UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

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

Activities and Publications Report

PhD Student: Luigi Libero Lucio Starace

Student ID: DR993893

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

PhD program student's start date: 01/11/2019
PhD program student's end date: 30/11/2022

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PhD scholarship funding entity:
Funded by NetCom Group SpA.

General information

Luigi Libero Lucio Starace received in year 2018 the Master of Science degree in Computer Science from the University of Napoli Federico II. He attended a curriculum in Computer Science within the PhD program in Information Technology and Electrical Engineering. He received a grant from NetCom Group SpA.

Study activities

Attended Courses

Year	Course Title	Type	Credits	Lecturer	Organization
1st	Accelerated computing with CUDA C/C++	Ad hoc course	0.4	Dr. Luigi Troiano	DIETI, Università degli Studi di Napoli Federico II
1st	Intelligenza artificiale ed etica: la ricerca in IA alla prova delle sfide etiche	Ad hoc course	1.6	Prof. P.A. Bonatti et al.	DIETI, Università degli Studi di Napoli Federico II
1st	Safety Critical Systems for Railway Traffic Management	Ad hoc course	3.3	Dr. Mario Barbareschi	DIETI, Università degli Studi di Napoli Federico II
1st	Matlab Fundamentals	Ad hoc course	2	Prof. Agostino De Marco et al.	Università degli Studi di Napoli Federico II
1st	Virtualization technologies and their applications	Ad hoc course	4	Dr. Luigi De Simone	DIETI, Università degli Studi di Napoli Federico II
1st	Innovation management, entrepreneurship, and intellectual property	Ad hoc course	5	Prof. P. Rippa	StartCup Campania 2020
1st	Design and Implementation of Augmented Reality Software Systems	Ad hoc course	4	Dr. D. Amalfitano at al.	DIETI, Università degli Studi di Napoli Federico II
1st	Metodi Formali	M. Sc. course	3	Prof. Valeria Vittorini	DIETI, Università degli Studi di Napoli Federico II
1st	Machine Learning	Ad hoc course	4	Prof. A. Corazza et al.	DIETI, Università degli Studi di Napoli Federico II
1st	Strategic Orientation for STEM Research & Writing	Ad hoc course	3.6	Dr. Chie Shin Fraser	DIETI, Università degli Studi di Napoli Federico II
2nd	Data Science for Patient Records Analysis	Ad hoc course	2.5	Prof. Marcello Cinque et al.	DIETI, Università degli Studi di Napoli Federico II
2nd	Statistical data analysis for science and engineering research	Ad hoc course	4	Prof. Roberto Pietrantuono	DIETI, Università degli Studi di Napoli Federico II

2nd	Scientific programming and visualization with Python	Ad hoc course	2	Prof. A. Botta	DIETI, Università degli Studi di Napoli Federico II
2nd	Computer Forensics' methods, practices, and tools	Ad hoc course	3	Dr. Giovanni Cozzolino	DIETI, Università degli Studi di Napoli Federico II

Attended PhD Schools

Year	School title	Location	Credits	Dates	Organization
3rd	8th International School on Software Engineering	Bolzano, Italy	3.6	4-6 Luly 2022	Free University of Bozen-Bolzano, Italy

