



BANCO DE PORTUGAL  
EUROSISTEMA



## WORKSHOP ON EMPIRICAL RESEARCH IN THE AI ERA

16-17 DEC 2024

All materials are available here.

### Program

(GMT times)

16 DEC 2024

14h00- 14h15 **Welcome**

**Paulo Guimarães**, Banco de Portugal - BPLIM

14h15 - 15h00 **Leveraging Generative AI in Research and Policy Analysis**

**Jesse Lastunen**, UNU-WIDER

This presentation explores how generative AI applications can reshape the daily work of economists and policy analysts. Specifically, it examines how generative AI, especially Large Language Models like GPT-4, can improve various aspects of researchers' work. The presentation is structured around six domains where AI can make a significant impact: ideation and feedback, writing, background research, coding, data analysis, and mathematical derivations. The main argument is that by automating routine tasks and supporting research-related activities, these tools can boost productivity and allow researchers to direct more of their focus to their core expertise and critical thinking.

15h00 - 15h45 **Uses of Generative AI for Economics Research**

**Kevin Bryan**, University of Toronto



Advances in Large Language Models and other forms of generative AI are enormously useful for economics research and continue to improve by the month. As of late 2024, LLMs used correctly are particularly useful for annotating data, reading difficult-to-OCR documents, calibrating surveys, assisting with brainstorming and proof corrections, and constructing statistically-useful data for unstructured corpora of text and images. We show examples of each use case in detail, noting where advances are still necessary.

**15h45 – 16h15** *Coffee Break*

**16h15 – 17h00** **Unlocking Economic Data with LLM**

**Sérgio Correia**, Board of Governors of the Federal Reserve System

Valuable economic data is often locked inside unstructured documents such as reports, regulations, and news articles. This talk discusses how to use LLMs and related tools to extract data from these documents into formats suitable for empirical research. We will start with a high-level perspective and then transition into practical Python examples while covering some of the existing challenges and best practices.

**17h00 – 17h45** **Using Local LLMs and RAG for Exploring Research Papers**

**Nelson Areal**, Universidade do Minho

LLMs have limited up-to-date knowledge and can produce plausible but incorrect or nonsensical responses. Additionally, it is not always possible to identify the sources used when answering questions, which is particularly concerning in a research context. Retrieval-augmented generation (RAG) can enhance these LLM models by using document repositories, enabling more precise and contextualized responses based on relevant research papers. This presentation will explore the deployment of RAG and LLMs in local environments using open-source tools, emphasizing the advantages of privacy, control, and customization for academic research.

**17h45– 18h30** **Financial Agents for Research and Practice**

**Michael Dowling**, DCU Business School, Dublin City University

The next two stages of Generative AI will unleash reasoning agents capable of carrying out complex multi-level tasks. A number of platforms – most prominently the AutoGen platform of Microsoft – allow us to catch a glimpse of what AI agent behavior will be like when these stages are fully established. This talk will demonstrate working financial agents capable of reasoning and collective action. It will show how agents are capable of referring to distinct knowledge databases, implementing complex code functions, and interacting with other agents to arrive at more informed decisions than current chat-based Generative AI.



17 DEC 2024

**09h30 – 10h15 Integrating AI in Stata Programming: Perspectives on Enhancement and Constraints Across Skill Levels**

**Ricardo Mora**, Universidad Carlos III Madrid

This presentation explores the integration of AI tools, specifically ChatGPT, within Stata programming across different user proficiency levels—from absolute beginners to advanced ado programmers. We assess how ChatGPT can enhance programming productivity by automating routine tasks, providing real-time troubleshooting, and suggesting coding strategies tailored to varying levels of expertise. Through case studies, we show the potential time efficiency and analytical accuracy benefits that ChatGPT offers, as well as discuss its limitations and shortcomings in complex scenarios. This evaluation aims to provide insights into the practical applications and constraints of using AI in econometric programming, reflecting on how these technologies can be adapted to improve user experience and outcomes in Stata programming. (Written with AI technology assistance.)

