



PhD in Information Technology and Electrical Engineering
Università degli Studi di Napoli Federico II

PhD Student: Marco Grazioso

Cycle: XXXVI

Training and Research Activities Report

Year: First

Marco Grazioso

Tutor: Prof. Francesco Cutugno

Co-Tutor: Valentina Russo

Date: October 21, 2021

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Author: Marco Grazioso

1. Information:

- PhD student: Marco Grazioso
- DR number: DR995138
- Date of birth: 26/11/1990
- Master Science degree: Computer Science University: University of Naples Federico II
- Doctoral Cycle: XXXVI
- Scholarship type: *Funding company*
- Tutor: Francesco Cutugno
- Co-tutor: Valentina Russo

2. Study and training activities:

Activity	Type ¹	Hours	Credits	Dates	Organizer	Certificate ²
Robot Manipulation and Control	Seminar	2,5	0,5	17/11/2020	Prof. Bruno Siciliano	Y
Digital Project Management: practices, processes, techniques, tools and scientific approach (picariello lectures)	Seminar	1	0,2	18/11/2020	Prof. Dario Carotenuto	Y
"L'esperienza del progetto di teleriabilitazione NEUROREAB"	Seminar	1,5	0,3	24/11/2020	ing. D. Furno e ing. L. Romanelli	Y
SCIENCE, REALITY AND CREDIBILITY THE ROLE OF SCIENTIFIC CRITICAL THINKING TO CONTRAST DISINFORMATION AND FACE THE GREAT CHALLENGES OF THE FUTURE.	Seminar	1,5	0,3	24/11/2020	prof. Saul Perlmutter	N
"#andràtuttobene: Images, Texts, Emojis and Geodata in a Sentiment Analysis Pipeline (picariello lectures)	Seminar	1,5	0,3	25/11/2020	Prof. Serena Pelosi	Y

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Telemedicina, e-health e «mobile health» si può davvero usare il digitale nel percorso assistenziale?	Seminar	3	0,6	26/11/2020	Dott.ssa Simonetta Scalvini	Y
How to Get Published with IEEE	Seminar	1,5	0,3	2/12/2020	Dr. Paul Henriques	Y
At the Nexus of Big Data, Machine Intelligence, and Human Cognition	Seminar	1	0,2	2/12/2020	George S. Djorgovski	Y
Network Systems, Kuramoto Oscillators, and Synchronous Power Flow	Seminar	1,5	0,3	3/12/2020	Prof. Francesco Bullo	Y
Artificial Intelligence between Research and Industry	Seminar	1,5	0,3	7/12/2020	- Marco Cristani (University of Verona) - Rita Cucchiara (University of Modena and Reggio Emilia) - Alessio del Bue (Italian Institute of Technology) - Olivia Gambelin (Ethical AI) - Vittorio Murino (University of Verona and Huawei) - Stefan Raue	Y

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					(Arceptive)	
CRISPR-cas9 screens and multi-omic data integration for identifying and prioritising anti-cancer therapeutic targets.	Seminar	1	0,2	4/12/2020	Prof. Francesco Iorio	Y
Patent Searching best practices with IEEE Xplore	Seminar	1	0,2	27/11/2020	Dr. Eszter Lukacs	Y
GDPR basics for computer scientists	Seminar	1,5	0,3	10/12/2020	Dr. Ringo Wenning	Y
Data Driven Transformation in WINDTRE through Managers voice (picariello lectures)	Seminar	2	0,4	16/12/2020	Marcello Savarese, Erica Bertone and Amida Kudasheva	Y
Exploiting Deep Learning and Probabilistic Modeling for Behavior Analytics (picariello lectures)	Seminar	1	0,2	9/12/2020	Prof. Giuseppe Manco	Y
Subclonal reconstruction of tumour architectures by using machine learning and population genetics	Seminar	1	0,2	11/12/2020	Prof. Giulio Caravagna	Y
Digital Forensics' methods, practices and tools	Courses	15	3	03-05-06-09-10/11/2020	Dr. Giovanni Cozzolino	Y
From photometric redshifts to improved weather forecasts: an interdisciplinary view on machine learning (picariello lectures)	Seminar	1	0,2	13/01/2021	Kai Polsterer	Y

