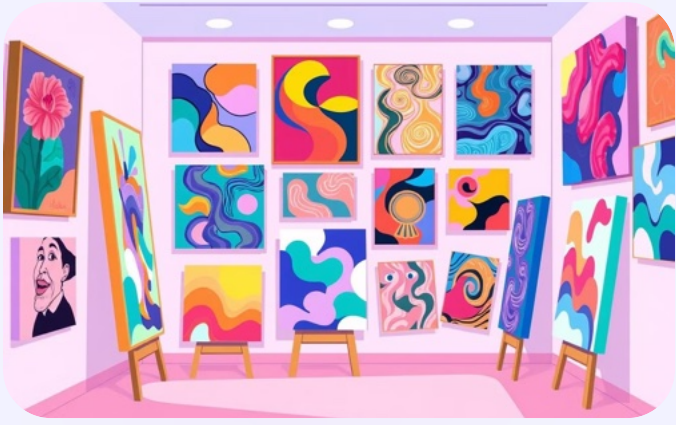
1. Identify main concepts discussed.
2. Evaluate accuracy and depth of understanding.
3. Note any misconceptions or areas needing clarification.
4. Suggest specific resources for improvement. Format the feedback with: i) Specific examples from the student's work. ii) Both strengths and areas for improvement iii) Clear, actionable suggestions."

PROMPT EXAMPLE 2: "Creating Automated Communication"

A prompt example for course announcements: "Generate a course announcement for [TOPIC/EVENT]. Include:

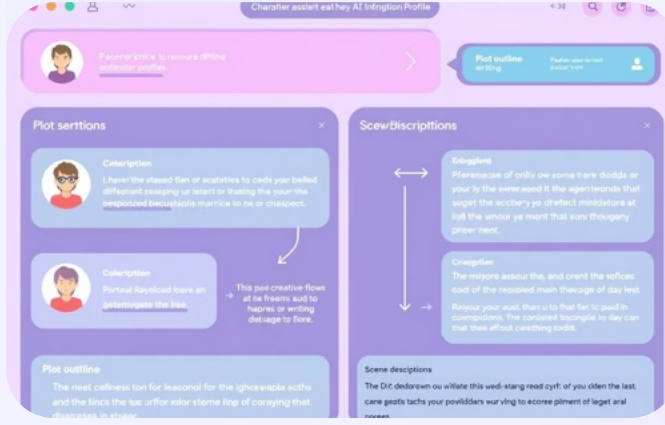
1. Clear, engaging subject line.
2. Brief context or background.
3. Key information (what, when, where, how).
4. Any required student actions.
5. Deadline if applicable. 6. Friendly, supportive tone. Additional specifications: i) Use inclusive language. ii) Address potential questions. iii) Include a call to action".

Support for Creative Assignments in different disciplines



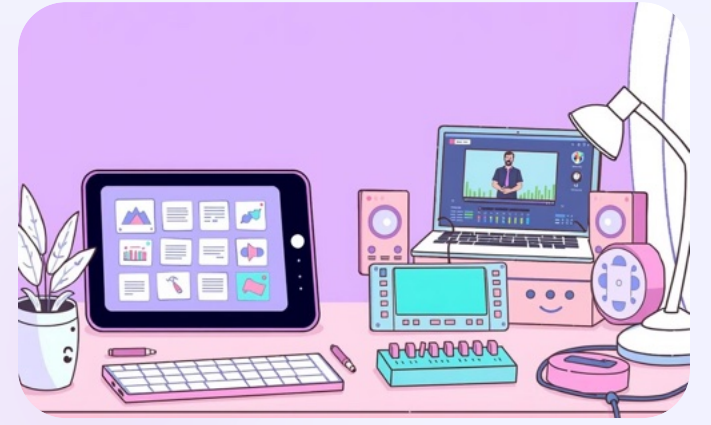
Art and Design

GenAI tools like **DALL-E** and **Midjourney** can generate visuals based on textual descriptions, supporting projects in digital art, graphic design, and architecture. Students can create unique artworks or develop visual presentations based on conceptual ideas.



Creative Writing

Text-based GenAI tools like **ChatGPT**, **Claude**, **Sudowrite**, and **Jasper** can help students brainstorm ideas, generate plot summaries, or develop character descriptions. This is particularly useful in writing-intensive disciplines like English, creative writing, and journalism.



Multimedia Storytelling

In media and communication courses, GenAI tools like **Runway**, **Synthesia** and **Adobe Firefly**: can produce multimedia content, such as podcasts, videos, or interactive stories, integrating visual, auditory, and textual elements.

EXAMPLE: "Uses of ChatGPT in Classroom"



20

ways to use ChatGPT in the classroom



1 Use it as a more complex source of information than Google.



2 Use it to provide students access to lots of good examples.



3 Use it to remix student work.



4 Ask it for definitions (on a variety of levels).



5 Ask it for feedback for student work.



6 Ask it to do some teacher tasks for you.



7 Add it to the "think pair share" thinking routine.



8 Grade the bot.



9 Debate the bot.



10 Ask the bot for advice.



11 Use it to summarize texts.



12 Use it for insight into big, difficult-to-solve problems.



13 Ask ChatGPT to write your lesson plans.



14 Anticipate the response you'd expect from AI.



15 Take several responses and make a better product.



16 Create personalized learning experiences.



17 Provide tutoring or coaching.



18 Generate prompts and questions to facilitate discussions.



19 Provide information and answer questions.



20 Supplement in-person instruction.



Get an overview of ChatGPT in the classroom at ditchthattextbook.com/ai.
Infographic by Matt Miller (@jmattmiller / DitchThatTextbook.com)

Implementing GenAI in Higher Education Curriculum

1

AI Literacy Programs

Develop comprehensive AI literacy programs to educate students and faculty about the capabilities, limitations, and ethical considerations of GenAI tools.

2

Integration into Existing Courses

Incorporate GenAI tools and concepts into existing course structures, demonstrating practical applications across various disciplines.

3

New AI-Focused Courses

Create new courses specifically focused on AI and its applications in different fields, preparing students for an AI-driven future.

4

Collaborative AI Projects

Encourage interdisciplinary projects that utilize GenAI, fostering collaboration between departments and exposing students to diverse applications of AI.



Content Generation in Higher Education



1

Creating Lecture Notes and Study Guides

Instructors can use GenAI to draft initial lecture notes, provide summaries of complex topics, or develop course outlines. Tools like [ChatGPT](#) and [Claude](#) can quickly summarize research articles or textbooks, facilitating the creation of comprehensive study materials.

A prompt example follows: “As an expert professor in [SUBJECT], create detailed lecture notes for a 50-minute class on [TOPIC]. Include:

1. 3-5 key learning objectives.
2. A clear outline with main points and sub-points.
3. Potential student questions and answers.
4. 2-3 points where you would pause for class discussion. Also, suggest 2-3 supplementary resources for students who want to dive deeper.”

2

Generating Examples and Case Studies

Educators can use GenAI to produce customized examples or hypothetical scenarios to illustrate key concepts in various subjects, such as ethical dilemmas for philosophy courses or market trends for business studies. [ChatGPT](#) can create diverse, realistic scenarios while [Gemini](#) can produce detailed, complex examples.

A prompt example follows: “Create 3 real-world examples that demonstrate the application of [CONCEPT] in [SUBJECT]. For each example: 1) Describe the scenario. 2) Explain how the concept applies. 3) Identify potential challenges or complications. 4) Suggest discussion questions for students.”