Attended Seminars

Year	Seminar Title	Credits	Lecturer	Lecturer affiliation	Organization
1st	A dynamic and probabilistic orienteering problem	0.2	Prof. Claudia Archetti	ESSEC Business School in Paris	University of Napoli Federico II
1st	Flexible two-echelon location-routing for supply networks	0.2	Prof. Claudia Archetti	ESSEC Business School in Paris	University of Napoli Federico II
1st	Lo spazio cibernetico come dominio bellico	0.4	Dr. Giampiero Siroli	Università di Bologna	University of Napoli Federico II
1st	Marked Point Processes For Object Detection And Tracking In High Resolution Images: Application To Remote Sensing Data	0.2	Prof. Josiane Zerubia	INRIA	University of Napoli Federico II
1st	Cybersecurity and Fuzzing for Robots, Blockchain, and more	0.2	Dr. Antonio Ken Iannillo	University of Luxembourg	University of Napoli Federico II
1st	Computational Biology: Large scale data analysis to understand the molecular bases of human diseases	0.2	Prof. Michele Ceccarelli	DIETI	University of Napoli Federico II
1st	Elettromagnetismo e salute	0.2	Prof. Rita Massa	DIETI	University of Napoli Federico II
1st	How to get published with IEEE	0.4	Eszter Lukacs	IEEE	Dott. Alessandra Scippa, Unina
1st	Design e Nuove tecnologie. Possibili scenari per fronteggiare l'emergenza	0.2	Amleto Picerno Ceraso	Innovation Village 2020	
1st	La programmazione europea e la ricerca. Nuovi scenari della	0.4	Ing. Filippo Ammirati	Innovation Village 2020	

1st	programmazione europea dopo il 2020 - La gestione di un progetto di ricerca				
1st	SAS Analytics	0.4	Dr. Cinzia Gianfiori	SAS Academic Program Manager	
1st	Planning 5G under EMF constraints: challenges and opportunities	0.4	Prof. L. Chiaraviglio	, Univ. of Rome Tor Vergata	Dr.ssa A. Cacciapuoti, Dr. M. Caleffi - DIETI
1st	Joint Design of Optics and Post-Processing Algorithms Based on Deep Learning for Generating Advanced Imaging Features	0.4	Raja Giyres	IEEE Computational Imaging Technical Committee	
1st	Virtual Seminars on 'Sensing'	0.8	Dr. J. Wenger et al.		Plasmonica, Prof. Carlo Forestiere, DIETI
1st	Bias from the wild	0.4	Prof. Nello Cristianini	CVPL - Associazione Italiana per la ricerca in Computer Vision, Pattern recognition e machine Learning	
1st	Software Safety for Aerospace Applications	0.3	Alan Tribble	On-line course offered on the IEEE Xplore platform	
1st	Amazon EC2 and S3 Hands-on	0.3	Cloud Strategy Partners LLC	On-line course offered on the IEEE Xplore platform	
1st	Large Scale Training of Deep Neural Networks	0.4	Dr. Giuseppe Fiameni		
1st	Noninvasive Mapping of Electrical Properties using MRI	0.3	Prof. Riccardo Lattanzi		Prof. R. Massa Dip. Fisica UNINA, Prof. G. Ruello Dieti UNINA
1st	Exploring Autonomy in Robotic Flexible Endoscopy	0.4			Prof. Fanny Ficuciello
1st	"Linear regression in PyTorch" and "Convolutional Neural Networks"	0.4	Dr. Christian Hundt	CINI AIIS Labs.	Dr. Giuseppe Fiameni
1st	"Efficient Data Loading with DALI" and "Mixed Precision Training using Apex"	0.2	Dr. Giuseppe Fiameni et al.	CINI AIIS Labs.	Dr. Giuseppe Fiameni

