

PROEDUCA

Guide for the Responsible Use of Generative AI in Research Tasks

17/07/2024

Contents

1. Executive Summary - 3
 - Key points for general application
 - Case study guide
2. Introduction - 5
 - Basic use of generative AI
3. Responsible Use of AI - 7
 - Text editing
 - Content production, including audiovisual content
 - Doctoral theses
 - Reports on competitive projects and research grants
 - Review and evaluation of texts and scientific productions
 - Applied research and execution of competitive projects
4. Authorship - 9
 - Acknowledgment of the use of generative AI tools
5. Credits - 10
6. Copyright and Citation - 10
7. References - 10
8. ANNEX 1. Examples of Conversations and Tasks with Generative AI - 13

1. Executive Summary

PROEDUCA establishes guidelines for the responsible use of generative Artificial Intelligence (AI) tools in the field of research, which are developed or implemented by all the universities within the educational group, such as Universidad Internacional de La Rioja (UNIR), UNIR Mexico, MIU City University Miami, UNIPRO and others.

1.1. Key points for general application

- **Ethics:** the use of generative AI in research tasks should adhere to the same ethical principles as any other process of production, editing, review and dissemination. Special attention should be paid to authorship and attribution, the privacy and security of both personal and third-party data, and responsible use under any circumstances.
- **Authorship:** generative AI cannot be credited as an author of a research project. Only individuals who can assume responsibility and give consent for their inclusion should be recognised as authors.
- **Acknowledgment:** it is mandatory to document the use of generative AI at any stage of the research process. Researchers must verify originality, avoid plagiarism, respect copyright and ensure that these tools or the content they produce do not introduce biases. Depending on the specific use, footnotes, acknowledgments or citations can be used to recognise support by AI.
- **Responsible use:** a distinction is made between content correction and assistance in the creation or substantial modification of content. While the former does not require specific citation, any significant reformulation or support provided by AI should be acknowledged.
- **Data privacy and security:** care must be taken when sharing data with commercial generative AI tools to avoid disclosing sensitive or protected material, both on the part of the author and the institution they belong to. There are alternatives that allow the use of generative AI locally to protect privacy.

1.2. Case study guide

- **Text editing:** significant rewriting of texts should acknowledge the use of generative AI tools. However, any tool may be used for spelling checks, grammatical construction or expressions in non-native languages.
- **Content production, including audiovisual content:** it is generally not recommended to use generative AI to create or alter images, videos, audios or any multimedia products intended for inclusion in a doctoral thesis or scientific article, unless the AI-generated content is directly relevant to the research topic. However, the use of image editing tools for adjustments like changing contrast or brightness, as well as other non-substantial modifications of the original image, is permitted. In the case of audiovisual production or any type of resource associated with a research project (systematic review, educational content, programming code, competency framework, etc.), AI can be used with the authorisation of the relevant Vice-rector and should adhere to the key points outlined in the previous section.
- **Doctoral theses:** given the importance of autonomous learning, the use of generative AI to write doctoral theses, including literature reviews, is not permitted. In other cases (e.g., as a support tool for conducting quantitative analysis), PhD students must have the express authorisation of their supervisor and the necessary university bodies.

- **Competitive project proposals and research grants:** the use of generative AI in writing proposals for grant applications is generally not permitted. If AI is used for supplementary paragraphs or sections, authorisation must be given from the Vice-rector overseeing the proposal.
- **Review and evaluation of scientific production:** for the review or evaluation of project reports, scientific articles, books, theses, technical reports or any other type of scientific output commissioned by any university within the PROEDUCA educational group, the use of generative AI tools is not permitted. If the commission comes from another entity (public or private), institution or scientific community, personal authorship is recommended, but the guidelines of the requesting entity will be followed.
- **Applied research and execution of competitive projects:** generative AI can be used for applied research tasks as a tool to enhance productivity. However, data privacy must always be considered, and only data that could be shared with external organisations according to privacy policies should be shared with generative AI tools. Once data or documents are shared with a generative AI tool, they are openly exposed. The use of generative AI for writing technical reports for any type of funded or supervised research project, whether internally or externally, is not permitted.

PROEDUCA's educational group universities commit to monitoring the development and implementation of these technologies and adjusting this policy as needed, aligning with practices adopted by other academic institutions at national and international levels. Any researcher from a PROEDUCA group university who uses generative AI in one or more of the scenarios covered by this policy, or in any other present or future scenario, does so under their own responsibility and attribution, with PROEDUCA and its universities not being liable for any inappropriate use.

2.. Introduction

Generative AI tools can create text, images, voice or video in response to a prompt. Some examples of these tools include ChatGPT-3.5, ChatGPT-4.0, Gemini and Grammarly for text generation, and DALL-E for image production.

Generative AI tools can be used in various ways throughout a research process: writing, translating and reviewing texts, discovering and analysing literature, automatically generating code, generating and modifying images, data analysis, etc. These tools can also be used to produce supplementary resources, such as videos, images and voice (for generating, editing or cloning, for example). It is important to emphasise that the accuracy and completeness of generative AI outputs cannot be guaranteed by default, and they must be appropriately checked.

This document aims to provide researchers with guidance on the use of generative AI and AI-assisted technologies. PROEDUCA will monitor the development of these technologies and adjust or refine this policy as needed. Researchers are permitted to use generative AI tools legitimately within the scope of relevant policies and guidelines, and this also applies to PhD students.

PROEDUCA's policy, implemented by its universities, aligns with those already established by other national (Universidad Carlos III de Madrid [1], Universidad de Granada [2], Universidad Autónoma de Madrid [3]) and international universities and research centres (Deakin University [4], University of Melbourne [5, 6], Australian Research Council [7], University of California, Los Angeles [8], Aalto University [9]).

2.1 Basic use of generative AI

Generative AI refers to a branch of AI focused on creating models that can generate new content, such as text, images, videos, voice or music. For text generation, a Large Language Model (LLM) is a key component of generative AI. An LLM is an algorithm trained to understand and produce coherent text in one or multiple languages. These models use neural networks to identify linguistic patterns from extensive text datasets. It differs from a base LLM, which consists of statistical models that capture language patterns, without any specific application, and models tailored for specific activities. These are base models that have been adapted for particular tasks, such as translating text or holding conversations. For example, GPT-4.0 is a base model, while ChatGPT-4.0 is an adapted model trained for human-like conversations.

The basic way to interact with generative AI tools, whether they generate text, images or voice, is through prompts. A prompt is a brief instruction or question given to the generative AI model to initiate content generation. It is crucial to clearly and concisely formulate prompts, as they significantly influence the quality and relevance of the generated responses. An effective prompt should have the following characteristics:

- Clear: it should be understandable and specific to guide the model towards generating the desired content.
- Concise: it should be brief and to the point, avoiding ambiguities or redundancies.
- Contextualised: it should provide relevant context to help the model generate more accurate and coherent responses.

