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

PhD Student: Vittorio Orbinato

Cycle: XXXVI

Training and Research Activities Report

Year: First

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Tutor: prof. Domenico Cotroneo   _____

Co-Tutor: prof. Roberto Natella

Date: October 28th, 2021

Training and Research Activities Report
PhD in Information Technology and Electrical Engineering

Cycle: XXXVI   **Author: Vittorio Orbinato**
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1. Information:

- ➢ **PhD student: Vittorio Orbinato**
- ➢ **DR number: DR995144**
- ➢ **Date of birth: 20/11/1996**
- ➢ **Master Science degree: Computer Engineering**
  University: Università degli Studi di Napoli Federico II
- ➢ **Doctoral Cycle: XXXVI**
- ➢ **Scholarship type: MUR PON**
- ➢ **Tutor: prof. Domenico Cotroneo**
- ➢ **Co-tutor: prof. Roberto Natella**

2. Study and training activities:

Robot Manipulation and Control	**Seminar**	**2.5**	**0.5**	**17/11/20**	**Prof. Bruno Siciliano (DIETI)**	**Y**
Digital Project Management: practices, processes, techniques, tools and scientific approach	**Seminar**	**1.0**	**0.2**	**18/11/20**	**Data Science MSc & DIETI**	**Y**
#andràtuttobene: Images, Texts, Emojis & Geodata in a Sentiment Analysis Pipeline	**Seminar**	**1.5**	**0.3**	**25/11/20**	**Data Science MSc & DIETI**	**Y**
Patent Searching Best Practices with IEEE Xplore	**Seminar**	**1.0**	**0.2**	**27/11/20**	**IEEE**	**Y**
5G International PhD School	**Doctoral School**	**24.0**	**3.0**	**01-03/12/20**	**CNIT**	**Y**
How to Get Published with IEEE	**Seminar**	**1.5**	**0.3**	**02/12/20**	**IEEE**	**Y**
At the Nexus of Big Data, Machine Intelligence and Human Cognition	**Seminar**	**1.0**	**0.2**	**02/12/20**	**Data Science MSc & DIETI**	**Y**
Exploiting Deep Learning and Probabilistic Modeling for Behavior Analytics	**Seminar**	**1.0**	**0.2**	**09/12/20**	**Data Science MSc & DIETI**	**Y**

GDPR basics for computer scientists	Seminar	1.5	0.3	10/12/20	Prof. Piero Bonatti (DIETI)	Y
Data Driven Transformation in WINDTRE through Managers' voice	Seminar	2.0	0.4	16/12/20	Data Science MSc & DIETI	Y
From Photometric Redshift to Improved Weather Forecasts: an interdisciplinary view on machine learning	Seminar	1.0	0.2	13/01/21	Data Science MSc & DIETI	Y
Cybercrime and electronic evidence	Seminar	1.0	0.2	20/01/21	Data Science MSc & DIETI	Y
AI LEGAL: Artificial Intelligence for notary's sector	Seminar	1.0	0.2	27/01/21	Data Science MSc & DIETI	Y
The era of Industry 4.0: new frontiers in business model innovation	Seminar	1.0	0.2	03/02/21	Data Science MSc & DIETI	Y
Machine learning: causality lost in translation	Seminar	1.5	0.3	10/02/21	Data Science MSc & DIETI	Y
Approaches to Graph Machine Learning	Seminar	1.0	0.2	17/02/21	Data Science MSc & DIETI	Y
Visual Interaction and Communication in Data Science	Seminar	2.0	0.4	03/03/21	Data Science MSc & DIETI	Y
Dai mainframe all'IoT: una retrospettiva sull'evoluzione delle architetture di calcolo	Seminar	2.0	0.4	08/03/21	Prof. Antonino Mazzeo (DIETI)	Y
Scientific programming and visualization with Python	Course	18.0	2.0	08-10/03/21	DiSt (UNINA)	Y
Big data and Computational Linguistics	Seminar	2.0	0.4	10/03/21	Data Science MSc &	Y

