Responsible Use of AI tools to Generate Documents and Presentations: a mini-course

Rafael Vazquez

1   Introduction

In the current era, marked by unprecedented technological advancements, artificial intelligence (AI) has become an essential tool in multiple fields, including aerospace engineering. AI's ability to process large volumes of data, propose ideas, perform complex calculations, and facilitate decision-making makes it an invaluable ally in any technical field, such as orbital mechanics or spacecraft design.

The purpose of this mini-course is to explore the responsible use of AI tools, with a specific focus on ChatGPT, in the preparation of academic works and presentations, but also extendable to professional presentations. Through this activity, students will have the opportunity to interact with an AI application to enhance their understanding of some aspect related to the subject "Orbital Mechanics and Spacecraft Vehicles" and also apply this knowledge in creating more effective and efficient documents and presentations while saving time[1].

This mini-course not only seeks to familiarize students with emerging technologies but also to foster critical reflection on the role of AI in education and research. By understanding the benefits and limitations of these tools, future aerospace engineers can learn to use AI ethically and effectively, maximizing its potential while being aware of the challenges it presents.

In a world where AI is increasingly present, it is essential for aerospace engineering students to develop a solid understanding of these technologies, not only as users but also as future innovators and leaders in the field. This mini-course is a very small step towards that goal, providing a foundation for informed and responsible use of AI in their future professional careers. As Uncle Ben from Spider-Man rightly said, "with great power comes great responsibility," and this idea is especially relevant in the use of artificial intelligence.

2   A Brief Historical Introduction to AI

The history of artificial intelligence (AI) is a fascinating journey of discovery, innovation, and technological evolution. AI, as a concept, begins to take shape in the first half of the 20th century, but its roots go back much further, with the first attempts to create machines capable of mimicking aspects of human intelligence.

1950s: The modern era of AI begins in the 1950s. Alan Turing[2] publishes his famous

---

[1]This mini-course, including the images, and the associated presentation have been generated from text generated in ChatGPT Pro and on Overleaf with a good dose of human supervision. The associated prompts are available to students here (in Spanish), it is interesting to see the problems that arose.

[2]Alan Turing, a British mathematician and logician, is widely considered one of the founding fathers of computer science. His pioneering work in the 1950s laid the theoretical groundwork for modern AI, and his reflections on the nature of machine intelligence continue to influence the field to this day.

paper "Computing Machinery and Intelligence" in 1950, posing the question "Can machines think?" and proposing the Turing Test as a criterion for evaluating a machine's intelligence [Turing, 1950]. In 1956, the Dartmouth Conference is held, where the term "artificial intelligence" is coined by John McCarthy, formally marking the beginning of the discipline [McCarthy et al., 2006].

1960s and 1970s: During these decades, significant advances are made in the field, with the development of the first AI programs capable of solving problems and performing specific tasks [Newell et al., 1961]. Other milestones include the creation of programming languages like LISP, designed specifically for AI [McCarthy, 1960], and the development of expert systems, which mimic the decision-making of a human expert in a particular field [Feigenbaum and McCorduck, 1983].

1980s: The popularity of expert systems grows, and AI begins to be implemented in commercial applications. However, by the end of the decade, the so-called "AI winter" occurs, a period where funding and interest in AI diminish due to unmet high expectations [Nilsson, 1984].

Early 21st Century: With the advent of more advanced algorithms, increased computational power, and the availability of large amounts of data, AI experiences a renaissance. Deep learning and convolutional neural networks drive advances in areas such as natural language processing, computer vision, and speech recognition, leading to the creation of applications like virtual assistants and the first steps in autonomous vehicles [LeCun et al., 2015].

Today, AI is at an unprecedented point of development and integration into society, driving innovation in sectors ranging from medicine to aerospace engineering, and posing both opportunities and ethical and social challenges that must be addressed responsibly. AI has also had notable impacts in areas beyond the technical, such as chess. A prominent example is the victory of Deep Blue, an IBM computer, over world chess champion Garry Kasparov in 1997. This event marked a milestone in the history of AI, demonstrating the capacity of machines to challenge and surpass humans in high-level intellectual tasks [Campbell et al., 2002].

## 2.1   Two examples in aerospace engineering and a vision for the future

Moreover, AI has had significant applications in aerospace engineering. For example, AI has been used to optimize the design of spacecraft, as in the case of NASA's generative design software, which uses evolutionary algorithms to create more efficient and lightweight spacecraft components [Hornby et al., 2006]. Similarly, AI has played a crucial role in space missions, such as the Mars Curiosity rover, which uses AI for autonomous navigation and scientific decision-making [Estlin et al., 2012].

Looking towards the future, AI could play an even more crucial role in aerospace engineering. Advanced AI technologies could lead to revolutionary developments in space exploration and colonization. For instance, autonomous AI systems could be designed to manage long-duration interplanetary missions, making real-time decisions and adapting

to unforeseen conditions without human intervention. Additionally, AI could be fundamental in the construction of autonomous space habitats, where intelligent systems would manage vital resources and maintain optimal living conditions for astronauts. These futuristic visions, though speculative, highlight the transformative potential of AI in advancing our capacity to explore and inhabit outer space.

But there's no need to look so far. The purpose of this mini-course is to show how currently available AI tools can assist in everyday tasks.

3   What is ChatGPT?
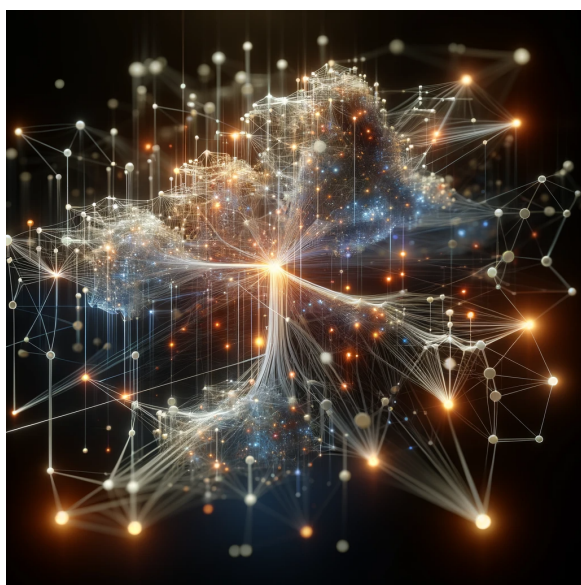
ChatGPT is an advanced natural language processing model developed by OpenAI, part of the Generative Pre-trained Transformers (GPT) family. These deep neural networks are designed to understand and generate human language in a coherent and contextual manner, based on the neural network architecture known as "transformer". A *transformer* is a type of neural network architecture designed for natural language processing. This architecture is notable for its ability to handle data sequences, especially in tasks such as automatic translation and text generation. Transformers use attention mechanisms[3] to weigh the influence of different parts of the input on the output, allowing the model to focus on relevant parts of the text and capture long-term contextual relationships.

The LLM and Their Technological Foundation: Large Language Models (LLM), such as ChatGPT, use the transformer architecture to process extensive text sequences, learning patterns and contextual relationships. As Stephen Wolfram excellently explains in a technical article[4], ChatGPT generates text by adding one word at a time, based on the probability derived from analyzing a large amount of textual data.