For instance, the prompt "Talk to me about climate change" is neither clear nor concise and may produce vague or irrelevant responses. A more effective prompt would be:

"I am a teacher introducing climate change to 14-year-old students. Give me a comprehensive and detailed overview of the historical development of climate change, including its causes, impacts and the scientific understanding of this phenomenon."

Prompting is generally an iterative process where the user provides a clear, concise and contextual prompt, then evaluates the results produced by the system. Based on these results, the user refines the prompt to continue providing necessary context to achieve a satisfactory output. Thus, a satisfactory result is not achieved through a single prompt but through a series of interactions with the generative AI. These interactions progressively provide more context and guidance to the tool to produce the desired output.

For text-based generative AI, the main functions are summarising, inferring, expanding and transforming text. Examples of transformations include text translation, correction and improvement, style changes (formal, informal, scientific, etc.) and format changes (prose, verse, etc.) or output formats (HTML, JSON, Markdown, etc.). These functions have various applications in research, such as processing scientific documents, enhancing and expanding project ideas, autocorrection and transitioning to a scientific style, code generation and data analysis, tutoring and study assistance.

There are also various strategies for constructing prompts [10][11]. One common strategy is RTF (Role-Task-Format), where the prompt specifies the role of the LLM, the task it should perform, and the format of the output. For example:

“Act as an Art History professor. Develop a curriculum for the course Introduction to Modern Art in Spain. The course spans 14 weeks with two 90-minute classes per week. Also, create two assignments for week 5 and week 12, including a project submission. Provide the result in HTML for uploading to a website.”

This prompt uses an RTF strategy and provides the necessary context (number of classes, duration, desired output format, etc.) to complete the task. The initial output may not be perfect, so subsequent prompts should indicate necessary changes until a satisfactory result is achieved. Appendix 1 includes several examples of conversations with generative AI.

Lastly, as mentioned in the introduction, it is important to note that the accuracy and completeness of generative AI results cannot be guaranteed by default, and appropriate verifications should always be conducted. One phenomenon to consider with generative AI is hallucinations. This term refers to instances occur where AI generates incorrect, unverifiable or entirely fictitious information, presenting it as if it were real. The presence of such hallucinations highlights the critical importance of reviewing and validating results produced by generative AI algorithms. Section 4 provides detailed steps to consider before using results generated by AI.

3. Responsible Use of AI

This policy distinguishes five areas of application for generative AI: text editing, image creation, doctoral theses, competitive project reports and research tasks.

3.1. Text editing

Text editing encompasses any modifications to text, such as rewriting, expansion, translation and/or filtering. Two levels can be distinguished: (1) content correction and improvement, which includes grammatical and spelling changes, and (2) reformulation, expansion, rewriting and filtering of text, focusing on generating or rewriting text based on input, whether it be a question or a basic idea to reformulate, filter or expand. An example of the first case would be assistance provided by Microsoft Word or Google Docs, which currently only offers spell-check and grammatical improvements. More recent tools provide additional editing assistance. For example, Grammarly helps with expression and grammar but also assists with reformulation, expansion, filtering, rewriting and translation.

For the first case, use of the tool does not need to be cited. However, any text that falls into the second category (including translation between different languages) must acknowledge the use of the corresponding tool. Generally, substantial rewriting of a text is considered more than just text correction and should recognise the use of generative AI tools.

3.2. Content production, including audiovisual content

The use of generative AI is generally not recommended for creating or altering images, videos, audio or any multimedia products intended for inclusion in a doctoral thesis or scientific article, unless the generation of the image by AI is directly relevant to the research topic. Tools for image editing **instead allows image editing tools**, such as adjusting contrast or brightness, and other aspects of image retouching that do not result in substantial modification of the original image, are permitted.

For audiovisual production or any type of resource associated with a research project (systematic reviews, educational content, programming code, competency frameworks, etc.), **the use of AI is permitted provided that it receives authorisation** from the relevant Vice-rector and adheres to the key points outlined in the previous section.

3.3. Doctoral theses

Doctoral theses are a special case due to the student's learning process. It is expected that a PhD candidate will be able to carry out all stages of research, from developing concepts to communicating results, which includes not only writing texts but also structuring arguments, developing complex points, etc.

Generally, one of the main purposes of a doctoral thesis is for the student to learn to effectively express complex ideas in writing. Therefore, **the use of generative AI to draft or make substantial revisions of any part of a doctoral thesis, including literature reviews or systematic literature reviews, is not permitted.**

If deemed appropriate by the thesis supervisor, the doctoral programme, and the university's School of Doctoral Studies, the use of generative AI may be permitted for specific applied tasks (see the relevant section). In these cases, the principles of Authorship and Acknowledgment outlined in this document would apply.

Generative AI tools exist for the production of literature reviews and understanding scientific literature. However, the use of generative AI tools for literature reviews or for studying the state of the art is not advised due to the importance of understanding the state of the art in producing a thesis and because generative AI tools' collections of works are often neither exhaustive nor necessarily the most relevant.

Furthermore, the use of generative AI tools for understanding scientific articles or generating summaries is not recommended. Reading an article involves understanding it, which is crucial for the learning process. Additionally, while the summaries produced by these tools might seem effective, the content may still be inconsistent or incorrect.

3.4. Reports on competitive project and research grants

When drafting applications for grants, the use of generative AI should be approached with caution, as it can raise issues related to intellectual property and copyright, in addition to potentially producing factually incorrect information [7].

As a general rule, the use of generative AI for writing reports on competitive projects is not permitted. For occasional use (e.g., individual paragraphs or supplementary sections), applicants must adhere to the guidelines outlined in the sections on Authorship and Acknowledgment provided later in this document. Additionally, they must seek authorisation from the Vice-rector responsible for managing the grant application process. It is also recommended to ensure that the funding entity does not impose restrictions on the use of generative AI.

3.5. Review and evaluation of texts and scientific productions

For the review or evaluation of competitive project reports, scientific articles, books, theses, technical reports or any other type of scientific production conducted on behalf of any university within the PROEDUCA educational group, the use of generative AI tools is not permitted. This restriction is due, among other reasons, to the need for providing fair and unbiased criticism and maintaining privacy. In cases where the review or evaluation is commissioned by a (public or private) organisation, institution or scientific community, personal authorship is recommended, but the guidelines of the requesting entity should be followed.

3.6. Applied research and execution of competitive projects

Generative AI tools have a number of applications in research beyond merely generating text and structuring documents. Some of these applications include data analysis, text analysis and generating recommendations. **The use of generative AI for these tasks is permitted as a tool to enhance productivity.** However, data privacy must always be considered, and only data that could be shared with external organisations according to privacy policies should be used with generative AI tools. Once data or documents are shared with a generative AI tool, they are openly exposed [12].

When uploading data to a commercial tool, control over that data is lost. Although companies may provide options for users to limit the use of this material, there is always a risk of reuse of the information submitted. In particular, copyrighted material, confidential material, personal information and/or human-based research data should not be shared with commercial tools. In general, the General Data Protection Regulation (GDPR) should always be considered before submitting data to a generative AI tool [9].

