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Centro Nazionale di Ricerca in HPC,
Big Data and Quantum Computing

SAIFIN

Satellite data and Artificial Intelligence for FINtech

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Spoke 2 Progetti Bandi a Cascata, 11/12/2024

Project Overview

The **SAIFIN** project aims to develop an **AI-driven algorithmic trading system** that leverages both Artificial Intelligence (AI) and generative AI to identify financial trading strategies using data sourced from the web and satellite information.

By integrating **satellite data**, AI, and high-performance computing (**GPU**), the system enables nowcasting of key variables to enhance performance in **high-frequency trading (HFT)**, **short-term**, and **medium-to-long-term** trading scenarios.

The use of these technologies aims to optimize computational efficiency while adhering to **environmental standards**, reducing the consumption of primary resources.



Technical Objectives, Methodologies and Solutions

- The use of **satellite data** offers unique, real-time information on various economic and environmental factors that can **impact financial markets**. Analysis of satellite imagery can reveal activity in resource extraction areas, agriculture, construction, and even traffic in shopping centers, providing early indicators of economic performance.
- The use of **Deep Learning** and **Generative AI** offer data-driven insights uncovering trends, correlations and opportunities on **big data** volumes (satellite and web). This enables traders to respond rapidly to market changes.
- The use of **GPUs** for processing and analyzing large volumes of data from satellite images and the web enables the development of **real-time trading** strategies. This approach **efficiently and sustainably** leverages computational resources, allowing for faster and more accurate analysis to inform trading decisions.



Development of Trading System Methodologies

Technological Scouting

- Identified state-of-the-art tools: PyTorch, TensorFlow (GPU acceleration), Apache Spark.
- Selected AI methodologies: CNNs, LSTMs, RL algorithms.
- LLM-based agents.
- Open-source LLMs for trading.

Data Sources and Trading Signals

- Mapped sources: satellite imagery (optical, radar, multispectral) and web-based sentiment data.
- Preliminary identification of trading indicators from crop indices and web sentiment.

Crop Condition Indices from Satellite Images

- Algorithms for vegetation indices (NDVI, EVI, etc) and CNN-based feature extraction.
- Foundational models for images analyses.



Development of Trading System Methodologies

Forecasting Algorithms for Trading Indicators

- Developing LSTM/GRU-based models for trend and momentum prediction.
- Early prototypes analyzing time-series data.

Sentiment Analysis

- Utilizing Transformer models (e.g., BERT, GPT, FinGPT) for economic news and social media analysis.
- Testing initial sentiment scoring pipeline.

Reinforcement Learning-Based Trading Agent

- Evaluation of trading strategies with PPO and DQN algorithms.

