

LEARNING TO RANK

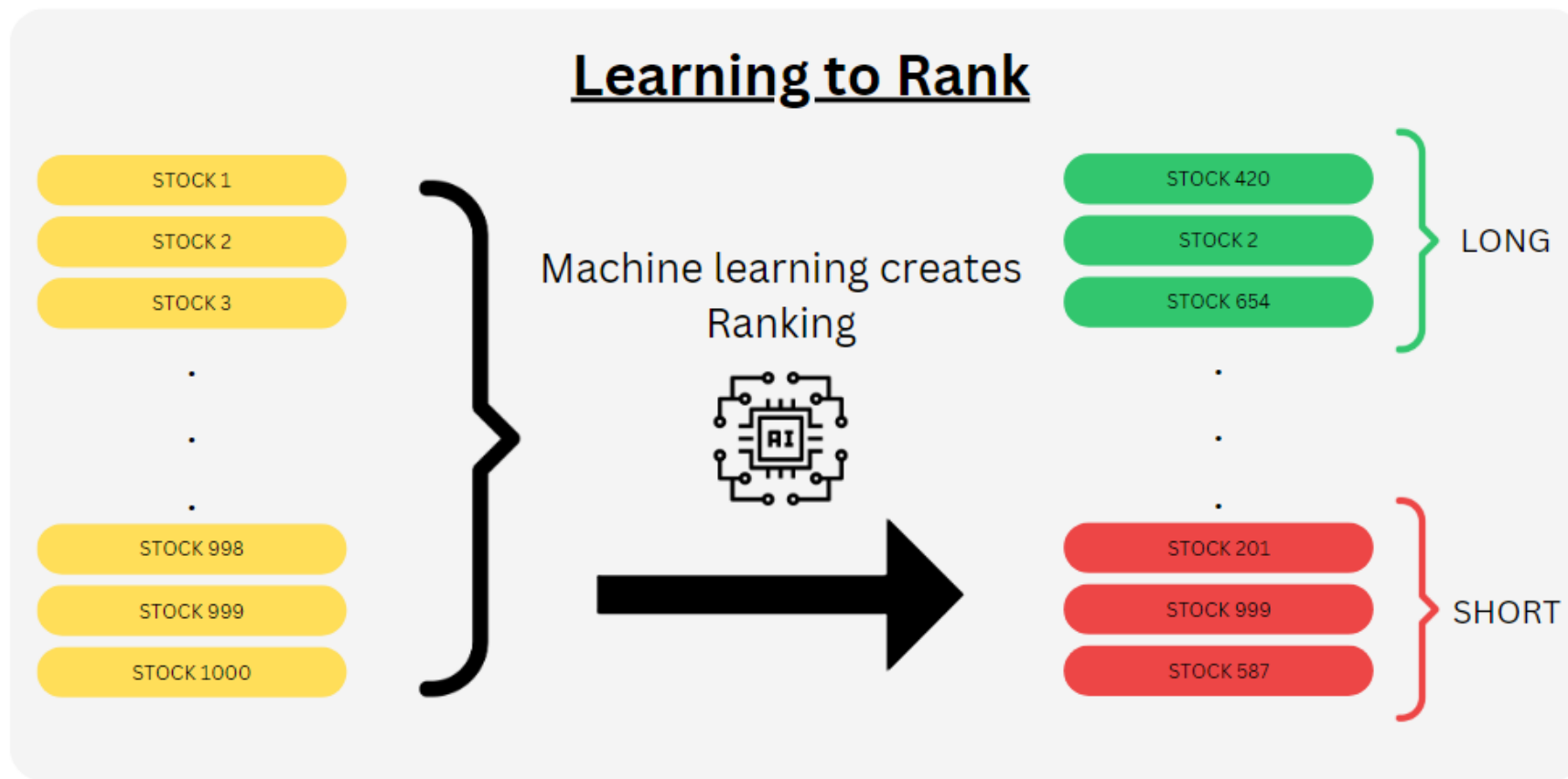
A Machine Learning Approach to Rank Assets

- What is Learning to Rank (LTR)?
- How to use Learning to Rank for trading strategies
- Results
- Next Steps