Given these considerations, it is also not recommended to share scientific products (articles, theses, technical reports, project reports, etc.) for review with commercial generative AI tools, as this could involve sharing some of the aforementioned sensitive information and losing control over the data and associated production. Some publishers, such as SAGE [13], explicitly prohibit the use of generative AI when reviewing scientific articles.

For the drafting of technical reports or products resulting from any type of research project funded or supervised internally or externally, the use of generative AI is not permitted.

If there is a desire to use generative AI for these cases, alternatives to commercial tools exist that can be run locally without the need for specific hardware [14][15]. In these cases, although the response time is usually longer, data privacy is preserved since the data never leaves the local environment.

4. Authorship

Only authors who give their consent and hold responsibility for the work can be included as authors of the research. All listed authors are accountable for the results presented in the work, including those where generative AI tools have been used.

Generative AI tools cannot be named as authors of a research work, as they cannot consent to be part of the work or be held responsible for it. Intellectual property rights are personal, inalienable and non-transferable. This means they cannot be misappropriated, nor can they be transferred or sold.

4.1. Acknowledgment of the use of generative AI tools

If material has been created, reviewed or enhanced using a generative AI tool at any stage of the research process, this must be acknowledged and documented. Furthermore, since the accuracy and completeness of generative AI results cannot be guaranteed by default, all authors are responsible for ensuring the correctness of the published work and for acknowledging the use of generative AI. This includes the following responsibilities:

- All authors are responsible for verifying the accuracy of the material generated.
- Authors must ensure that the generated material does not constitute plagiarism, as generative AI outputs may sometimes replicate content from other sources.
- Authors are responsible for ensuring that the material is reviewed for copyright issues, since generative AI can produce outputs that are protected by copyright law.
- Authors must ensure that generative AI tools have not introduced any biases into the generated content. Like any data-driven system, generative AI can introduce biases in the provided information, requiring conscious efforts to identify and mitigate them.
- Authors should be explicit about which material, such as specific text passages or images, was created or modified by generative AI tools.

If a publication includes text generated and/or edited by AI and meets the conditions detailed above, it is the authors' responsibility to establish and acknowledge the AI's assistance in the content provided for specific sections of the work [16]. The method of acknowledgment will depend on the task for which the AI was used. Some options include:

- **Footnote or reference:** for text editing and enhancement or literature discovery, a footnote instead of an in-text reference should be used, indicating the tool used, the version (if available), the date of use and prompt used. Since the process typically involves iterative conversations with the AI tool to reach the desired result, **a link to the conversation should be attached.** Most commercial tools offer the option to generate a link from the conversation.
- **Citation:** a traditional citation is especially recommended when generative AI is used for data analysis or for tasks such as language processing or classification. Following the APA style, it would look like this:
 - OpenAI. (2023). ChatGPT (Mar. 14 version) [Large Language Model]. <https://chat.openai.com/chat>
- **Specific section:** some publishers may require the insertion of a specific section detailing the use of generative AI, specifying the tool, the reasons for and purposes of its use and acknowledging the authorship and responsibility for the content of the publication. For example, Elsevier requires the use this type of section [17]
- **Automatic incorporation:** some tools, like Grammarly, provide a button to acknowledge the use of generative AI in texts and automatically include mention of it [18]. Researchers must be aware of the reliability of these tools and the constant need for updates.
- **Other cases:** some journals may have their own policies regarding the use of generative AI for any of the aforementioned tasks. It is important to ensure compliance with the journal's requirements before submitting a scientific article. Examples include Elsevier [17], SAGE [13], Science [19] or Wiley [20].

5. Credits

- Editor: Daniel Burgos, Universidad Internacional de La Rioja (UNIR), MIU City University Miami
- Authors: Enrique Frías, Dai Griffiths, Pablo Moreno, Rubén González, José Carlos San José, Natalia Padilla, Alberto Corbí, Joaquín Alonso, Shila Ganguly, Stefania Aceto, Sérgio Vilela (UNIR)

6. Copyright and Citation

- © Universidad Internacional de La Rioja (UNIR) / Proeduca. Licensed under Creative Commons CC-BY-NC: <https://www.creativecommons.org/licenses/by-nc/4.0/deed.es>
- Cite as: "Universidad Internacional de La Rioja (2024). Guide to the Responsible Use of Generative Artificial Intelligence in Research Tasks." Proeduca. DOI: <https://doi.org/10.5281/zenodo.11609187>

7. References

- [1] "Recomendaciones para la docencia con inteligencias artificiales generativas", Universidad Carlos III de Madrid, Vicerrectorado de Postgrado y Formación Permanente (PDF; Accessed 5 March 2024), <https://e-archivo.uc3m.es/rest/api/core/bitstreams/456229c0-3670-4198-b86d-ff2762a3e1f9/content>
- [2] "Inteligencia Artificial en la universidad", Centro de Producción de Recursos para la Universidad Digital, Universidad de Granada (PDF, Accessed 5 March 2024), <https://ceprud.ugr.es/formacion-tic/inteligencia-artificial>
- [3] "Guía básica sobre el uso de la Inteligencia artificial para docentes y estudiantes", Universidad Autónoma de Madrid, <https://www.uam.es/uam/media/doc/1606941290988/guia-visual-iagen.pdf>
- [4] "Responsible use of GenAI in Research", Deakin University, <https://deakin.libguides.com/generative-ai-research/begin>
- [5] "Statement on responsible use of digital assistance tools in research", The University of Melbourne, <https://research.unimelb.edu.au/strengths/ethics/research-integrity-and-digital-assistance-tools>
- [6] "Graduate researchers and digital assistance tools", The University of Melbourne (Accessed 3 April), <https://gradresearch.unimelb.edu.au/preparing-my-thesis/graduate-researchers-and-digital-assistance-tools>
- [7] "Policy on Use of Generative Artificial Intelligence in the ARCs grants programs", Australian Research Council (version 2023.1, 7 July 2023), <https://www.arc.gov.au/sites/default/files/2023-07/Policy%20on%20Use%20of%20Generative%20Artificial%20Intelligence%20in%20the%20ARCs%20grants%20programs%202023.pdf>
- [8] "Guidance for the use of Generative AI", UCLA Center for the Advancement of Teaching, https://teaching.ucla.edu/resources/ai_guidance/
- [9] "Responsible use of Artificial Intelligence in the research process", Aalto University, <https://www.aalto.fi/en/services/responsible-use-of-artificial-intelligence-in-the-research-process>
- [10] "Prompt engineering for educators – making generative AI work for you", D. Liu, The University of Sidney, <https://educational-innovation.sydney.edu.au/teaching@sydney/prompt-engineering-for-educators-making-generative-ai-work-for-you/>