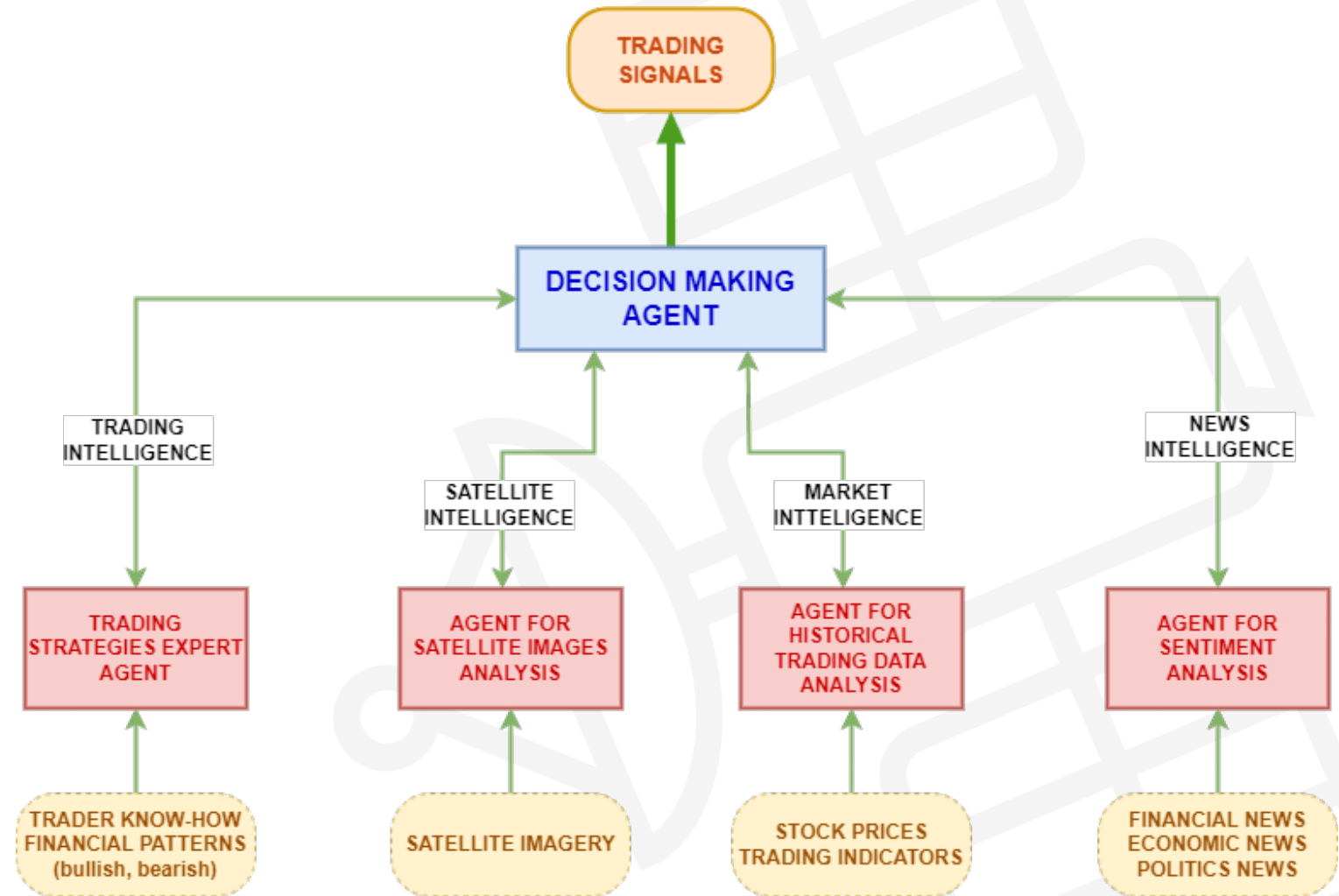
LLM-Based Trading Agent System

- Retrieval information for trading strategy from satellite imagery, historical trading data, financial and economic news with orchestrated LLM agents.
- Decision making for trading signals with LLM.





LLM Agents Workflow for SAIFIN Trading System



Timescale, Milestones, SAL

WP	TASK
WP1 - Study and definition of methodologies	Task 1.1: Study and development of AI methods and technologies for the trading system
WP2 - Automated trading system	Task 2.1: Design of Algorithmic Trading System
	Task 2.2: Testing and Validation in a real simulation environment



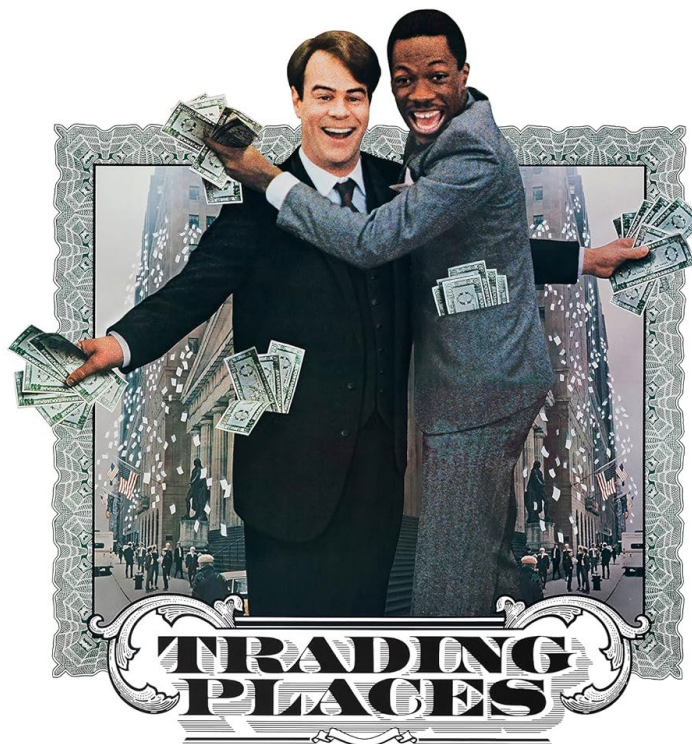
High-performance computing

Estimate of HPC resources:

- Leonardo Booster Module node
- RAM: 512 GB
- GPU: 4 x Nvidia A100 64 GB
- Storage: 10 TB
- GPU hours: 1000 h



Dan Aykroyd Eddie Murphy
They're not just getting rich... They're getting even.



Some very funny business.

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