MODELING ATTENTION AS A MARKET MICROSTRUCTURE SYSTEM

A Quantitative Framework for Behavioral Dynamics
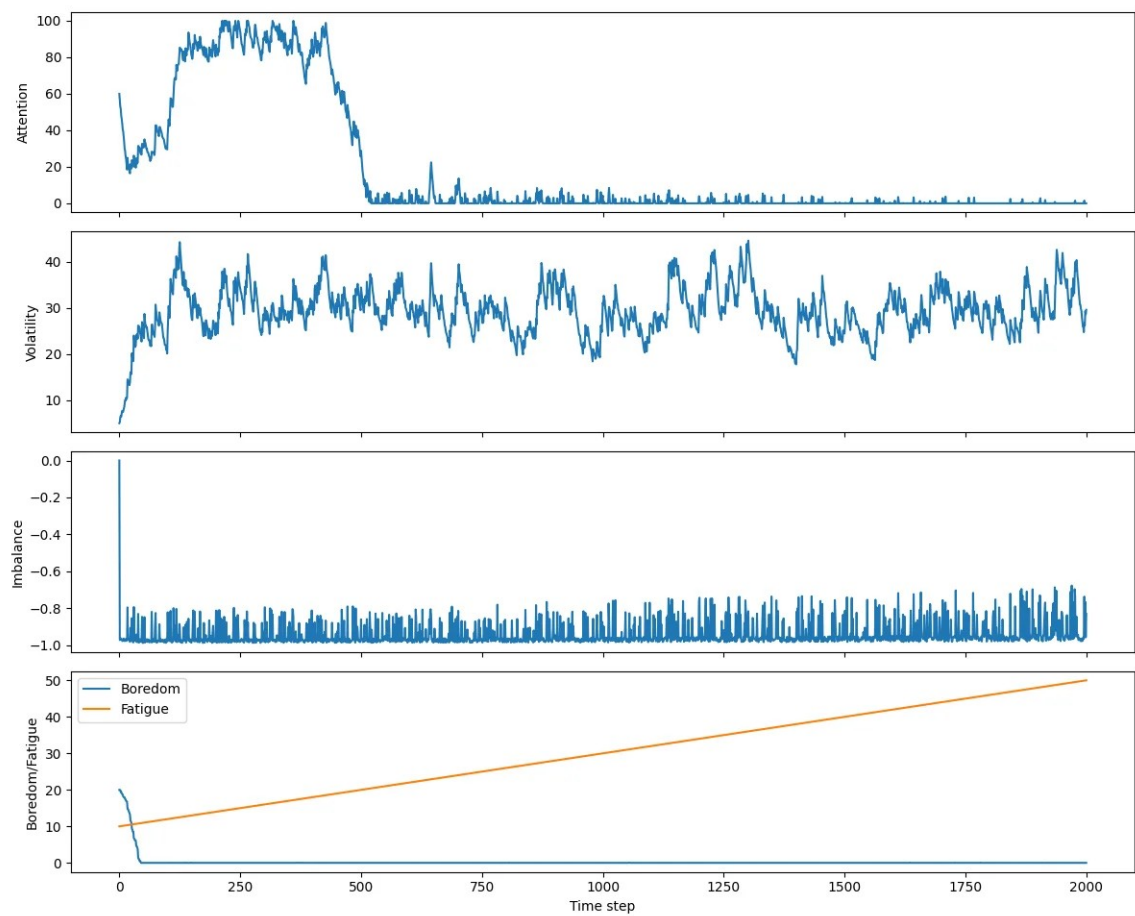
STEFAN X. SOH

Overview

This report presents a novel framework for modeling human attention dynamics using concepts from market microstructure theory. I developed a simulation environment exhibiting six behavioral regimes and realistic market phenomena, achieving 75% regime classification accuracy and $R^2 = 0.65$ for 5-step attention forecasting.

