Vincenzo Lanzetta

Deep learning methods for analysis and prediction of financial data

Tutor: Prof. R. Prevete Cycle: XXXVII

Year: second

My background

- MSc degree: Chemistry
- Second MSc degree (to be completed - 4 exams left): Statistics
- laboratory: AIPA
- PhD start date: November 1, 2021
- Scholarship type: no scholarship

Research field of interest

Deep learning methods in Finance

Summary of study activities

	Courses	Seminars	Research	Tutorship	Total
Total (year 1 + year 2)	31	10,2	78	0	119,2
Expected (year 1 + year 2 + year 3)	30 - 70	10 - 30	80 - 140	0 – 4.8	180

2nd year PhD courses:

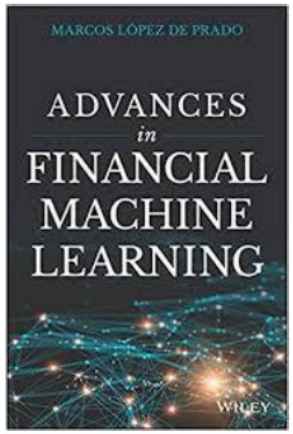
- Using deep learning properly
- English B2 (CLA-Unina)

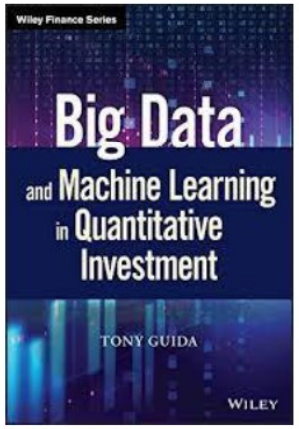
Research activity: Deep Learning for financial markets predictions (1/4)

Problem:

Financial industry demands for new methods aimed at capturing non-linear relationships, in the financial market data, for prediction purposes

•<< A key argument for applying ML techniques to financial problems is that ML methods capture non-linear relationships [28] in the data.>>[*]





•<< the literature regarding financial market prediction using machine learning is vast>> [**]

•<<there is a wide range of ML techniques being successfully applied to many areas in the development of quantitative investing strategies[*]

Objective

Development of new deep learning approaches for financial market prediction

Research activity: Deep Learning for financial markets predictions (2/4)

Methodology

1. A systematic review on approaches for financial market predictions, with a focus on Transfer Learning (TL) ones

2. Experimenting several Machine Learning methods to perform financial markets predictions

Research activity: Deep Learning for financial markets predictions – review step - (3/4)

Systematic approach of the conducted review	
1	Definition of filters (years, subject area, search words...)
2	Defining the data extraction form (problem taxonomy, dataset characteristics, ...)
3	Conducting the systematic research
4	Summary of the reviewed papers
5	Answer to research questions
6	Conclusions
7	Experimenting on financial market predictions