Probabilistic Nature of the Generated Text: A key aspect of ChatGPT, therefore, is its probabilistic nature. When generating text, ChatGPT does not always choose the most likely word; instead, it introduces an element of randomness, meaning that asking the same thing twice can lead to different answers. This approach increases the creativity and variety of the generated text, although it can also be frustrating (it may seem like there are "bad days and good days").

OpenAI and Its Vision: OpenAI, according to its own statement of intent, seeks to develop AI technologies that are safe and ethically aligned, with the goal of benefiting

---

[3]Attention mechanisms in the context of neural networks, especially in transformers, refer to the network's ability to differentially weigh parts of an input when processing information. This technique allows the network to focus on more relevant aspects of the data for a given task, improving its performance in natural language processing. This technique's turning point was achieved with the work of Vaswani et al. in their seminal work "Attention is All You Need"[Vaswani et al., 2017].

[4]What Is ChatGPT Doing ... and Why Does It Work?

humanity. The concepts of Artificial General Intelligence (AGI) and Artificial Superintelligence (ASI) represent long-term goals in AI research, highlighting the importance of responsible development. The former would be capable of any task that humans can perform, while the latter would be superior to humans.

Training and Alignment: ChatGPT is trained on vast volumes of textual data, allowing it to learn linguistic patterns and knowledge. Alignment ensures that the model's actions and responses are in line with human ethical values and objectives, but obviously reflects the vision and mindset of those who train it (see later comments on biases).

The Underlying Simplicity of Human Language: ChatGPT's ability to generate coherent text suggests an underlying simplicity and regularity in human language and the thought patterns behind it. This observation suggests the possibility of discovering "laws of language" that we do not yet know.

Therefore, ChatGPT is a valuable tool in various fields, not only for its ability to interact conversationally but also for its potential to explore and better understand the nature of human language and cognition. In other words, to better understand ourselves.

3.1 ChatGPT and the Development of Soft and Hard Skills

Artificial intelligence, and ChatGPT in particular, offers unique opportunities for the development of both soft and hard skills. In the context of engineering and science, these skills are crucial for professional and academic success.

3.1.1 Development of Soft Skills

Soft skills, such as communication, teamwork, creative problem-solving, and empathy, are fundamental in engineering. ChatGPT, with its capability to generate human-like and contextualized responses, can be an excellent tool for enhancing these skills (surprisingly, even empathy). Students can interact with the model to practice effective communication, learn to formulate clear and precise questions, and develop a deeper understanding of how to approach problems from different perspectives. Additionally, ChatGPT can simulate real-life situations, allowing students to rehearse and improve their communication and teamwork skills in a controlled and safe environment.

It is the personal opinion of the professor that it is in this aspect where ChatGPT truly excels, and is the raison d'être for this mini-course. One can save hours in preparing documents, presentations, or performing mechanical tasks, among other possibilities.

3.1.2 Development of Hard Skills

Regarding hard skills, ChatGPT can also be a valuable resource. In areas such as programming, data analysis, and mathematical modeling, ChatGPT can assist in code generation, provide explanations on technical concepts, and offer practical examples. This can be particularly useful for students when facing complex problems, as it allows them to explore different approaches and solutions. However, it is important to remember that, although ChatGPT is a powerful tool, it should be used as a complement to traditional teaching and self-directed learning, and not as a substitute.

It is the personal opinion of the professor that it is in this aspect where ChatGPT poses more danger, as hard skills are those that really require human understanding. Here, ChatGPT should not go beyond being a "copilot"

and assistant and will not replace (at least for now) hours of study and experience.

3.2   Access to ChatGPT

Students who wish to explore the capabilities of ChatGPT have several options, each with its own features and advantages. The most accessible and free version is ChatGPT-3.5, which offers remarkable performance in natural language tasks and can be used through various interfaces and online applications. Although it does not have access to the web for updated information, it remains a powerful tool for text generation, summaries, and code, among other uses.

On the other hand, ChatGPT-4 represents the most recent and advanced evolution of this technology. Although OpenAI has not disclosed the exact number of parameters of GPT-4, it is estimated to be in the order of 100 trillion, a magnitude greater than the 175 billion of GPT-3. Available through a ChatGPT Plus subscription for $20 a month, GPT-4 is more accurate and features multimodal capabilities, being able to analyze text, images, and voice. For example, it can generate accurate responses from images and, using DALL-E 3, create images from textual descriptions. Additionally, GPT-4 has a more extensive short-term memory, handling approximately 64,000 words, and it is expected that this capacity will increase to 128,000 words in the near future.

ChatGPT Plus subscribers also have exclusive access to the GPT Store and ChatGPT plugins. This allows the use of customized GPT bots and the leverage of third-party applications for specific tasks, such as financial analysis, solving mathematical equations, or generating content for social media. Some examples are given later.

For those who wish to experiment with similar technology without the cost of a subscription, it is suggested[5] to use Bing Chat, a chatbot powered by GPT-4 with DALL-E 3 integration. Although the experience may differ slightly from ChatGPT Plus, Bing Chat offers a free and accessible alternative.

Finally, for those more technologically adept, there is a halfway alternative between the free applications and the subscription, which consists of using the ChatGPT API. This API is "pay-per-use" and for a couple of Euros, multiple tests can be conducted. The simplest way to do this is to create an API account and use the Python scripts provided by OpenAI itself[6].

In conclusion, the choice between the free version of ChatGPT, Bing Chat, the API, and the ChatGPT Plus subscription will depend on the user's specific needs and the desired depth and sophistication in the AI's responses and capabilities.

---

[5]https://www.zdnet.com/article/chatgpt-vs-chatgpt-plus-is-it-worth-the-subscription-fee/

[6]https://openai.com/blog/openai-api

3.3   Limits and Challenges of ChatGPT

Despite the advanced capabilities of ChatGPT and its impact on the field of artificial intelligence, it's important to recognize its inherent limitations and challenges. These aspects are crucial for understanding and using ChatGPT responsibly and effectively, especially in academic and professional settings.

3.3.1   Token Limit

One of the most significant limits of ChatGPT is its short-term memory capacity, measured in terms of tokens. A token can be a word, part of a word, or even a character, depending on the context and the language used. In versions of ChatGPT like GPT-3.5, the short-term memory limit is approximately 8,000 tokens, which can limit the depth and context of longer conversations. Although GPT-4 has improved this by extending it to around 64,000 tokens, there is still a limitation in terms of the amount of information it can handle in a single instance. It can sometimes be frustrating as ChatGPT loses the thread of the conversation by reaching the limit and one has to start from scratch.

3.3.2   Hallucinations

"Hallucinations" in ChatGPT refer to situations where the AI generates responses that are incorrect, irrelevant, or simply nonsensical. These errors often occur when ChatGPT faces complex, ambiguous questions or questions outside its training scope. For example, when asked for references, it sometimes makes them up. Although improvements in more recent versions like GPT-4 have reduced the frequency of these hallucinations, they remain a significant challenge, especially when using ChatGPT for tasks that require high precision or reliability.