3

Developing Interactive Learning Content

GenAI can be used to generate quizzes, flashcards, and interactive activities that reinforce key learning objectives. Tools like [Quizlet AI](#) and [ChatGPT](#) can create dynamic, text-based simulations for student interaction.

Generative AI / AI: Content Creation Tools

Generative AI

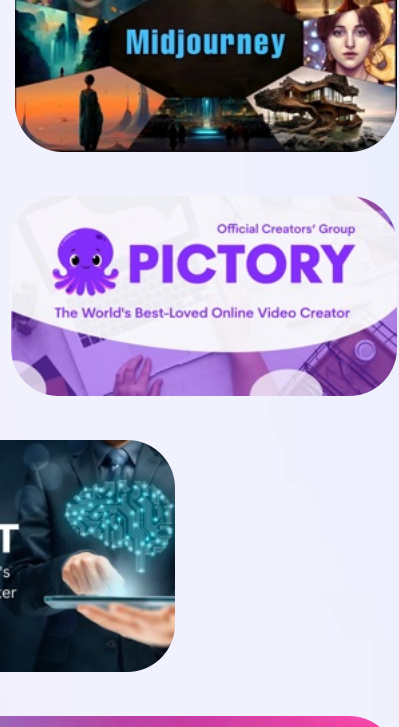
is able to produce new content based on the data it is given. It creates **new data from old data**.

Non Generative AI

The non-Generative AI can learn from the data, but **it is not able to create new data** itself. By learning from data, it can identify patterns to make predictions or decisions. It relies purely on information it has already collected (unlike GenAI, which uses algorithms to create new data).

Examples GenAI

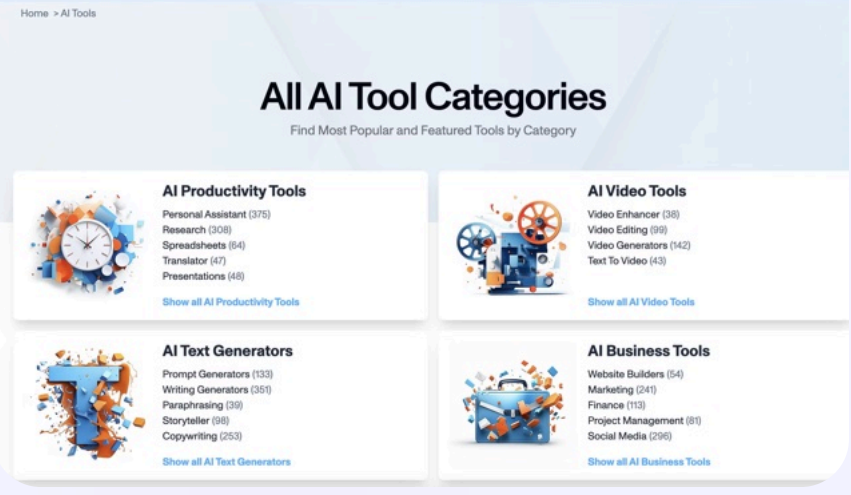
Text, Image, music, video generators.



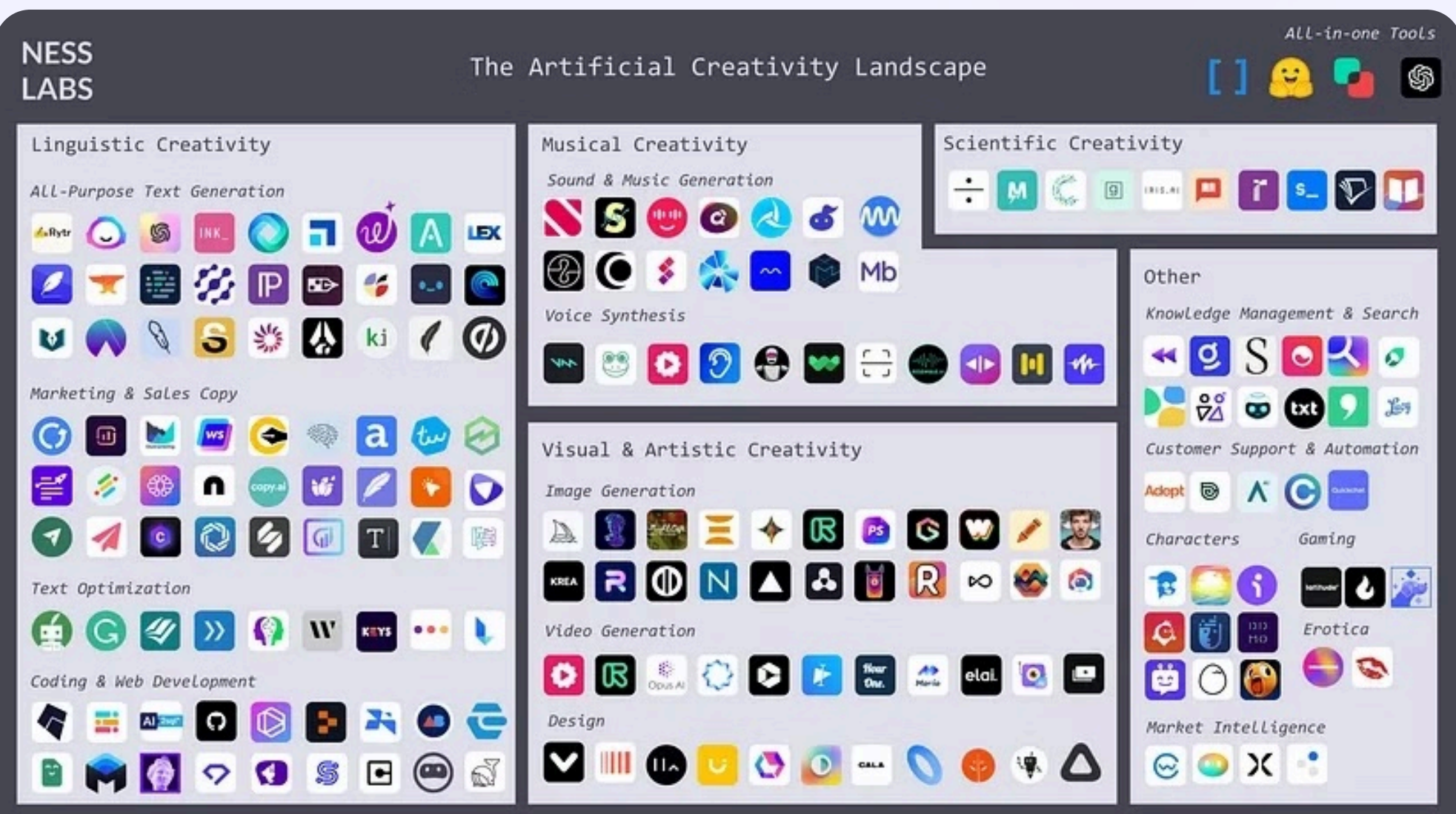
Examples Non GenAI

1. Adaptive learning,
2. Automated scoring with feedback,
3. Conversational AI
4. Facial & Speech Recognition

Collection of Generative AI Tools



The platform **Futuropedia** offers **5764 AI tools** classified into **10 categories** (video, images, art, text generators, etc.). You can find complete catalogues, easy-to-follow guides, a weekly newsletter and an informative YouTube channel.