- [11] "Must-Read Best Of Practical Prompt Engineering Strategies To Become A Skillful Prompting Wizard In Generative AI", L. Eliot, Forbes, Dec. 28 2023, <https://www.forbes.com/sites/lanceeliot/2023/12/28/must-read-best-of-practical-prompt-engineering-strategies-to-become-a-skillful-tprompting-wizard-in-generative-ai/?sh=1e3369d019cd>
- [12] "Generative Artificial Intelligence (AI). Thinking about using AI in your research? Read this first", Deakin University, <https://www.deakin.edu.au/research/support-for-researchers/research-integrity/generative-artificial-intelligence-ai>
- [13] "ChatGPT and Generative AI", Sage Editorial Policies, <https://us.sagepub.com/en-us/nam/chatgpt-and-generative-ai>
- [14] GPT4ALL, <https://gpt4all.io/index.html>
- [15] "6 Ways For Running A Local LLM (how to use HuggingFace)", Tomas Fernandez, <https://semaphoreci.com/blog/local-llm>
- [16] "Authorship and AI Tools", COPE Committee on Publications Ethics, <https://publicationethics.org/cope-position-statements/ai-author>
- [17] "The use of generative AI and AI-assisted technologies in writing for Elsevier", Elsevier, <https://www.elsevier.com/about/policies-and-standards/the-use-of-generative-ai-and-ai-assisted-technologies-in-writing-for-elsevier>
- [18] "Back to School in the Generative AI Era", Grammarly, <https://www.grammarly.com/blog/back-to-school-in-the-generative-ai-era/>
- [19] "Editorial Policies, Image and Text Integrity ", Science Journals, <https://www.science.org/content/page/science-journals-editorial-policies#image-and-text-integrity>
- [20] "Best Practice Guidelines on research Integrity and Publishing Ethics", Artificial Intelligence Generated Content, Wiley Author Services, <https://authorservices.wiley.com/ethics-guidelines/index.html>

ANNEX 1. Examples of Conversations and Tasks with Generative AI

The detailed examples in this appendix showcase applications of generative AI in an academic setting. These conversations were generated by ChatGPT 3.5 and, in some cases, by ChatGPT 4.0. In the conversations, "User" represents the prompt entered by the human (highlighted in blue), and ChatGPT indicates the output produced by the generative AI tool. **The data produced has not been validated, verified or cross-checked.**

Example 1: Student tutor

User (prompt): I am a first-year Computer Science student. I'm studying the Introduction to Operating Systems course. Right now, I'm on the chapter about processor management. I don't understand FIFO management. Can you explain it to me?

ChatGPT

The processor management using the FIFO (First-In-First-Out) algorithm is a simple method of scheduling processes in an operating system. Essentially, this algorithm manages processes in the queue so that the first to arrive is the first to be executed. Here's a more detailed explanation of how processor management works with FIFO:

8. Process queue: when multiple processes are waiting to be executed, they are placed in a queue. This queue is a data structure that follows the "First-In-First-Out" (FIFO) principle.
9. Process selection: when the operating system needs to select a process to execute, it takes the process that is at the front of the queue. This process has been in the queue the longest and is thus considered the next to be executed.
10. Process execution: the selected process runs on the CPU until it completes execution or is interrupted for some reason (e.g., it gets blocked waiting for an input/output operation). Once the current process is completed or blocked, the next process in the FIFO queue is selected for execution.
11. Advantages and disadvantages: the main advantage of FIFO is its simplicity. It is easy to implement and understand. However, it might not be the best option in terms of performance, as it does not consider process priority or resource usage.

User: What is a process queue?

ChatGPT

The "process queue" refers to a data structure used in operating systems and concurrent programming to keep track of processes waiting to be executed or processed by the system. In simple terms, it is an ordered list of processes waiting to be handled by the central processing unit (CPU) or other system resources.

Each process in the queue has a set of associated attributes, such as its current state, priority, identifier, arrival time, remaining execution time and other relevant data. The process queue is managed by the operating system and is used to make decisions about which process will run next and how CPU time will be allocated.

There are different scheduling algorithms that determine how a process is chosen from the queue for execution. Some of these algorithms include FIFO (First-In-First-Out), priority scheduling, round-robin scheduling, among others. Each scheduling algorithm has its own rules and criteria for selecting the next process in the queue and assigning it CPU time.

User: Can you give me a practical example of a FIFO queue?

ChatGPT

Of course! Here is a practical example of how a FIFO queue works in process management in an operating system:

Let's assume you have three processes, A, B and C, that want to use the CPU, and they are queued for execution in the order they arrived:

1. Process A arrives first and is placed in the queue.
2. Process B arrives next and is placed in the queue behind A.
3. Process C arrives last and is placed in the queue behind B.

At this point, the FIFO process queue would look like this:

FIFO queue: A -> B -> C

Now, the operating system must decide which process will run next using the FIFO algorithm. In this case, since FIFO follows the "First-In-First-Out" principle, process A, which arrived first, will be selected for execution. The operating system assigns CPU time to process A for its execution.

While process A is running, the other processes (B and C) remain in the queue waiting. Once process A has finished its execution or has been blocked for some reason (e.g., waiting for input/output), the next process in the FIFO queue, which is process B, will be selected for execution. Process C will run after process B has finished or has been blocked.

Example 2: Generating ideas for research projects

User: For my Modern Spanish History course, I have to do an assignment. I'm particularly interested in the relationship between Spain and Asia. What topics would you suggest for my assignment?

ChatGPT

The relationship between Spain and Asia during the modern period is a fascinating topic and offers a variety of subtopics you could explore in your assignment. Here are some topics you could consider:

1. The Philippines under Spanish rule (1565-1898):
 - o The conquest and colonisation of the Philippines.
 - o Filipino revolts and resistance against Spanish rule.
 - o Spanish cultural and religious influence in the Philippines.
2. The Manila Galleon Route:
 - o The economic and strategic importance of this maritime route between Acapulco (Mexico) and Manila.
 - o The exchange of goods between Asia and the Americas through this route.
3. Diplomatic relations with Japan:
 - o The first contacts and Jesuit missions in Japan.
 - o The persecution of Christians and the expulsion of missionaries.
4. Relations with China:
 - o Franciscan and Jesuit missions in China.
 - o Trade between China and Spain through the Philippines.
5. Competition with other European powers in Asia:
 - o Tensions and conflicts with powers like Portugal, Holland and England in the region.
6. The end of Spanish rule in Asia:
 - o The causes and consequences of losing the Philippines after the Spanish-American War in 1898.
7. Spanish cultural influence and legacy in Asia:

- The impact of Spanish language, religion and traditions in Asian countries, especially in the Philippines.

These are just some general topics you could consider. Depending on your interest and the length of the work you need to produce, you could focus on one of these topics or explore several together. Good luck with your assignment!

User: I have to focus on the 19th century—give me three topics centred on that century.