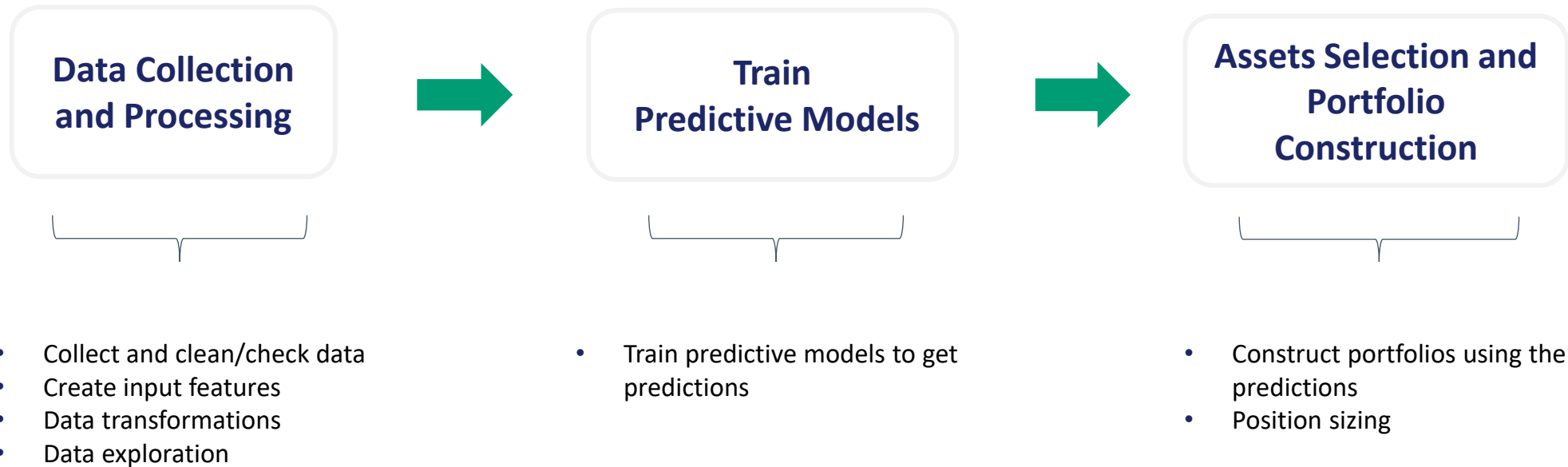
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Learning to Rank in Finance

