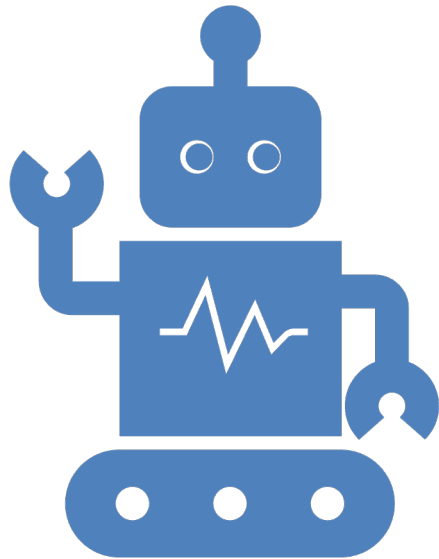# Educación e Inteligencia Artificial

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Space Surveillance Chair

Outline

A Personal Journey into AI

- As many, learned Neural Networks in the 90s during my studies
- ***"Fear of black boxes"***
- Though of AI as yet another hype
- Grudgingly recognized its use in difficult-to-model problems

First steps, first disappointments

- Mainly ignoring AI developments, in the late 2022-early 2023 I first heard about this thing called ChatGPT

- Initial trials to help in grant writing (Jan 23): hallucinations, mostly superficial writing…

- Start to see the potential but quickly forget about it in the maelstrom of work

ChatGPT thinks my office is like this. Maybe not totally wrong.

A coming AI Tsunami ?

- Took a course in Jun'23 (not unlike this one) that opened my eyes to the potential.
- Teacher described AI as a "coming Tsunami" therefore:
  - Ignore it at your own peril
  - Or learn to swim!
- Used the tool to prepare a new course syllabus with much better success (not perfect though) -> subscribed to ChatGPT4 since.

From skeptic to avid user of AI

1. Embracing AI for Course Development:
   1. Creating engaging and dynamic course materials.
   2. Translating academic content for wider accessibility.
2. Leveraging AI in Scholarly Activities:
   1. Helping write papers (e.g. abstracts, conclusions, improving English)
   2. Streamlining editorial processes and peer reviews.
   3. Simplifying routine bureaucratic tasks.
3. Enhancing Technical Tasks:
   1. Assisting with programming and software development.
   2. Crafting a distinctive social media presence for professional branding.
4. Creative Utilization of AI:
   1. Fighting writer's block
   2. Generating visual content like presentation slides and logos.

