Jian GUO, Heung-Yeung SHUM, 2025. Large investment model. *Frontiers of Information Technology & Electronic Engineering*, 26(10):1771-1792. https://doi.org/10.1631/FITEE.2500268

Large Investment Model

Key words: Artificial general intelligence; End-to-end; Large investment model; Quantitative investment; Foundation model; Multimodal large language model

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Motivation and Paradigm Shift

Abstract: Traditional quantitative investment research is encountering diminishing returns alongside rising labor and time costs. To overcome these challenges, we introduce the large investment model (LIM), a novel research paradigm designed to enhance both performance and efficiency at scale. LIM employs end-to-end learning and universal modeling to create an upstream foundation model, which is capable of autonomously learning comprehensive signal patterns from diverse financial data spanning multiple exchanges, instruments, and frequencies. These "global patterns" are subsequently transferred to downstream strategy modeling, optimizing performance for specific tasks. We detail the system architecture design of LIM, address the technical challenges inherent in this approach, and outline potential directions for future research.

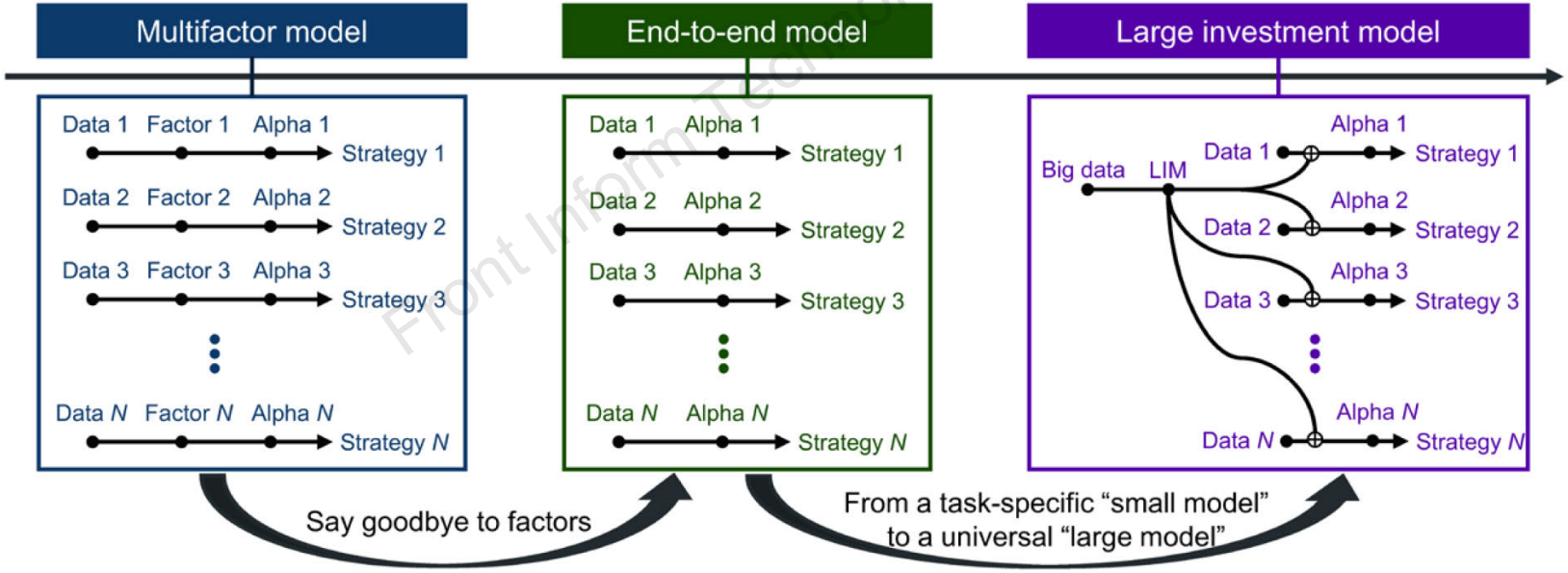


Fig. 1 Three quant research paradigms: multifactor model, end-to-end model, and large investment model (LIM)

