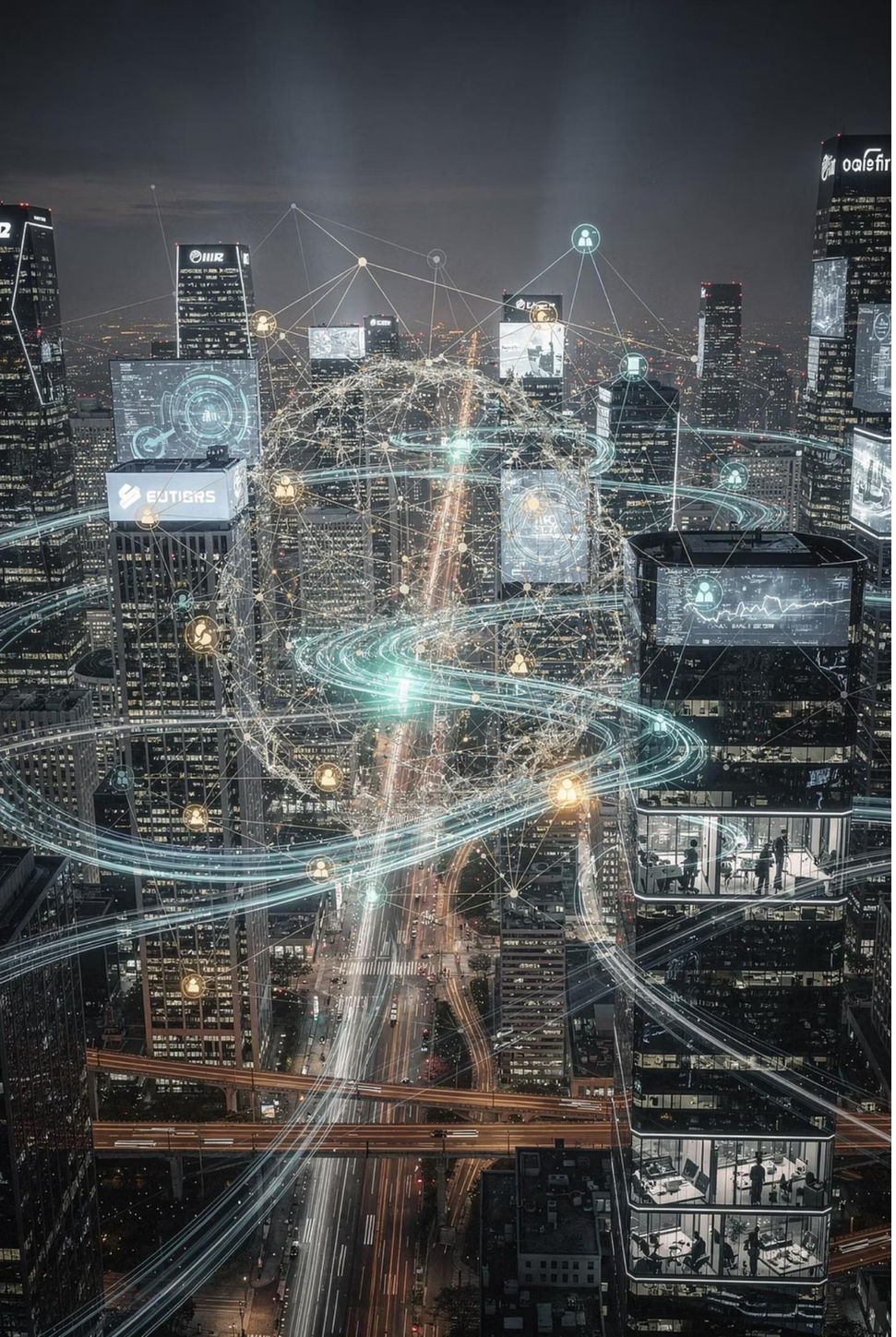
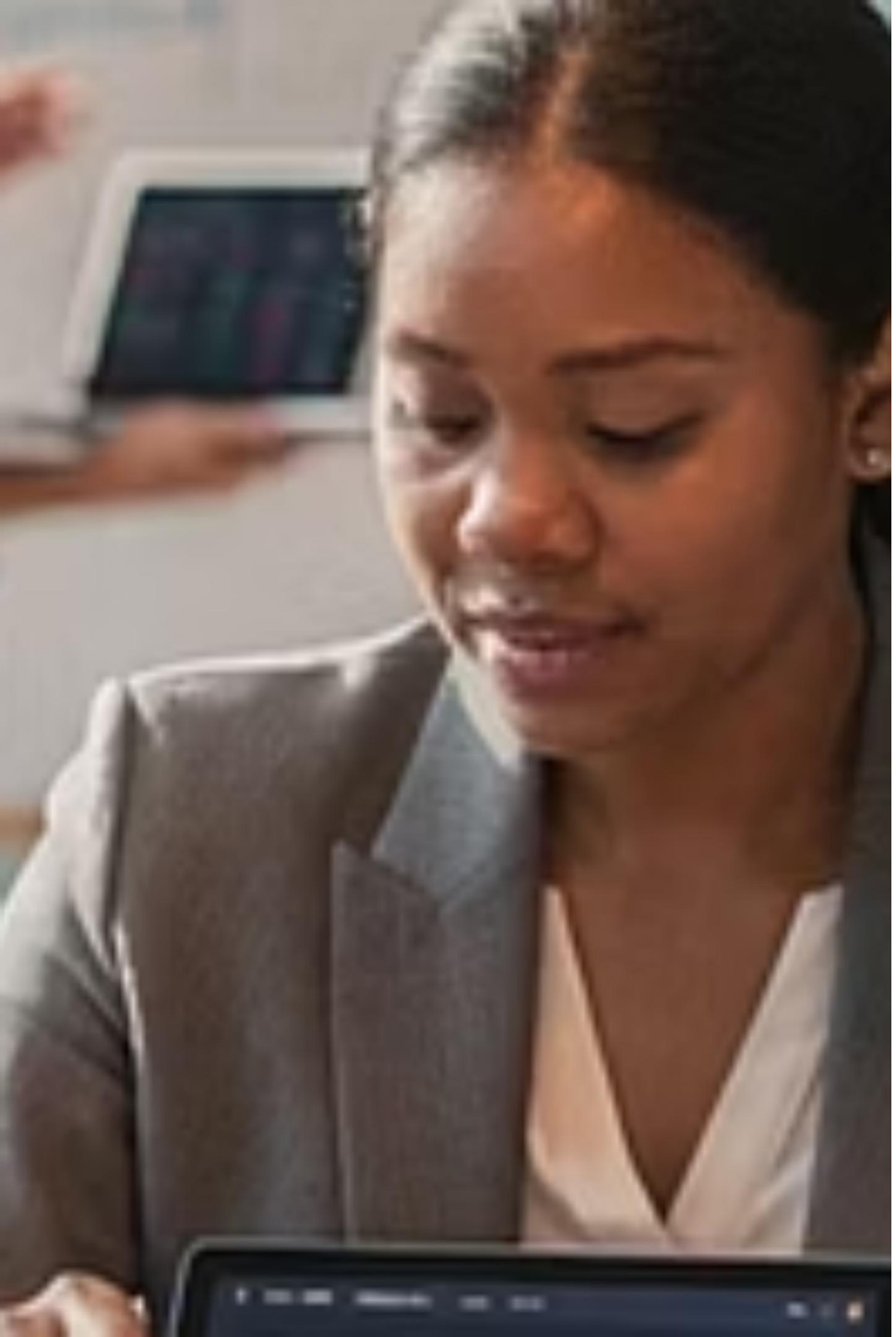