1st	Wearable Brain-Computer Interface for Augmented Reality-based Inspection in Industry 4.0	0.2	Prof. P. Arpaia, DIETI	DIETI	DIETI
1st	Algorithmic Accountability – Affidabilità e responsabilità degli algoritmi	0.4	Dr. Joshua A. Kroll		Fondazione Ugo Bordoni
2nd	Robot Manipulation and Control	0.5	Prof. Bruno Siciliano	DIETI	Proff. Paolo Dario and Cesare Stefanini
2nd	Digital Project Management: practices, processes, techniques, tools, and scientific approach.	0.2	Dr. Dario Carotenuto		Part of the Picariello Lectures on Data Science
2nd	Science, Reality and Credibility.	0.3	Prof. Saul Perlmutter		FuturoRemoto2020
2nd	#andràtuttobene: Images, Texts, Emojis and Geodata in a Sentiment Analysis Pipeline	0.3	Prof. Serena Pelosi		Part of the Picariello Lectures on Data Science
2nd	Patent Searching Best Practices with IEEE Xplore	0.2	Eszter Lukacs	IEEE	Dott. Alessandra Scippa
2nd	JISET: JavaScript IR-based Semantics Extraction Toolchain	0.2	Prof. Sukyoung Ryu	KAIST	Facebook Testing and Verification Symposium
2nd	Automatic Generation of Optimal Mutant Reduction Strategies	0.2	Prof. Federica Sarro	UCL	Facebook Testing and Verification Symposium
2nd	Testing Web Enabled Simulation at Scale using Metamorphic Testing	0.2	Prof. Mark Harman	UCL	Facebook Testing and Verification Symposium
2nd	Metamorphic Testing of Android Graphics Drivers	0.2	Prof. Alistair Donaldson	Imperial College London	Facebook Testing and Verification Symposium
2nd	Software robustness: A survey, a theory, and some prospects	0.2	Prof. David Clark	UCL	Facebook Testing and Verification Symposium
2nd	Using Developers' Intuitions to Improve Property-Based Tests	0.2	Prof. John Hughes	Chalmers University	Facebook Testing and Verification Symposium
2nd	CRISPR-cas9 screens and multi-omic data integration for identifying and prioritising anti-cancer therapeutic	0.3	Prof. Francesco Iorio	DIETI	Computational and Quantitative Biology Ph.D. Program (DIETI)
2nd	Exploiting Deep Learning and Probabilistic Modeling for Behaviour	0.2	Prof. Giuseppe Manco		Part of the Picariello Lectures on Data Science

	Analytics				
2nd	GDPR basics for computer scientists	0.3	Dr. Rigo Wenning	Prof. Bonatti (DIETI)	DIETI
2nd	Data Driven Transformation in WINDTRE through Managers voice	0.4	Prof. Marcella Savarese et al.		Part of the Picariello Lectures on Data Science
2nd	From Photometric Redshifts to Improved Weather Forecasts: an interdisciplinary view on machine learning	0.2	Dr. Kai Polsterer	HITS	Part of the Picariello Lectures on Data Science
2nd	Cybercrime and e-evidence: the criminal justice response	0.4	Dr. Matteo Lucchetti	Council of Europe	Part of the Picariello Lectures on Data Science
2nd	AI: Artificial Intelligence for notary's sector - a case study	0.2	Dr. Salvatore Palange	FLUEL	Part of the Picariello Lectures on Data Science
2nd	The era of Industry 4.0: new frontiers in business model innovation	0.2	Dr. Marco Balzano	University of Venice Ca' Foscari	Part of the Picariello Lectures on Data Science
2nd	Machine learning: causality lost in translation	0.3	Dr. Edwin A. Valentijn	Rijksuniversiteit Groningen	Part of the Picariello Lectures on Data Science
2nd	Signature reversion and other computational strategies for identifying drug repositioning opportunities	0.3	Prof. Francesco Iorio	DIETI	Organized by the Computational and Quantitative Biology Ph.D. Program
2nd	Supporting machine learning with biological knowledge to extract insight from omics data	0.2	Prof. Julio Saez-Rodriguez		Organized by the Computational and Quantitative Biology Ph.D. Program
2nd	Robo Ludens: A game design taxonomy for human-robot interaction	0.2	Dr. John Edison Munoz Cardona	University of Waterloo	Professor Silvia Rossi, PRISCA Lab. - DIETI
2nd	Dai Mainframe all'IoT: una retrospettiva sull'evoluzione delle architetture di calcolo	0.2	Prof. Antonino Mazzeo	DIETI	Professor Alessandro Cilardo, DIETI
2nd	Big Data and Computational Linguistics	0.4	Prof. Francesco Cutugno	DIETI	Part of the Picariello Lectures on Data Science
2nd	The coming revolution of Data driven Discovery (a fourth Methodological Paradigm of Science)	0.3	Prof. Giuseppe Longo	UNINA	Part of the Picariello Lectures on Data Science
2nd	IEEE Authorship and Open	0.3	Eszter	IEEE	

