Giacomo **Boldini**

PhD Student
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About Me

I am a Ph.D. student in Computer Science focusing on static analysis, abstract interpretation, and program verification, with applications to low-level languages. My works (academic/personal/small-team) span topics such as parallel computing, GPU programming, AI applied to source code analysis, and web development for small to mid-sized websites. As an Arduino/ESP32/self-hosting enthusiast, I enjoy working on DIY projects, exploring embedded systems, and delving into network systems.

Education

PhD in Computer Science
Venice, Italy

Ca' Foscari University of Venice
2023 - On Going

- Research theme: Static Analysis approaches for improving critical Software Engineering.
- Supervisor: Pietro Ferrara.
- Member of the Software Verification and Validation (SVV) research group.

M.S. in Computer Science
Parma, Italy

University of Parma
2020 - 2023

- Grade: 110/110 cum laude.
- Thesis: Source code clustering via explainable code similarity based on control flow graph features.

B.S. in Computer Science
Parma, Italy

University of Parma
2016 - 2019

- Grade: 105/110.
- Thesis: DualSPHysics code profiling with Intel Compiler.

Industrial-Technical High School Diploma in Computer Science
Remedello, Italy

M.R. Padre Giovanni Bonsignori
2011 - 2016

- Grade: 85/100.

Experience

Substitute Teacher
Remedello, Italy

Istituto Omnicomprensivo Bonsignori
Mar. 2024 - Apr. 2024

- Substitute teacher for a full position (18 hours) in Computer Science and Technology Laboratories at a technical high school (secondary level).
- Taught the following subjects: Tecnologie Informatiche (first biennium), Sistemi e Reti, Gestione di progetto e organizzazione di impresa, Tecnologie e Progettazione di Sistemi Informatici e Telecomunicazioni (second triennium).

Curricular Internship
Parma, Italy

University of Parma
Sep. 2022 - Mar. 2023

- Designed and implemented explainable machine learning methodologies in the context of source code similarity.
- Developed a graph representation based on Control-flow Graph and LLVM-IR, with subsequent feature generation through graph indexing tools.
- Performed similarity search using artificial intelligence techniques, including clustering and classification.
- Worked in a team of 4, and presented results at the 9th International Conference on Machine Learning, Optimization, and Data Science (LOD 2023).

Research Fellow
Parma, Italy

University of Parma
Jan. 2022 - Jul. 2023

- Research theme: Implementation of parallel algorithms on GPU (transl.)
- Researched and implemented a new algorithm for NVIDIA GPUs (CUDA/C++) for computing eigenvalues and eigenvectors of small symmetric, positive semidefinite matrices.
- Studied and utilized Tensor Core architecture of NVIDIA GPUs for reimplementation of proprietary numerical computation algorithms.
- Implemented two ad-hoc solutions with CUDA/C++ to improve performance, achieving a speedup of x2N in execution time for matrix diagonalization.

Curricular Internship

Parma, Italy

University of Parma

Jul. 2019 - Dec. 2019

- Studied and profiled C++ code for hydrodynamic simulation (dualSPHysics) using Intel® compiler and Intel® Parallel Studio suite.
- Optimized and parallelized part of the code with OpenMP API to leverage SIMD vector architecture of Intel® processors.
- Achieved a 3x improvement in execution time for the parallelized solution.

Web Developer

Various Locations, Italy

Freelance/Small Group of People

2016 - 2021

- Designed and implemented websites (showcase sites and small e-commerce) for acquaintances and local small businesses.
- Used technologies such as HTML, CSS, Javascript, PHP, SQL, Bootstrap framework, and Wordpress CMS.
- Managed web domains and hosting, and designed website structure and graphical interfaces.
- Created and managed small databases for the websites.

Skills

Software Dev	C++, C, Java, HTML, CUDA, SQL, Python, Prolog (base), MATLAB (base), LLVM-IR
Web Dev	HTML, CSS, JavaScript, PHP
Systems and Tools	Windows, Linux/Ubuntu, Arduino, FPGA (base), NVIDIA GPU, LaTeX, Microsoft Office, LLVM, Git (base)
Driving Licences	Motorbikes: AM (EU/IT), Cars: B (EU/IT)
Languages	Italian (Mother Tongue), English (B2)

Publications

[2024] **G. Boldini, A. Diana, V. Arceri, V. Bonnici, and R. Bagnara**, *"A Machine Learning Approach for Source Code Similarity via Graph-Focused Features"*, in Machine Learning, Optimization, and Data Science, 2024, pp. 53–67. DOI: 10.1007/978-3-031-53969-5_5

Teaching

Teaching Assistant

Ca' Foscari University of Venice

Reti di Calcolatori (CT0373)

Nov. 2024 - On Going

- 30 hours of work
- Assisted professor in documentation setup and building a network simulator

Research Community Activities

Lipari Summer School on Abstract Interpretation (ABSINT24)

Lipari, Italy

Attendee

01/09/2024 – 07/09/2024

- ABSINT24 program link

PLDI24 + Programming Languages Mentoring Workshop (PLMW)

Copenhagen, Denmark

Attendee

24/06/2024 – 28/06/2024

- PLMW program link and PLDI24 program link

Challenges of Software Verification Symposium 2024 (CSV24)

Venice, Italy

Attendee and Session Chair

06/06/2024 – 07/06/2024

- CSV24 program link

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