ChatGPT

Sure! Focusing on the 19th century and Spain's relationship with Asia, here are three specific topics:

1. The decline of the Manila Galleon in the 19th century:
 - The economic, political and technological reasons that led to the cessation of this maritime route in 1815.
 - The consequences for trade between Asia and America and how it affected Spanish colonies on both continents.
2. Revolts and independence movements in the Philippines:
 - The rise of nationalist and reformist movements like that of José Rizal and the Liga Filipina.
 - The Philippine Revolution of 1896 and its connection to the Spanish-American War.
 - The role of revolutionary leaders like Emilio Aguinaldo and Andrés Bonifacio.
3. The Spanish-American War and the loss of the Philippines (1898):
 - The causes and background of the conflict with the United States.
 - The main battles and events in the Philippines during the war.
 - The consequences of the Treaty of Paris, which resulted in the cession of the Philippines to the United States and marked the end of the Spanish colonial empire in Asia.

These topics will allow you to explore in depth the relationship between Spain and Asia during the 19th century, focusing on the most significant events and changes of that period. I hope they are useful for your assignment!

User: Were there any Spanish territories in Asia apart from the Philippines in the 19th century?

ChatGPT

During the 19th century, the Philippines was Spain's primary and most significant territory in Asia. However, in addition to the Philippines, Spain had brief possessions and establishments in other parts of Asia, although their control and importance were not comparable to that of the Philippines. Some of these territories and establishments include:

0. Mariana Islands: although these islands were discovered by Magellan in the 16th century, Spain consolidated its control over them in the 17th century. The Marianas, with Guam as the main island, were administered as part of Spanish territory in the Philippines. Although Guam was ceded to the United States after the Spanish-American War in 1898, the other Mariana Islands were sold to Germany in 1899.
1. Caroline Islands: Spain formally claimed these islands in the 19th century, although missions had been established as early as the 17th century. At the end of the 19th century, there were tensions with Germany and the United Kingdom due to colonial ambitions in the region. Finally, in 1899, Spain sold the Caroline Islands, along with the Palau Islands, to Germany.

2. Palau Islands: these islands, like the Caroline Islands, were part of Spanish possessions in the Pacific and were sold to Germany in 1899.
3. Commercial establishments in China: although Spain did not have formal colonies in China, it did establish a commercial presence in ports like Canton. Additionally, Spanish missionaries, mainly Jesuits, had a significant presence in China from previous centuries.

In summary, while the Philippines was Spain's most important possession in Asia during the 19th century, there were other territories and establishments in the Pacific and mainland Asia. However, by the end of the 19th century, Spain had lost or sold most of these possessions.

User: Suggest a topic for an assignment on Spain's commercial presence in Canton.

ChatGPT

Of course! Spain's commercial presence in Canton during the 19th century is an interesting and less-explored topic compared to other aspects of Spanish colonial history. Here's a detailed topic for your assignment:

"Trade Between Spain and China in the 19th Century: The Role of Canton as the Gateway to the Chinese Market"

Within this topic, you could cover the following points:

1. Historical background:
 - A brief review of trade relations between Spain and China before the 19th century.
 - The importance of Canton as the main commercial port for China with the West.
2. Establishment of Spanish commercial presence:
 - The economic and political motivations for Spain to establish trade relations with China.
 - The creation of Spanish factories and commercial establishments in Canton.
3. Products and goods exchanged:
 - The main products exported from Spain to China and vice versa.
 - The relevance of the silver trade and how Canton became a key point for the flow of this precious metal.
4. Challenges and competition:
 - The tensions and challenges faced by Spanish traders in Canton, including issues with local authorities and competition with other European powers.
 - The impact of the Opium Wars and how they affected the trade dynamics in Canton.
5. Consequences and legacy:
 - The economic and cultural impact of trade between Spain and China in the 19th century.
 - The influence and legacy of the Spanish commercial presence in Canton on subsequent Sino-Spanish relations.

This topic will allow you to explore a specific and lesser-known aspect of Spain's commercial history in Asia, offering a unique perspective on global interactions in the 19th century. I hope this is useful and wish you success in your research!

Example 3: Processing and understanding scientific articles

Read the following article [URL]. Don't give me any information right now.

ChatGPT

Link Reader used

I have successfully read the article titled "Spectral Clustering for Sensing Urban Land Use using Twitter Activity". I will keep the information in mind for when you have questions or need details from the article. Let me know how I can assist you further!

User: (anonymous source) What is the title?

ChatGPT

The article is titled "Spectral Clustering for Sensing Urban Land Use using Twitter Activity."

User: Explain what Section 4.1 says.

ChatGPT

Sure! Section 4.1 of the article is titled "Twitter Datasets," and here's a summary of its content:

- Twitter datasets: this section describes how Twitter data was collected and used for the study.
- Geolocation of Tweets: Twitter users can tag tweets with their current geospatial location. Specifically, they can set their geographic location by specifying a city or region or by allowing Twitter to track their GPS coordinates of longitude and latitude. When a new tweet is created, Twitter records the user's geographic information at that moment, along with a variety of other metadata. To model land use within an urban environment, they only collected tweets whose location is automatically recorded by Twitter through GPS and not manually reported by the user.
- Data collection: they used Twitter's Streaming API to collect geolocated tweets in near real-time. This API allows the establishment of a high-performance stream with Twitter, enabling the collection of a large volume of public tweet states. Specifically, the Twitter Streaming API provides a sample of all public tweet states, currently around one percent of the complete set of tweets from the Firehose. Their final Twitter dataset consists of 49 days (seven weeks) of geolocated tweets worldwide from 25 October to 12 December 2010.
- Selected geographic areas: the geographic area for London is defined by the area that would have been Ringway 1. For Madrid, they considered approximately the urban area within the M-30 motorway.

This is a summary of Section 4.1 of the article. If you need more details or information about other sections, just let me know!

User: I don't quite understand the method used in Section 4.2. Please explain it to me in simple terms.

ChatGPT

Link Reader used

Section 4.2 of the article is titled "Land Segmentation and Land Use Clustering". Here's a simplified explanation:

Section 4.2 focuses on how the urban area is segmented into different land segments and how these segments are grouped based on Twitter activity to identify different land uses.

1. Land segmentation with geolocated tweets:

- The method uses a type of neural network called Self-Organising Maps (SOM) to divide the urban area into different land segments based on Twitter activity.
- These land segments are defined according to the concentration of tweets in different areas. For example, an area with many tweets will have more segments (or neurons) than an area with fewer tweets.
- To determine the size and shape of these segments, the method explores different map sizes and selects the one that best fits the distribution of tweets in the urban area.

2. Land use clustering:

- Once the land segments are defined, each segment is characterised by its "tweet activity vector", which is essentially a summary of when and how much tweeting happens in that segment.
- These activity vectors are used to group similar segments together. The idea is that segments with similar Twitter activity patterns likely have similar land uses.
- To do this clustering, the method uses a technique called "spectral clustering". This technique aims to group segments that are similar to each other and different from other groups.
- The number of groups or clusters is determined by a technique called "eigengap detection".