3.3.3   Up-to-date Knowledge and Internet Access

ChatGPT is trained on a text corpus that is periodically updated, but not in real-time. This means that its knowledge base can become outdated, limiting its usefulness for questions about current events or information that has changed recently. While the integration of "Browse with Bing" in GPT-4 allows for some access to updated information, users of earlier versions or the free version may not have access to the most recent data.

3.3.4   Biases and Fairness

Like any AI system trained on real-world data, ChatGPT is subject to the biases present in its training set as well as the human filter of its developers. This can lead to responses that reflect stereotypes, prejudices, or cultural biases, raising ethical concerns, especially in sensitive contexts. On the other hand, OpenAI's effort to avoid these biases can introduce others.

3.3.5   Dependence on the Quality of the Prompt

The quality and accuracy of ChatGPT's responses heavily depend, as of today, on the quality of the prompts or questions asked. A clear, specific, and well-structured prompt tends to generate more accurate and relevant responses, while a vague or poorly formulated prompt can lead to confusing or inaccurate results.

3.3.6 Shallowness

Particularly in technical topics, the knowledge with which ChatGPT comes trained may be too simple to perform adequately without feeding it more external information. It can be difficult to detect this situation if ChatGPT is used to perform a task of which one has no prior knowledge.

3.3.7 Inappropriate Language

It is important to set the tone of the language through a good prompt, as discussed in the following section. Even so, sometimes it is easy to identify text generated by ChatGPT because it uses language that is too pompous or artificial. In the case of languages other than English, it sometimes makes mistakes. For instance, generating documents in Spanish, sometimes it makes poor translations of technical vocabulary from English or uses Spanish variants from other regions that may be striking.

4 Limitations on Data Security and Privacy with Chat-GPT

The use of ChatGPT and other artificial intelligence technologies raises significant concerns regarding data security and privacy. These tools process large volumes of information, including sensitive and personal data, posing potential risks in their handling and storage. Protecting data privacy and complying with current regulations, such as the General Data Protection Regulation (GDPR) in the European Union, are critical aspects that must be considered when integrating ChatGPT into academic and professional processes. In short, one must be aware of the information one is providing to these tools.

In summary, although ChatGPT is a powerful tool with broad applications, it is crucial to be aware of its limitations and use it in an informed manner, taking these challenges into account. Understanding these limits is fundamental for using ChatGPT responsibly in research, education, and other fields.

5 Prompt Engineering for ChatGPT: Basic Concepts

Prompt engineering is currently an essential skill in interacting with language models like ChatGPT. A "prompt" is a textual input that guides the model to generate a specific response. The accuracy and relevance of the response largely depend on how the prompt is formulated. This skill becomes even more crucial as language models are used in more complex and diverse applications, where greater specificity and clarity in responses are required.

A prompt is essentially an instruction or question directed at the model. The way a prompt is crafted can significantly influence the quality of the response. Well-designed prompts can lead to more accurate, creative, and useful responses. For example, a generic prompt like "Write a story about traveling" can lead to a vague response, whereas a detailed prompt with clear context and specifications will generate a richer, more focused narrative; there are wonderful examples that can be found online, here we will highlight

some[7].

5.1   Key Elements for a Good Prompt

A good prompt generally includes two main elements: the objective and additional context. Context can include specific details, desired tone, length limitations, among others. These elements help guide the model to produce a response that more closely matches the user's needs. [8].

5.1.1   The Role of the Sender

Including a specific role in the prompt, like asking the model to act as an expert on a particular topic, can significantly change the nature of the response. This helps to establish a framework for the interaction and adjusts expectations about the type of response that will be generated.

5.1.2   Additional Information

Adding specific information is crucial for enhancing the accuracy and relevance of the responses. This can include details about the target audience, the purpose of the text, style restrictions, etc.

5.1.3   Adjusting Results and Follow-up Questions

Even with a well-designed prompt, it is often necessary to adjust the responses through follow-up questions. This allows for further refining the model's response and ensuring it aligns with the user's expectations.

5.1.4   The Importance of Emotion and Courtesy

Interacting with language models can be significantly improved by using an emotionally intelligent and polite tone. This not only makes the experience more enjoyable but can also influence the nature of the generated responses. Surprisingly, showing gratitude or empathy in prompts can lead to responses that reflect greater consideration and care.

5.2   Practical Examples of Prompt Engineering

- **Generic Prompt:** "Write a story."

- **Enhanced Prompt:** "Create a short story about a traveler who finds a mysterious object in an ancient city. The story should include elements of suspense and detailed descriptions of the environment."

---

[7]https://github.com/f/awesome-chatgpt-prompts
[8]https://www.linkedin.com/pulse/beginners-guide-prompt-engineering-chatgpt-hayk-simonyan/

- **Emotional Prompt, setting the role:** "As a friendly tour guide, describe the most fascinating places in Rome and share exciting anecdotes about each place."

Additional examples[9]

1. **Prompt for Cooking Recipes:** "As an expert chef, please create a vegetarian recipe that includes tofu and vegetables, ideal for a healthy dinner. Describe the steps and the necessary ingredients."

2. **Prompt for Gardening Tips:** "Act as an experienced gardener and provide tips on caring for orchids in a humid climate, including watering frequency and light exposure."

3. **Prompt for Book Summary:** "As an avid reader, summarize the book '1984' by George Orwell, highlighting the main themes and the relevance of its message in today's context."

4. **Prompt for Creative Story:** "Imagine you are a storyteller. Write a short story set in a futuristic world where artificial intelligence and humans coexist, centered on the friendship between a boy and a robot."

Some prompts from the professor:

1. **Social media:** Writing as an expert in social media, please give some thoughts for a LinkedIn repost. The content of the original post is XXX. I'd like to emphasize YYY.

2. **Entertainment/trivia on a road trip:** Give us 5 questions about the History of Spain in the Middle Ages... Key dates about the history of the Iberian Peninsula in those dates, also provide the answers.

3. **Text summary and writing of comments or formal letters:** Read the next three reviews and summarize the major points in three paragraphs. Write as an associate editor using formal language. The reviewers should be mentioned by their number and never by their name. One of the reviewers uploaded a pdf file whose content I provide right below the review.

4. **Generation of documents with scarce technical content using buzzwords**: Act as an expert in pedagogy using formal language. I need, for a report, a section called "educational innovative project", about 2 to 3 pages; something transversal, inclusive, diverse ... The project has to be for the course XXX. Duration about 6 months to 1 year. It should be something transversal to the studies XXX and a long-term project. Start by proposing ideas, then a structure for the project that we will then fill in.

5. **Drafting a text from notes or short sentences**: you are an expert project evaluator. Summarize the following objectives in one sentence for each, but linked together:[...]

---

[9]See the results in this shared ChatGPT conversation (in Spanish)

6. **Generation of variations on a pre-existing text**: hi chatgpt, can you help me in writing a recommendation letter to one of my students? Please act as a seasoned professor and warm human being. Don't exaggerate and don't be pompous. I have a draft, please respect it as much as possible and try slightly improve it without changing the tone. Please also respect the latex codes. Here is the draft: [...]

