

# Enhancing Efficiency in Mathematical Research with Generative AI: Tools and Techniques

Jordi Linares-Pellicer<sup>1</sup>

Valencian Research Institute for Artificial Intelligence, Universitat Politècnica de València  
Camí de Vera s/n, València, Spain.

## Abstract

The field of artificial intelligence (AI) has witnessed significant advancements in recent years, particularly in the domains of generative AI and large language models (LLMs). These cutting-edge technologies have the potential to revolutionize the way researchers approach various tasks, including literature review, information synthesis, and paper writing. This presentation aims to explore the current possibilities and advantages of employing AI-assisted tools in the research activities of mathematical modeling in engineering and human behaviour.

We will begin by providing an overview of the latest developments in generative AI, deep learning (DL), and LLMs, focusing on their applications in research workflows. Attention will be given to retrieval-augmented generation (RAG) techniques, which enable AI models to access and utilize external knowledge sources effectively. We will then introduce popular AI-assisted tools, and demonstrate how they can streamline and enhance various aspects of the research process.

Through real-world examples and case studies, we will illustrate how these tools can aid researchers in conducting comprehensive literature reviews, identifying relevant papers, and extracting key insights. Additionally, we will discuss the potential of AI in assisting with the writing process, from generating initial drafts to providing suggestions for improvement.

Furthermore, we will address the challenges and limitations associated with the adoption of AI in research, such as data privacy concerns and the need for human oversight. Strategies for effectively integrating AI-assisted tools into existing research workflows will also be discussed.

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<sup>1</sup>jorlipel@upv.es