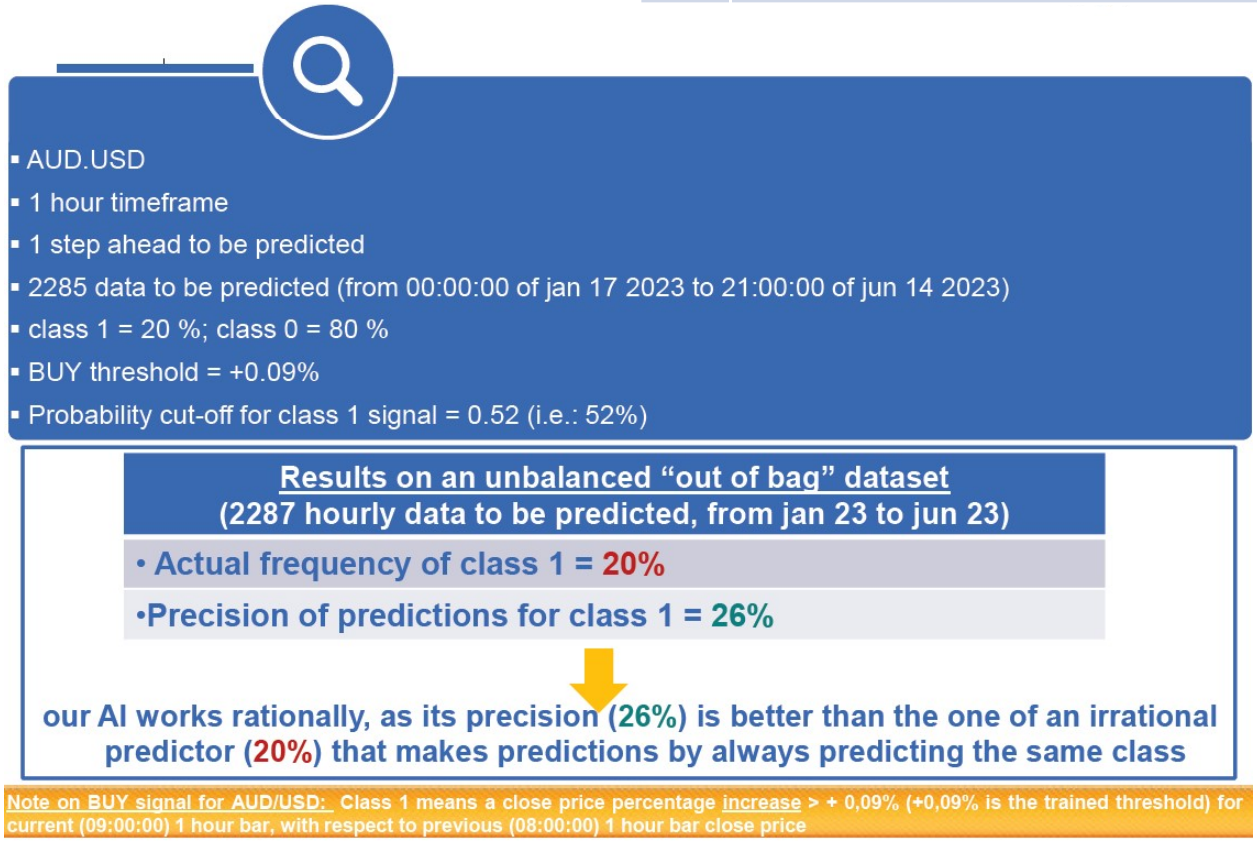
Main results
Transfer Learning (TL) for accelerating training
TL for over-fitting problem
TL for discovering asymmetric causal structure between different domains
TL for overcoming data scarcity issue

Challenges and future directions
Number of domains for pre-training step
Factors influencing the selection of source domain data
Possible error propagation issue due to sequential training
Impact of different learning mechanism on TL performance
TL within the explainable Artificial intelligence framework

Research activity: Deep Learning for financial markets predictions – experimenting step - (4/4)

Tested dataset	
1	Daily index market data
2	Daily stock data
3	Daily Forex data
4	Hourly index market data
5	Hourly Forex data

Experimented ML Techniques	
1	Feed Forward NN
2	CNN
3	LSTM
4	CNN-LSTM
5	XGBoost



itee PhD
information technology
electrical engineering

Products (1/2) – Startup/Spin-off project

Not secure | predictionlabs.ai/login

Stock Signals

SIGNAL TIME	Stock	Difference in time in minute	Starting Time	Closing Time	Target price	Take profit price	Stop loss price	Probability Prediction for Class 1	SUGGESTED STRATEGY
17/07/2023, 09:01:00	AUD_USD	60	17/07/2023, 09:00:00	17/07/2023, 10:00:00	0.68005	0.680662	0.679438	0.53	BUY

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Products (2/2) – Campania Start Cup Competition of 7 Campania's universities

PredictionLabs.ai has been selected for the regional final

Results – Work in Progress paper

Title	Status
Transfer learning for financial data predictions: a systematic review	Completed (to be submitted)

Next year plan

2 Publications - on journals to be defined - on the following topics:

- Deep Learning for financial markets predictions
- New neural network methods for what-if policy analysis on regional innovation data

Developing PredictionLabs.ai, with respect to following options:

- seed capital/business angels commitment
- establishment/recognition of the Spin Off qualification at our University
- Invitalia commitment (Smart&Start measure)

Research periods abroad:

- Spending a period abroad to start an international collaboration

Thank you for your attention