7. **Quick calculations**: how much memory would be required, in MB, to store as floats 17 physical quantities sampled in 10 second increments over one year?

8. **Calculations and presentation of intertwined data (requires the Pro version and the Mathematica plugin)**: you are a mathematician expert in Latex. Give me the latex code for a table with nine columns and three rows. The element 1,1 should contain "N", the element 1,2 "real eigenvalue" and the element 1,3 "approximated eigenvalue". Now, the first row starting at 1,2 should contain the numbers from 1 to 8. The second row starting at 2,2 should contain the first eight positive solutions of the equation $\cos(2*x)*\cosh(2*x)-1=0$ discarding the solution at zero. The third row starting at 3,2 should contain the numbers $3*pi/2+n*pi/2$ for n from 0 to 8.

9. **Preparation for roundtable questions**: hola chatgpt, I'm going to pass you the answers to some questions that will be asked of me in a round table. Act as a scientific speaker. The questions are in bold, please do not change them. In relation to the answers, if you see something that you can improve a bit do it, correcting errors that you see, but please do not change much. Keep the tone of the text. Thank you.[...]

10. **Preparation of emails and translation**: Hi ChatGPT, please prepare a cheerful email for a visiting professor (XXX) proposing him this agenda (you should translate to English): [..]

The results of some of these prompts will be discussed in the mini-course.

5.3   Future Perspectives on Prompt Engineering

As we move towards the future of AI, the need for specific prompt engineering seems to be diminishing. Language models, like GPT, are evolving towards a more natural and efficient phase of self-learning, driven by continuous and diverse user interaction. This evolution reflects a fundamental shift in the way we interact with AI, moving from being passive consumers of information to active participants in its learning process [10].

Constant user feedback is allowing models to recognize patterns, understand contexts, and adapt in a way similar to how organisms evolve in response to their environment. Consequently, the accuracy and intuition of the models are improving, reducing the dependence on meticulously crafted prompts. We can anticipate an AI landscape where prompt engineering as we know it today may become a skill of the past, giving way to a new era of more fluid and natural interaction with artificial intelligence.

---

[10]See, for example, this article on Prompt Engineering.

6   Code Generation

6.1   Using ChatGPT in Programming

The use of language models like ChatGPT in code generation offers a wide range of possibilities for programmers, including automating repetitive tasks, assisting in debugging, and generating code examples. In the educational context, for example, for students who need to work with MATLAB, ChatGPT can be a valuable tool for improving the understanding and application of programming concepts.

6.1.1   Practical Applications

ChatGPT can help students generate code for specific tasks, offering quick solutions and examples that serve as starting points for more complex projects. For instance, in MATLAB, ChatGPT can be used to:

- Generate scripts and functions that perform specific mathematical calculations.

- Create advanced visualizations, helping to remember and apply parameters in the creation of graphs, such as font size, ticks, line thickness, and legends.

- Provide examples of the use of less common functions and tools in MATLAB, facilitating the learning of advanced programming features.

A significant advantage of ChatGPT when writing codes is that it can provide explanations, sometimes very detailed, of the codes it has generated. This can be very useful for learning purposes.

6.1.2   Risks and Considerations

Despite its advantages, generating code through ChatGPT presents certain risks:

- **Accuracy:** ChatGPT can generate code that is syntactically correct but does not meet the desired specifications or contains logical errors.

- **Dependence:** There is a risk of becoming too dependent on AI for problem-solving, which could limit the development of programming skills.

- **Originality:** In the educational context, it is important to ensure that the work generated with the help of ChatGPT remains original and reflects the student's understanding.

6.2   Examples in MATLAB

6.2.1   Data Visualization Example

Prompt: "Hi, ChatGPT. I'm working on a project in MATLAB and need your help to generate a specific graph. Specifically, I need a MATLAB graph that shows three different functions: y = sin(x), y = cos(x), and y = sin(2x), in the range from 0 to 2pi radians. For each function, use different line styles and colors. Please include a legend with the labels of each function written in LaTeX, and label the axes also in LaTeX. The title of the graph should be Data Visualization Example with MATLAB. Make sure the font

sizes are large enough to be legible even when the image is reduced to half its original size. I would also like you to add a grid to facilitate reading the graph. Finally, please include the code to save the graph as a PNG file."

```matlab
% Function definitions
x = linspace(0, 2*pi, 1000);
y1 = sin(x);
y2 = cos(x);
y3 = sin(2*x);

% Creating the figure
figure;

% Plotting the functions
plot(x, y1, 'r-', 'LineWidth', 3);
hold on;
plot(x, y2, 'b--', 'LineWidth', 3);
plot(x, y3, 'g-.', 'LineWidth', 3);

% Adding legend with LaTeX code
legend({'$y = \sin(x)$', '$y = \cos(x)$', '$y = \sin(2x)$'},...
'Interpreter', 'latex', 'FontSize', 16);

% Adding labels with LaTeX code
xlabel('$x$ (radians)', 'Interpreter', 'latex', 'FontSize', 18);
ylabel('$y$', 'Interpreter', 'latex', 'FontSize', 18);

% Graph title
title('Data Visualization Example with MATLAB', 'FontSize', 20);

% Setting axis limits
xlim([0 2*pi]);
ylim([-1.5 1.5]);

% Adding grid
grid on;

% Setting axis ticks
xticks(0:pi/2:2*pi);
xticklabels({'0', '\pi/2', '\pi', '3\pi/2', '2\pi'});
yticks(-1.5:0.5:1.5);

% Additional settings to enhance appearance
set(gca, 'FontSize', 16); % Axis font size

% Saving the figure
saveas(gcf, 'data_visualization_example.png');
```
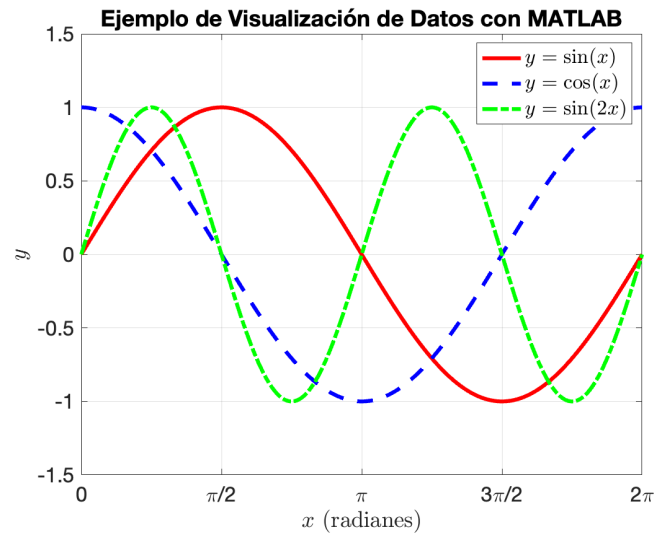
Figure 1: Visualization generated in the first MATLAB example. Note that the text font sizes are appropriate.