**10h15 – 11h00 How Large Language Models Support Statistical Analysis**

**Peter Gruber**, USI Università della Svizzera Italiana

It seems like a contradiction: a language model supporting deeply mathematical tasks in statistical analysis. Yet OpenAI's Data Analyst GPT promises to do exactly that, making it one of the most widely used functions of ChatGPT. In this talk, we discuss why many statistical problems are at their core problems of language and translation – rendering language models extremely useful tools. We highlight the importance of precise (and standardized) language as well as the appropriate usage mode of AI assistants. We show with practical examples how the lack of precision leads to incorrect results, introducing the term "statistical tribe". We conclude by discussing how AI adoption changes the skill set required from a modern statistician.

**11h00 – 11h30 *Coffee Break***

**11h30 – 12h15 Using Large Language Models for Text-As-Data Studies in the Social Sciences**

**Ulrich Matter**, Bern University of Applied Sciences, and University of St. Gallen

We explore the use of large language models (LLMs) to enhance Text-as-Data (TaD) methods in social science research. TaD approaches, which leverage machine learning to extract valuable information from digital text data for quantitative analysis, often require specialized skills and significant preprocessing effort. Our goal is to simplify this process by leveraging the capabilities of foundation models like LLMs. We aim



to determine whether LLMs can efficiently perform natural language processing tasks and whether this can outpace traditional methods and human coders. In the first part, we look at prevalent TaD procedures in the social sciences and compare the performance of traditional TaD procedures with comparatively easily implementable LLM approaches. In addition, we look at new LLM applications in social science research that go beyond traditional NLP approaches in social science research.

**12h15 – 13h00 Reproducibility and AI: Potential, Challenges, and Other Preliminary Thoughts**

**Lars Vilhuber**, Cornell University, and American Economic Association

This talk will explore how AI, while offering great potential for enhancing research, introduces challenges that parallel the historical difficulties researchers have faced when using black-box systems, commercial software, or external APIs. By examining AI's role in reshaping traditional research workflows, we will discuss issues such as algorithmic transparency, data dependencies, and the difficulty of archiving machine learning models and outputs. The talk will highlight key strategies for ensuring reproducibility in AI-driven research and propose pathways for researchers to navigate this evolving landscape.

**13h00 – 13h10 Closing Remarks**



## BIOGRAPHIES:

### Jesse Lastunen, UNU-WIDER

Jesse Lastunen is a research associate at UNU-WIDER, focusing on tax-benefit microsimulation modeling and related topics such as social policy, taxation, and employment. As part of the SOUTHMOD project, he coordinates the research and technical assistance activities in Vietnam, Rwanda, and Uganda. This includes collaborative, often policy-driven research and organizing training events for local government officials and researchers.

Before WIDER, he worked for organizations such as OECD, RAND Corporation, Internet Association, Technopolis Group, and CERN. A big chunk of this work involved research on the intersection of technological change and the labor market. He is particularly interested in the applications of generative AI in research and the analysis and visualization of complex data.

He received his PhD in policy analysis from the Pardee RAND Graduate School, with analytical concentrations in economics and quantitative methods. Before that, he studied public policy (UChicago), international economics (BSE), technology policy (Cambridge), and engineering and management (Masdar Institute and Tampere University).

### Kevin Bryan, University of Toronto

Kevin Bryan is an Associate Professor, in the Strategic Management Area. His work primarily consists of applied theoretical and empirical analyses of innovation and entrepreneurship. Among other questions, he has investigated why firms may do R&D on socially inefficient research projects (including during the Covid-19 pandemic), how startups find early employees and decide where to locate, when and why acquisitions of high-growth startups may be worrying about antitrust, how artificial intelligence can profitably be used alongside human workers, what types of science are most useful for inventors in industry, and how rideshare networks function when they compete with each other. His work has been published in the Journal of Economic Theory, the Review of Economics and Statistics, Research Policy, and the University of Chicago Law Review. He maintains a side interest in studying history of thought, the history of the Industrial Revolution, and social scientific methodology.

In addition to academic research, Professor Bryan does extensive public writing about economic theory and policy. He writes the research weblog A Fine Theorem (<http://afinetheorem.wordpress.com>) devoted to discussions of new economics and strategy research; the site has been visited over 750,000 times and has been discussed by The Economist, Slate, Reuters, Forbes, and Bloomberg, among others.

