



UNIVERSITÀ DEGLI STUDI DI NAPOLI
FEDERICO II

itee^{PhD}
information technology
electrical engineering



Luca Giamattei

Reasoning-based Software Testing

Tutor: Roberto Pietrantuono

Cycle: XXXVII

Year: First

My background

- MSc degree in Computer Engineering
 - Thesis: “MicroserTest: a flexible tool for automated testing of microservices applications”
- Research group: DEpendable and Secure Software Engineering and Real-Time Systems (DESSERT – Proff. Russo, Cotroneo, Cinque – www.dessert.unina.it)
- PhD start date: 1st November 2021
- Fellowship: Unina

Summary of study activities

| | Courses | Seminars | Research | Tutorship |
|------------|---------|----------|----------|-----------|
| First Year | 29 | 1,1 | 28,3 | 1,6 |
| Expected | 20-40 | 5-10 | 10-35 | 0-1,6 |

- **PhD schools:**

- International Winter School on Blockchain Technology and Applications – Hyperledger, Università di Camerino
- Advanced Course on Data Science & Machine Learning, Proff. Nicosia, Pardalos

- **Courses:**

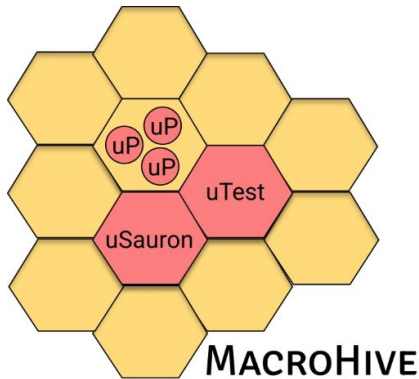
- Machine Learning (MSc course)
- Statistical data analysis for science and engineering research (PhD course)
- Virtualization technologies and their applications (PhD course, Dr. De Simone)

- **Conferences attended:**

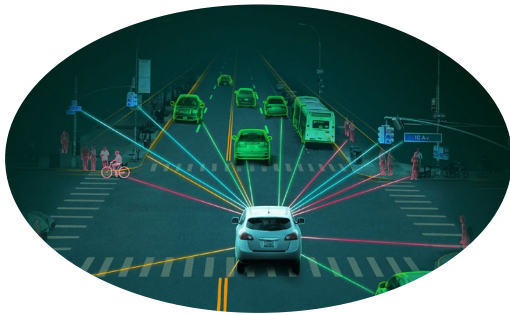
- International Conference on the Quality of Information and Communications Technology (QUATIC), Talavera de la Reina, Spain, September 2022

Research field of interest: Software Testing

Research topics:



- Testing of Microservices Architectures
 - Product:
MacroHive, a prototype for automated grey-box MSA testing



- Testing of Machine Learning-based Autonomous Systems



Testing Microservices

- Automated testing and monitoring of Microservices Architectures
- Activities:
 - Research of techniques for testing of microservices
 - Survey on microservices monitoring tools
 - Research on energy consumption in microservices architectures
- EU Marie Marie Skłodowska-Curie uDevOps (PI: Roberto Pietrantuono) – www.udevops.eu
- 3 (not consecutive) months spent in “Panel Sistemas Informaticos” (Madrid), a Spanish IT company