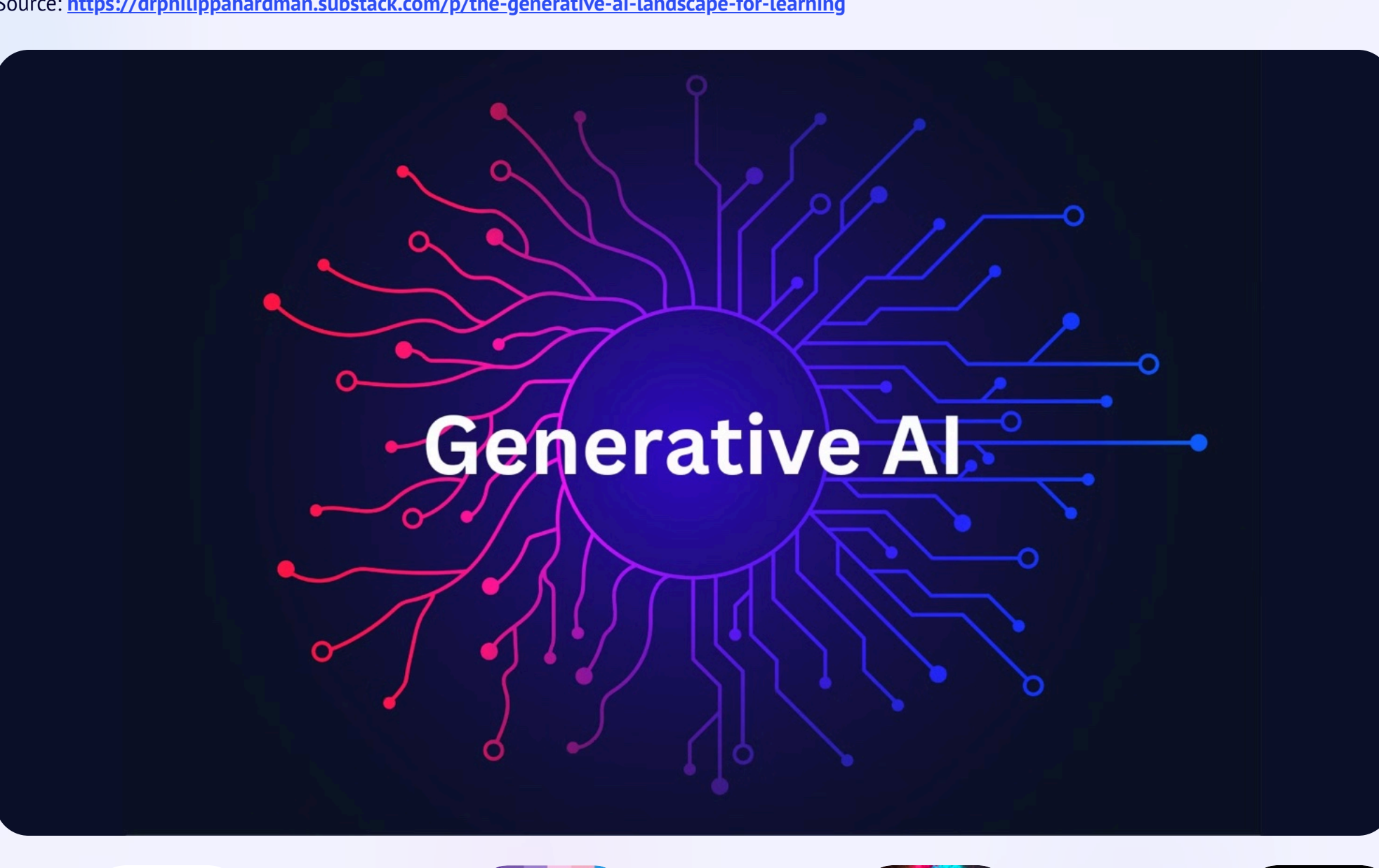


2022 : The artificial creativity space is moving so quickly, it would be impossible to map the entire landscape without missing any of the new applications that are launched every day. However, this map with more than 180 AI tools gives you an idea of the thriving ecosystem as of 2022. <https://nesslabs.com/artificial-creativity>

The Generative AI Landscape for Learning Designers

Domain Expertise Elicit, Explainpaper, ChatGPT	Efficiency Uizard, Quickchat, LAVENDER, mem, copy.ai, Mintify, copysmith
Video Creation Runway, Rephrase.ai, Diverse, Synthesia, Tavus, Fliki	Image Generation Playground, MAGE, PhotoRoom, Crayon, ROSEBUD.AI
Text Generation Jasper, Writesonic, Rytr, AI-POWERED STORYTELLING	Audio Creation WellSaid, Coqui, VOICEMOD
Music Creation SPLASH, Boomy, Harmonai, Mubert	Diagram Generation Uizard, mirage, VIZCOM, Diagram Labs

Source: <https://drphilippahardman.substack.com/p/the-generative-ai-landscape-for-learning>



Domain Expertise Elicit: Uses language models to automate and accelerate research processes, helping users quickly develop expertise in any field. Explainpaper: Allows uploading complex academic papers, highlighting confusing text for AI-powered explanations. ChatGPT: Generates comprehensive information on any topic and provides interactive, in-depth responses.	Diagram Tools: Uizard & Diagram: Design diagrams rapidly using AI. Vizcom: Bring drawings to life instantly.	Efficiency Tools Quickchat: Build support bots to scale academic and administrative feedback. Copy, Typewise & Lavender: Automate personalized email communications. Mem: Facilitates AI-powered project collaboration across multiple documents. Runway: Streamlines collaborative image and video creation and editing. Mintify & Notion AI: Simplify beautiful documentation creation.	Multimedia Creation Video Tools: Fliki: Converts text to video instantly. Dubverse: Creates multilingual video content effortlessly. Opus: Transforms text into videos, game assets, and visual effects. Rephrase: Generates personalized avatars. Tavus: Multiplies a single video into thousands of variations. Synthesia: Produces multilingual personalized videos.
Image Generation: DALL-E can generate visual concepts and artistic examples MidJourney can create detailed artistic illustrations, Leonardo AI can develop style-specific art. Playground & Craiyon: Generate downloadable AI images quickly. PhotoRoom: Batch edit hundreds of images in seconds. Mage Space: Create and download AI-generated images. Rosebud: Access royalty-free AI-generated stock photos and videos.	Text Generation: Subtxt: Develop engaging narratives for optimized learning. Jasper, Writesonic & Rytr: Generate course content, titles, and testimonials rapidly. Claude can generate complex writing and feedback. ChatGPT can create varied writing prompts. Sudowrite can assist for specialized creative writing (e.g., fiction).	Music Generation: Splash: Compose original music and lyrics easily. Boomy: Create songs quickly, no musical expertise required. Harmonai: Open-source generative audio tools for accessible music production. Mulbert: Generate free, royalty-free music tracks.	Audio Creation: Resemble: Generate human-like voiceovers instantly. WellSaid: Real-time text-to-voice conversion. Coqui: Deliver messages using AI voices. VoiceMod: Create original voices for free.

