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

PhD Student: Arianna Anniciello

Cycle: XXXVIII

Training and Research Activities Report

Year: First

Tutor: prof. Elio Masciari

Co-Tutor:

Date: October 18, 2023

1. Information:

- ➢ **PhD student: Arianna Anniciello**
- ➢ **DR number:**
- ➢ **Date of birth: 25/10/1994**
- ➢ **Master Science degree: Management**   **University: University of Naples**
  Engeneering   **Federico II**
- ➢ **Doctoral Cycle: XXXVIII**
- ➢ **Scholarship type:** *no scholarship*
- ➢ **Tutor: Elio Masciari**
- ➢ **Co-tutor:** *no co-tutor*

2. Study and training activities:

Activity	Type[1]	Hours	Credits	Dates	Organizer	Certificate[2]
Seminar		**2**	**0,4**	13/12/2022	Prof. Leonardo Badia	**N**
Ad-hoc Course	**A**	**12**	**3**	21-24-28-30/11/2022	Ing. Lorenzo Ricciardi Celsi	**Y**
Seminar		**2**	**0,4**	13/12/2022	Massimiliano Albanese	**Y**
Seminar		**12**	**3**	23-24-25-26/01	Prof. Ing. Mariagrazia Dotoli, Ph.D.	**Y**
Ad-hoc Course	**A**	**12**	**4**	09-13-16-20-23-27/01/2023	Dr. Raffaele Della Corte, DIETI	**Y**
Ad-hoc Course	**A**	**10**	**4**	10-12-17-19-24/01/2023	Dr. Andrea Apicella, DIETI	**Y**
Ad-hoc Course	**A**	**20**	**5**	30/01; 03-06-10-13-20-24-27/02; 03/03/2023	Dr. Luigi De Simone, DIETI	**N**
Ad-hoc Course	**A**	**35**	**3**	10-11-17-18-24-25-31/01/2023; 01-07-08-14-15-21-22/02/2023	**Prof. Giorgio Buttazzo**	**N**
Ad-hoc Course	**A**		**3**		**Prof. Giorgio Buttazzo**	**N**
Ad-hoc Course	**A**		**3**		**Prof. Giorgio Buttazzo**	**N**

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English language	B	**32**	**3**	24-28/02/2023; 3-7- 10-14-17-21-24-28-31/03/2023; 4-14-18-21-28/04/2023; 2-5-9-12-16-19-23-26, 30/05/2023	**D.ssa Esposito**	**N**
Ad-hoc Course	C	**17**	**4**	29-31/05/2023;05-15-20-29/06/2023	**Prof. P. Rippa, DII**	**Y**
Seminar		**2**	**0,2**	03/05/2023	prof. C. Forestiere	**Y**
Seminar		**2**	**0,2**	20/06/2023		**Y**
Ad-hoc Course	A	**10**	**3**	17-18/4 – 5-8-10/5/2023	prof. Nicola Mazzocca - DIETI, Unina	**Y**
Ad-hoc Course	A	**20**	**5**	26-29/06 06-07-10-12-14-19-20/07/2023	**Prof. Giancarlo Sperlì – DIETI, Unina**	**N**
Ad-hoc Course	A	**8**	**1,6**	14-28/09/2023 12/10/2023	Ministero dell'Università e della Ricerca, Ateneo Federico II	**Y**
Seminar		**6**	**1**	22/09/2023	CINI	**Y**
Ad-hoc Course	A	**12**	**2,4**	4-11-18-15/10/2023 8/11/2023	Italian Society for Ethics of AI	**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	**3**	**0,8**	**3**		**6,8**
Bimonth 2	**8**	**3**	**2**		**13**
Bimonth 3			**2**		**2**
Bimonth 4	**3**	**0,4**	**0,2**		**3,6**
Bimonth 5	**4**		**2**		**6**
Bimonth 6	**4**	**1**	**5**		**10**
Total	22	5,2	14,2		41,4
Expected	**20 - 40**	**5 - 10**	**10 - 35**	**0 – 1.6**	

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3.   Research activity:

Research topic: Artificial Intelligence for Decision Making
Our research journey began by building on previous work in Computational Social Science (CSOC), specifically focusing on Majority Judgment (MJ), a voting system designed to elect candidates based on the highest median rating. In multi-winner elections, there was a challenge: minorities, despite being numerous, were not adequately represented. To address this issue, we introduced K-Medoids cluster algorithms into MJ.

Our innovative approach led to the creation of Clustered Majority Judgment, a new model that groups similar judgments together. Within each of these groups, we applied the Majority Judgment rule to rank candidates. This ensured better representation for minorities. This flexible algorithm can be used in various areas where decision-making is important.

During the initial semester of our research, we concentrated on blending Multicriteria Decision Making (MCDM) tools with CSOC. The aim was to create a new model to help decision-makers make rational, global, and collective choices.

In pursuit of this goal, we introduced a unique method that combines the Analytic Hierarchy Process (AHP) and MJ. This approach not only takes into account the opinions of each decision-maker when evaluating alternatives, but also includes them in identifying and weighing criteria. This method adheres to the basic principles of rationality and fairness in the field of voting theory. It aims to provide a more complete and equitable decision-making process.

While this method proved to be highly effective, it is inherently reliant on the expertise and knowledge of human decision makers. This realization led us to explore the concept of distilling human expertise and enhancing it through a perpetual learning mechanism driven by feedback data from the actual performance of decisions made. This transition in our research direction brought us to the realm of Artificial Neural Networks (ANNs).

Our focus has also been drawn to the concept of "Trustworthy AI." In fact, the adoption of AI solutions by potential prospects is just as crucial as the design and implementation of the solutions themselves. The AI solutions we are developing for decision-making processes are intended to meet the needs of critical decision contexts. As a result, stakeholders must ensure the reliability and, at times, the ethical integrity of the processes in use. Without trust, even the most innovative models would remain underutilized.

During this first year of research we also made a couple parallel research work together with the tutor's research team: one on the positive impact of COVID 19 on e-Health and an the other one on Smart Cities.

4.   Research products:

- ✓ *Cluster algorithm for social choice – A. Anniciello, E. d'Ajello, D. Formica, E. Masciari, G. Mattia, C. Moscariello, S. Quintarelli and D. Zaccarella, European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases, ECML PKDD 2022 Workshops, published.*

✓ *[A Judgment Aggregation Method For Fuzzy Multi Criteria Decision Making](#) – A. Anniciello, E. Masciari, 31st Euromicro International Conference on Parallel, Distributed, and Network-Based Processing, PDP 2023, published*

✓ *[Covid-19 impact on health information technology: the rapid rise of e-Health and Big Data driven innovation of healthcare processes.](#) – A. Anniciello, S. Fioretto, E. Masciari, E. Napolitano, 2022 IEEE International Conference on Bioinformatics and Biomedicine – BIBM – accepted and presented*

5. Conferences and seminars attended

2022 IEEE International Conference on Bioinformatics and Biomedicine – IEEE BIBM 2022 – December 6-9, Las Vegas and Online

2023 31st Euromicro International Conference on Parallel, Distributed and Network-Based Processing – PDP 2023 – March 1-3, Naples, Italy

- *Torino online*

6. Activity abroad:

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7. Tutorship

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