Since arriving at Rotman in 2014, he has also served as Lab Economist and moderator for the Creative Destruction Lab, the world's largest science-based entrepreneurship program, taught as a visiting professor at Duke Fuqua in Durham, North Carolina, and at Université Cheikh Anta Diop in Dakar, Senegal, and served as Associate Editor for Management Science.

### Sérgio Correia, Board of Governors of the Federal Reserve System

Sérgio Correia is an economist at the Board of Governors of the Federal Reserve System, in the Division of Financial Stability. His research interests include banking and corporate finance, with a focus on banking competition and how it relates to consumer and firm credit access. He is also interested in economic history as well as empirical methods and their application on very large datasets.

### Nelson Areal, Universidade do Minho

Nelson Areal is an Associate Professor at the Department of Management, School of Economics and Management, University of Minho, and a member of the Center for Research in Economics and Management (NIPE). He holds a PhD in Finance from Lancaster University (2006). Throughout his academic career, he has held several management positions such as Head of the Management Department, Director of the Master's in Finance, and Director of the PhD in Management. He has collaborated as a consultant with public and private entities.



His research interests include risk measures and their forecasting, evaluation of derivative instruments through numerical methods, performance evaluation, text as data, and socially responsible investments. His work has been published in several academic journals. He has experience working with high-dimensional financial data.

### **Michael Dowling, DCU Business School, Dublin City University**

Michael is the former founder and director of the AI-driven Centre in Rennes School of Business (2017-2020). Since moving to Dublin as Professor of Financial Technology he has concentrated on developing AI-driven FinTech ideas for research and practice, including publishing the first research study on ChatGPT in finance. He engages in widespread consulting with banks on AI and was recently awarded startup funding from Enterprise Ireland for his bank.seQ idea – to integrate AI in the SME banking relationship. He is founder of PoliClear.org, the first Generative AI product deployed in the Irish government.

### **Ricardo Mora, Universidad Carlos III Madrid**

Ricardo Mora is Associate Professor of Economics at Universidad Carlos III de Madrid. Mora develops and applies empirical methods in topics related to Labor Economics, Development Economics, and Public Economics. In addition to his contributions to the study of labor markets, he has lately published research on segregation, the measurement of hospital quality, infant mortality, and wage differentials. He has published his research in international journals like the Journal of the European Economic Association, the Journal of Applied Econometrics, World Development, American Sociological Review, and Social Science and Research. More information on his research and copies of his papers can be found at: <http://www.eco.uc3m.es/~ricmora/>. He holds a Ph.D. in Economics from the London School of Economics, UK.

### **Peter Gruber, USI Università della Svizzera Italiana**

Peter Gruber has PhDs in financial economics and particle physics. He is Senior Lecturer at the Università della Svizzera italiana (USI) in Lugano. Before this, he was part of the neutrino physics efforts at CERN. His current research interests include applications of Large Language Models, data visualization, asset pricing and entrepreneurship. He currently serves as director of the USI master program in Financial Technology and Computing. A passionate educator, Peter has initiated several innovative education formats at USI, including the USI Digicamp, where students teach students computing, the Writing Smart Contracts Winter School and the Founders' Track of the Fintech master, which supports student startups.

### **Ulrich Matter, Bern University of Applied Sciences, and University of St.Gallen**

Ulrich Matter is a Professor of Applied Data Science at Bern University of Applied Sciences and an Affiliate Professor of Economics at the University of St. Gallen. His primary research interests lie at the intersection of data science, quantitative political economics, and online media economics. He currently is the PI for the SNSF Grants on Consequences of Personalized Information Provision Online (2022-2026) and on Ideological Ad Targeting in Consumer Markets and the Political Market Place (2023-2027) and has authored several books on applied data science with R (most recently: Data Analysis with AI and R: Using OpenAI, Copilot, and aider). Before joining the University of St. Gallen, he was a Visiting Researcher at the Berkman Klein Center for Internet & Society at Harvard University.

### **Lars Vilhuber, Cornell University, and American Economic Association**

Lars Vilhuber is Executive Director of Cornell University's Labor Dynamics Institute. He is the Data Editor of the American Economic Association, Managing Editor of the Journal of Privacy and Confidentiality, and on advisory boards of restricted-access data centers in France, Canada, and the United States.