Figure 1 is satisfactory for inclusion in a professional document. Even, the font sizes could be increased further. This is a classic mistake by students in their work, using default sizes. Just by analyzing the code, the student can learn many visualization options faster than reading MATLAB help.

6.2.2 Use of Unusual Functions

Sometimes, a student may have a need and not know which function to use; it turns out that the problem they want to solve has a classic solution, but it is necessary to be very specific to find it.

Prompt: "Hi, ChatGPT. I need your help to create a figure in MATLAB. I have a set of 10 points randomly distributed in a 100x100 space. I would like to generate regions in this space so that each region is defined by being closer to one of these points than to the rest of them. Draw lines that separate these regions. Mark the points with red dots and the lines with blue. Also, include labels for the axes and a descriptive title. Please, make sure the graph is clear and easy to understand. Finally, generate a PNG with the result. Thank you for your help."

It turns out that the student, unknowingly, needs a Voronoi diagram. The result is shown in Figure 2.

```
% Generate random points
points = 100 * rand(10, 2);

% Calculate Voronoi diagram
[v, c] = voronoin(points);

% Create figure
figure;
hold on;

% Draw Voronoi diagram lines
```
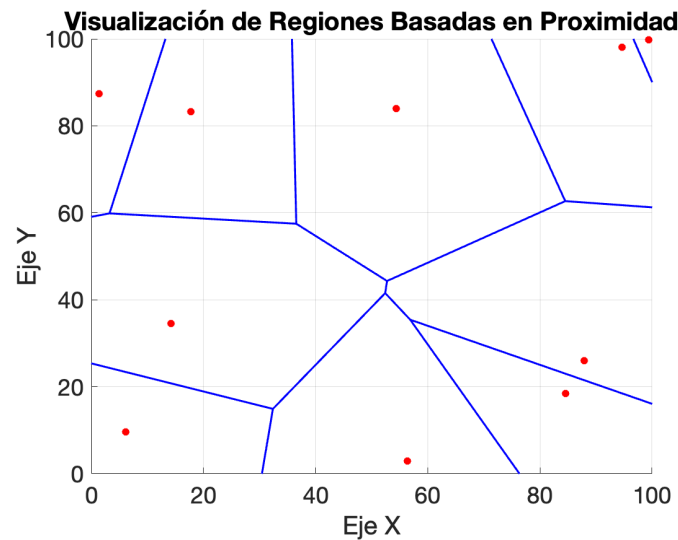
Figure 2: Second example. The student has discovered the concept of a Voronoi diagram.

```
[vx, vy] = voronoi(points(:,1), points(:,2));
plot(vx, vy, 'b-', 'LineWidth', 1.5); % Draw lines

% Draw points
plot(points(:,1), points(:,2), 'r.', 'MarkerSize', 20); % Draw points

% Customize the graph
title('Proximity-Based Region Visualization', 'FontSize', 18);
xlabel('X Axis', 'FontSize', 18);
ylabel('Y Axis', 'FontSize', 18);
set(gca, 'FontSize', 18); % Axis label font size
xlim([0 100]);
ylim([0 100]);
grid on;

% Save the figure as PNG
saveas(gcf, 'voronoi_diagram.png');

hold off;
```

Of course, if one asks ChatGPT, it can reveal what a Voronoi diagram is:

Prompt: "define, for a 4th-year aerospace engineering student, what is a Voronoi diagram, thanks"

Response: A Voronoi diagram is a mathematical tool used to divide a space into regions based on proximity to a set of specific points. Imagine you have a group of points scattered across a space, like stars in the sky. The Voronoi diagram allows you to create boundaries around each point so that any point within a region is closer to that point than to any other in the set. These regions are called "Voronoi cells".

In the context of aerospace engineering, Voronoi diagrams are used to solve problems related to resource distribution or route planning. For example, if you are planning a

space mission and have a network of ground stations, a Voronoi diagram would help you determine which of these stations is closest to a specific location in space, which can be crucial for spacecraft communication or navigation.

These examples demonstrate how ChatGPT can be used to generate code in MAT-LAB, facilitating the understanding and application of complex programming concepts and even learning new concepts. However, it is crucial that students use these tools as a complement to their learning and not as a substitute for deep understanding of programming principles. Since, usually, the codes provided by ChatGPT are often in need of modification.

6.3   An Example in Python

At times, routine operations require generating numerous document copies with minor alterations. Python, with its extensive selection of libraries for various format manipulations, stands out as a valuable resource for these bureaucratic tasks. Yet, the search for the right library can be daunting and may lead to automation efforts that exceed the original task's duration. Here, ChatGPT steps in, offering a "prompt" resolution that further broadens our understanding of Python.

Prompt: "Hi chatgpt. Do you know any way to automate the generation of a Word document? I have a base document, where it is necessary to write the name and ID of several people in various places. I separately have the list of people and IDs. I would like a separate document to be generated for each one with this information replaced. Provide a Python script that performs this task easily and quickly."

ChatGPT suggests using the "python-docx" library (even providing installation instructions if necessary) and the following code:

```python
from docx import Document

def fill_template(template_path, personal_data, output_dir):
    for person in personal_data:
        # Load the template
        doc = Document(template_path)

        # Replace placeholders throughout the document
        for paragraph in doc.paragraphs:
            if '{name}' in paragraph.text:
                paragraph.text = paragraph.text.replace('{name}', person['name'])
            if '{ID}' in paragraph.text:
                paragraph.text = paragraph.text.replace('{ID}', person['ID'])

        # Save the filled document
        output_path = f"{output_dir}/{person['name']}_document.docx"
        doc.save(output_path)

# Path to your document template
template_path = 'path/to/your/template.docx'
```

```
# People's data
personal_data = [
    {'name': 'John Doe', 'ID': '12345678A'},
    {'name': 'Jane Smith', 'ID': '23456789B'},
    # Add as many people as you need
]


# Output directory for the generated documents
output_dir = 'path/to/generated/documents'

fill_template(template_path, personal_data, output_dir)
```

The generated code is commented, self-explanatory, and easy to adapt to individual needs. Note that even the variable names are relatively well chosen for easy understanding.

7 Preparing Academic Papers with ChatGPT

This section is the core of this mini-course. Integrating ChatGPT into the process of preparing academic papers can be a powerful tool to enhance efficiency and quality of documents and save time in their preparation. Here, we will focus on creating documents in LaTeX (exploiting ChatGPT's ability to generate code), for example on the Overleaf platform, but of course, these ideas can be applied in Word and similar platforms. Below, various ways in which ChatGPT can assist in this process are detailed.

