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

PhD Student: Stefano Cilio

Cycle: XXXV

Training and Research Activities Report

Year: First

Tutor: Prof. Giorgio Ventre

Co-Tutor: Prof. Alessio Botta.

Date: October 21, 2020

1. Information:

➤ **PhD student: Stefano Cilio**
➤ **DR number: 993894**
➤ **Date of birth: 06/11/1994**
➤ **Master Science degree: Automation Engineering University: Federico II**
➤ **Doctoral Cycle: XXXV**
➤ **Scholarship type:** *no scolarship*
➤ **Tutor: Giorgio Ventre**
➤ **Co-tutor: Alessio Botta**

2. Study and training activities:

Activity	Type[1]	Hours	Credits	Dates	Organizer	Certificate[2]
Study on the state of the art of UAV	**Research**		**4**	**1/11/2019-31/12/2019**		
Study on the state of the art of Computer Networks	**Research**		**4**	**1/03/2020-30/04/2020**		
Reti di Calcolatori 1	**Course**		**6**	**17/06/2020**	**Prof. Valerio Persico**	**Y**
Innovation management, entrepreneurship and intellectual property	**Course**		**5**	**19/06/2020**	**Prof. Pierluigi Rippa**	**Y**
SAS Analytics	**Seminar**	**2**	**0.4**	**14/05/2020**	**Prof. Antionio Picariello**	**N**
Planning 5G under EMF constraints: challenges ad opportunities	**Seminar**	**2**	**0.4**	**18/05/2020**	**Prof. Luca Chiaravaglio**	**N**
SPACE Webinar Series: Joint Design of Optics and Post-Processing Algorithms Based on Deep Learning for Generating Advanced Imaging Features	**Seminar**	**1**	**0.2**	**19/05/2020**	**Prof. Raja Gyres**	**N**

Sensing – Plasmonica	**Seminar**	**4**	**0.8**	**20/05/2020**	**Prof. Wenger, Baldassarre, Rockstuhl, Fleischer**	**Y**
CVPL Cv & ML online seminar series: Bias from the wild	**Seminar**	**2**	**0.4**	**26/05/2020**	**Prof. Nello Cristianini**	**N**
CVPL Cv & ML online seminar series: Adversarial attacks on image classifiers	**Seminar**	**2**	**0.4**	**10/06/2020**	**Prof. Andrea Cavallaro**	**N**
CVPL Cv & ML online seminar series: Learning representations and geometry from unlabelled videos	**Seminar**	**2**	**0.4**	**25/06/2020**	**Prof. Andrea Vedaldi**	**N**
Exploring Autonomy in Robotic Flexible Endoscopy	**Seminar**	**2**	**0.4**	**12/06/2020**	**Prof. Fanny Ficuciello**	**Y**
Study on the state of the art of Computer Networks and Cloud Robotics	**Research**		**3**	**1/05/2020-30/06/2020**		
Machine Learning	**Course**		**4**	**31/08/2020**	**Prof. Carlo Sansone**	**Y**
Big Data Analytics and Business Intelligence	**Course**		**6**	**23/07/2020**	**Prof. Vincenzo Moscato**	**Y**
Wearable Brain-Computer Interface for Augmented Realitybased Inspection in Industry 4.0	**Seminar**	**1**	**0.2**	**29/07/2020**	**Prof. Pasquale Arpaia**	
Machine Learning applications in Cloud Robotics	**Research**		**7**	**1/07/2020-31/08/2020**		
IEEE Xplore Webinar: How to publish Open	**Seminar**	**1**	**0.2**	**23/09/2020**	**Prof. Derek Abbott,**	**Y**

