UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

DOTTORATO DI RICERCA / PHD PROGRAM IN
INFORMATION TECHNOLOGY AND ELECTRICAL ENGINEERING

Activities and Publications Report

PhD Student: Vincenzo Lanzetta

Student DR number: DR995980

PhD Cycle: XXXV II
PhD Cycle Chairman: Prof. Stefano Russo

PhD program student's start date: Nov 1, 2021
PhD program student's end date: Oct 31, 2024

Supervisor:

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PhD scholarship funding entity:
No scholarship.

General information

Vincenzo Lanzetta received the Master Science degree in Chemistry from the University of Napoli Federico II. He attended the PhD program in Information Technology and Electrical Engineering. He enrolled into the ITEE PhD program without a grant.

Study activities

Attended Courses

Year	Course Title	Type	Credits	Lecturer	Organization
1st	Operational Research: Mathematical Modelling, Methods and Software Tools for Optimization Problems	Ad hoc course	4	Prof. Adriano Masone	ITEE
1st	Sustainable ship for the energy transition of maritime transport	Ad hoc course	4	Prof. Tommaso Coppola	ITEE
1st	Machine Learning for Science and Engineering Research	Ad hoc course	5	Professors Corazza, Prevete, Isgrò, Sansone, Pezzulo	ITEE
1st	Imprenditorialità accademica	Ad hoc course	4	Prof. Pierluigi Rippa	ITEE
1st	Statistical data analysis for science and engineering research	Ad hoc course	4	Prof. R. Pietrantuono	ITEE
2nd	Using deep learning properly	Ad hoc course	4	Dott. Andrea Apicella	ITEE
2nd	English B2	Ad hoc course	6	Prof. Dianna Jean Pickens	CLA (UNINA)

Attended Seminars

Year	Seminar Title	Credits	Lecturer	Lecturer affiliation	Organization
1st	Bench to Bytes to Bedside: Converting genomic data intohealthcare tools	0.2	Serena NikZainal	University of Cambridge	Computational and Quantitative Biology Lecture - Series - Prof. Michele Ceccarelli – Univ di Napoli Federico II
1st	Explainable Natural Language Inference	0.3	Dr. Marco Valentino	Idiap Research Institute	ITEE (Prof. Cotugno)
1st	Using Delays for Control	0.2	Prof. E. Fridman	Tel-Aviv university	Federico II University of Naples

1st	Symbiotic Control of Wearable Soft Suits for human motion assistance and augmentation	0.4	Prof. Lorenzo Masia	Technische Universität München (TUM)	Federico II University of Naples
1st	AR for remote use of measurement instrumentation	0.4	Prof.ssa Annalisa Liccardo and Dr. Francesco Bonavolonta'	Federico II University of Naples	Federico II University of Naples
1st	Artificial Intelligence and 5G combined with holographic technology: a new perspective for remote health monitoring	0.4	Dr. Pietro Ferraro and Dr. Pasquale Memmolo	CNR ISASI	Federico II University of Naples
1st	Towards substainable IT	0.4	Dr. Giorgia Sepe	-	Federico II University of Naples
1st	History of fusion	0.2	Prof. Pietro Martin	Università di Padova	ITEE
1st	Introduction to Intellectual Property Management	0.4	Prof. Alessandro Marroni	-	Federico II University of Naples
1st	Tutorial on "statistical Learning for sensory and consumer science	1.6	Prof. Naes, Prof. Tomic, Prof. Romano	NOFIMA AS, Norwegian University of Life Science Norway, Federico II University of Naples Italy	Federico II University of Naples
1st	Privacy-preserving machine learning	0.4	Prof. R. Natella, Prof. S. P. Romano	Federico II University of Naples	Federico II University of Naples
1st	Image processing for medical applications	0.3	E. Cosgrove	Mathworks	Math works event team
2nd	Quantum Complexity	0.3	Alioscia Hamma	Federico II University of Naples	Federico II University of Naples
2nd	Complex network systems: introduction and open challenges	0.3	Pietro De Lellis	Federico II University of Naples	Federico II University of Naples
2nd	GINGER, Gyroscopes IN GEneral Relativity	0.3	Angela D. V. di Virgilio	INFN	Federico II University of Naples
2nd	Entangled relativity	0.3	Olivier Minazzoli	Observatoire de la Côte d'Azur	Federico II University of Naples
2nd	Industry 4.0 Fundamentals in Bosch Applications	2	Bosch and the Decision	Bosch and the Decision and Control	Bosch and the Decision and Control