7.1 Generation of Structures and Indices
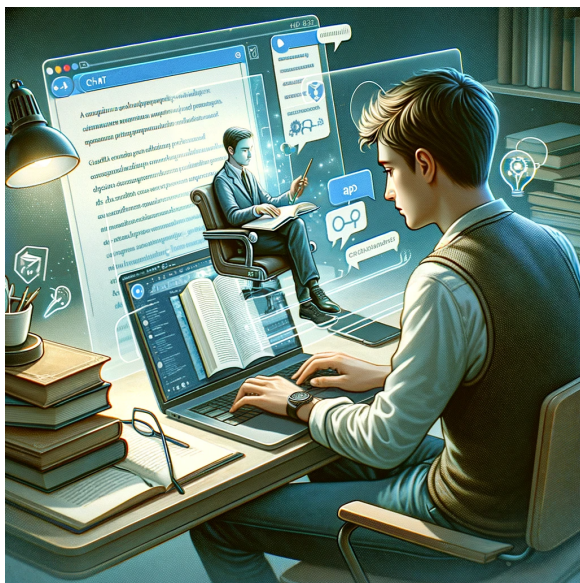
Starting an academic paper can be overwhelming, but ChatGPT can facilitate this initial process by offering assistance in generating structures and indices. By providing an overview of the topic or area of study, ChatGPT can generate a tentative outline or index that serves as a map for the document's development. This outline can include section titles, subtitles, and key points that should be addressed, thus providing a clear and coherent structure from the beginning on which to start iterating, helping to kickstart the process and breaking the writer's block.

Moreover, ChatGPT can suggest different or unconventional approaches to structuring the document, which can be particularly useful for complex or interdisciplinary topics. For example, in a paper about space debris, ChatGPT can suggest a

structure that combines theoretical aspects with practical applications, or that integrates specific case studies to illustrate key concepts.

Prompt:"As an expert in space engineering, generate a detailed index for a paper on space debris, including theoretical sections and practical applications, in LaTeX and providing the generated code."

7.2   Use of LaTeX Templates

Choosing an appropriate LaTeX template is an important step in preparing any academic document, and it should be set as early as possible. ChatGPT can help students in the selection and adaptation of templates for different types of documents, such as articles, reports, presentations, or final year projects (although these sometimes have predefined templates). By providing recommendations on templates that fit the specific needs of the project and academic field, ChatGPT ensures that students start with a solid and professional base.

In addition, ChatGPT can offer guidance on how to customize and modify these templates to adapt them to the specific requirements of the course or study area. This can include customizing the document structure, adding specific sections, and modifying the design and visual style to comply with academic guidelines.

Students can also take advantage of ChatGPT's ability to suggest and explain the use of additional LaTeX packages that enrich the document, such as those related to creating bibliographies, inserting advanced mathematical symbols, or enhancing the presentation of graphs and tables.

Prompt:"Recommend a visually appealing LaTeX template for an engineering project report, and explain how to customize it."

7.3   Iteration and Content Enrichment

Once a basic structure has been established in a template, ChatGPT can assist in iterating and enriching the content of each section, for which it is suggested to proceed section by section. ChatGPT can provide initial drafts, ideas for developing arguments, or explanations of technical concepts. However, these contributions should be considered as starting points and not as final products.

It is essential that students review and adapt the content generated by ChatGPT to ensure that it meets academic standards and the expectations of their field of study. This involves verifying the accuracy of the information, expanding arguments with relevant examples and data from reliable sources, and ensuring that the content is coherent and well-structured. To avoid simplicity of content, it is suggested to seek external information (with or without the help of ChatGPT) and feed the document with these sources, possibly summarized by ChatGPT itself. **IMPORTANT: all external work used must be cited.**

Moreover, ChatGPT can be a useful tool for exploring different perspectives or approaches on a given topic, or even for generating ideas "out of thin air". For example, in a paper on aerospace engineering, ChatGPT might suggest discussing both the technical aspects and the environmental or economic impacts of certain technologies, thus providing a more complete and nuanced view of the topic.

Prompt:"Act as an expert in aerospace engineering. Provide an initial draft for a section on the environmental impacts of space propulsion in an aerospace engineering

paper."

Prompt:"Improve section X, focusing specifically on the environmental impact generated by a launch, providing more details."

Prompt:"I copy here below some paragraphs from an article on chemical propulsion. Please, summarize the aspects that may be most interesting for my paper. Don't forget to generate a citation to this article I've used, whose bibliographic information is as follows: xx"

The process carried out for this same document can be consulted here (in Spanish), although it is important to note that it has been significantly revised afterwards, and then translated (obviously, with the help of ChatGPT).

7.4   Verification and References

Accuracy and reliability are fundamental in academic writing. Although ChatGPT may suggest references or data, it is crucial that students perform their own verification of any information provided. This includes consulting primary sources, reviewing studies published in scientific journals, and verifying facts and citations using reliable academic databases.

In addition, students should be aware of ChatGPT's knowledge cutoff date and the inherent limitations in its ability to provide up-to-date information. Therefore, it is essential to complement ChatGPT's suggestions with independent and up-to-date research. This is particularly important in rapidly evolving fields such as technology, medicine, and sciences.

Students must also learn to critically evaluate the relevance and quality of the sources suggested by ChatGPT. This includes understanding the difference between primary and secondary sources, recognizing potential biases in research, and selecting sources that are appropriate for the academic context.

Prompt:"Suggest some recent references on artificial intelligence in aerospace engineering. Generate the corresponding bibtex file for inclusion in LaTeX."

Important: All generated references must be verified!

Important: All included references must be explicitly cited in the text. A common mistake among students is to cite multiple sources without specifying where they have been specifically used .

7.5   Integrated Formulas and Graphics

ChatGPT can be a valuable tool to facilitate the integration of formulas and graphics in LaTeX documents. This is especially useful in technical and scientific disciplines, where the presentation of data, formulas, and visualizations is essential. ChatGPT can generate LaTeX code to include figures, tables, charts, and complex mathematical equations, helping students present their work in a clear and professional manner.

Besides generating basic code, ChatGPT can offer guidance on how to customize the appearance of these elements. For example, it can suggest options to modify figure sizes, adjust table layouts, or improve the readability of equations.

It is important, however, for students to verify and adjust the generated code to ensure it meets their specific needs and integrates correctly into the document. They should also familiarize themselves with best practices for data and graphic presentation, such as choosing appropriate types of charts and including clear legends and labels.

Prompt:"Generate LaTeX code for a table showing the performance data of different types of space propellants."

Additionally, when LaTeX compilation errors occur, they can be passed to ChatGPT, which is often capable of helping to resolve the error or propose an alternative approach that does not fail. Also, ChatGPT can suggest methods to optimize the LaTeX workflow, such as using useful packages or organizing the document into multiple files for easier management.

7.6   Customization and Document Style

Customizing the style of an academic document is crucial to ensure its readability and professionalism. ChatGPT can assist in this aspect by providing examples of LaTeX commands for adjusting formatting, page layout, typography, and other stylistic elements. This includes suggestions for selecting fonts, defining margins, spacing between paragraphs, and setting up headers and footers.

Moreover, ChatGPT can offer tips for improving the visual coherence of the document, such as using a consistent color scheme, selecting appropriate font sizes for different levels of headings, and creating a balanced page layout. These adjustments not only enhance the document's presentation but also contribute to the clarity and understanding of the content.

Students can also use ChatGPT to explore advanced LaTeX features some of which have already been mentioned, like creating custom covers, inserting lists of figures or tables, and implementing cross-references and automated bibliographies. This allows them to create complete and well-structured documents that reflect the standards of their academic discipline.

Prompt:"Show an example of LaTeX code for a visually appealing, custom cover for an aerospace engineering report."