Outline
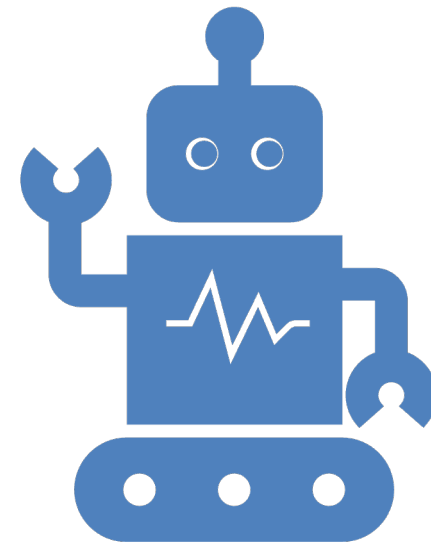
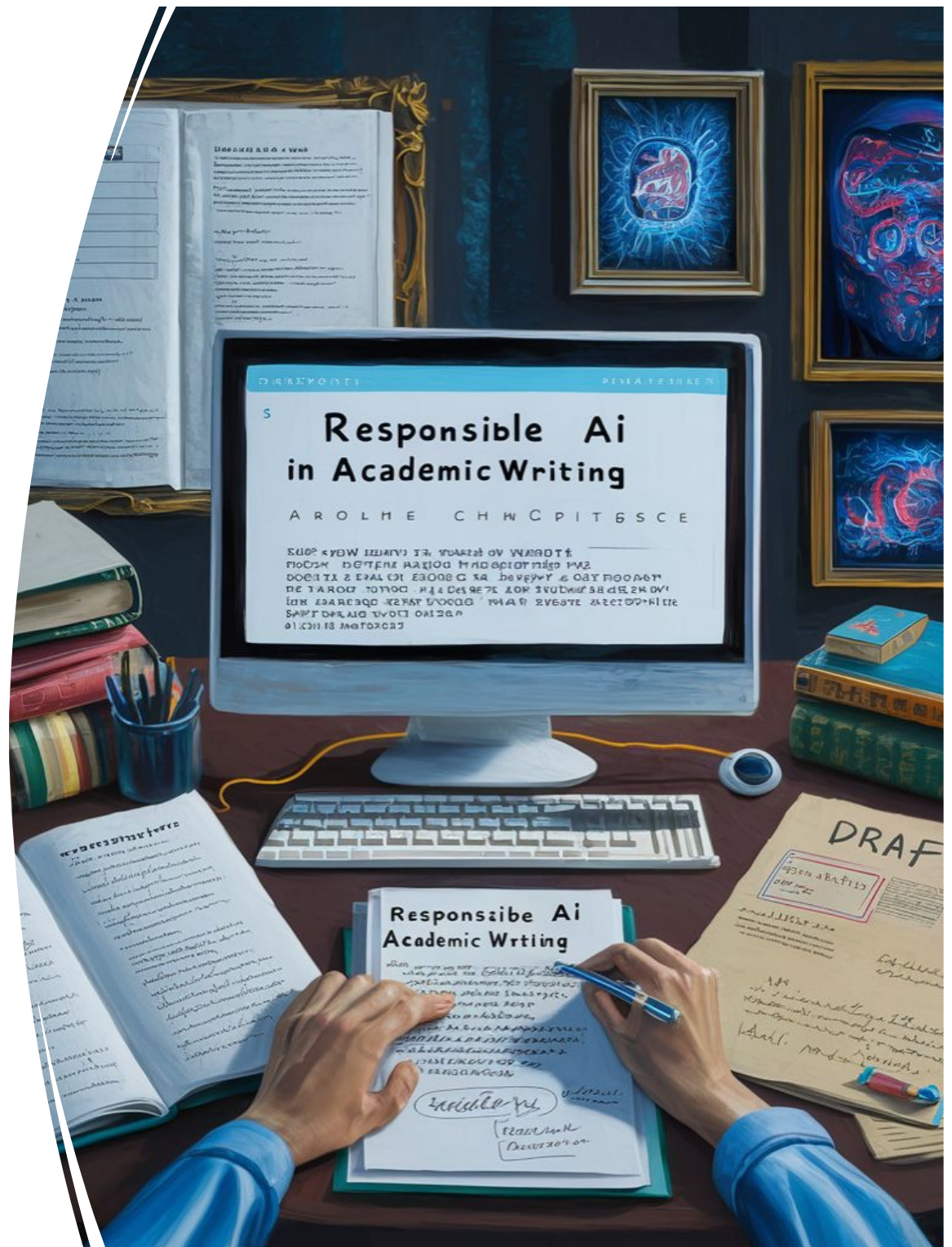# Why a Mini-Course on Responsible AI

- Decision to create the mini-course:
  - Pass knowledge on to students
  - The best way to learn something is teaching it
  - Challenge: Can I make a course on AI with AI?
  - The Opportunity: voluntary lab at the end of "Orbital Mechanics" Class
  - Emphasis on responsible, ethical use, dangers…

Creating the Mini-Course on Responsible AI

- Start: **Write an Academic paper on the responsible use of AI to write academic papers, using AI in a responsible way.**

- Challenge: tons of information, used just a few sources

- Include my own case uses and of course the own paper creation as an example itself

- Include some nice AI generated images

Creating the Mini-Course on Responsible AI

- Next: From the paper develop a presentation for the mini-course
- Incorporate some task for the student: generate a small paper + presentation on a space topic, for instance:
  - Space debris
  - NEOs
  - Gauss's Ceres discovery
  - Halo orbits
  - Pluto's reclassification as a dwarf planet

Outline

1. A personal journey into AI
2. Creating a mini-course on Responsible AI use
3. **The mini-course: highlights**
4. Outcomes of the mini-course
5. Generative AI for professors
6. Conclusions: best practices & outlook
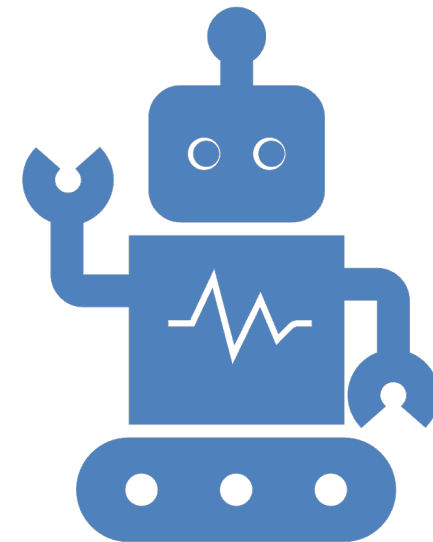
Mini-Course Structure and Key Content

- Target audience of aerospace engineering students (last year undergrads)
- Short duration, interactive format.
- Core topics: After some history and context, focuses on prompt engineering, code generation, academic writing, and presentation skills.
- Responsible and ethical use
- Incorporating feedback for continuous improvement: a necessity given the moving landscape of the field

And now finally... let's take a peek at the minicourse!