			and Control Laboratory (Bari polytechnic)	Laboratory (Bari polytechnic)	Laboratory (Bari polytechnic)
2nd	Attention Mechanism in Neural Networks; Transformers and their applications	0.5	Alberto Testolin, Samuel Cognolato	Università di Padova	CNR – ISTC
2nd	Blockchain in business and 5G in business	0.5	Conforto Luca, Mutarelli Gabriele	CapGemini Invent	Federico II University of Naples
2nd	I principi della comunicazione	0.6	Diego Gaviglio – CapGemini Invent	CapGemini Invent	Federico II University of Naples
2nd	Symbiotic analysis: ordinal patterns in time series analysis	0.2	Manuel Ruiz Marin	Universidad Politécnica de Cartagena	Federico II University of Naples
3th	ETHICS IN AI AND DIGITAL FINANCE	0.8	Ferreira Bruno, Catarina Silva, Susana Aires de Sousa, Ioana Coita, Suela Maxhelaku	University of Oradea	University of Oradea

Research activities

Vincenzo Lanzetta has developed research activities with respect to two research topics:

Topic 1: transfer learning for prediction of financial markets
Topic 2: new neural network methods for what-if policy analysis on regional innovation data

Methodology for topic 1:

V. Lanzetta has followed a systematic approach to review previous studies in order to understand how Transfer Learning has been applied for financial market predictions, and in order to know which are the challenges and potential future directions of the transfer learning methodologies for financial market predictions.

Results of topic 1:

Several researchers have developed transfer learning models in order to overcome the financial data scarcity issue; as example, by starting from the observation that the common financial markets characteristics are able to explain the capability of technical indicators for providing financial forecast signals, some scholars used transfer learning models in order to extract the general pattern underlying financial data of different securities markets, and in which the neural network architecture is then re-trained on the specific data of the stock, to be predicted, for a fine-tuning step. Furthermore, literature highlighted the role of transfer learning as a method for accelerating the training [Nakagawa et al.], and for discovering asymmetric causal structure between different domains. Several studies have also pointed out the transfer learning capability to address the over-fitting problem, by means of leveraging source of data belonging to different domains. About challenges and potential future directions of the transfer learning methodologies for financial market predictions, literature highlighted the relevance to go deeper into the factors influencing the selection of source domain data, by considering also the number of domains to be used; furthermore, literature have also highlighted the need to address the possible error propagation issue related to the usual transfer learning process, as it involves sequential training of models that can adversely affecting the performance of downstream models. In the end, literature suggested to investigate the impact of different learning mechanism, such as the attention mechanisms as example, on the transfer learning performance. As last point for challenges and potential future directions, we highlight the need to study Transfer learning techniques within the explainable Artificial intelligence framework

Methodology for topic 2:

Literature highlights that Neural Network (NN) is a very useful tool for developing what-if analysis on complex labelled dataset, as its capability to infer complex and not linear relationship between input variables and labels. As interesting application, literature suggests Neural Network architectures as tools for modelling relationships between regional innovation indicators (features) and regional innovative capacity (label). Indeed, NN can be used as simulation tool for evaluating the potential effectiveness of selected policies (to understand, for example, what can be done - by a region - to be able to move from a less innovative cluster to a more innovative one). Accordingly, Vincenzo Lanzetta developed research, on the above topic, in order to study NN as a what-if tool for policy analysis on regional innovation data.

Results of topic 2:
the student has developed a new methodology aimed at overcoming issues of current commonly adopted methodological tools for the scenario analysis and policies definition of regional innovation systems.

Credits summary *(180)*

PhD Year	Courses	Seminars	Research	Tutoring / Supplementary Teaching
1st	21	5.2	33	0
2nd	10	5	45	0
3rd	0	0.8	60	0

PhD Thesis

The thesis is focused on *Deep learning methods for scenario analysis and predictions of complex systems*, exploring how these methodologies can be applied in some specific complex research areas such as financial markets and social systems. With respect to financial markets, a systematic literature review - on transfer learning methodology for financial data prediction – has been developed, and some deep learning architectures for financial predictions task have been experimented. With respect to social systems, a new methodology - aimed at overcoming current issues of commonly adopted methodological tools for scenario analysis and policies definition of regional innovation systems – has been developed.

Date Oct 15, 2024

Vincenzo Lanzetta

PhD student signature

Supervisor signature Roberto Prevete