3. Cluster interpretation:

- Once the clusters are formed, they can be interpreted to identify different land uses. For example, a cluster with high Twitter activity at night might represent an area of nightlife.
- The location of the clusters in the urban area also helps interpret their use. For example, a cluster near a park might represent recreational areas.

In summary, Section 4.2 describes how Twitter activity can be used to divide an urban area into different land segments and how these segments can be grouped to identify different land uses. The idea is that the way people tweet in different areas can give us clues about how that area is used in real life.

User: Describe the clusters identified in Section 4.2.

ChatGPT

AI PDF used

Section 4.2 identifies several clusters based on Twitter activity in different urban areas. These clusters represent different types of land uses. Here's a description of the clusters identified:

1. Cluster Type 1: Business

This cluster shows Twitter activity that is consistent during the day and decreases at night. Geographically, it covers areas associated with business activities/offices, such as the financial district in Manhattan, the City and Canary Wharf in London, and the surroundings of Castellana and the AZCA area in Madrid.

2. Cluster Type 2: Leisure/Weekend

This cluster shows a significant difference between Twitter activity during the weekend and weekdays. Geographically, it covers regions like Central Park in Manhattan, Hyde Park in London and El Retiro Park in Madrid. It also includes tourist areas.

3. Cluster Type 3: Nightlife

This cluster has Twitter activity that increases significantly at night, especially on weekends. Geographically, it covers areas associated with nightlife, such as the West End in London and Malasaña/Chueca in Madrid.

4. Cluster Type 4: Residential

This cluster shows Twitter activity that is consistent during the weekend and peaks in the afternoon on weekdays. Geographically, it covers predominantly residential areas in the three cities.

5. Cluster Type 5: Industrial (only identified for London)

This cluster has Twitter activity that is higher during the morning on weekdays and decreases during the rest of the day. Geographically, it covers areas in the east and south of London, such as the area around Battersea Power Station and the Olympic Park.

These clusters were identified by analysing the "Twitter activity signature" of each cluster, which is a summary of when and how much tweeting happens in that cluster and comparing it with the geographical distribution of the clusters on the city map.

It's important to note that these clusters represent hypotheses about land uses based on Twitter activity and are interpreted based on their activity and location in the urban area.

Example 4: Review of the state of the art

User: I am writing a review of the state of the art on the topic "machine learning applications in higher education". Please find other scientific papers that have already presented a review on this topic.

ChatGPT

Certainly! Reviewing the state of the art on "machine learning applications in higher education" is a comprehensive task, and numerous researchers have written about this. Here are some papers and articles from before my last update in 2022 that could be pertinent to your research:

1. Huda, M., Maselena, A., Atmotiyoso, P., Siregar, M., Ahmad, R., Jasmi, K. A., & Muhamad, N. (2018). Big data emerging technology: Insights into innovative environment for online learning resources. *International Journal of Emerging Technologies in Learning*, 13(1), 23-36.

2. Dutt, R., Ismail, M. A., & Herawan, T. (2017). A systematic review on educational data mining. *IEEE Access*, 5, 15991-16005.
3. Duan, Y., Edwards, J. S., & Dwivedi, Y. K. (2019). Artificial intelligence for decision making in the era of Big Data—evolution, challenges and research agenda. *International Journal of Information Management*, 48, 63-71.
4. Cortez, P., & Silva, A. M. G. (2008). Using data mining to predict secondary school student performance. In A. Brito & J. Teixeira Eds., *Proceedings of 5th Annual Future Business Technology Conference*.
5. Shahiri, A. M., Husain, W., & Rashid, N. A. (2015). A review on predicting student's performance using data mining techniques. *Procedia Computer Science*, 72, 414-422.
6. Baker, R. S., & Yacef, K. (2009). The state of educational data mining in 2009: A review and future visions. *Journal of Educational Data Mining*, 1(1), 3-17.
7. Dekker, G. W., Pechenizkiy, M., & Vleeshouwers, J. M. (2009). Predicting students drop out: A case study. In *2nd International Conference on Educational Data Mining*.
8. Ali, A., & Smith, A. (2015). Review of machine learning approaches to predict learning outcomes. in *Proc. Science and Information Conference (SAI)*.
9. Marbouti, F., Diefes-Dux, H. A., & Madhavan, K. (2016). Models for early prediction of at-risk students in a course using standards-based grading. *Computers & Education*, 103, 1-15.
10. Agrawal, R., & Srikant, R. (1995). Mining sequential patterns. In *Proceedings of the 11th International Conference on Data Engineering*.

Remember that while these articles can provide an overview and insights on the topic, it is essential to access each paper and evaluate its relevance to your specific focus within the broader topic. Additionally, considering the rapid advancement of technology and methodologies, it's crucial to look for more recent articles and reviews (post-2022) to ensure your review is comprehensive and up-to-date.

User: Just give me references from 2020 or newer

ChatGPT

Certainly, focusing on more recent work is a great idea to ensure that your review is up-to-date. Here are some articles and papers from 2020 onwards that delve into machine learning applications in higher education:

1. Alghamdi, A., Karpinski, A. C., Lepp, A., & Barkley, J. (2020). Data mining in higher education: University student dropout case study. *International Journal of Information and Learning Technology*.
2. Jiang, S., Williams, A. E., Schenke, K., Warschauer, M., & O'Dowd, D. K. (2020). Predicting MOOC performance with week 1 behavior. *Journal of Computer Assisted Learning*.
3. Martínez-Plumed, F., Contreras-Ochando, L., Ferri, C., Hernández-Orallo, J., & Ramirez-Quintana, M. J. (2020). From predicting educational achievement to identifying learning strategies: A meta-analysis. *User Modeling and User-Adapted Interaction*.
4. Gogoulou, A., Gouli, E., Boas, G. V., & Liakou, E. (2020). Exploiting machine learning for predicting student's performance. *Journal of Educational Computing Research*.
5. Vieira, C., Parsons, P., & Byrd, V. (2020). *Data Mining Techniques on Students' Learning Behavior*. In *Computer Supported Education*. Springer.

6. Shen, L., Wang, M., & Shen, R. (2020). Affective e-learning: Using "emotional" data to improve learning in pervasive learning environment. *Educational Technology & Society*.
7. Khan, I. A., Alotaibi, F. M., & Ahmad, F. (2021). A predictive model using machine learning for improving higher education enrolment management. *Education and Information Technologies*.
8. Tan, C., & Shao, P. (2021). Using artificial intelligence to support higher education learning: Possibilities and challenges. *British Journal of Educational Technology*.
9. Almarabeh, H., & Mohammad, H. (2021). Machine Learning Techniques in E-Learning Systems: A Systematic Review. *Education and Information Technologies*.
10. Ramírez-Quintana, M. J., Martínez-Plumed, F., Ferri, C., & Hernández-Orallo, J. (2021). Machine Learning for Student Modelling and Adaptive Education: A Survey. *Artificial Intelligence Review*.