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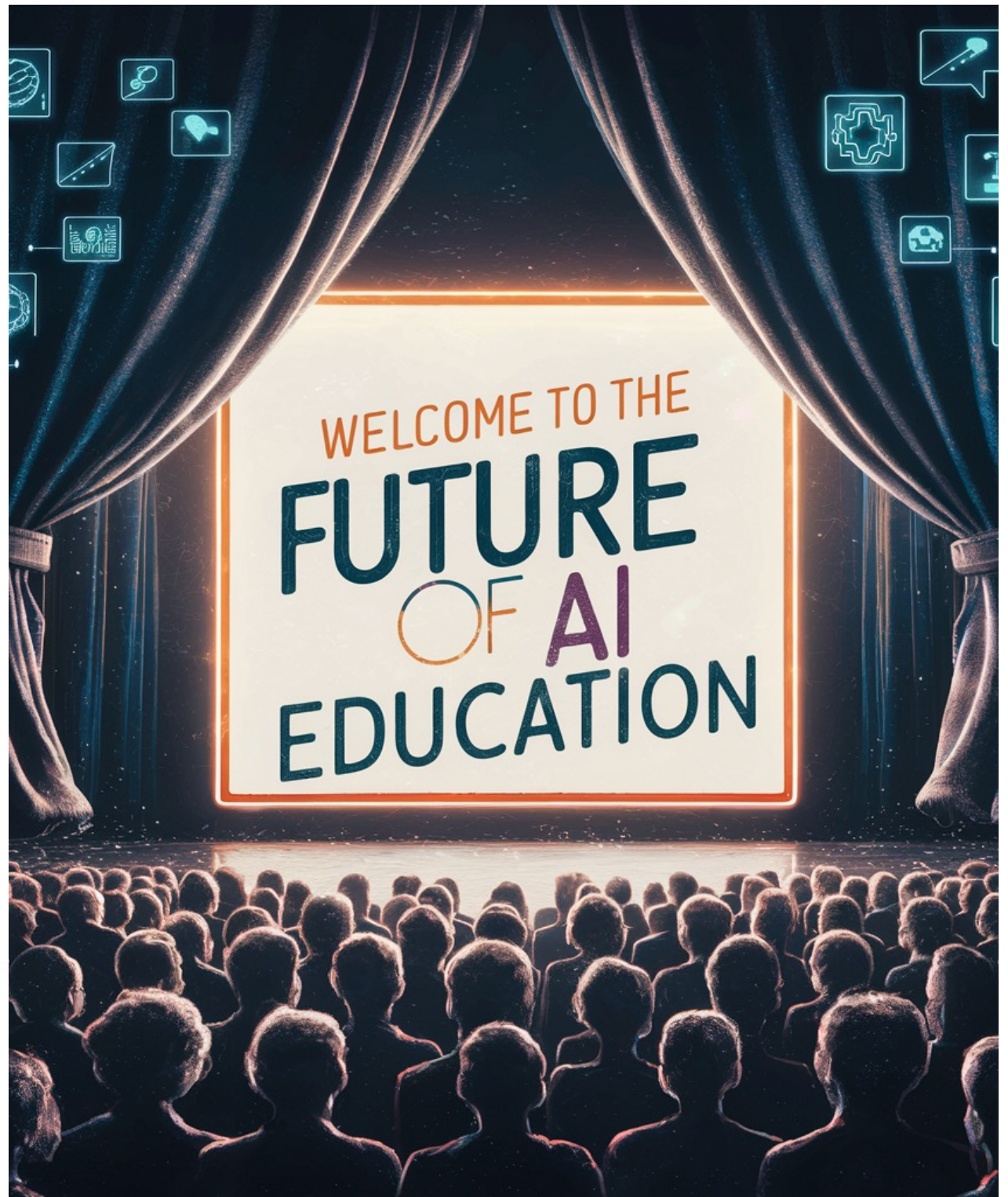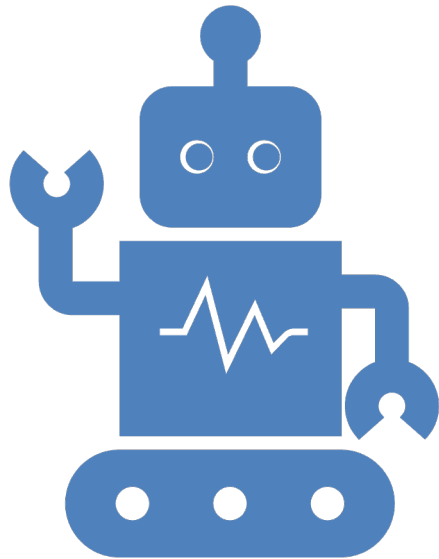6. Conclusions: best practices & outlook