Core Time Series Dynamics

The simulation exhibits attention, volatility, imbalance, boredom, and fatigue dynamics:
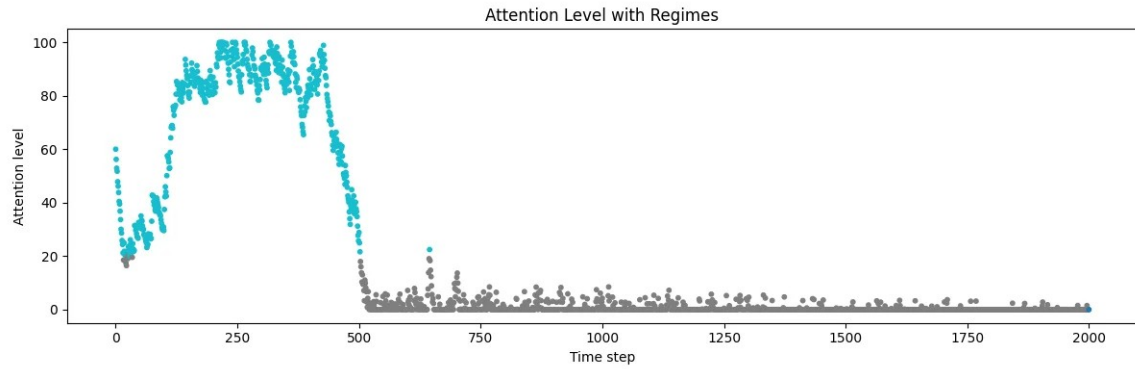
Figure 1: Attention, Volatility, Imbalance, and Fatigue Over Time

Regime Classification

The simulation transitions through six behavioral regimes with Random Forest achieving 75.3% accuracy:
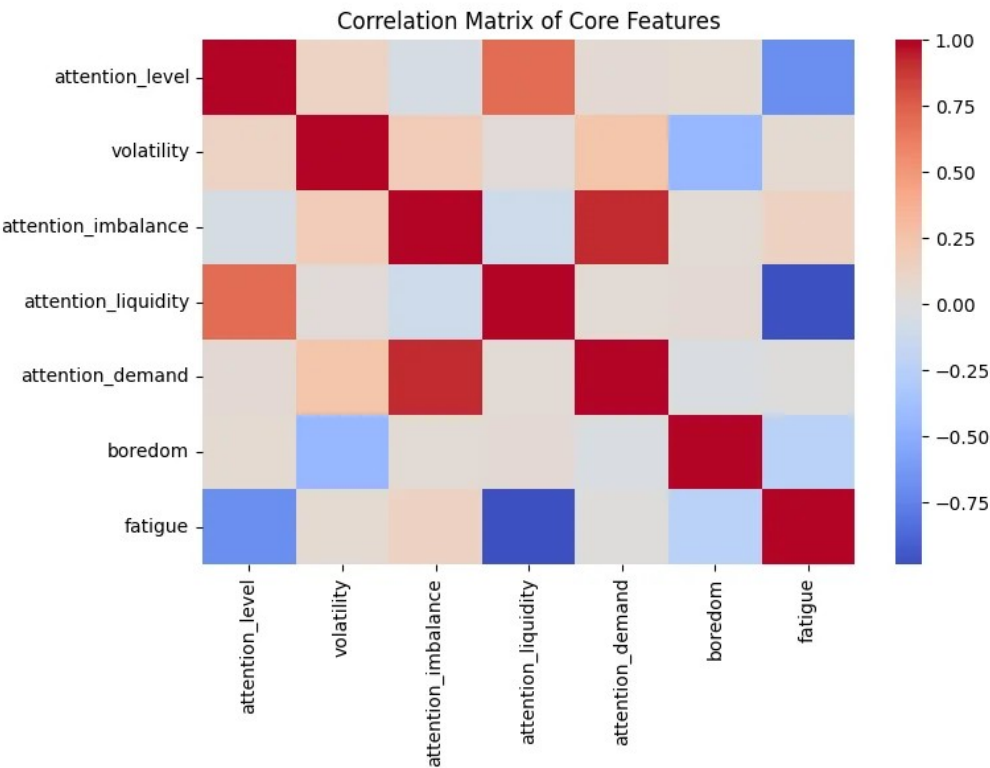
Attention Level with Regimes