To ensure a thorough and comprehensive review, I recommend accessing these papers and analyzing their methodologies, findings, and relevance to your specific area of interest within the topic of machine learning in higher education. Additionally, don't forget to also consider more recent publications from 2022 onwards, which may not be covered here.

User: Considering these references, write an introduction that uses them

ChatGPT

Certainly! Here's an introduction that references the provided articles:

Introduction. The application of machine learning in higher education has emerged as a transformative force, shaping educational paradigms, predicting student outcomes, and personalizing learning experiences. Recent years have witnessed an upsurge in research seeking to harness the potential of these intelligent algorithms for various aspects of higher education. For instance, Alghamdi et al. (2020) delved into the arena of data mining, presenting a pivotal study on the prediction of student dropout rates in universities. Similarly, highlighting the potential of early behavior in Massive Open Online Courses (MOOCs), Jiang et al. (2020) posited that the initial week's behavior could be instrumental in predicting overall MOOC performance.

Yet, the implications of machine learning in education are not confined to just prediction. The work of Martínez-Plumed et al. (2020) ushered in a novel perspective by transitioning from mere predictive analyses to identifying effective learning strategies through meta-analyses. Complementing this, Gogoulou et al.'s (2020) study further substantiated the value of machine learning, specifically in augmenting students' performance in e-learning environments.

As e-learning platforms become increasingly sophisticated, the role of emotional data in shaping learning experiences cannot be understated. Shen et al. (2020) championed this cause, emphasizing the importance of affective e-learning and how "emotional" data can be harnessed to foster better learning in pervasive educational environments.

The administrative aspects of higher education have not remained untouched either. Khan et al. (2021) crafted a predictive model leveraging machine learning, aiming to enhance the efficiency of higher education enrollment management. This intertwining of administration and machine learning underscores the holistic impact of such technologies on the academic realm.

Furthermore, as Tan and Shao (2021) posit, while the potential of artificial intelligence, including machine learning, in supporting higher education learning is vast, it is not devoid of challenges. Their comprehensive overview provides a balanced viewpoint, elucidating both the possibilities and hurdles of integrating AI into higher education. Complementing this, both Almarabeh & Mohammad (2021) and Ramírez-Quintana et al. (2021) offer exhaustive reviews on machine learning techniques in e-learning systems and the broader spectrum of student modelling and adaptive education.

Example 5: Building a syllabus and a presentation

User: I am preparing a course for the final year of a Computer Engineering degree. I want to create a syllabus for the course "Introduction to Deep Learning." The course will run for 14 weeks, with 2 classes per week of 90 minutes each. The students already have knowledge of machine learning and Python programming. The syllabus should include practical examples in Python and 2 projects to be submitted, the first in week 7 and the last in week 14.

ChatGPT

What an exciting project! Deep Learning is one of the most fascinating areas of Artificial Intelligence. Based on the structure you have provided, I propose the following syllabus for your course "Introduction to Deep Learning":

Week 1: Introduction to Deep Learning

- History and motivation behind Deep Learning.
- Differences between machine learning and deep learning.

Week 2: Artificial Neural Networks

- Structure and functioning.
- Implementation and practical examples using TensorFlow/Keras.

Week 3: Activation Functions and Backpropagation

- Activation functions: ReLU, Sigmoid, Tanh, etc.
- The backpropagation algorithm.

Week 4: Regularisation and Optimisation

- Regularisation methods: Dropout, L1 and L2 Regularisation
- Optimisers: SGD, Adam, RMSprop, etc.

Week 5: Convolutional Neural Networks (CNNs)

- Introduction and applications.
- Implementation of CNNs with practical examples.

Week 6: Recurrent Neural Networks (RNNs)

- Concept and applications.
- LSTM and GRU: Implementation and examples.

Week 7: Advanced Techniques and Project 1

- Batch normalisation, Transfer learning, Data Augmentation.
- Presentation and development of the first project.

Week 8: Autoencoders

- Introduction and applications.

- Implementation and practical examples.

Week 9: Generative Adversarial Networks (GANs)

- Concept and applications.
- Implementation of basic GANs.

Week 10: Attention and Attention Mechanisms

- Introduction to the concept of attention in neural networks
- Transformers and BERT: Overview.

Week 11: Deep Learning for Natural Language Processing (NLP)

- Word embeddings: Word2Vec, GloVe.
- Implementation of NLP models using RNNs and Transformers.

Week 12: Deep Learning in Computer Vision

- Object detection, semantic segmentation.
- Implementation of practical examples.

Week 13: Reinforcement Learning

- Basic concepts and applications.
- Implementation of simple examples with DQN.

Week 14: Reviews and Project 2

- General review and resolution of doubts.
- Presentation and development of the second project.

Projects:

- Project 1 (Week 7): Image classification using CNNs. Students can work with datasets like CIFAR-10 or Fashion MNIST.
- Project 2 (Week 14): Choice between:
 - Creating an NLP model for sentiment analysis.
 - Developing a GAN for image generation.
 - Implementing a reinforcement learning model in a simple environment, such as a basic game.

This syllabus covers a wide range of deep learning topics and should provide students with a solid introduction to the field. I hope you find it useful and wish you success with your course!

User: The students already have specific courses in NLP and computer vision. Remove those two weeks and add extra content to Weeks 6 and 9.

ChatGPT

Got it! Considering that the students already have experience in NLP and computer vision, we can delve into more specific topics related to Recurrent Neural Networks (RNNs) and Generative Adversarial Networks (GANs), and possibly introduce some advanced topics that would be of great interest. Here's the adjusted syllabus:

Week 1: Introduction to Deep Learning

- History and motivation behind Deep Learning.
- Differences between machine learning and deep learning.

Week 2: Artificial Neural Networks

- Structure and functioning.
- Implementation and practical examples using TensorFlow/Keras.

Week 3: Activation Functions and Backpropagation

- Activation functions: ReLU, Sigmoid, Tanh, etc.
- The backpropagation algorithm.

Week 4: Regularisation and Optimisation

- Regularisation methods: Dropout, L1 and L2 Regularisation
- Optimisers: SGD, Adam, RMSprop, etc.

Week 5: Convolutional Neural Networks (CNNs)

- Introduction and applications.
- Implementation of CNNs with practical examples.

Week 6: Advanced Recurrent Neural Networks (RNNs)

- LSTM and GRU: Implementation and examples.
- Advanced applications of RNNs: text generation, time series and music.

Week 7: Advanced Techniques and Project 1

- Batch normalisation, Transfer learning, Data Augmentation.
- Presentation and development of the first project.

Week 8: Autoencoders

- Introduction and applications.
- Implementation and practical examples.

Week 9: Advanced Generative Adversarial Networks (GANs)

- Conditional GANs, CycleGANs and StarGANs.
- Implementation of advanced GANs and innovative applications.

Week 10: Attention and Attention Mechanisms

- Introduction to the concept of attention in neural networks
- Transformers: structure and applications.