	Access Symposium: Best Practices to Get Published to Increase the Exposure and Impact of Your Research		Lukács		
2nd	Artificial Intelligence and 5G combined with holographic technology: a new perspective for remote health monitoring	0.4	Dr. Pietro Ferraro et al.	CNR	Prof. Antonia Tulino, DIETI
2nd	Distributional Semantics Methods: How Linguistic features can improve the semantic representation	0.2	Prof. Alessandro Maisto	Università di Salerno	Part of the Picariello Lectures on Data Science
2nd	Risk assessment in real life: experiences from the railway domain	0.3	Dr. E. Di Martino et al.	Hitachi Rail	Prof. Valeria Vittorini – DIETI
2nd	'Sadas Engine', an innovative DBMS for the DATA WAREHOUSE, great performance in the VLDB environment	0.3	Luca De Rosa	SADAS	Part of the Picariello Lectures on Data Science
2nd	L'esposizione ai campi elettromagnetici generati dal sistema 5G - Metodologie scalari e vettoriali di misura dell'esposizione e tecniche di estrapolazione	0.8	Dr. S. Adda et al.		Prof. Nicola Pasquino (DIETI)
2nd	SAE 2021 - Big4small, Data Science Methodology Transfer: Big to Small	0.4	Dr. Edwin Valentijn et al.	University of Groningen	Session of the SAE2021 conference, chaired by Prof. Giuseppe Longo
2nd	Analyzing and Supporting the Evolution of Data-Intensive Systems	0.2	Prof. Antony Cleave	Visiting professor, USI	Prof. Paolo Tonella, Software Institute, USI
2nd	Visualizing Discord Servers	0.2	Dr. Marco Raglianti	USI	Prof. Paolo Tonella, Software Institute, USI
2nd	Qiskit: state of the art and tools for Quantum Computers from IBM	0.4	Dr. Federico Accetta	IBM Italia	Prof. Cacciapuoti (DIETI)
2nd	Quality Metrics and Oracles for Autonomous Vehicles Testing	0.2	Dr. Gunel Jahangirova	USI	Prof. Paolo Tonella, Software Institute, USI
2nd	Second Quantum Revolution: innovation trends and expected	0.4	Dr. A. Manzalini	TIM	Prof. Cacciapuoti (DIETI)

	industrial impacts				
3rd	When does correlation imply causation?	0.2	Prof. C. A. Furia	Università della Svizzera Italiana	Università della Svizzera Italiana
3rd	Do you understand the code that you write? 'I hope the Tas won't look at this!	0.2	Dr. A. Gallidabino	Università della Svizzera Italiana	Università della Svizzera Italiana
3rd	Supporting code-related tasks via Deep Learning	0.2	Dr. A. Mastropaolo	Università della Svizzera Italiana	Università della Svizzera Italiana
3rd	Automated Test Input Generation to Check if the Machine Actually Learned	0.2	Dr. V. Riccio	Università della Svizzera Italiana	Università della Svizzera Italiana
3rd	Mobile Apps: The Dark Side of the Droid	0.3	Prof. A. Merlo	Università di Genova	Università della Svizzera Italiana
3rd	Can a Text-to-Speech Engine Generate Human Sentiments?	0.2	Prof. Vijay K. Gurbani		Università di Napoli Federico II
3rd	Software Product Line Management and Software Versioning in SADAS	0.4	Dr. Roberto Mosca	SADAS	Università di Napoli Federico II

Research activities

Luigi Libero Lucio Starace participated in research activities in the domain of End-to-End testing of web and mobile applications. In the domain of End-to-End web testing, the candidate tackled the problem of near-duplicate web page detection in the automatic generation of End-to-End tests for web apps. The candidate worked on the definition and on the empirical evaluation of two novel near-duplicate detection techniques. In the domain of End-to-End GUI testing of Android apps, the candidate worked on two empirical studies aimed at comparing the effectiveness of different testing techniques. Lastly, in the domain of non-functional end-to-end testing of web applications, the candidate worked on a novel solution to support the automatic generation of workloads for performance testing for web applications, starting from existing end-to-end tests.