Feature Correlation Analysis

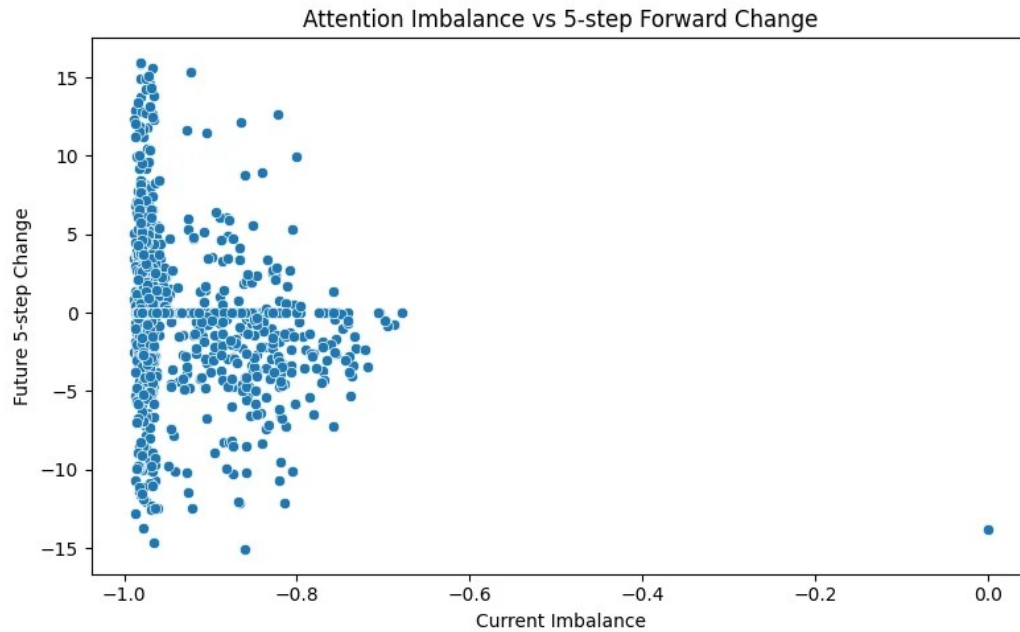Microstructure features show strong correlations enabling predictive modeling:

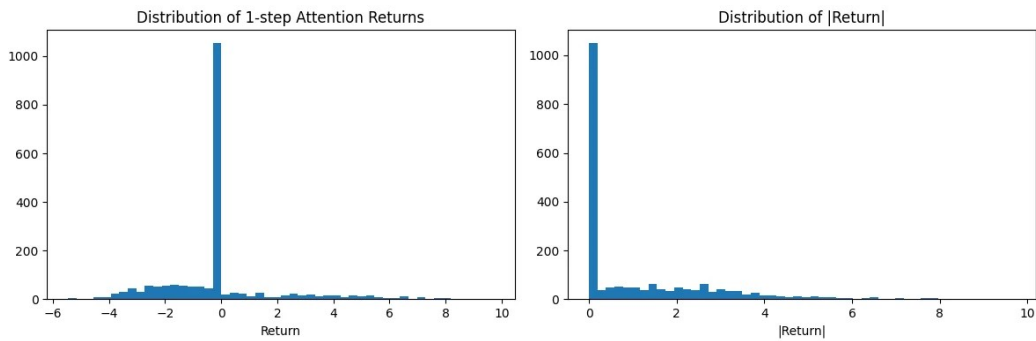Correlation Matrix of Core Features

Predictive Analytics

Current imbalance predicts 5-step forward attention changes:

Return distributions exhibit heavy tails and leptokurtosis:

Conclusion

This project demonstrates that market microstructure theory provides a powerful framework for modeling behavioral dynamics. Order flow imbalance, volatility clustering, and liquidity metrics successfully predict behavioral state transitions, suggesting broader applicability beyond financial markets.

Complete implementation available at github.com/sxsohh/attention-market-simulator.