Outcomes of the minicourse

- 13 students attended.
- Student's feedback was positive on the course but generally negative on the use of ChatGPT (see next slide)
- Superficial and vacuous answers were reported
- Papers (in Spanish) were quite bad with no references or almost no references
- Maybe too much for a voluntary lab…

However there were two really great papers

Student Feedback Highlights

- Gratitude for the opportunity to learn about AI and its practical applications

- Appreciation for the interactive nature of the practice, which facilitated understanding

- Desire for more diverse case studies and examples to explore a wider range of AI applications

- Recognition of the potential and limitations of AI tools like ChatGPT

- Challenges with using ChatGPT to start a project from scratch, leading to generic and superficial content

- Usefulness of ChatGPT for tasks like LaTeX, document revision, and formatting

- Suggestion to include more hands-on exercises during the session to enhance engagement

- Appreciation for addressing the ethical and social concerns surrounding AI

Outcomes of the minicourse

- One student created a great report:

El descubrimiento de Plutón y su posterior categorización como planeta enano

(Pluto's discovery and posterior reclassification as a dwarf planet)
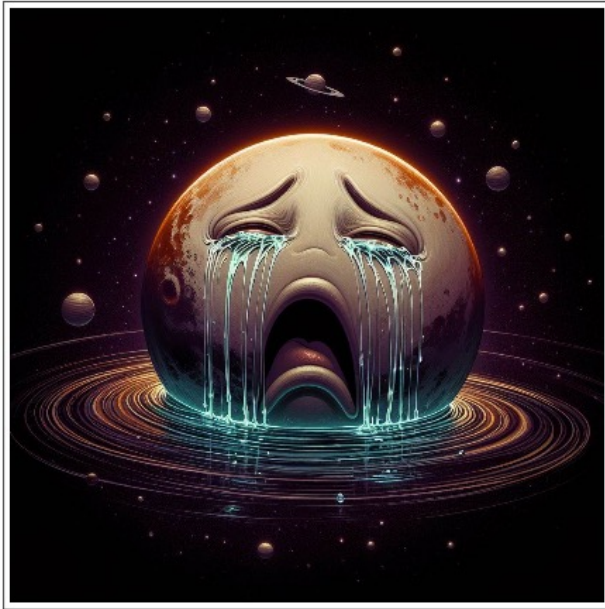
¡Plutón descubre que el tamaño sí lo es todo!

Pluto finds out that size does matter!

Outcomes of the minicourse

- This student used the API!

- Pay-per-use to avoid subscription and just spend a small amount

- He was able to generate images and even audio, quality was good

- He also turned in an appendix explaining the use of the API

- Later I had an interaction with the student to learn myself

Outcomes of the minicourse

- Another student handed in an excellent document:

  - The student began by requesting an outline from ChatGPT.
  - They expanded on each section using ChatGPT, then cross-referenced the information with other sources to create real citations. Often, they added their own
  - They read and revised the language for a more casual tone.
  - The cover image was generated using a premium version of ChatGPT
  - Finally, they created a Beamer presentation with ChatGPT's assistance, acknowledging the results were basic and not very professional, attributing this to a lack of time

Other Outcomes

- Publicized the course on LinkedIn (using ChatGPT as a tool to save time)

- Students of 3rd year asked for a session (which was given, no homework assigned)

- A vicedean at my school asked for a version of this course for professors (more on this later)

Implementing AI in a Class

- For 1st year Master's students: directly integrated into a new class "Applied Orbital Mechanics" as another tool for the tasks in the class

- Homework: do a cover letter

- Assigned and evaluated by AIs (ChatGPT, Gemini) and the professor (much tougher), rubric generated by AI as well.

Cover letters

Name of Student	Type of Cover Letter	Object of the Cover Letter
	Applying for a fellowship	Postgraduate Fellowship in Interstellar Medium Studies at Cosmic Phenomena Institute
	Applying for a grant	Asteroid Mining Techniques Study supported by the Asteroid Foundation
	Applying for a prize	Excellence in Space Systems Design Award by the Association of Space Explorers
	Applying for a job	Junior Space Systems Engineer at Orion Spacecraft Inc.
	Applying to a study program	MSc in Astrodynamics at the Institute of Space Technology
	Applying for a grant	Space Habitat Design Challenge Grant by the Future Living in Space Agency
	Applying for a prize	Young Innovator in Space Science Prize by the Space Science Foundation
	Applying to a study program	Graduate Certificate in Satellite Communication at Cosmos Education Center
	Applying for a job	Mission Analyst at Lunar Exploration Enterprises
	Applying for a job	Aerospace Dynamics Specialist at Deep Space Technologies
	Applying to a study program	BSc in Aerospace Engineering at the Academy of Astronautical Sciences
	Applying to a study program	Undergraduate Research Program in Martian Geology at Planetary Studies Institute

Voluntary Homework 1 (HW1)

Dear Students,

You are invited to participate in the Voluntary Homework 1 (HW1) as part of our class. This exercise is designed to harness the innovative capabilities of generative AI to aid in your learning and understanding of the subject matter.