7.7   Collaboration and Review on Overleaf

Overleaf, suggested for this mini-course, is a free version platform ideal for collaboration on academic writing projects, and ChatGPT can play a significant role in this process. ChatGPT can suggest strategies for joint document review and editing, facilitating communication and idea exchange among team members.

For instance, ChatGPT can generate comments and questions that encourage discussion and critical reflection on the document's content. This can be particularly useful in the initial stages of a project, where the goals and approach of the work are defined. Additionally, ChatGPT can help identify areas of the document that require further development or clarification, enhancing the cohesion and quality of the final work.

ChatGPT can also offer tips for efficient project management on Overleaf, such as file organization, change tracking, and assigning tasks and responsibilities among team members. This helps keep the project structured and ensures that all contributions are harmoniously integrated into the final document.

Prompt:"Suggest some strategies for effective collaboration on a group report writing in Overleaf."

7.8 Tips for Effective Academic Writing

ChatGPT can be a valuable tool for improving academic writing skills. Besides technical assistance in LaTeX, ChatGPT can offer practical advice for constructing strong arguments, maintaining a coherent structure, and developing a clear and concise writing style.

Students can learn how to logically and compellingly present ideas, how to connect different sections of the document for greater cohesion, and how to avoid common mistakes in academic writing, such as ambiguity, redundancy, or improper use of technical jargon.

ChatGPT can also assist in revising and editing the document, suggesting improvements in clarity, grammar, and style. This is especially helpful for students who are learning to write in an academic context or in a second language, as one can provide content in Spanish and ask it to write the result in English. Lastly, it can also generate proposals for abstracts or conclusions.

Prompt:"Provide tips for improving coherence and fluency in writing a scientific article."

Prompt:"Apply the previously provided tips to this block of text and explain the changes you have made."

Prompt:"Merge the second and third paragraphs so that the text flows better, and also generate a summary of the text."

7.9 Balance Between Assistance and Own Knowledge

It is crucial to emphasize that, although ChatGPT is a great tool for assisting in the preparation of academic papers, it does not replace actual knowledge or deep understanding of the subject. Students should use ChatGPT as a **complement** to their own study, research, and critical analysis as well as to save time in drafting.

It is important to be aware of the limitations of ChatGPT, including the possibility of errors or generating outdated information. Students should always verify the information provided by ChatGPT and not rely exclusively on it for their academic work.

Moreover, the use of ChatGPT must be ethical and responsible. Students should acknowledge the assistance received from ChatGPT in their work and understand that the main goal is

Figure 3: Image of dubious value.

to facilitate learning and improve their skills, not to replace effort and personal understanding.

IMPORTANT: All text produced by ChatGPT must be read with a critical spirit, especially if it makes categorical statements about topics that are unknown to the "author" of the paper. It is important to check that such claims are correct, or there is a risk of generating a work with false statements. In other words: ChatGPT should not be used to discuss about something you barely know anything about! In those cases, what is produced by ChatGPT

should be used as a starting point, and time should be put into reading sources and iterating with external contents.

7.10   Tips for Managing the Limits and Challenges of ChatGPT

In this section, we offer practical advice to help students use ChatGPT effectively and responsibly, taking into account its limitations and challenges outlined in Section 3.3.

Token Limit. Tip: Given ChatGPT's short-term memory limitation, it is recommended to divide extensive topics into more manageable parts. When addressing a complex subject, asking specific questions in segments can help maintain coherence and avoid losing context.

Hallucinations. Tip: It is essential to verify all information provided by ChatGPT. Although its responses can be useful, they should always be corroborated with external sources, especially when accuracy and reliability are required.

Up-to-date Knowledge and Internet Access. Tip: To obtain current information, consider supplementing ChatGPT's answers with searches in recent sources. If you need data on recent events, you can search for current articles and use relevant excerpts as part of the prompt for ChatGPT.

Biases and Fairness. Tip: Be aware of potential biases in ChatGPT's responses. When dealing with sensitive topics, it's important to approach them with a critical and bias-aware mindset. In academia, it's useful to discuss and reflect on these aspects with peers or even the professor.

Dependence on the Quality of the Prompt. Tip: Invest time in formulating clear and specific prompts. A good prompt increases the likelihood of receiving relevant and coherent responses from ChatGPT. Explore different ways of framing your questions to obtain different perspectives or more detailed answers.

Shallowness: For many topics, ChatGPT alone does not have enough knowledge to elaborate a work with sufficient depth. Tip: feed the creative process with external sources, which can be searched separately or suggested by ChatGPT itself. These sources (or sections of them) can be fed to ChatGPT to generate more content, although it is important later to ensure that the work follows an appropriate argumentative thread (and the sources are properly cited).

Inappropriate Language: Tip: Carefully read all the text generated by ChatGPT. If you find strange words or weird translations, there is probably a mistake; when in doubt between a verified source (for example, professor's lecture notes or own knowledge, or an external source) and ChatGPT, usually the verified source is right. Lower the tone of grandiloquence and pomposity by managing the prompts. Avoid unfounded statements or exaggerations in academic works.

Security and Privacy Limitation: Use ChatGPT and similar technologies on controlled platforms and environments that ensure data protection is not possible, in general, at the time of writing. Tips: Avoid sharing personal, confidential, or sensitive information when interacting with ChatGPT. Know data privacy and security policies that regulate the use of artificial intelligence at your institution or company. Stay informed about the latest security and privacy updates from OpenAI and other AI platforms.

These tips are designed to optimize the use of ChatGPT, helping students to navigate its capabilities and limitations effectively and critically.

8 Creating Presentations

Creating effective presentations is an essential skill in both the academic and professional arenas. Using a LaTeX document as a starting point, ChatGPT can be a valuable tool for transforming the content of a written work into a visually appealing presentation using Beamer, a LaTeX class for creating slides.

8.0.1 Format and Visual Design

ChatGPT can provide suggestions on the format and visual design of the slides to kick off the presentation. This includes choosing an appropriate color scheme, using images and graphics to illustrate concepts, and tips for effectively arranging text and other visual elements.

Prompt:"Based on the document I provide, suggest a format for a Beamer presentation in LaTeX, including a title, a color scheme, and an attractive cover. Pass me the code for that presentation."

8.1 Generating Slides Section by Section

The process of creating the content for a Beamer presentation can begin by feeding ChatGPT with the text of each section from the original document. Based on this content, ChatGPT can generate suggestions for the title and content of each slide, ensuring that key ideas and important concepts are presented clearly and concisely.

Selection of Relevant Content: When converting a document section into slides, it's important to select only the most relevant content and avoid overloading the slides with too much text. ChatGPT can help identify the key points that should be highlighted and formulate them in a way that is easily understandable for the audience. However, sometimes it may be too succinct. It is advisable to thoroughly review and iterate.

Prompt:"Start generating the document with the introduction section. I'll pass you the LaTeX for that section. There are two figures; it would be great if somehow one of them could be integrated into the cover. Please, return the revised LaTeX code of the cover as well as the proposal for the introduction section for the presentation. Be concise but do not omit relevant information."