PROMPT EXAMPLES


1 Art & Design A prompt example for concept exploration follows: "Create a series of 4 different artistic interpretations of [THEME] using contrasting styles: 1) Minimalist. 2) Baroque. 3) Contemporary abstract. 4) [Specific art movement relevant to your lesson]. For each style, explain: i) Key visual elements used. ii) Historical context and significance. iii) How it communicates the theme differently."	2 Creative Writing A prompt example for character development follows: "Create a character profile template for a [GENRE] story. Include: 1. Essential character attributes (3-5). 2. Character background questions (5-7). 3. Potential conflict sources (internal and external). 4. Character arc outline. Then, demonstrate how to fill this template for two contrasting characters, showing how their interactions could drive a narrative."	3 Multimedia Storytelling: A prompt example for storyboarding follows: "Create a detailed storyboard outline for a 3-minute multimedia story about [THEME]. Include: 1. Visual descriptions for key frames. 2. Audio elements (music, sound effects, dialogue). 3. Transitions between scenes. 4. Interactive elements for audience engagement. Consider how different media elements can: i) Enhance the narrative. ii) Evoke specific emotions. iii) Create memorable moments."
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Recommendations for Higher Education

- Verify AI-generated content for accuracy
- Use tools as supplements, not replacements for critical thinking
- Teach responsible AI usage
- Explore tools' potential for personalized learning
- Stay updated on emerging AI technologies

REPOSITORIES/COLLECTIONS

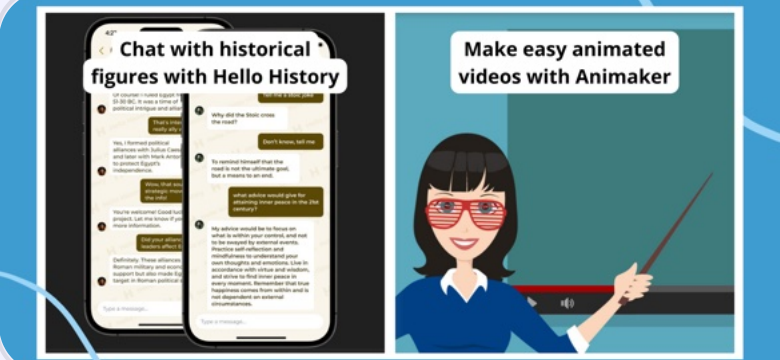
Generative AI: Content Creation Tools



www.magicschool.ai

MagicSchool - AI Built for Schools

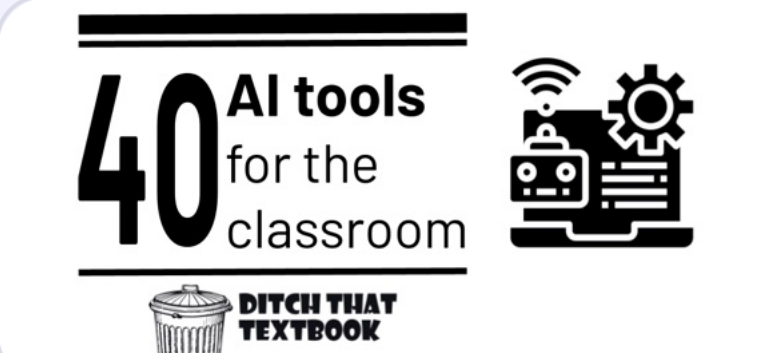
The leading AI platform for schools. Loved by over 2 million teachers saving time with AI to assist with lesson plans & more. Free for teachers.



[We Are Teachers](#)

AI For Teachers: 33 Tools to Make Your Life Easier in 2024


From personalizing learning experiences to automating administrative tasks, these tools should be on every teacher's radar.



[Ditch That Textbook](#)

40 AI tools for the classroom

Artificial intelligence is growing by leaps and bounds. It's no longer science fiction anymore! Lots of AI tools can serve as our own personal



dev-share.clickup.com

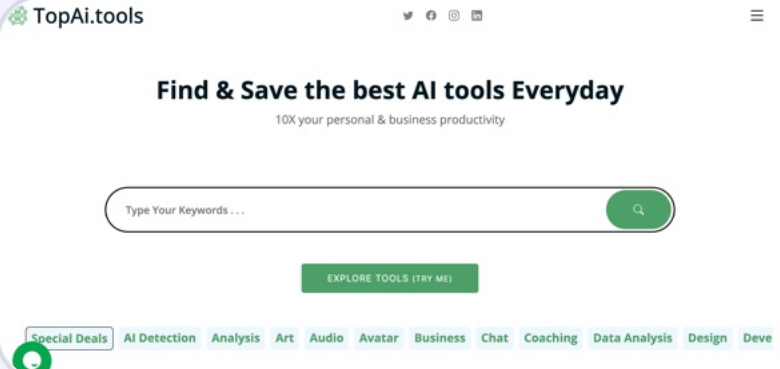
ClickUp

This is an up-to-date AI Tools database sourced from ClickUP, containing a comprehensive list of available AI tools.

theresanaiforthat.com

Loading...


The largest database, featuring 12,061 AIs capable of handling over 2,099 tasks, is continually updated on a daily basis.



topai.tools

All AI tools, in one place - TopAI.tools


Explore the largest list of AI tools on the web, with 10K+ AI tools in one place for every task you have. Boost your productivity with AI tools and get more...



[huggingface](https://huggingface.com)

Spaces - Hugging Face

Discover amazing ML apps made by the community



www.briskteaching.com

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Developing Interactive Learning Materials

Interactive learning materials can increase student engagement, promote active learning, and support the mastery of complex concepts. GenAI tools enable educators to create dynamic and adaptive content, such as simulations, chat-based scenarios, and multimedia learning activities, that go beyond static text or traditional lecture materials.

1 Simulations and Scenario-Based Learning



Definition: Simulations and scenario-based learning place students in lifelike contexts where they can practice decision-making, problem-solving, and critical thinking. These experiences are particularly valuable in fields like medicine, business, and engineering, where students must learn to apply theoretical knowledge in practical situations.

GenAI Tools for Simulations: GenAI tools can serve as interactive agents in text-based simulations, guiding students through branching scenarios.

For example, in a medical course, **ChatGPT** could simulate a patient presenting symptoms, allowing students to diagnose conditions and recommend treatments based on their interactions with the AI. **Claude** can generate complex, branching simulations while **AI Dungeon** (customized) interactive storytelling.

A prompt example for a medical scenario: "Create a detailed scenario in which a group of medical students is interacting with a GenAI system during a clinical simulation exercise. In this scenario, the GenAI presents a case study of a patient with specific symptoms. The students must analyze the symptoms, discuss possible diagnoses, and recommend appropriate treatments. Include the following elements:

1. **Patient Profile:** Brief background information about the patient, including age, gender, medical history, and presenting symptoms.
2. **GenAI Interaction:** Describe how the GenAI communicates the symptoms and facilitates discussion among the students.
3. **Student Dynamics:** Illustrate the interactions among students as they collaborate to diagnose and propose treatment options. Highlight any disagreements or differing opinions.
4. **Outcome:** Conclude with the students' final diagnosis and treatment plan, as well as any feedback from the GenAI on their reasoning and choices. Make sure to emphasize the educational value of the exercise and how the GenAI enhances the learning experience."

Implementation: Educators can develop these simulations by scripting potential scenarios and outcomes, using GenAI to respond dynamically to student inputs. This can be achieved through platforms like Twine for interactive storytelling or using chat-based AI tools for real-time scenario responses.

2 Chat-Based Scenarios and Role-Playing Exercises



Definition: Chat-based scenarios involve conversational interactions where students can engage in role-play with a virtual AI character. These scenarios help students practice language skills, conduct mock interviews, or encounter ethical dilemmas in a safe and structured environment.

GenAI Tools for Role-Playing: GenAI Tools like **ChatGPT** or **Google's Gemini** can be used to create these role-play scenarios by acting as a character with a specific personality and background. For example, in a business ethics course, ChatGPT could assume the role of a fictional CEO, engaging students in a dialogue about corporate responsibility.