Objective:

Your task is to prepare a letter of motivation for one of the unique opportunities assigned to you. This letter should articulate your interest, qualifications, and the reasons you are a suitable candidate for the selected opportunity.

Instructions:

1. Review the opportunity assigned to you in the provided Excel file.
2. Utilize a generative AI tool to help draft your letter of motivation. You may choose any generative AI platform you are comfortable with (e.g., ChatGPT, etc.).
3. Your letter should be a maximum of one page, structured properly, and should cover the following points:
   - Introduction: Briefly introduce yourself and mention the opportunity you are applying for.
   - Body: Discuss your qualifications, experiences, and any relevant projects or coursework. Explain why you are interested in this specific opportunity and how it aligns with your career goals in astrodynamics or space engineering.
   - Conclusion: Conclude with a statement expressing your enthusiasm for the opportunity and a polite thank you to the reader for considering your application.
4. Ensure your letter is coherent, persuasive, and creatively uses AI-generated content where appropriate.

Submission:

- Your completed letter of motivation must be submitted by **Monday, 26th of February at 23:59**.
- Please submit your homework in DOCX format via the course's online platform.

Rubric:

Your homework will be evaluated based on the following criteria:

- **Adherence to the Assignment Instructions (30%)**: Follows the homework guidelines and structure as specified.
- **Content Quality and Relevance (40%)**: The letter is engaging, relevant to the assigned opportunity, and demonstrates a clear understanding of the subject matter.
- **Creativity and Originality (15%)**: Effective use of generative AI to enhance the letter's content.
- **Grammar and Presentation (15%)**: Proper use of language, grammar, and overall presentation.

This homework is an excellent opportunity to explore the potential of AI in crafting professional documents and to reflect on your aspirations within the field of space engineering. We look forward to reading your insightful letters of motivation.

Name	R1 (3)	R2 (4)	R3 (1.5)	R4 (1.5)	Total	Comments
	2.7	3.2	1.2	1.3	8.4	Shows creativity and technical insight; minor grammatical issues.
	2.9	3.8	1.4	1.4	9.5	Deep passion and interdisciplinary interest; minor note on sentence structure.
	2.8	3.6	1.4	1.4	9.2	Compelling application; suggestion for simplifying complex sentences.
	2.9	3.6	1.4	1.4	9.3	Strong motivation and background; slight suggestion for sentence refinement.
	2.9	3.7	1.4	1.4	9.4	Dedicated to space science, creative problem-solving approach; minor grammatical suggestion.
	2.8	3.6	1.4	1.3	9.1	Effective communication of enthusiasm for astrodynamics; suggestion for sentence variety.

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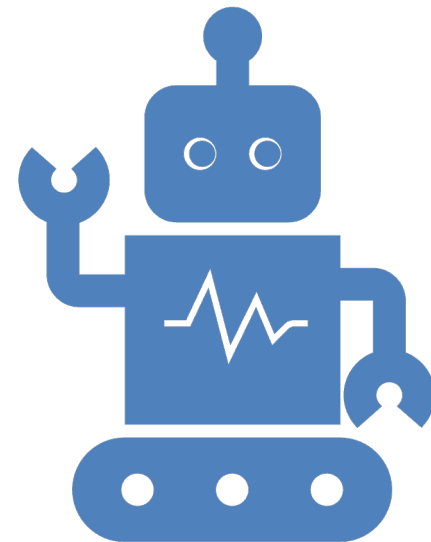
Generative AI in Academic Research and Management

- This presentation (together with images) was generated in a few hours.
- It's not only the images but also the structure and suggestive ideas for many slides.
- Many other routine or non-routine work can be more efficiently carried out with the use of AI
- Use of AI can liberate our time or allow us to do more things (personal choice).