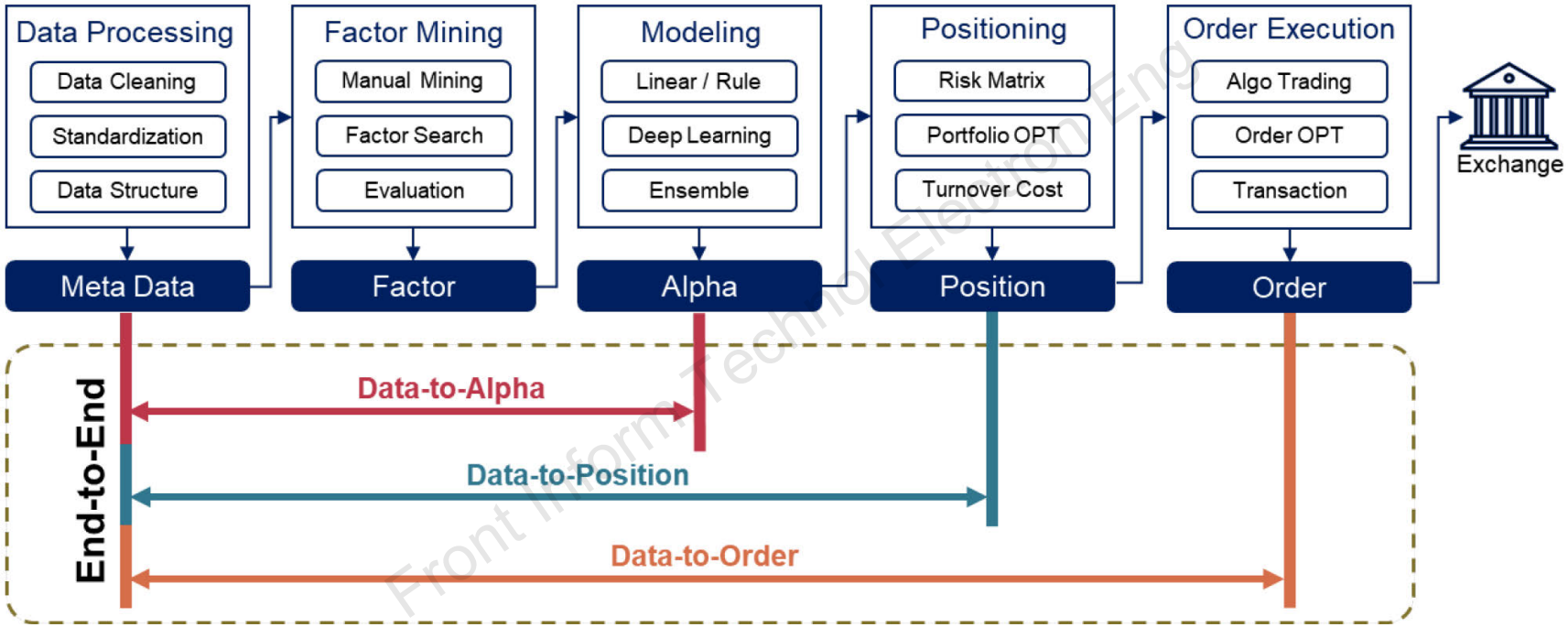
Evolution of Quantitative Investment Paradigm

A quantitative strategy is a systematic function or trading methodology used for trading financial instruments in financial markets. A standard quantitative strategy should specify several configurations, such as the universe of financial instruments to be traded, the average holding period, and the trading frequency.

This figure presents a strategy matrix that illustrates many popular trading strategy examples. The horizontal axis introduces a variety of financial instruments, including stocks, ETFs, futures, options, bonds, foreign exchange (forex), and cryptocurrencies (crypto). The vertical axis contains four types of common trading approaches.

End-to-End Quantitative Modeling

End-to-end training refers to a modeling approach that directly learns the complex function that links raw inputs to final outputs and encompasses all intermediate stages.



There exist three types of end-to-end modeling, each starting from the original meta-data (raw data with standardized and simple preprocessing) and leading to different outputs: alpha predictions (e.g., predicted returns over a future horizon), portfolio positions (e.g., the optimal position size at the next trading point), and trade orders (e.g., the optimal order size in the next second for trading).

Large Investment Model

We propose to transplant the “pretraining+ fine-tuning” paradigm to quantitative investment. Specifically, in the pretraining stage, we build a universal foundational model using financial data from different exchanges, different instruments, and different frequencies to discover transferable trading patterns and investment logics. Then the following quantitative strategy research might be reconceived as a fine-tuning task tailored to specific strategy requirements and investment scenarios. Such a paradigm shift could dramatically increase research efficiency in the field.