Tutoring and supplementary teaching activities

Luigi Libero Lucio Starace carried out tutoring and supplementary teaching activities within B.Sc. ("Ingegneria del Software", "Object Orientation") and M.Sc. courses ("Software Project Management and Evolution", "Operating Systems for Mobile, Cloud, and IoT") in the Computer Science programs at the Università degli Studi di Napoli Federico II. Within these courses, Luigi Libero Lucio Starace prepared several seminar lectures and exercises. Moreover, during his Ph.D., Luigi Libero Lucio Starace co-supervised 14 B.Sc. in Computer Science students working on their curricular internships and theses, as well as 4 M.Sc. in Computer Science students working on their theses.

Credits summary

PhD Year	Courses	Seminars	Research	Tutoring / Supplementary Teaching
1st	30.7	7.9	32	1.6
2nd	11.5	10.8	41	1.6
3rd	3.6	1.7	57	1.6
TOT	45.8	20.4	130	4.8

Research periods in institutions abroad and/or in companies

PhD Year	Institution / Company	Hosting tutor	Period	Activities
2nd and 3rd	Università della Svizzera Italiana, Software Institute, Lugano, Svizzera	Paolo Tonella, Full Professor and Chair of the TAU (Testing AUtomated) Laboratory	01/10/2022 to 31/12/2022	Research on Web Application Testing, near-duplicate detection techniques Lab experiments on novel near-duplicate detection techniques Joint scientific paper preparation.

PhD Thesis

In the PhD Thesis, Luigi Libero Lucio Starace presents contributions in the domain of End-to-End testing of web and mobile applications. The thesis is articulated in three main chapters, each of which presents the candidate's contribution in a different sub-domain of End-to-End testing, namely (1) GUI-level testing of web applications, (2) performance testing of web applications, and (3) GUI-level testing of Android applications.

In the first domain, the candidate presents two novel techniques, based on Machine Learning approaches, to address the for the near-duplicate detection problem, a key issue in the automatic generation of GUI-level tests for web apps. The effectiveness of the proposed techniques, as well as the practical benefits of their application in automatic test generation for web apps, are assessed in an empirical study involving massive datasets available in the literature and open-source web applications.

In the second domain, the candidates presents a novel technique for automating the generation of workloads for performance testing of web applications, starting from existing GUI-level web tests. The effectiveness of the proposed technique is preliminarily evaluated in an industrial case study. Results showed that the proposed approach is promising, and capable of automatically generating workloads that are comparable to those that are manually generated by practitioners.

Lastly, in the third domain, the candidate presents two empirical studies aimed at investigating the effectiveness of different techniques for end-to-end GUI-level testing of mobile applications. The studies involve 20 masters' students and four open-source Android application. The first study aims at comparing the testing effectiveness of automatic test generation tools against that of unskilled practitioners using Capture and Replay tools and exploratory testing strategies. The second study focuses on a crowdtesting scenario in which crowdtesters use Capture and Replay tools to generate test suites for Android apps. Both studies provide useful insights to Software Project Managers and Decision Makers, on which they could make more informed decisions when establishing a testing strategy for a given mobile app.

Publications

Research results appear in *4* papers published in international journals, *0* papers published in national journals, *8* contributions to international conferences, *0* contributions to national conferences, *0* patents.

List of scientific publications

International journal papers

V. Casola, A. De Benedictis, S. Di Martino, N. Mazzocca, L. L. L. Starace,
Security-aware Deployment Optimization of Cloud-Edge systems in Industrial IoT,
IEEE Internet of things Journal,
vol. 8 (16), pp. 12724-12733, 2021, DOI: 10.1109/JIOT.2020.3004732.