A prompt example for a role-playing exercise about business ethics: "Design a role-playing exercise where GenAI takes on the role of a functional CEO of a fictional company. The scenario involves a discussion with students about corporate responsibility and ethical decision-making in business. Include the following elements:

1. **Company Background:** Provide a brief overview of the fictional company, including its industry, size, mission statement, and recent challenges related to corporate responsibility.
2. **CEO Characterization:** Describe the CEO's personality, leadership style, and approach to corporate ethics. Include their views on the importance of corporate social responsibility (CSR) and how it aligns with the company's goals.
3. **Discussion Topics:** Identify key topics for discussion, such as: i) The role of businesses in addressing social and environmental issues. ii) Balancing profit motives with ethical obligations. iii) Stakeholder versus shareholder perspectives. iv) Real-world examples of ethical dilemmas faced by companies.
4. **Student Interaction:** Outline how students will interact with the CEO, including questions they may ask, challenges they might present regarding corporate decisions, and how they can propose alternative ethical strategies.
5. **Outcome Reflection:** Conclude with a reflection section where students summarize what they learned from the exercise about corporate responsibility and ethical leadership. Encourage creativity and critical thinking in both the CEO's responses and the students' inquiries."

Implementation: Educators can create prompts that define the scenario, character traits, and objectives. They can also set boundaries for the AI's responses to ensure the interaction aligns with learning outcomes.

3 Adaptive Learning Activities and Adaptive Tutorials



Definition: Adaptive learning materials adjust their content and pacing based on the student's performance and needs. This can include quizzes that change in difficulty or tutorials that offer hints when students struggle.

GenAI Tools for Adaptive Learning: Platforms like **Knewton** use AI to analyze student interactions and provide personalized content recommendations. Educators can integrate these tools into their courses to create responsive learning environments that cater to diverse student needs.

Implementation: Educators can develop modular learning units that include various branching paths, quizzes, and activities. GenAI can then be used to guide students through these units based on their responses and performance.

A prompt example for personalized assessment: "Analyze the student's responses to:

1. Identify preferred learning styles (visual, auditory, kinesthetic).
2. Determine optimal content delivery methods.
3. Suggest personalized study strategies.
4. Recommend resources matching their style. Format the analysis as: i) Primary learning style. ii) Secondary learning style. iii) Recommended study techniques. iv) Tailored resource list."Strategy

Using GenAI for Personalized Learning Paths

One of the greatest strengths of GenAI is its ability to create tailored learning experiences that meet individual students where they are, providing personalized support.

Creating Personalized Learning Paths



1 Definition: Personalized learning paths use data about students' profiles, strengths, weaknesses, and learning preferences to offer a customized sequence of learning activities and content.

GenAI Tools for Personalization: Tools like **Squirrel AI** and **Carnegie Learning's MATHia** use AI to track student performance and provide personalized learning recommendations. AI can analyze student inputs and suggest resources, tasks, or alternative learning strategies.

Educators can set up AI-powered dashboards that provide real-time data on student performance. Based on this data, GenAI can recommend specific exercises or topics that the student should revisit. For example, after a student performs poorly on a quiz, the AI can suggest targeted practice problems and offer brief tutorials on misunderstood concepts.

A prompt example for content personalization:

"Adapt this [concept/lesson] for a student who:

1. Learning style: [visual/auditory/kinesthetic]
2. Current knowledge level: [beginner/intermediate/advanced]
3. Specific interests: [relevant interests]
4. Identified challenges: [areas of difficulty] Include: i) Customized examples relating to student interests, ii) Scaffolded explanations based on current level, iii) Multi-modal presentation of concepts, iv) Personalized practice exercises."

2 AI-based Students' Support

Definition: Educational support aims at helping students overcome learning gaps and achieve mastery of course material.

GenAI Tools for Students' Support: GenAI Tools like **ChatGPT** can serve as 24/7 tutors, offering explanations, worked examples, and additional practice questions in response to specific queries. **Khan Academy's Khanmigo** use AI to provide adaptive hints and scaffolded support.

Implementation: Educators can create a knowledge base of common misconceptions and use GenAI to generate explanations tailored to the specific errors a student makes. For example, if a student consistently struggles with solving quadratic equations, the AI can provide step-by-step guidance and gradually increase the complexity of the problems as the student's proficiency improves.

A prompt example for knowledge gap analysis: "

"Based on the student's performance in [assessment]:

1. Identify specific knowledge gaps.
2. Analyze patterns in incorrect answers.
3. Determine prerequisite concepts needing review.
4. Suggest targeted support activities. Provide: i) List of concepts to review, ii) Recommended order for support, iii) Estimated time for each review activity, iv) Checkpoints to assess progress." A prompt example for generating a support plan: "Create a personalized support plan for [concept]:
5. Break down the concept into component parts.
6. Provide alternative explanations for each part.
7. Design progressive practice exercises.
8. Include self-assessment checkpoints. Structure the plan with: i) Clear learning objectives, ii) Estimated completion time, iii) Various types of practice activities, iv) Success criteria for each checkpoint."

Supporting Student Engagement and Collaboration

When students work on group projects, GenAI tools can help organize group and project management as well as facilitate communication and collaboration among the group members. GenAI can suggest the best way to form groups by looking at each student's strengths and learning styles, suggest how to divide tasks based on what each student does best, and keep track of everyone's progress. GenAI can also help manage group discussions to make sure everyone has a chance to speak and can help resolve any disagreements by offering fair suggestions.

For project brainstorming, GenAI can come up with creative ideas, combine different thoughts from the group, and spot any gaps or new opportunities in their work. By keeping track of how the group interacts and contributes, GenAI tools also help educators see how each student is doing and give better advice to both groups and individual students.

University teachers can use GenAI tools to make it easier for students to get support and work together on projects. These GenAI tools are always available and can answer common questions about classes, deadlines, and assignments quickly, which helps lighten the educator's workload. Finally, they can explain difficult ideas, suggest helpful resources, and guide students step-by-step through tough problems, acting like personal tutors that are available anytime.

Creating Virtual Assistants for Student Support



1 Developing AI Chatbots for Q&A and Tutoring

Definition: AI chatbots serve as automated systems that can respond to frequently asked questions, tutor students on specific topics, and provide general academic support.

GenAI Tools for AI Chatbots: GenAI Tools like [ChatGPT](#) and [Microsoft's AI-powered QnA Maker](#) are popular platforms for creating AI chatbots. These tools can be customized to provide responses based on course content, previous lectures, or assignment guidelines.

Implementation: Educators can design these chatbots to answer course-related questions, clarify assignment expectations, and offer hints on problem sets. For example, a chatbot in a computer science course might help students debug code by asking diagnostic questions and suggesting potential solutions. See Appendix 4 for an AI Tutor prompting framework.

2 Virtual Peer Tutoring



Definition: AI-powered peer tutors simulate the role of a knowledgeable peer who provides feedback, suggests resources, and engages students in collaborative learning.

GenAI Tools for Virtual Peer Tutoring: GenAI platforms like [TutorAI](#) can be set up to engage students in Socratic questioning, prompting them to explain their reasoning and think critically about their responses.

Implementation: Educators can use GenAI tools to simulate a virtual peer who poses open-ended questions, such as "How would you approach solving this problem if you were given different constraints?" This helps students develop metacognitive skills and explore alternative problem-solving strategies.

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Ethical Considerations and Challenges

"AI lacks emotional intelligence, empathy, morality, compassion, and integrity, all of which are (or, if not, then they should be) central values to any higher-education institution" Lucy Avramidou.