Next, a few posible examples/case uses (some slightly futuristic)

Embracing AI for Course Development

- Generate syllabus for new courses
- Generate new content based on articles and webpages
- Revolutionize your course materials by leveraging AI to create engaging and interactive content
  - Utilize AI-powered tools to generate dynamic presentations, videos, and animations
  - Incorporate AI-driven adaptive learning systems to personalize the learning experience for each student

Embracing AI for Course Development

1 ⟶ **2**

Make your academic content more accessible to a wider audience

- Employ AI to simplify complex concepts and break down technical jargon
- Generate summaries, infographics, and visual aids to enhance comprehension
- Utilize AI-powered translation tools to make your content available in multiple languages

Streamline course administration and management

- Automate grading and feedback processes using AI-driven assessment tools
- Use AI to generate personalized learning paths and recommendations for students
- Implement AI-powered chatbots to provide 24/7 student support and guidance

Leveraging AI in Scholarly Activities

- Enhance your academic writing process with AI assistance
  - Generate compelling abstracts and conclusions using AI-powered writing tools
  - Improve the clarity and coherence of your writing by utilizing AI-driven language optimization
  - Ensure grammatical accuracy and proper English usage with AI-powered proofreading and editing
- Streamline editorial processes and peer reviews
  - Use AI to automatically format manuscripts according to journal guidelines
  - Employ AI-driven plagiarism detection tools to ensure originality and academic integrity
  - Facilitate peer review processes by using AI to match manuscripts with suitable reviewers and summarize reviews
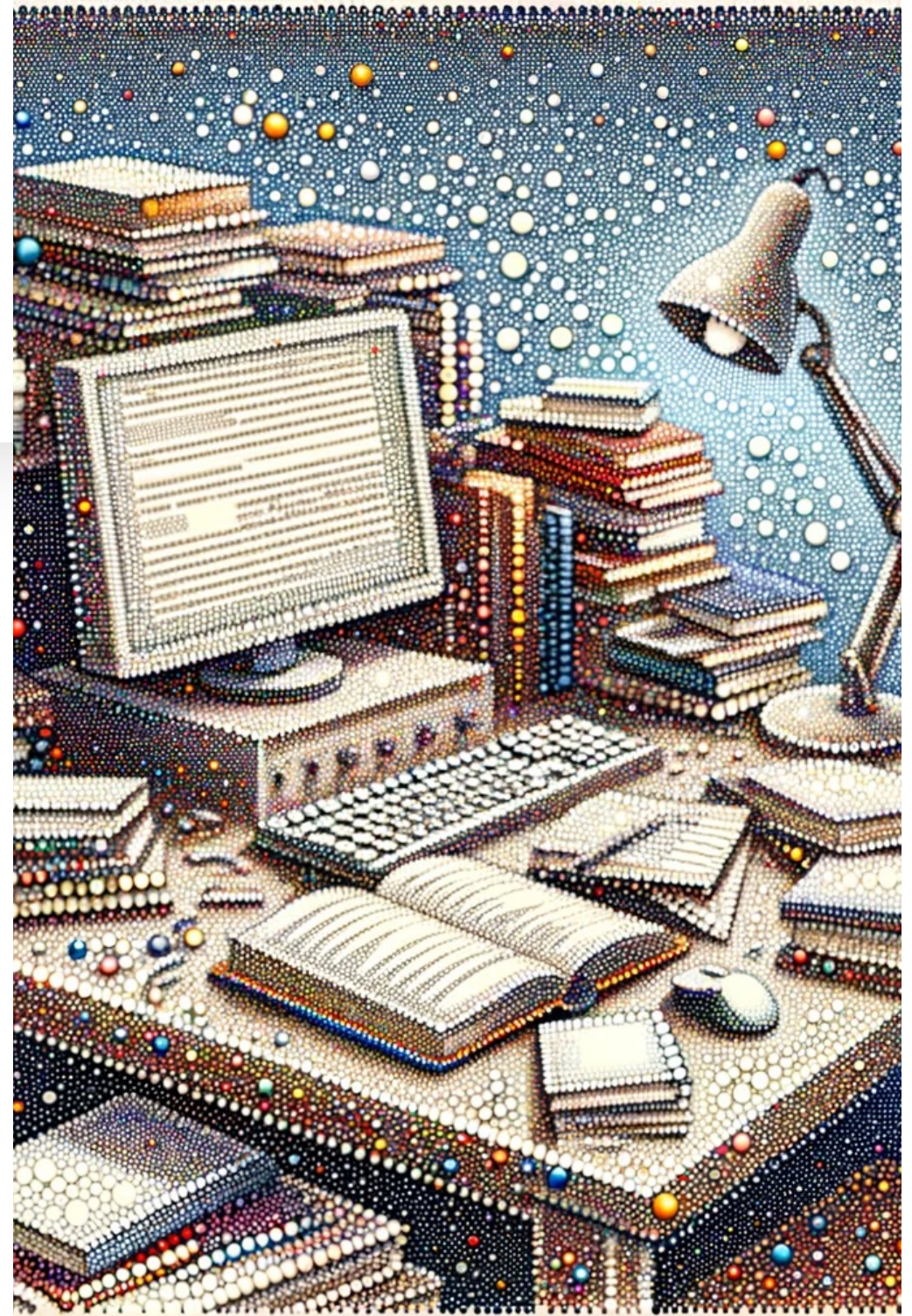
Leveraging AI in Scholarly Activities