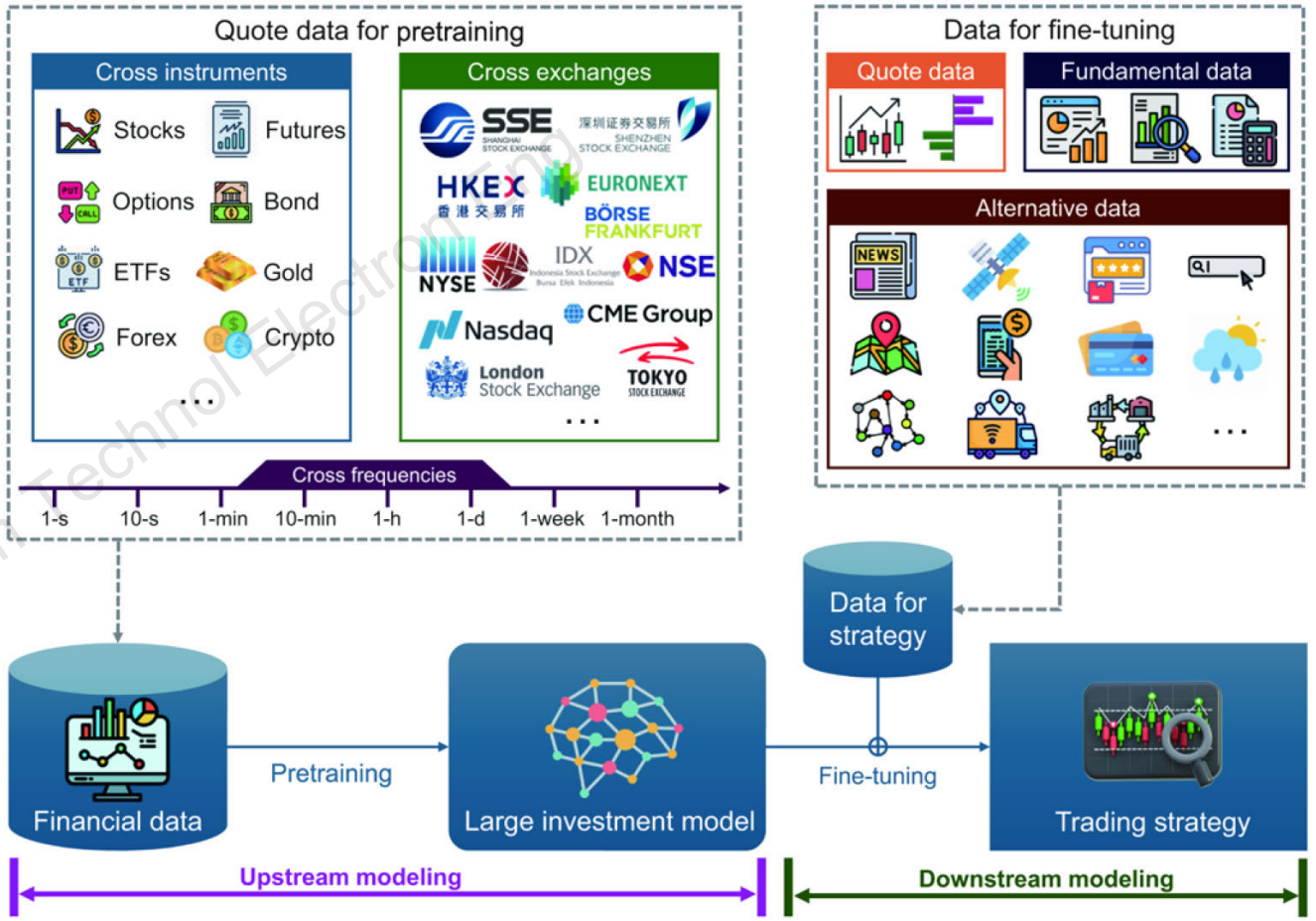