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Cybercrime and e-evidence: the criminal justice response (picariello lectures)	Seminar	2	0,4	20/01/2021	Matteo Lucchetti	Y
NLP ed AI nel mondo enterprise	Seminar	1,5	0,3	21/02/2021	Massimo Chiriatti e Glauco Cenciotti	Y
AI LEGAL: Artificial Intelligence for notary's sector - a case study (picariello lectures)	Seminar	1	0,2	27/01/2021	Salvatore Palange	Y
the era of industry 4.0: new frontiers in business model innovation (picariello lectures)	Seminar	1	0,2	03/02/2021	Marco Balzano	Y
Designing a Socially Assistive Robot for adaptive and personalized assistance to patients with dementia	Seminar	1	0,2	17/02/2021	Antonio Andriella	Y
Machine learning: Causality lost in translation (picariello lectures)	Seminar	1,5	0,3	10/02/2021	Edwin A. Valentijn	Y
AIRO PhD School 2021 and 5th AIRO-Young Workshop, «Optimization and Data Science: Trends and Applications»	Doctoral School		3,6	08-09-10-11-12/02/2021	Prof. Maria Grazia Speranza, Prof. Antonio Frangioni, Prof. Michele Monaci, Prof. Stefano Lucidi, Prof. Manlio Gaudio, Prof. Alberto Ceselli, Prof.	Y

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					. Ivana Ljubic	
Visual interaction and communication in data science (picariello)	Seminar	2	0,4	03/03/2021	Marco Quartulli	Y
Big data and Computational Linguistics (picariello)	Seminar	2	0,4	10/03/2021	Francesco Cutugno	Y
Dai mainframe all'IoT: una retrospettiva sull'evoluzione delle architetture di calcolo	Seminar	2	0,4	08/03/2021	Prof. Antonino Mazzeo	Y
Emotions in Reinforcement Learning Agents	Seminar	1	0,2	17/03/2021	Prof. Joost Broekens	Y
The coming revolution of Data driven Discovery (picariello)	Seminar	1,5	0,3	25/03/2021	Prof. Giuseppe Longo	Y
Why Do We Cooperate? Understanding and Modelling Societies using Reinforcement Learning	Seminar	1	0,2	01/04/2021	Prof. Mirco Musolesi	Y
Logic-based Learning of Answer Set Programs	Seminar	1	0,2	08/04/2021	Mark Law	Y
Distributional Semantics Methods: How Linguistic features can improve the semantic representation (picariello)	Seminar	1,5	0,3	28/04/2021	Alessandro Maisto	Y
Optimized Graph Representations for Right-Wing Reddit Community Using Graph Neural Networks	Seminar	1	0,2	30/04/2021	Mr. Mohamed Diaoulé Diallo	Y
Artificial Intelligence and 5G combined with holographic technology: a new perspective for remote health monitoring	Seminar	2	0,4	27/04/2021	Dr. Pietro Ferraro, Dr. Pasquale Memmolo	Y

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Modelling the Complexity of Multiagent Activity for Human-AI Interaction using Dynamical Primitives	Seminar	1,5	0,3	06/05/2021	Michael Richardson	Y
INTRODUCTION TO UNDERWATER ROBOTICS	Seminar	2	0,4	18/05/2021	Prof. Gianluca Antonelli	Y
Lectures on Computational Linguistics 2021	Seminar	1,5	3	16-17-18/06/2021	Grzegorz Chrupała, Roberto Navigli, Fabio Massimo Zanzotto, Ivan Vulic, Milica Gašić, Konstantinos Ioannis, Danilo Croce	Y
IEEE Authorship and Open Access Symposium for Europe and the Middle East: Best Practices to Get Published to Increase the Exposure and Impact of Your Research	Seminar	3	0,6	29/09/2021	Dr. Saifur Rahman, Judy Brady, Eszter Lukacs	Y
Game Engine Architectures and Interactive Experiences	Courses	48	6	19/10/2021	Prof. Antonio Origlia	Y
Human Language Technologies	Courses	72	9	13/10/2021	Prof. Giuseppe Attardi	Y

