

• Critical Evaluation of AI Research Methodologies

Peer Review Activity

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Task

In preparation for this week's seminar, you will need to source at least 2 papers in a Computing subject of your choice (AI, Cybersecurity, Data Science, or a general interest topic in Computer Science), provided they utilise two different types of research methods to achieve their goal/research aims. Now answer the following questions (please provide justifications for your answers) and be prepared to discuss them in the session:

- Familiarise yourself with the purpose, problem, objective or research question of each paper. Are they in line with your experience or thoughts on the topic, contributing to the collective body of knowledge in this area?
- Is the research methodology utilised in each paper appropriate for the stated purpose or question?
- In terms of data collection and analysis, is this also appropriate for the stated purpose or question? (We will discuss this further in upcoming units.)
- Does each paper support its claims and conclusions with explicit arguments or evidence?
- How would you enhance the work/paper?

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Paper 1: Qualitative Approach

Purpose: investigating generative AI tools (ChatGPT, Bard) to support coding in deductive qualitative research, assessing their impact on cost-effectiveness, throughput and inter-coder reliability.

Research Question: Does generative AI serve as a viable alternative to human qualitative coders?

Methodology: Semi-structured interviews with five domain experts and analysed dataset of 122 respondents that required categorisation into six predefined categories.

Appropriateness: mixed-methods design effectively explores comparative reliability, with Cohen's Kappa supporting inter-coder agreement evaluation.

Data Analysis: AI-assisted coding is benchmarked against human expert and non-expert coders, measuring speed and consistency in predefined categories.

Support for Claims: Findings show that a hybrid approach (AI + human expert) is most efficient, delivering cost and time savings while improving reliability > Evidence

Enhancements: Larger samples and wider domains, more detailed error analysis, would enhance generalisability and robustness

Reference: Pattyn, F. (2024) 'The Value of Generative AI for Qualitative Research: A Pilot Study.' *Journal of Data Science and Intelligent Systems*, 4(2), Article 2964. Available at: <https://doi.org/10.47852/bonviewJDSIS42022964>

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Paper 2: Quantitative Approach

Purpose: A comprehensive survey of AI's integration into the quantitative investment pipeline, focusing on deep learning and large language models (LLMs).

Research Question: How do contemporary AI models affect the accuracy and automation of quantitative finance strategies?

Methodology: This quantitative literature survey analyses historical progress from human-crafted models to fully automated agent strategies, citing statistical performance benchmarks and risk controls.

Appropriateness: Systematic coverage and quantitative synthesis effectively address developments in predictive modelling and autonomous trading.

Data Analysis: Performance metrics and error rates of AI-driven pipelines are evaluated against traditional benchmarks, showing paradigm-shifting advances.

Support for Claims: The paper substantiates claims with extensive citations and comparative benchmarks but notes limitations in overfitting risk and the opacity of deep learning models. > Arguments

Enhancements: Transparency could be improved by open-sourcing data and models, plus including human-in-the-loop validation for critical trading decisions.

Reference: Cao, B., Wang, S., Lin, X., Wu, X., Zhang, H., Ni, L.M. and Guo, J. (2025) 'From Deep Learning to LLMs: A Survey of AI in Quantitative Investment.' *arXiv Preprint*. Available at: <https://doi.org/10.48550/arXiv.2503.21422>

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Reflection and Justification

- Papers contribute to AI research methodology debates
- Offer rigorous approaches
- Support claims with strong evidence
- Qualitative study shows efficiency improvements
- Quantitative survey highlights technological advances
- Calls for increased transparency