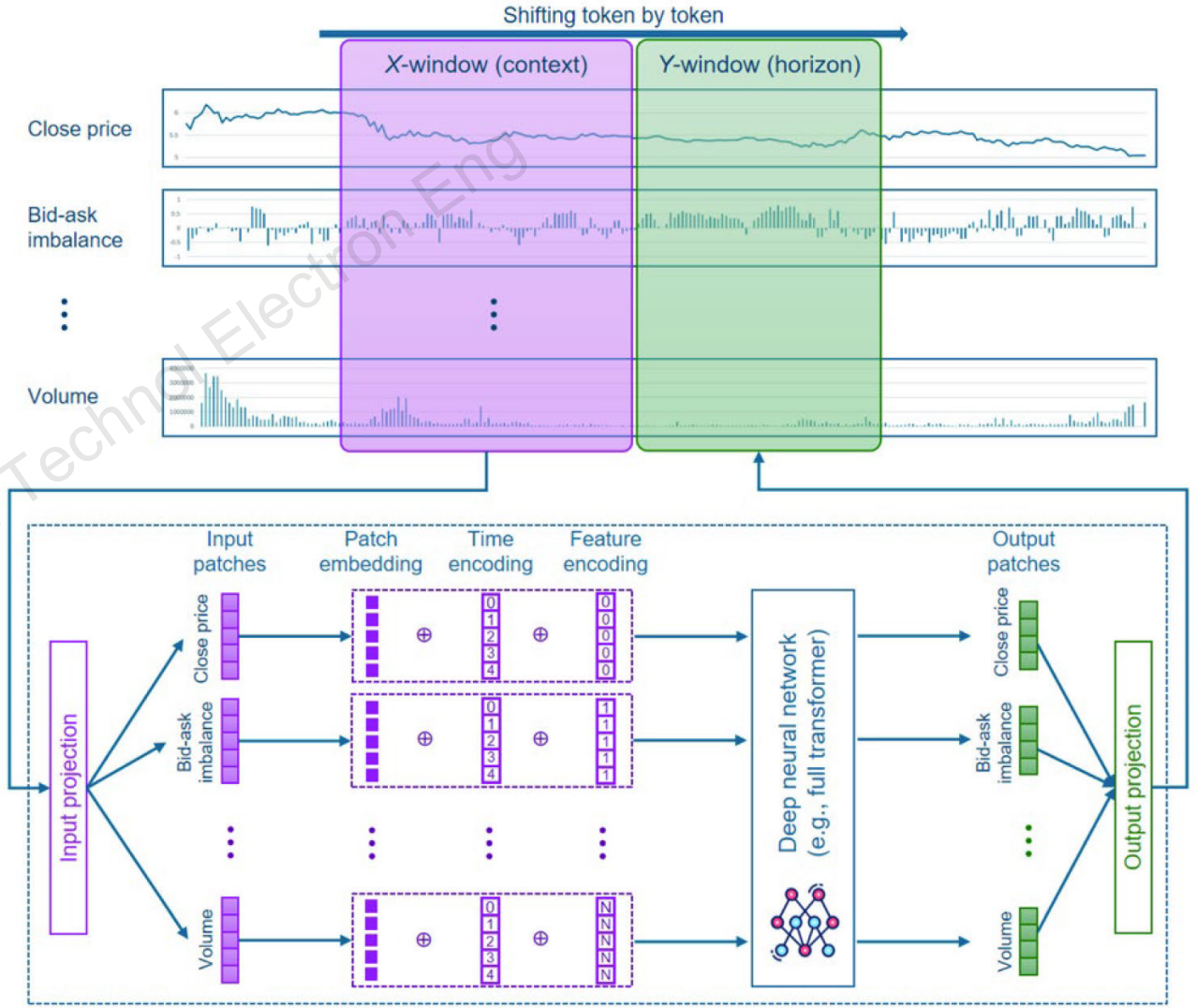