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Access with IEEE to increase the exposure and impact of your research					Dr. Kajos Hanzo, Andre L. Popper	
Algorithmic Accountability: Affidabilità e responsabilità degli algoritmi	**Seminar**	**2**	**0.4**	**24/09/2020**	Fondazione Ugo Bordoni	**N**
IBM Quantum: i primi computer quantistici per la ricerca e la didattica	**Seminar**	**2**	**0.3**	**09/10/2020**	Crui - IBM	**N**
Salute, algoritmi e Intelligenza Artificiale. Tecnologie digitali al servizio di medici e pazienti	**Seminar**	**2**	**0.4**	**22/10/2020**	Fondazione Ugo Bordoni	**N**
Webinar Oracle Proxima Safe	**Seminar**	**1.5**	**0.3**	**23/10/2020**	Crui - Oracle	**N**
Machine learning techniques for optimal available bandwidth measurement	**Research**		**9**	**1/09/2020-31/10/2020**		

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**	**0**	**4**	**0**	**4**
Bimonth 2	**0**	**0**	**0**	**0**	**0**
Bimonth 3	**0**	**0**	**4**	**0**	**4**
Bimonth 4	**11**	**3.4**	**3**	**0**	**17.4**
Bimonth 5	**10**	**0.2**	**7**	**0**	**17.2**
Bimonth 6	**0**	**1.6**	**9**	**0**	**10.6**
Total	**21**	**5.2**	**27**	**0**	**53.2**
Expected	**30 - 70**	**10 - 30**	**80 - 140**	**0 – 4.8**	

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3. Research activity:

The main topic of my research activity is the study and optimization of networking in modern enterprises.

Industrial Context: In modern enterprises, independently from the main business of the company, the IT infrastructure represents a crucial asset capable to deliver a business value and a competitive advantage. A well designed and functioning IT infrastructure can indeed: greatly rise quality and reduce time needed to carry out business processes; make much easier to catch customer data from which get useful business driving insights; assure availability and consistency of the IT services offered to both internal (employees and collaborators) and external stakeholder (third parties and customers).

Being the network the backbone of the IT infrastructure, the problem of measuring its performance is a topic of great interest.

Research Context: Several methods have been proposed in literature to measure Quality of Service parameters such as bandwidth utilization, packet loss, delay etc. For instance, in the case of Available Bandwidth (AB) tools like PathChirp, Pathload, Abing, Spruce, DietTopp, Assolo have been presented in literature. Each of these tools adopts a different approach and has consequently some pros and cons. Performance of these tools has usually been measured in terms of accuracy, intrusiveness, and probing time. The intrusiveness is the total amount of probing traffic generated during measurement sessions, while the probing time can be defined as the difference between timestamps of first and last probe packet, and thus is related to the time needed by the algorithm to produce the measurement. As many comparative studies have shown, the aforementioned tools perform better or worse depending on the network setup and state [1,2].

Moreover, the enterprises have changed a lot over the last years along with their network, with new trends like the Internet of Things, Software Defined Networks, and cloud or hybrid cloud IT infrastructures. In these conditions the traditional measurement methods seem poorly performing in facing the new challenges posed by the different network configuration and behaviour, thus the urge to introduce novel approaches to the problem[3].

My research activities have focused on the development of novel techniques to measure network performance more accurately and efficiently, and in particular on the application of machine learning techniques to dynamically select the most fitting measurement tool according to varying network *condition.*

[1] Giuseppe Aceto, Alessio Botta, Antonio Pescapè, Maurizio D'Arienzo, Unified Architecture for Network Measurement: the case of available bandwidth Journal of Network and Computer Applications, Elsevier, Volume 35, Issue 5, September 2012, Pages 1402-1414

[2] Emanuele Goldoni and Marco Schivi, End-to-End Available Bandwidth Estimation Tools, An Experimental Comparison University of Pavia, Dept. of Electronics, 27100-Pavia, Italy (2018)

[3]Pèter Megyesi, Alessio Botta, Giuseppe Aceto, Antonio Pescapè, Sàndor Molnàr, Challenges and solution for measuring available bandwidth in software defined networks Computer Communications, Elsevier, Volume 99, 1 February 2017, Pages 48-61

4. Research products:

In preparation: Alessio Botta, Gennaro Esposito Mocerino, Stefano Cilio, Giorgio Ventre, A Machine Learning approach for dynamic selection of available bandwidth measurement tools according to varying network condition.

5. Conferences and seminars attended