8.2 Integration of Visual Elements

Effective presentations often include visual elements such as graphs, tables, images, and diagrams. ChatGPT can help identify opportunities to integrate these elements into the slides, enhancing the understanding of the content and maintaining the audience's attention. Sometimes, images can even be generated with the Tikz package in LaTeX.

Prompt:"Generate a LaTeX code to include a graph illustrating elliptical orbits on a Beamer slide."

8.3   Review and Final Adjustments

Before concluding the presentation, a careful review and final adjustments are crucial to ensure its quality and effectiveness.

Consistency and Coherence. ChatGPT can assist in reviewing the slides to ensure consistency in style, format, and color use. It can also help verify that the presentation maintains a coherent and logical narrative, properly connecting all sections and key points.

Clarity and Simplicity. Clarity and simplicity are essential in presentations. Chat-GPT can suggest ways to simplify slides that are overloaded with information, helping to highlight key messages and ensuring they are easily understandable for the audience.

Visual and Aesthetic Impact. Finally, ChatGPT can offer tips for enhancing the visual and aesthetic impact of the presentation, such as adjusting the arrangement of elements on the slides, improving the quality of images and graphics, and ensuring that the presentation has a professional and attractive appearance.

Prompt:"Review the consistency and visual impact of the slides in my presentation on computational fluid dynamics. Suggest improvements if you see any possible."

8.4   Tips for an Effective Presentation

An effective presentation goes beyond well-designed slides; it also involves solid delivery and effective communication with the audience. ChatGPT can offer a series of valuable tips to improve the overall quality of the presentation.

For example, ChatGPT can provide guidance on enhancing communication and public speaking skills. This includes tips on body language, voice modulation, eye contact with the audience, and managing the pace and pauses during the presentation.

On the other hand, maintaining the audience's attention and interest is essential. ChatGPT can suggest techniques for engaging the audience, such as asking rhetorical questions, using relevant anecdotes, or including interactive material.

Finally, the Q&A section is an important part of many presentations. ChatGPT can offer strategies for effectively answering questions, handling difficult situations, and maintaining confidence and composure during this interaction.

Prompt:"Provide tips for successfully handling a question and answer session after a technical presentation."

Prompt:"Act as a professor very critical with his students. Based on the presentation I pass to you, generate five questions and propose answers to them."

9   Conclusions

Through this mini-course, we have delved into the use of ChatGPT and artificial intelligence in academic and professional contexts. We have learned that AI skills are increasingly fundamental, not only to enhance efficiency and work quality but also to stay up-to-date in a rapidly evolving technological environment.

In addition to the advantages offered by AI, such as content generation and support in complex tasks, we have discussed the associated risks, such as technological dependency and information accuracy. It is imperative that students develop a critical and ethical attitude towards the use of these tools, seeing them as complements and not replacements for personal effort and knowledge.
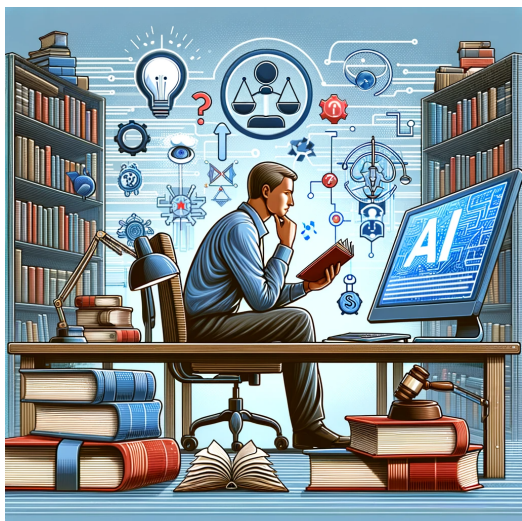
An important reflection is the balance between adopting emerging technologies and preserving fundamental skills. In a world where AI is increasingly integrated into various fields, it is essential to maintain a solid foundation of knowledge and analytical skills. AI can facilitate the learning process, but deep understanding and critical thinking are irreplaceable.

Looking towards the future, AI will continue to transform the way we work and learn. Preparing for this future is not just a matter of acquiring technical skills but also developing awareness of the ethical and social impact of technology. Both educators and students, we have the responsibility to use AI in a way that benefits society, always respecting ethical and moral principles.

In short, this workshop has been an opportunity to explore the potential of AI in education and professional practice and to reflect on how we can integrate these tools effectively and responsibly into our lives and careers.

Disclaimer

This document has been created to provide insights into the application of ChatGPT and related artificial intelligence technologies in academic and professional settings. However, it is important to recognize that this technology is evolving at a rapid pace, and as such, the content and recommendations within this document could become outdated shortly after its publication.

Furthermore, the author does not endorse any unethical use of ChatGPT or similar AI tools. Users are encouraged to always disclose the use of ChatGPT when submitting work that has been assisted by this technology, maintaining transparency and integrity in all academic and professional endeavors.

The use of artificial intelligence, including ChatGPT, should be approached with a critical and ethical mindset, ensuring that its application benefits society and adheres to the highest standards of moral responsibility.

References

[Campbell et al., 2002] Campbell, M., Hoane, A. J. J., and Hsu, F.-h. (2002). Deep blue. *Artificial Intelligence*, 134(1-2):57–83.

[Estlin et al., 2012] Estlin, T. A., Gaines, D. M., Chouinard, C. M., Castaño, R., Bornstein, B., Judd, M., Anderson, R. C., and Woodward, C. (2012). Aegis automated science targeting for the mer opportunity rover. In *AAAI*.

[Feigenbaum and McCorduck, 1983] Feigenbaum, E. A. and McCorduck, P. (1983). *The Fifth Generation: Artificial Intelligence and Japan's Computer Challenge to the World.* Addison-Wesley.

[Hornby et al., 2006] Hornby, G. S., Globus, A., Linden, D. S., and Lohn, J. D. (2006). Automated antenna design with evolutionary algorithms. *Space 2006.*

[LeCun et al., 2015] LeCun, Y., Bengio, Y., and Hinton, G. (2015). Deep learning. *Nature*, 521(7553):436–444.

[McCarthy, 1960] McCarthy, J. (1960). Recursive functions of symbolic expressions and their computation by machine, part i. *Communications of the ACM*, 3(4):184–195.

[McCarthy et al., 2006] McCarthy, J., Minsky, M., Rochester, N., and Shannon, C. (2006). A proposal for the dartmouth summer research project on artificial intelligence, august 31, 1955. Technical report, AI Magazine.

[Newell et al., 1961] Newell, A., Shaw, J. C., and Simon, H. A. (1961). *GPS, a Program that Simulates Human Thought.* RAND Corporation.

[Nilsson, 1984] Nilsson, N. J. (1984). Artificial intelligence, employment, and income. *Human Systems Management*, 5(2):123–135.

[Turing, 1950] Turing, A. M. (1950). Computing machinery and intelligence. *Mind*, 59(236):433–460.

[Vaswani et al., 2017] Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., Kaiser, Ł., and Polosukhin, I. (2017). Attention is all you need. In *Advances in neural information processing systems*, pages 5998–6008.