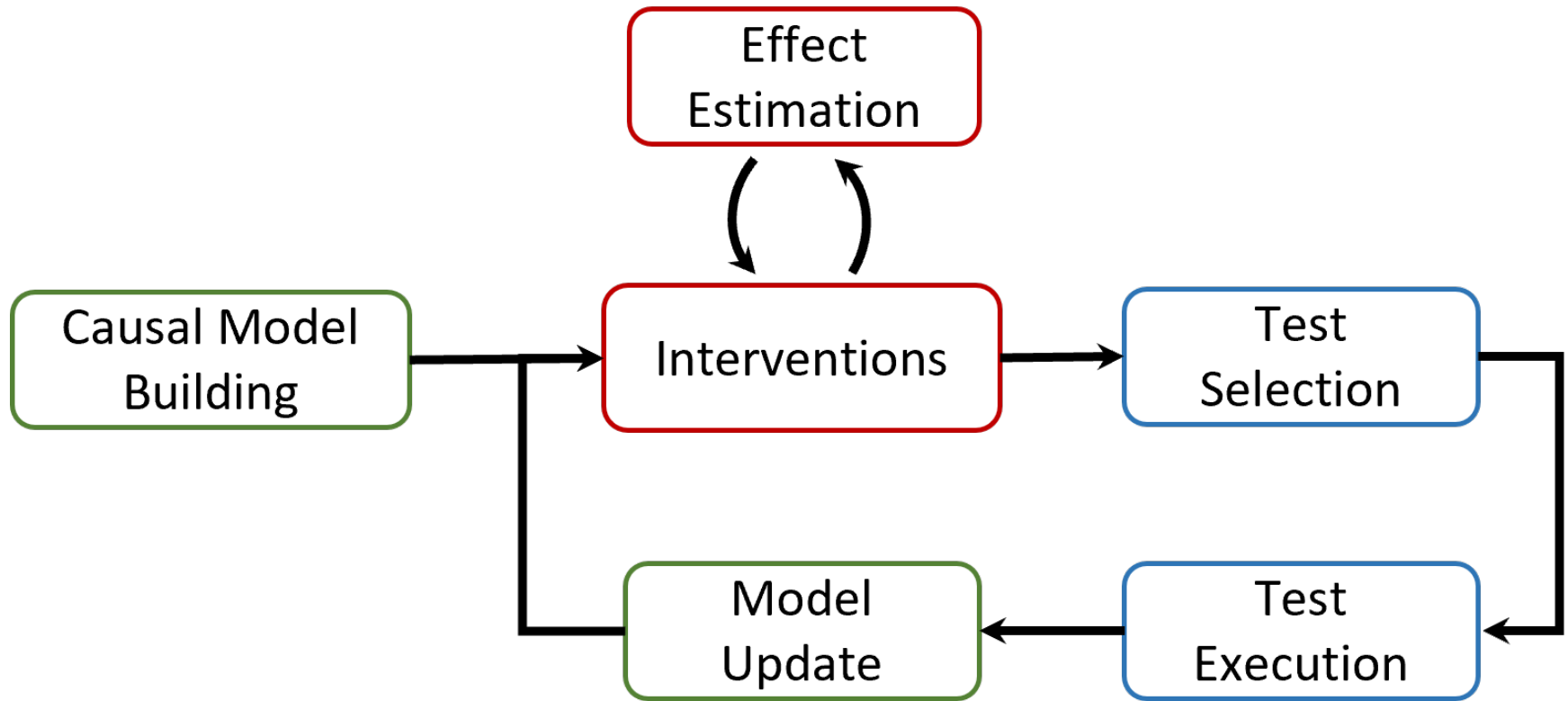
Research activity: Overview

- **Problem:**
 - Testing activities are costly and time-consuming
 - Automatic testing still a major challenge in many contexts
- **Goal:**
 - Go beyond limits of state-of-the-art Machine Learning-based testing techniques
 - They learn from past observation, but assume that the future resembles the past
- **Proposal:**
 - Development of automatic Reasoning-Based testing techniques aiming to:
 - Reduce cost
 - Increase effectiveness
- **Methodology:**
 - *Causal Discovery* to extract a causal model
 - *Causal Inference* for test case generation

Causal Reasoning in Software Testing

Proposal:

Causal Reasoning for test case generation



Products

| | |
|--------|---|
| [P1] | L. Giamattei, A. Guerriero, R. Pietrantuono, S. Russo, <i>Assessing Black-box Test Case Generation Techniques for Microservices,</i> International Conference on the Quality of Information and Communications Technology (QUATIC), Talavera de la Reina, Spain, September 2022 |
| [P2] | L. Giamattei, A. Guerriero, R. Pietrantuono, S. Russo, <i>Automated Grey-box Testing of Microservice Architectures,</i> IEEE International Conference on Software Quality, Reliability, and Security (QRS), Guangzhou, December 2022 |
| [P3] | L. Giamattei, A. Guerriero, R. Pietrantuono, S. Russo, <i>Testing of Autonomous Driving Systems using Causal Discovery and Causal Inference,</i> IEEE/ACM International Conference on Software Engineering (ICSE), Submitted , Melbourne, May 2023 |
| [P4] | L. Giamattei, R. Pietrantuono, S. Russo <i>Reasoning-Based Software Testing,</i> IEEE/ACM ICSE New Ideas and Emerging Results (ICSE-NIER), Submitted , Melbourne, May 2023 |
| [P1_A] | MacroHive prototype for automated grey-box MSA testing, uDEVOPS2020/MacroHive (github.com) |