- Simplify routine bureaucratic tasks
  - Automate data entry and form filling using AI-powered tools
  - Generate reports, summaries, and presentations with AI assistance
  - Use AI to schedule meetings, manage calendars, and coordinate team activities
  - Help to write emails, adjust the tone (more formal, cheerful, less angry...)

Enhancing Technical Tasks

Leverage AI to assist with programming and software development

Utilize AI-powered code completion and suggestion tools to streamline coding processes

Employ AI-driven debugging and error detection to identify and resolve issues quickly

Generate code documentation and tutorials using AI-powered content creation tools

Craft a distinctive social media presence for professional branding

Use AI to analyze social media trends and optimize your content for maximum engagement

Generate compelling social media posts, tweets, and updates with AI-driven content creation

Utilize AI-powered sentiment analysis to monitor and respond to audience feedback and interactions

Enhancing Technical Tasks

- Automate data analysis and visualization
  - Employ AI-driven tools to clean, process, and analyze large datasets
  - Generate insightful data visualizations and infographics using AI-powered design tools
  - Use AI to identify patterns, trends, and anomalies in your data

Creative Utilization of AI

- Overcome writer's block and spark creativity with AI
  - Generate writing prompts, ideas, and outlines using AI-powered brainstorming tools
  - Utilize AI to explore alternative perspectives and generate unique content angles
  - Employ AI-driven storytelling tools to create engaging narratives and plotlines
- Enhance your presentations and visual content
  - Use AI to generate visually appealing presentation slides and layouts
  - Create custom logos, graphics, and illustrations using AI-powered design tools
  - Utilize AI to optimize images and videos for various platforms and devices

Creative Utilization of AI

- Explore innovative applications of AI in your field
  - Stay up-to-date with the latest AI research and developments in your discipline
  - Identify potential use cases and applications of AI to solve unique challenges
 - Collaborate with AI experts and researchers to push the boundaries of what's possible
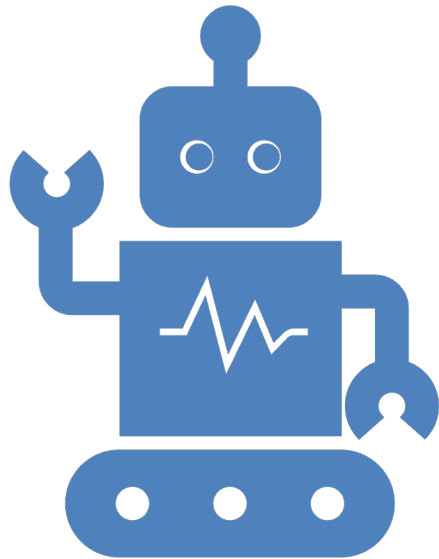
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Best Practices for Educators and Researchers

- Importance of understanding AI's capabilities and limitations
  - One must be familiar with AI tools and their potential applications
  - Need for critical thinking and human oversight when using AI-generated content
- Fostering a culture of responsible AI usage among students
  - Incorporate AI ethics and responsible usage guidelines into course curricula
  - Encourage students to question and validate AI-generated results
  - Promote transparency and disclosure when using AI in academic work