Fig. 6 Workflow of the large investment model (LIM)

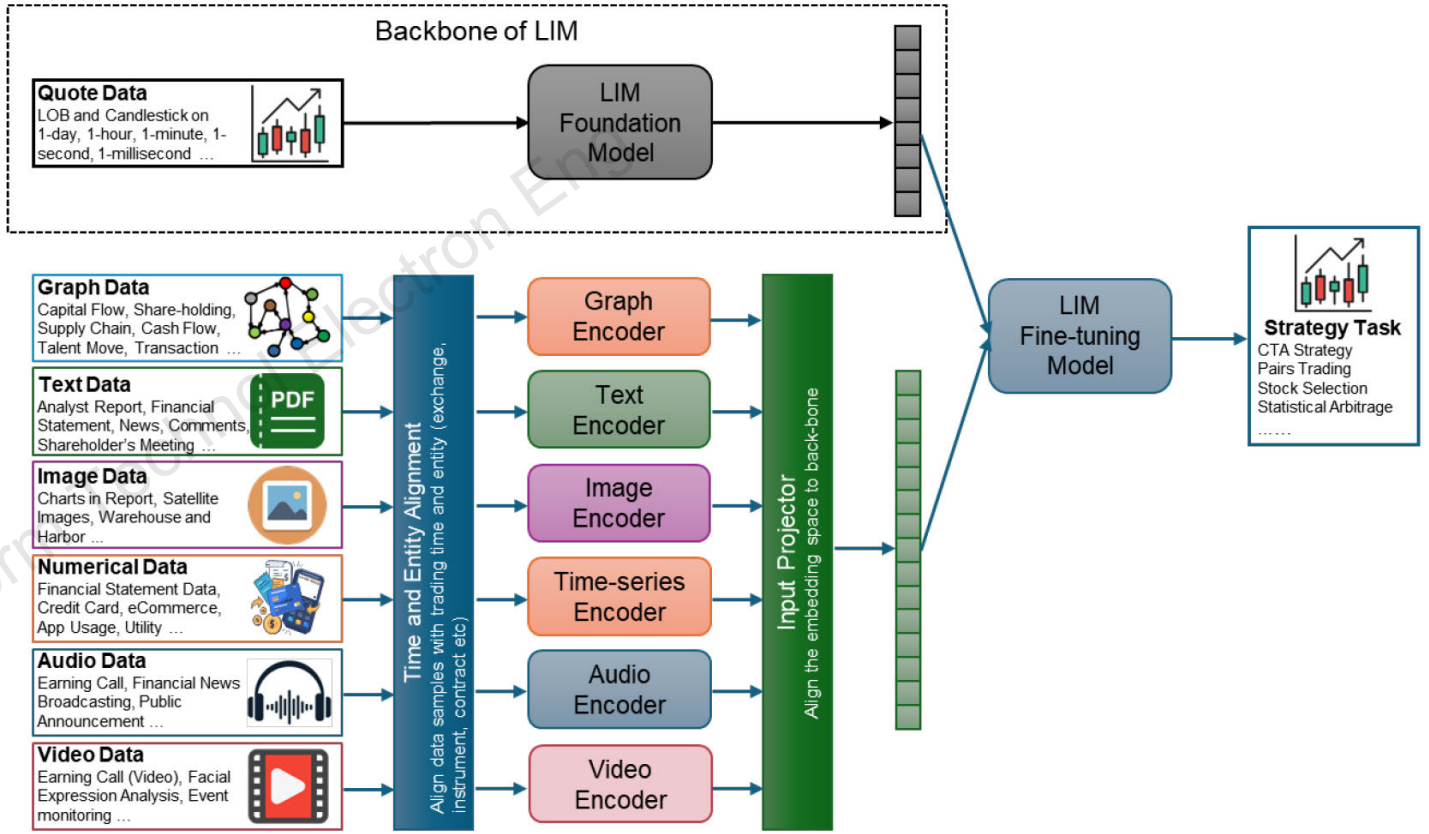
Upstream Foundation Modeling

Upstream modeling focuses on developing a universal foundation model for quantitative investment. This figure illustrates the workflow for the upstream foundation model. Financial quote data (price/volume and limit-order book) are used to construct the backbone of the foundation model, while other data types, including fundamental and alternative data, are integrated into the backbone aligned with the time axis and investment instruments.



Downstream Strategy Modeling

The downstream workflow bridges the foundation model from the upstream process to the final strategy development task. Unlike the foundation model, which primarily relies on quote data, downstream modeling can incorporate a wide variety of task-specific data sources, including news, supply chain information, satellite imagery, and earnings call transcripts. These diverse data types can be categorized into graph data, textual data, image data, numerical data, audio data, and video data. To effectively utilize these additional inputs, we employ specialized embedding techniques tailored to each data type, enabling the model to integrate and leverage the unique information contained within these varied structures.



System Architecture

We outline the construction of a real-world system founded on the LIM methodological framework. This comprehensive system supports the entire modeling pipeline, including computing infrastructure, data computation and storage, foundation modeling and management, automated strategy modeling, human-AI interaction agents, and a low-latency trading system.