Source: <https://ukrant.nl/chatgpt-is-amazing-and-everything-thats-wrong-with-the-world/?lang=en>

GenAI biases and limitations

While GenAI offers numerous advantages, it is essential to recognize and mitigate its **biases and limitations**.

50%

1. Bias in Training Data:

GenAI models are trained on large datasets that may include biased, outdated, or inappropriate content. This can lead to outputs that reflect stereotypes or inaccurate information. For example, a GenAI tool might generate text that reinforces gender or racial biases.

50%

2. Limitations in Domain Knowledge:

While GenAI tools like **ChatGPT** have broad knowledge, they may lack depth in specialized areas or fail to provide the most up-to-date research findings. Users must verify the GenAI outputs to ensure academic rigor.

50%

3. Over-Reliance on AI Assistance:

- There is a risk that students may become overly reliant on GenAI tools, undermining the development of critical thinking and problem-solving skills. It is crucial to use GenAI as a supplement, not a replacement, for active learning.

Data Privacy and Intellectual Property Concerns

When integrating GenAI tools into HE, it is essential to address privacy and intellectual property issues:

1. Data Privacy:

- GenAI tools may store user inputs to improve future performance, raising concerns about data privacy. Users should avoid inputting sensitive, personally identifiable information or copyrighted content and choose tools that comply with institutional data protection policies.

2. Intellectual Property:

- The use of AI-generated content raises questions about authorship and intellectual property rights. If a student submits an essay enhanced by GenAI tools, who owns the intellectual property? Clear guidelines must be established regarding the ownership and use of AI-generated materials.

3. Academic Integrity:

- Policies must define acceptable use of GenAI tools in assignments and research. This includes specifying when and how it is permissible to use AI for drafting, ideation, or coding, and ensuring that students appropriately attribute AI contributions.

Establishing Clear Guidelines for Academic Integrity



To promote ethical use of GenAI tools, institutions should establish clear policies that outline expectations for both faculty and students:

Developing Institutional Policies:

Universities should draft guidelines on the permissible use of GenAI tools, including considerations for academic honesty, intellectual property, and data privacy. HE should establish a committee to: 1) Monitor emerging AI technologies; 2) Gather feedback from faculty and students; 3) Update policies quarterly or as needed; 4) Communicate changes effectively to all stakeholders. For an example of an institutional GenAI policy framework, see Appendix 1.

Creating Transparency in GenAI Use:

Educators should be transparent about how GenAI tools are used in course design, teaching, and assessment. For example, if an AI tool is used to generate initial feedback, students should be informed and understand the role of the AI in the process.

Educating Students on Responsible Use:

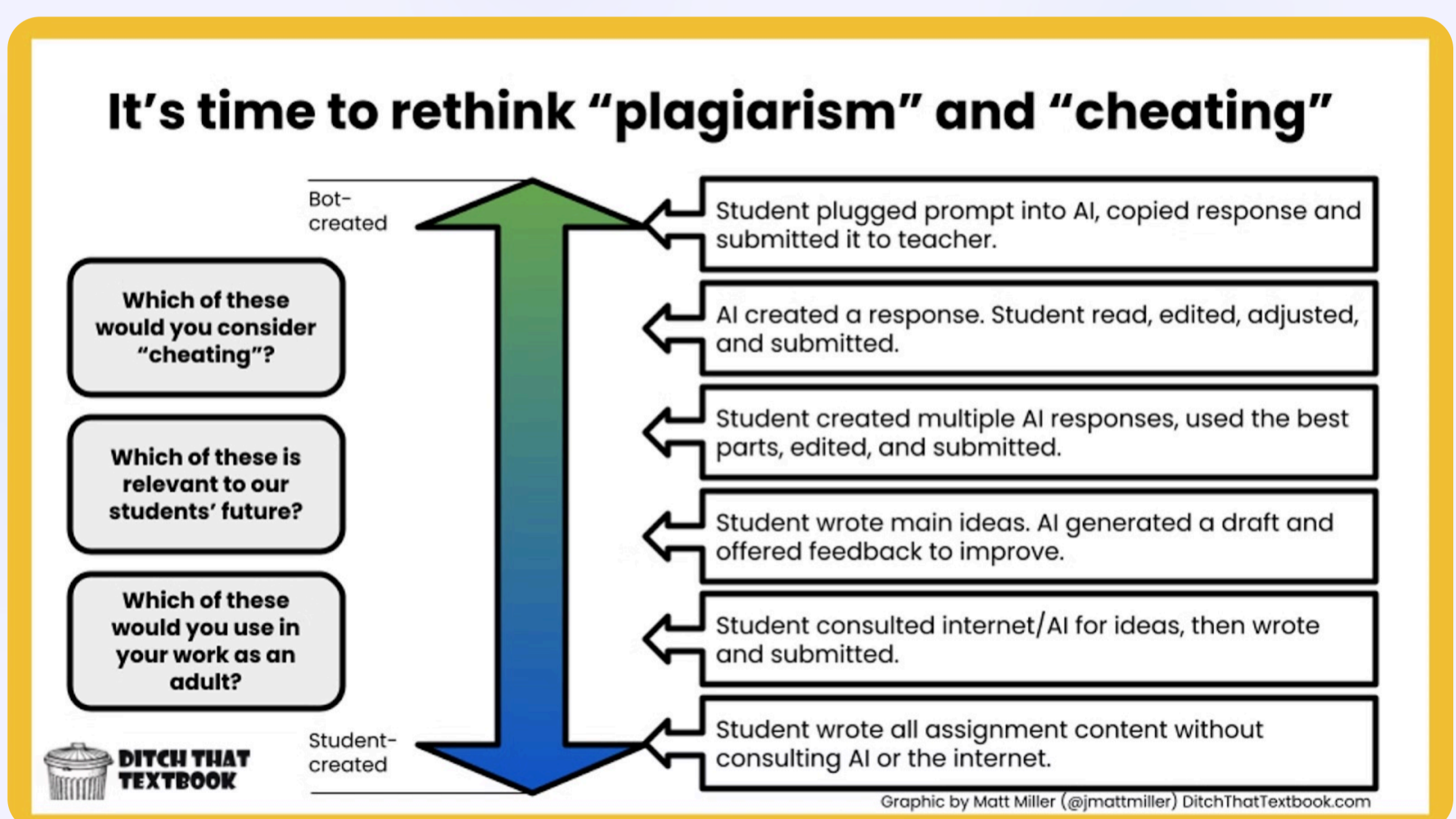
Workshops and tutorials can help students understand the ethical implications of using GenAI, including when and how to use these tools responsibly in their academic work. HE should develop a series of workshops or online modules covering: 1) Introduction to GenAI capabilities and limitations; 2) Hands-on exercises for responsible AI use; 3) Case studies of appropriate and inappropriate AI use; 4) Q&A sessions with AI ethics experts. For an example of a guide to responsible GenAI use in HE.

AI Ethics in Education: Recommendations

UNESCO's recommendations on AI ethics in education.

The UNESCO Recommendation on the Ethics of AI adopted in November 2021 by the 193 Member States, affirms that "AI actors should make all reasonable efforts to minimise, avoid strengthening or perpetuating applications and discriminatory or biased outcomes throughout the lifecycle of the AI system to ensure the fairness of these systems."