S. Di Martino, A. R. Fasolino, L. L. L. Starace, P. Tramontana,
Comparing the effectiveness of capture and replay agains automatic input generation for android graphical user interface testing,
Software Testing, Verification and Reliability,
vol. 31 (3), 2021, DOI: 10.1002/stvr.1754

D. Asprone, S. Di Martino, P. Festa, L. L. L. Starace,
Vehicular crowd-sensing: a parametric routing algorithm to increase spatio-temporal road network coverage,
International Journal of Geographic Information Science,
vol. 35 (9), pp. 1876-1904, 2021, DOI: 10.1080/13658816.2021.1893737

S. Di Martino, L. L. L. Starace,
Towards Uniform Urban Map Coverage in Vehicular Crowd-Sensing: a Decentralized Incentivization Solution,
IEEE Open Journal of Intelligent Transportation Systems,
vol. 3, pp. 695-708, 2022, DOI: 10.1109/OJITS.2022.3211540.

International conference papers

M. Benerecetti, U. Gentile, S. Marrone, R. Nardone, A. Peron, L. L. L. Starace, V. Vittorini,
From Dynamic State Machines to Promela,
26th International SPIN Symposium on Model Checking of Software,
Beijing, China, 2019, pp. 56-73, Springer, DOI: 10.1007/978-3-030-30923-7_4.

F. Altiero, A. Corazza, S. Di Martino, A. Peron, L. L. L. Starace,
Inspecting code churns to prioritize test cases,
32nd IFIP International Conference on Testing Software and Systems,
Naples, Italy, Dec. 2020, pp. 272-285, Springer, DOI: 10.1007/978-3-030-64881-7_17.

M. Benerecetti, F. Mogavero, A. Peron, L. L. L. Starace,
Expressing structural temporal properties of safety critical hierarchical systems,
14th International Conference on the Quality of Information and Communications Technology,
Algarve, Portugal, Sep. 2021, pp. 356--369, Springer, DOI: 10.1007/978-3-030-85347-1_26.

S. Di Martino, L. L. L. Starace,
Vehicular Crowd-Sensing on Complex Urban Road Networks: A Case Study in the City of Porto,
24th Euro Working Group on Transportation,
Aveiro, Portugal, Sep. 2021, pp. 350-357, Elsevier, DOI: 10.1016/j.trpro.2022.02.044.

A. Corazza, S. Di Martino, A. Peron, L. L. L. Starace,
Web Application Testing: Using Tree Kernels to Detect Near-duplicate States in Automated Model Inference,
15th IEEE/ACM International Symposium on Empirical Software Engineering and Measurement,
Bari, Italy, Oct. 2021, ACM, DOI: 10.1145/3475716.3484187.

F. Altiero, A. Corazza, S. Di Martino, A. Peron, L. L. L. Starace,
ReCover: a Curated Dataset for Regression Testing Research,
19th International Conference on Mining Software Repositories,
Pittsburgh, USA, May 2022, pp. 196-200, ACM, DOI: 10.1145/3524842.3528490.

L. L. L. Starace, A. Romdhana, S. Di Martino
GenRL at the SBST 2022 Tool Competition,
15th IEEE/ACM International Workshop on Search-Based Software Testing (SBST),
Pittsburgh, USA, May 2022, IEEE, DOI: 10.1145/3526072.3527533.

F. Altiero, G. Colella, A. Corazza, S. Di Martino, A. Peron, L. L. L. Starace,
Change-Aware Regression Test Prioritization using Genetic Algorithms,
48h Euromicro Conference on Software Engineering and Advanced Applications,
Gran Canaria, Spain, Sep. 2022, to appear in the proceedings.

Patents and/or spin offs
None.

Awards and Prizes
None.

Date 19/11/2022

PhD student signature

Supervisor signature