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Sensoria Health	Seminar	1.0	0.2	17/03/21	Data Science MSc & DIETI	Y
The coming revolution of Data Driven Discovery (a fourth Methodological Paradigm of Science)	Seminar	1.5	0.3	25/03/21	SSM	Y
Distributional Semantics Methods: how Linguistics features can improve the semantic representation	Seminar	1.5	0.3	28/04/21	Data Science MSc & DIETI	Y
Ethics of quantification	Seminar	2.0	0.4	26/05/21	Data Science MSc & DIETI	Y
Risk assessment in real life: experiences from the railway domain	Seminar	1.5	0.3	26/05/21	Prof. Valeria Vittorini (DIETI)	Y
Data Management	Course	28.0	6.0	16/06/21	Prof. Flora Amato (DIETI)	Y
Sadas Engine, an innovative DBMS for the Data Warehouse, great performance in the VLDB environment	Seminar	2.0	0.4	23/06/21	Data Science MSc & DIETI	Y
Intelligenza Artificiale	Course	28.0	6.0	21/09/21	Prof. Flora Amato (DIETI)	Y
Strategic Orientation for STEM Research & Writing	Course	18.0	4.0	15/06/21-14/10/21	Dr. Chie Shin Fraser	Y
Qiskit: state of the art and tools for Quantum Computers from IBM	Seminar	2.0	0.4	15/10/21	Prof. A. S. Cacciapuoti (DIETI)	Y
Second Quantum Revolution: innovation trends and expected industrial impacts	Seminar	2.0	0.4	22/10/21	Prof. A. S. Cacciapuoti (DIETI)	Y
La norma ISO 27001 e la sua	Seminar	2.0	0.4	22/10/21	Proff. D. Cotroneo,	Y

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					R. Natella, S. P. Romano (DIETI)	
contestualizzazione nel panorama normativo nazionale ed internazionale						

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**	**2.6**	**4.4**		**10.0**
Bimonth 2		**1.3**	**8.7**		**10.0**
Bimonth 3	**2.0**	**2.0**	**6.0**		**10.0**
Bimonth 4	**6.0**	**1.1**	**2.9**		**10.0**
Bimonth 5			**10.0**		**10.0**
Bimonth 6	**10.0**	**1.2**	**2.8**		**14.0**
Total	**21.0**	**8.2**	**34.8**		**64.0**
Expected	**30 - 70**	**10 - 30**	**80 - 140**	**0 – 4.8**	

3. Research activity:

My research activity concerns the enhancement of training environment for cybersecurity professionals, in particular Cyber Ranges which represent the most popular and widespread solution to train professionals for responding to cyber-threats and attacks. State-of-the-art Cyber Ranges are affected by two main problems: high costs, in terms of time and flexibility, and low flexibility. In order to set up a Cyber Range, a huge manual effort is needed from its managers for the creation of all the machines and networks and the configuration of the training environment. Moreover, the monitoring of the participants' activities during training sessions is intrusive due to the need of installing several specific tools on each machine and also because the analysis of logs and network traces is mostly manual. A significant number of people is also involved in training exercises, in order to cover all the roles needed for a proper simulation. Another critical problem is the possible leak of sensitive data, because Cyber Ranges run on external infrastructures and the scenarios could contain information which should not be made public. My research activity aims to define and develop new Cyber Range techniques which will be integrated into a next-generation platform. Such platform will have the following properties:

- *Realistic replication of the target infrastructure and advanced scenario simulation*: the infrastructure will be cloned in order to avoid impacting on the actual one. Scenarios will be created using a high-level domain-specific language;
- *Non-intrusive monitoring system*: thanks to the use of Virtual Machine Introspection (VMI) techniques, the monitoring of the participants' activities will be silent and automatic, without any manual effort from the training managers;
- *Actor simulation*: the platform will provide intelligent simulated actors to managers, in order to partially/fully automate training sessions. Such actors will be developed using AI techniques and will allow small teams to complete training session successfully.

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During the first year of my research activity, I studied virtualized environments for representative Cyber Ranges. Such study allowed me to develop a prototype test environment. My work was also focused on the study of the adversary emulation problem and the experimentation of the current adversary emulation tools, in order to better understand how to replicate and automate the behavior of an adversary.

4. Research products:

Liguori, P.; Al-Hossami, E.; Orbinato, V.; Natella, R.; Shaikh, S.; Cotroneo, D.; Cukic, B.

"EVIL: Exploiting Software via Natural Language"

32nd International Symposium on Software Reliability Engineering, ISSRE21, 2021 (accepted)

Orbinato, V.

"A next-generation platform for Cyber Range-as-a-Service"

32nd International Symposium on Software Reliability Engineering, ISSRE21, 2021 (accepted)

5. Conferences and seminars attended

Conferences:

- 32nd International Symposium on Software Reliability Engineering (ISSRE 2021), Wuhan, China, 25-28/10/2021 (Online). I attended this conference as presenting author for the paper *"A next-generation platform for Cyber Range-as-a-Service"*.

6. Activity abroad:

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7. Tutorship

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