Challenge	Description	Potential Solution
Academic Integrity	Risk of students using GenAI to complete assignments dishonestly	Develop clear guidelines for acceptable use and citation of AI-generated content
Equity and Access	Potential for unequal access to GenAI tools among students	Ensure institution-wide access to approved GenAI tools and provide necessary training
Data Privacy	Concerns about student data used to train or interact with GenAI systems	Implement strict data protection policies and use privacy-preserving AI technologies
AI Bias	Risk of perpetuating or amplifying biases in GenAI outputs	Regularly audit AI systems for bias and implement diverse training datasets



USEFUL RESOURCES to explore:

1. AI ethics EU report

European Commission, Directorate-General for Education, Youth, Sport and Culture, Ethical guidelines on the use of artificial intelligence (AI) and data in teaching and learning for educators, Publications Office of the European Union, 2022, <https://data.europa.eu/doi/10.2766/153756>



Publications Office of the EU

Ethical guidelines on the use of artificial intelligence (AI) an...

These ethical guidelines on AI and data usage in teaching and learning are designed to help educators understand the potential that the...

2. UNESCO's Recommendation on the Ethics of Artificial Intelligence: key facts

The Recommendation establishes a set of values in line with the promotion and protection of human rights, human dignity, and environmental sustainability.

unesdoc.unesco.org

3. "The Ethics of AI" : Free online course created by the University of Helsinki.

The course is for anyone who is interested in the ethical aspects of AI

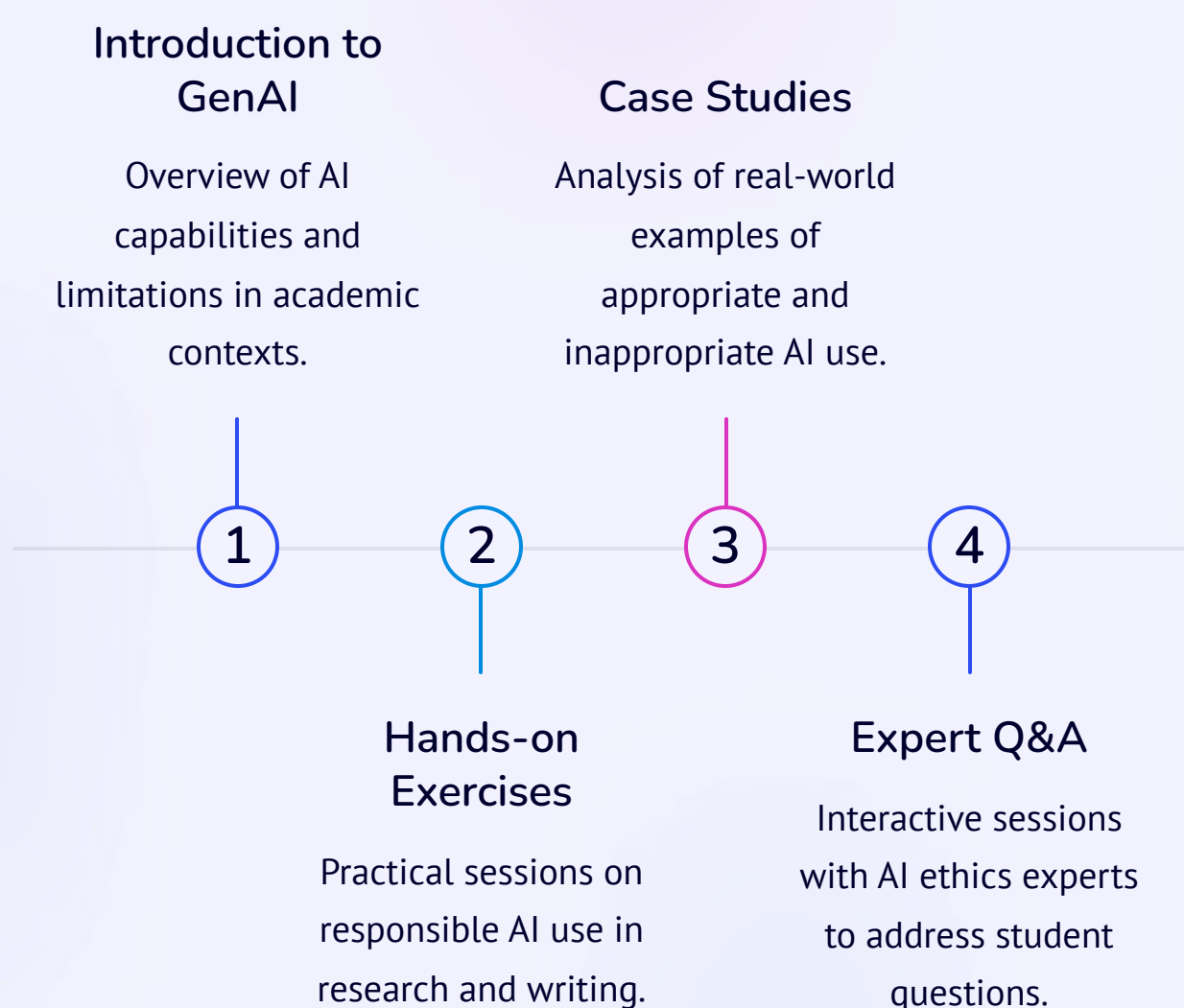
ethics-of-ai.mooc.fi

Ethics of AI

Educating Students on Responsible GenAI Use

To ensure responsible use of GenAI in higher education, institutions must prioritize educating students about the ethical implications and appropriate applications of these tools. This education should go beyond simple dos and don'ts, fostering a deep understanding of AI's capabilities, limitations, and potential impacts on academic integrity.

A comprehensive educational program might include [workshops, online modules, and hands-on exercises](#) that cover topics such as **AI bias, data privacy, and the boundaries of acceptable AI use in academic work**. These resources should be regularly updated to reflect the rapidly evolving AI landscape.



Oregon State University Ecampus

AI decision tree

A guide to help you decide when and how to incorporate artificial intelligence (AI) into your work.



* Consult a supervisor or other person who can provide expertise.

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Future Prospects of GenAI in Higher Education



Advanced AI Tutors

Future GenAI systems may act as personalized AI tutors, providing round-the-clock support and adapting to individual learning styles with unprecedented accuracy.



Immersive Learning Experiences

Integration of GenAI with virtual and augmented reality technologies could create highly immersive, adaptive learning environments for complex subjects.



Interdisciplinary Innovation

GenAI could drive new interdisciplinary fields of study, combining traditionally separate domains like art and computer science or biology and data analytics.



Global Collaboration

Advanced language models could break down language barriers, facilitating seamless global collaboration in research and education.



The Future of GenAI in Higher Education

As we look to the future, it's clear that generative AI will continue to play an increasingly significant role in higher education. The challenge lies in harnessing its potential while addressing ethical concerns and maintaining the core values of academic integrity and critical thinking.

By establishing clear guidelines, fostering transparency, and educating all stakeholders, institutions can create an environment where AI enhances rather than undermines the educational experience. The future of higher education will likely involve a symbiotic relationship between human expertise and AI capabilities, opening new avenues for research, creativity, and learning.



Advanced Research

AI tools will enable more sophisticated data analysis and hypothesis generation, accelerating scientific discoveries.



Enhanced Creativity

GenAI will serve as a powerful tool for ideation and prototyping in creative fields, pushing the boundaries of innovation.