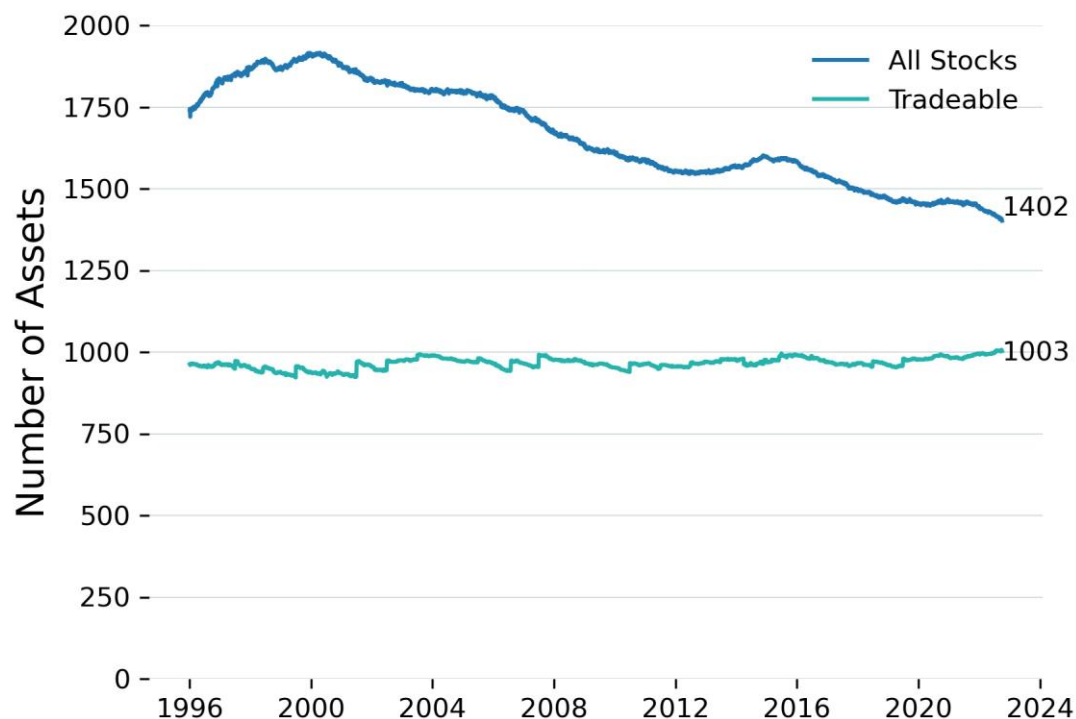


Trading Strategy Steps

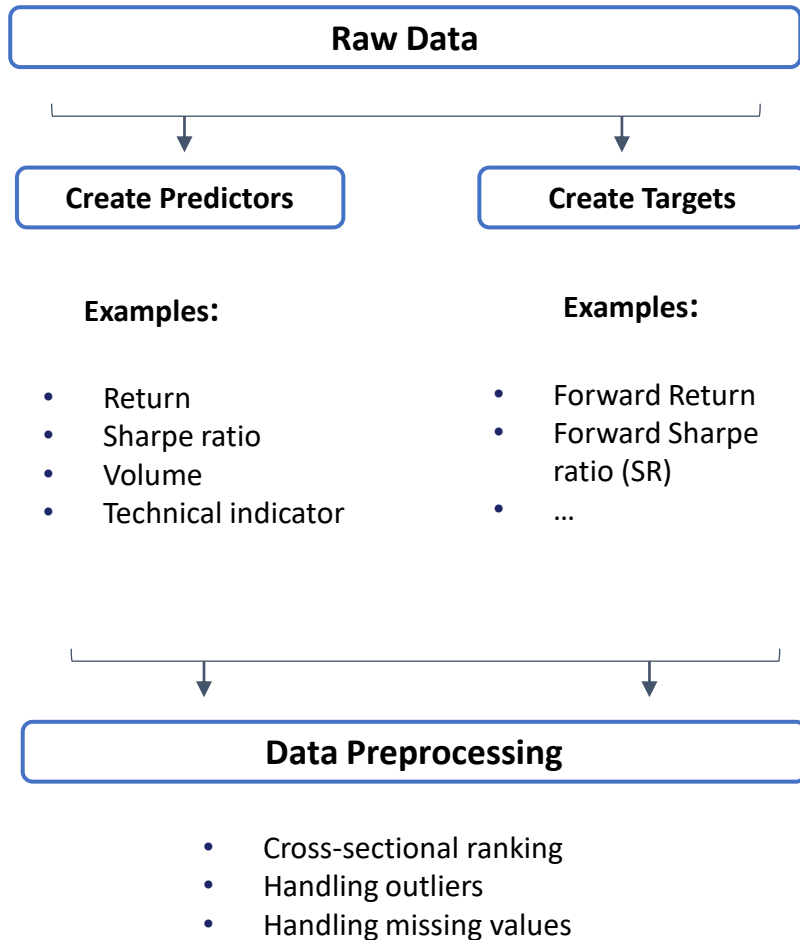


Data Description

- Universe: US Equities from **01/01/1995 – 04/10/2022**
- Daily pricing data for **3250 stocks**:
 - Open, High, Low, Close, Volume, Market Cap
- **Price and volume derived features** over several periods
- **Over 12.250.000 rows** and over **100 columns**
- **Tradeable: personal criteria**



Data Transformation and Preprocessing



- Features computed on several horizons
- Missing values: cross sectional imputation with the mean
- Normalization: cross-sectional ranking
 - Automatically handles outliers

Backtesting Setup

Models Presented

- **Benchmark:**
 - Russell 1000
 - One-Factor momentum strategy based on the return over several horizons
- **Learning to Rank Models (LTR)**
 - Multiple Linear Regression (MLR)
 - Regression Trees (Reg Trees)
 - No Hyper parameter tuning

Configurations

- **Universe:** US Equities
- **Prediction:** *relative* 10 day forward Sharp Ratio (*SR*)
- **Expanding walk forward:**
 - 1996 - 2022
- **Rebalancing Period and Allocation process:**
 - Russell 1000: bi-monthly and equal weighted
 - One-Factor momentum: monthly and equal weighted
 - LTR models: bi-monthly and rank-vol weighting
 - Max weight per stock 0.025

LTR Outperforms Benchmarks

Models Performances without Fees



Strategy	BM 1	BM 2	MLR	Boosting
Return (%)	10.76	13.96	15.54	19.97
Volatility (%)	20.8	23.22	15.62	16.98
Sharpe Ratio	0.52	0.60	0.99	1.17
Max DD (%)	62.43	57.02	37.96	49.41
Max TUW (Days)	865	1400	404	345

Key Takeaways

Strong consistent performance after transaction costs

- Signal is consistent over time
- More return
- Lower risk in terms of volatility and drawdown
- **Returns: 19,97% p.a. / Sharp Ratio: 1,17**

Multifunctional and Generalizable

- Applicable on other targets (returns, volatility...)
- Applicable to other universes and asset classes (European, Asian... market)
- Intuitive to incorporate new predictive features or add more assets