- 1) Courses, Seminar, Doctoral School, Research, Tutorship
- 2) Choose: Y or N

2.1. Study and training activities - credits earned

	Courses	Seminars	Research	Tutorship	Total
Bimonth 1	0	4,8	6	0	10,8

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Bimonth 2	6,6	1,8	4	0	12,4
Bimonth 3	0	3	4	0	7
Bimonth 4	0	3,7	6	0	9,7
Bimonth 5	0	0	2,1	0	2,1
Bimonth 6	15	0,6	3	0	18,6
Total	21,6	13,9	28,1	0	63,6
Expected	20 - 40	5 - 10	10 - 35	0 - 1.6	

3. Research activity:

During this first year I studied Dialogue Systems (DS) domain and I alternated phases of bibliographic research and software infrastructures development. Regarding that, I mainly focused my work on three modules: intent recognition, named entity recognition, knowledge base.

First, I focused my attention on the user intent recognition techniques. We define a “user intent” as the communicative intention expressed by the user utterance typically associated with an action he wants to perform. My personal approach is inspired by the features of some proprietary tools, such as Microsoft Azure LUIS and AWS Lex (NLU module), and aims at defining a generic infrastructure based on a graph database capable of automatically changing the training configuration basing on the graph data. Thus, I trained my own intent recognition module, being actually part of a chatbot prototype developed in collaboration with my industrial sponsor Logogramma, and reaching the around the 90% of accuracy on 35 intents.

Subsequently, I focused my attention on Named Entity Recognition, the task of locating and classifying named entities mentioned in unstructured texts into pre-defined categories, and Slot Filling, the task of identifying from a running dialogue different slots, which correspond to different parameters of the user's query. As I did for Intent Recognition, I studied the current models and approaches to develop my own module, also being part of the chatbot prototype.

Finally, I studied graph databases, largely used to store knowledge bases, and I designed a structure capable of storing the knowledge coming from the commercial context in which Logogramma works, and the nodes and relations coming from external sources (Wikipedia, WikiData).

Research plan for the next years

In the second year of my PhD course, I intend to investigate the task of Dialogue State Tracking (DST), which is a crucial part of dialogue based application, having the task of inferring the current state of the dialogue, given the full dialogue history up to the current turn. I decided to concentrate my studies on this topic, analyzing the state of the art approaches, from rule based to the generative and discriminative ones, and the related issues to be investigated and possibly solved. Regarding that, I discovered that the main datasets used to evaluate a dialogue state tracker are the MultiWOZ dataset and the various dialogue state tracking challenge corpora (DSTC-1, DSTC-2, DSTC-3), distributed in the respective challenges, and they will be used as a reference for my future work.

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4. Research products:

Grazioso M., Podda A.S., Barra S., Cutugno F. (2021) *Natural Interaction with Traffic Control Cameras Through Multimodal Interfaces*. In: Degen H., Ntoa S. (eds) *Artificial Intelligence in HCI. HCII 2021. Lecture Notes in Computer Science*, vol 12797. Springer, Cham.
https://doi.org/10.1007/978-3-030-77772-2_33

Russo V., Mancini A., Grazioso M., Di Bratto M., *A dialogue-oriented approach to the design of a knowledge base supporting complex pragmatic scenarios” submitted at IJCoL(Italian Journal of Computational Linguistics)*

D’Asaro F. A., Raggioli, L., Malek S., Grazioso M., Rossi S., *An Application of a Runtime Epistemic Probabilistic Event Calculus to Decision-making in e-Health Systems accepted with revision by the journal Theory and Practice of Logic Programming*

Developed a chatbot prototype performing intent recognition and slot filling

Developed a multimodal interaction system (voice and gestures) performing intent recognition and named entity recognition (see the publication Natural Interaction with Traffic Control Cameras Through Multimodal Interfaces)

5. Conferences and seminars attended

Attended CLiC-it: Seventh Italian Conference on Computational Linguistics, online, 1-3 March 2021

Presented a paper at AI-HCI: 2ND INTERNATIONAL CONFERENCE ON ARTIFICIAL INTELLIGENCE IN HCI, Washington DC, USA 24-29 July 2021

Attended REAACH-ID: Representation for Enhancement and management through Augmented reality and Artificial intelligence: Cultural Heritage and Innovative Design, online symposium, 13-14 October 2021

Attended ICMI: 23rd ACM International Conference on Multimodal Interaction, Montreal, Canada, 19-22 October 2021

6. Activity abroad:

7. Tutorship