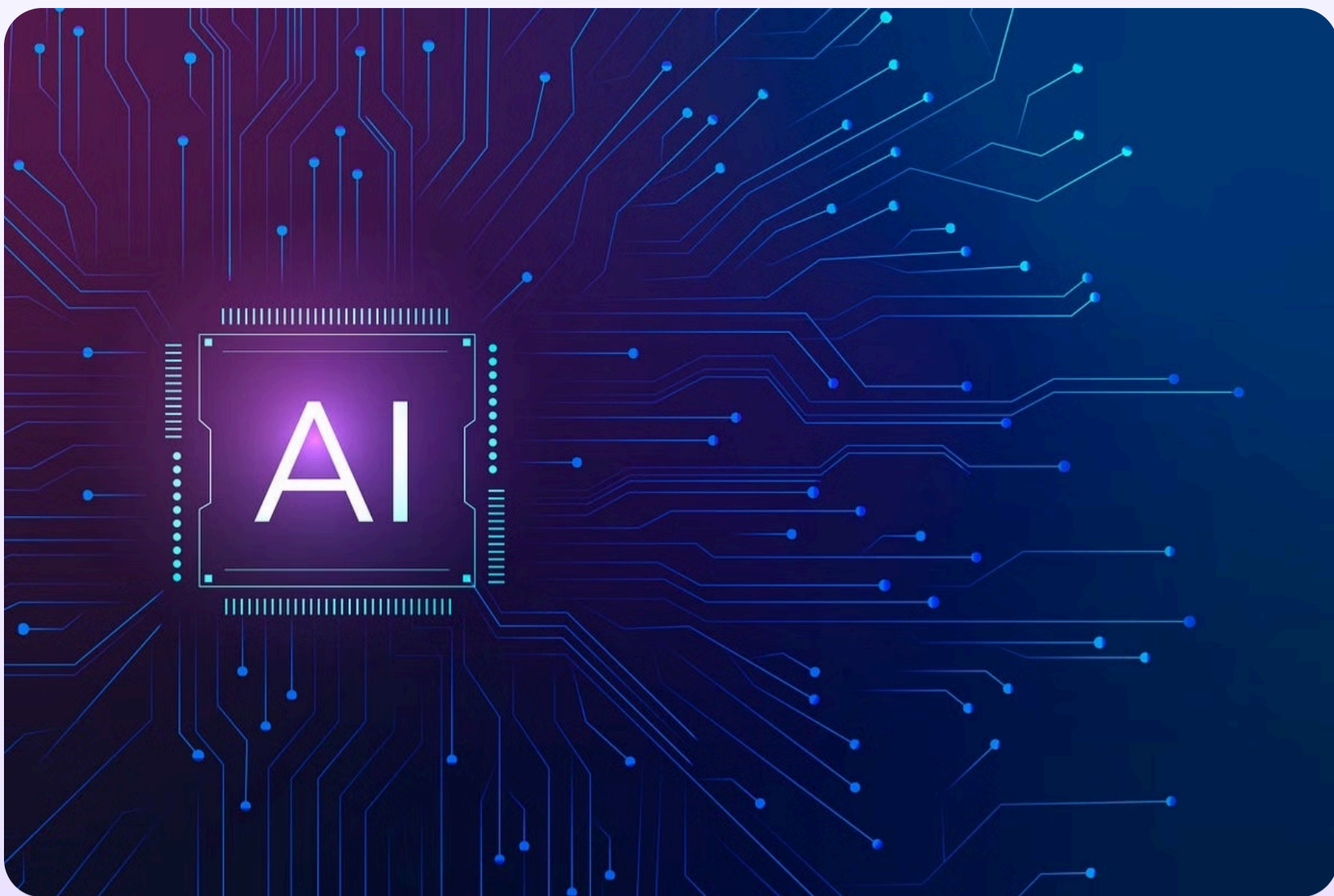


Personalized Learning

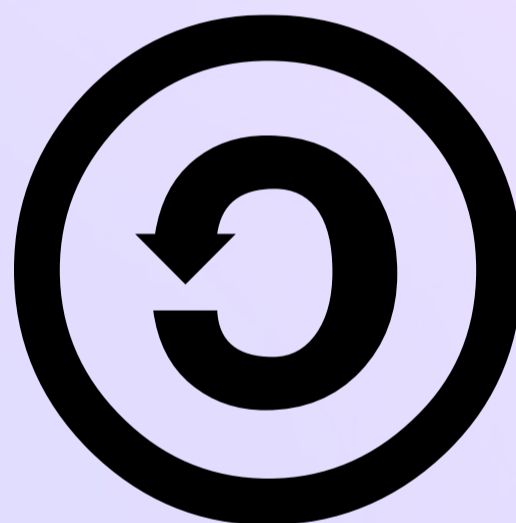
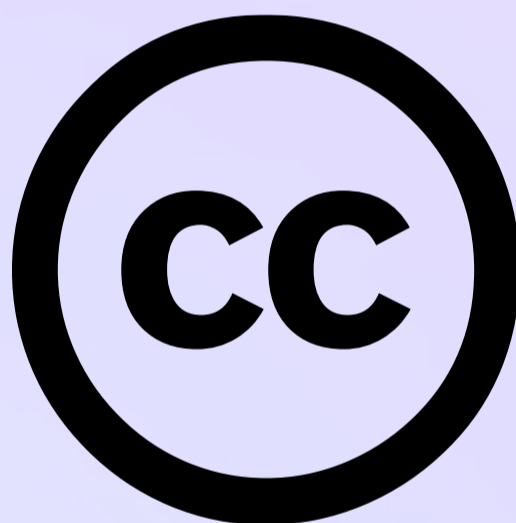
AI-driven adaptive learning systems will provide tailored educational experiences, optimizing the learning process for each student.

References

- Baker, R. S. (2016). Stupid Tutoring Systems, Intelligent Humans. *International Journal of Artificial Intelligence in Education*, 26(2), 600–614. <https://doi.org/10.1007/s40593-016-0105-0>.
- Casamayor, A., Amandi, A., & Campo, M. (2009). Intelligent assistance for teachers in collaborative e-learning environments. *Computers & Education*, 53(4), 1147-1154.
- Chiu, T. K. (2024). Future research recommendations for transforming higher education with generative AI. *Computers and Education: Artificial Intelligence*, 6, 100197.
- Chou, C. Y., Huang, B. H., & Lin, C. J. (2011). Complementary machine intelligence and human intelligence in virtual teaching assistant for tutoring program tracing. *Computers & Education*, 57(4), 2303-2312.
- Gašević, D., Siemens, G., & Sadiq, S. (2023). Empowering learners for the age of artificial intelligence. *Computers and Education: Artificial Intelligence*, 4, 100130.
- Howard, S. K., Swist, T., Gasevic, D., Bartimote, K., Knight, S., Gulson, K., ... & Selwyn, N. (2022). Educational data journeys: Where are we going, what are we taking and making for AI?. *Computers and Education: Artificial Intelligence*, 3, 100073.
- Luckin, R., Cukurova, M., Kent, C., & Du Boulay, B. (2022). Empowering educators to be AI-ready. *Computers and Education: Artificial Intelligence*, 3, 100076.
- Miwa, K., Terai, H., Kanzaki, N., & Nakaike, R. (2014). An intelligent tutoring system with variable levels of instructional support for instructing natural deduction. *Information and Media Technologies*, 9(1), 132-140.
- Schiaffino, S., Garcia, P., & Amandi, A. (2008). eTeacher: Providing personalized assistance to e-learning students. *Computers & Education*, 51(4), 1744-1754.
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education—where are the educators?. *International Journal of Educational Technology in Higher Education*, 16(1), 1-27.



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