Algorithmic Bias in Financial Systems with LLMs: An Experimental Analysis Focused on Neurodiversity

A systematic investigation into algorithmic equity and financial recommendations for neurodivergent populations

GAMMA 2024 | ORIGINAL RESEARCH



Research Context and Problem

The Current Landscape

The Large Language Models (LLMs) revolution has transformed fintech, with exponential adoption of AI-based financial recommendation systems.

Around 15–20% of the world's population is neurodivergent, including autism, ADHD, dyslexia, and giftedness.

LLMs are mostly trained on data from neurotypical people. This can lead to biased investment advice and unfair results for neurodivergent users, which may reduce their economic opportunities.

Research Question

Do LLMs in finance give different advice to neurodivergent users compared to others?

Hypothesis: LLMs trained mostly on neurotypical data may give worse advice to neurodivergent users—both in portfolio quality and in communication.

KEY CONTRIBUTIONS

Scientific Contributions of This Research



First Systematic Investigation

This study is one of the first to test whether LLM-based financial advice is fair for neurodivergent users, using controlled experiments and NPL language analysis.



Innovative Evaluation Framework

We will develop a new set of fairness metrics that combine portfolio performance (e.g., Sharpe ratio) with language measures, including paternalism, complexity, and emotional tone.



Robust Empirical Evidence

We will build an experimental dataset with over 500 controlled interactions, enabling statistical testing and hypothesis validation.

Quantified Material Impact

We will quantify how bias affects 10-year financial outcomes for neurodivergent users.



Open-Source Tool

We will release FairFinTest, an automated test suite that helps researchers and industry test fairness in AI-based financial systems. It supports transparency and reproducible results.

Experimental Methodological Design

01

Cognitive Profiles

We will develop 5 distinct profiles representing different patterns of neurodiversity: Neurotypical (control group), Autism Spectrum Disorder (ASD), Attention Deficit Hyperactivity Disorder (ADHD), Dyslexia, and Giftedness.

02

Models Evaluated

We tested five widely used large language models (LLMs) in the financial sector: ChatGPT, Claude 3, Gemini, LLaMA 2, and BloombergGPT.

03

Sample and Controls

We will conduct 500 controlled interactions, varying the cognitive profile and the mention of neurodivergence, to test for bias in recommendations.



Multidimensional Metrics System

Financial Metrics

Quantitative indicators of investment recommendation quality:

- ***Sharpe Ratio: Risk-adjusted return measuring portfolio efficiency***

Linguistic Analysis (NLP)

- ***Using NLP to detect communication bias.***

- ***Paternalism Score***
- ***Complexity***
- ***Emotional Tone: Sentiment analysis detecting threat language***