BEWARE THE CONSEQUENCES

Best Practices for Educators and Researchers

1

2
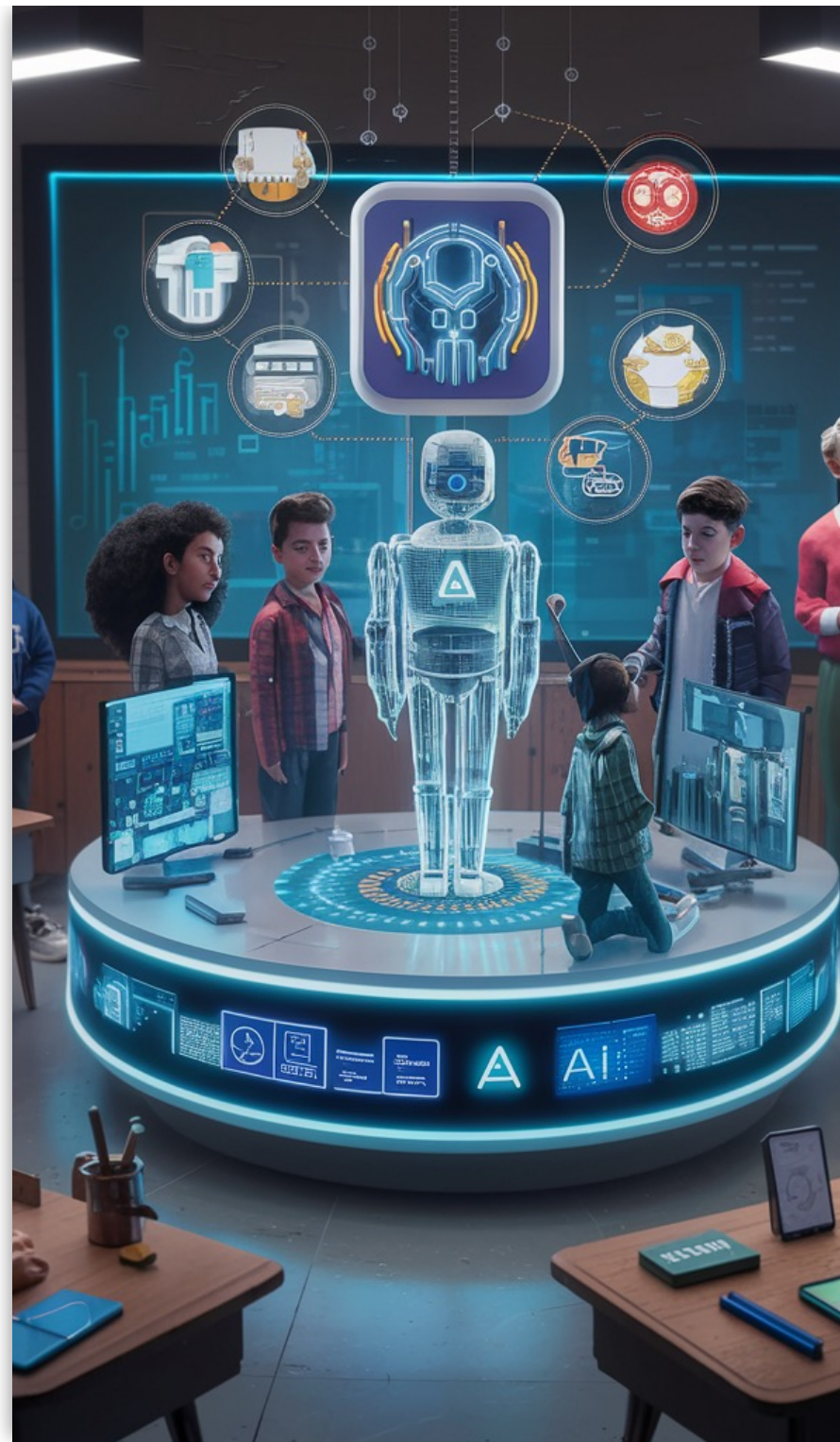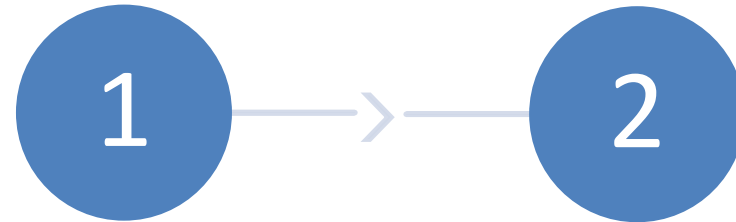
Develop clear policies and guidelines for AI usage in educational settings

- Establish institutional policies for the use of AI in coursework and research
- Provide guidance on citing and attributing AI-generated content
- Define consequences for misuse or unethical use of AI tools

Encourage collaboration and knowledge sharing among educators

- Create forums or communities for educators to share their experiences
- Foster interdisciplinary collaborations to explore innovative applications of AI in education
- Organize workshops and training sessions to upskill educators in AI technologies

Closing: Future Outlook

- AI has the potential to transform engineering education
- As many challenges as opportunities for AI in education
- Ongoing dialogue and collaboration is necessary for further progress

Some already think we are no longer necessary.

Thus we have to fight to stay relevant!

Let's surf the AI tsunami together!

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rvazquez1@us.es

Credits: Rafael Vazquez assisted by Claude 3 Opus, ChatGPT 4.0, DALL-E 3, ideogram.ai
Link to mini-course paper: http://aero.us.es/rvazquez/papers/Report_Eng.pdf
Link to mini-course slides: http://aero.us.es/rvazquez/papers/Presentation_Eng.pdf