Week 11: Deep Learning and Graphs

- Graph Neural Networks (GNNs).
- Applications and practical examples.

Week 12: Reinforcement Learning

- Basic concepts and applications.
- Implementation of simple examples with DQN.

Week 13: Generative Models and Audio

- Introduction to audio generation with deep models.
- WaveNet and other models for voice and music generation.

Week 14: Reviews and Project 2

- General review and resolution of doubts.
- Presentation and development of the second project.

Projects:

- Project 1 (Week 7): Image classification using CNNs. Students can work with datasets like CIFAR-10 or Fashion MNIST.
- Project 2 (Week 14): Choice between:
 - Text generation using advanced RNNs.
 - Development of an advanced GAN for an innovative application.
 - Implementing a reinforcement learning model in a simple environment, such as a basic game.

With these adjustments, the syllabus provides an in-depth exploration of RNNs and GANs, along with additional advanced topics that may be very interesting for students with a background in deep learning. I hope this proposal is helpful!

User: What basic bibliography would you recommend?

ChatGPT

Certainly! For a course on "Introduction to Deep Learning," there are several foundational texts that are highly recommended and provide comprehensive coverage of key concepts in the field. Here is a list of recommended basic bibliography:

1. "Deep Learning" by Ian Goodfellow, Yoshua Bengio and Aaron Courville.

This is likely the most comprehensive and fundamental book on deep learning. It covers everything from mathematical foundations to advanced topics like autoencoders, GANs and semi-supervised learning.

2. "Python Deep Learning" by Ivan Vasilev, Daniel Slater and Gianmario Spacagna.

This book is excellent for those who want to learn how to implement deep learning models using Python. It covers TensorFlow, Keras and other popular frameworks.

3. "Neural Networks and Deep Learning: A Textbook" by Charu Aggarwal.

It provides a deep understanding of neural networks and deep learning. Charu Aggarwal's explanations are clear and accessible, making it suitable for both beginners and experts.

4. "Hands-On Machine Learning with Scikit-Learn, Keras and TensorFlow" by Aurélien Géron.

Although it also covers machine learning in general, it has sections dedicated to deep learning. It is very practical and implementation-oriented, making it ideal for a course that combines theory with practical Python examples.

5. "Deep Learning for Computer Vision" by Rajalingappaa Shanmugamani.

Given that you will address topics related to CNNs and computer vision applications, this book may serve as a valuable additional resource for those specific topics.

6. "Generative Deep Learning: Teaching Machines to Paint, Write, Compos, and Play" by David Foster.

It is an excellent resource for delving into topics such as GANs, autoencoders and other generative models.

7. "Deep Reinforcement Learning Hands-On" by Maxim Lapan.

For the section on reinforcement learning, this book is one of the most comprehensive and practical resources available.

Remember that the world of deep learning is constantly evolving. While these books provide a solid foundation, it is always beneficial to complement them with research papers, online tutorials and blogs to stay updated with the latest techniques and advancements. I hope this list is helpful and I wish you success with your course!

User: Remind me of Week 3

ChatGPT

Certainly! Here's Week 3 from the proposed syllabus:

Week 3: Activation Functions and Backpropagation

- Activation functions: ReLU, Sigmoid, Tanh, etc.
- The Backpropagation Algorithm.

In this week, students would learn about the different activation functions used in neural networks and how they affect the propagation of information through the network. Additionally, the backpropagation algorithm would be introduced, which is essential for training neural networks by allowing weights to be adjusted based on calculated errors.

User: Prepare a presentation for Class 1.

ChatGPT

Unfortunately, I cannot create presentations directly here, but I can provide you with a detailed outline that you can use to build your presentation on activation functions in deep learning:

Presentation: Activation Functions in Neural Networks

- Slide 1: Title
 - Title: Activation Functions in Neural Networks
 - Subtitle: Week 3 - Class 1
 - Image: Graphic or image related to neural networks.
- Slide 2: Introduction
 - Definition: Activation functions determine the output of a node or neuron in a neural network.
 - Importance: They are crucial for adding non-linearity to the model, allowing the network to learn complex patterns.
- Slide 3: Types of Activation Functions
 - General list of activation functions to be discussed:
 - Sigmoid
 - Tanh (Hyperbolic Tangent)
 - ReLU (Rectified Linear Unit)
 - (Others, if you choose to include more).
- Slide 4: Sigmoid function
 - Formula $S(x) = \frac{1}{1 + e^{-x}}$
 - Graph: Sigmoid curve
 - Pros and cons:
 - Range between 0 and 1.
 - It can cause vanishing gradient problem.
- Slide 5: Tanh function
 - Formula: $\tanh(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}}$
 - Graph: Tanh Curve
 - Pros and cons:
 - Range between -1 and 1.
 - Although it can still cause vanishing gradient issues, it's zero-centred, making it preferable over Sigmoid in many cases.

- Slide 6: ReLU function
 - Formula: $f(x) = \max(0, x)$
 - Graph: Graph showing positive part and zero for negative values.
 - Pros and cons:
 - Helps mitigate the vanishing gradient problem.
 - It can cause "dead neurons" where some nodes do not activate.

- Slide 7: Other Activation Functions
 - Brief mention of other functions (if you choose to include them), such as:
 - Leaky ReLU
 - Swish
 - Softmax (especially used in output layers for classification).

- Slide 8: How to Choose an Activation Function
 - Generally: ReLU is a good starting point.
 - Binary Classification Problems: Sigmoid in the output layer.
 - Multiclass classification: Softmax in the output layer.
 - Considerations: Based on problem nature, network architecture and experimentation.

With this outline, you can use tools like PowerPoint, Google Slides or any other presentation software to create the slides. Adding images, graphs and animations as needed will make the presentation more engaging and informative. Good luck!

User: What would you say for Slide 4?

ChatGPT

For Slide 4: Sigmoid Function, here's a detailed script you can follow when presenting:

[Show title and formula]

"Now, let's move on to one of the most well-known activation functions: the Sigmoid function."

[Show graph of the Sigmoid curve]

"As you can see, the Sigmoid function takes any real number and 'squeezes' it into a range between 0 and 1. This is useful because it transforms large or small numbers into manageable values. We can observe that its curve has an 'S' shape."

[Show pros and cons]

"However, the Sigmoid function is not entirely perfect. While it's excellent for certain types of problems, especially for binary classification in the output layer, it has its challenges. One of the main issues is the vanishing gradient. What does this mean? If you look at the areas where the curve is nearly flat, you can imagine that the gradient is very small. This can make the updates during training minimal, which in turn can slow down convergence or, in some cases, halt learning altogether."

"It's important to remember that there's no single activation function that works for all scenarios. The choice will depend on the problem, the network architecture, and often, experimentation."

This script provides an overview of the Sigmoid function, highlighting its key features and challenges. During the presentation, it is important to engage with the students, perhaps by asking questions to ensure they understand or to find out if they have any previous experience with the topic.