Elia A. Attardo, Ph.D.

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Scientific Computing Specialist | High-Performance Computing | GPU Development

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Computational physicist with 15+ years of experience in high-performance scientific computing and algorithm development. Expert in GPU-accelerated computing (CUDA), parallel algorithms, and numerical methods for solving complex partial differential equations. Proven track record of achieving 10-20x performance improvements through algorithmic optimization and hardware acceleration.

Core expertise in computational electromagnetics with successful applications across biomedical imaging, industrial simulations, and commercial software development. Strong mathematical foundation combined with practical engineering skills in C++ and CUDA programming.

Areas of Expertise

- **High-Performance Computing:** GPU acceleration (CUDA), multi-GPU systems, parallel algorithms, performance optimization
- **Scientific Computing:** Finite Element Methods (FEM), computational electromagnetics, inverse problems, numerical linear algebra
- **Algorithm Development:** Sparse and dense matrix solvers, preconditioners, domain decomposition methods, iterative solvers
- **Software Engineering:** C++, CUDA C/C++, Python, MATLAB, Wolfram Mathematica, software architecture
- **Mathematical Modeling:** PDEs, Integral Equations, optimization methods, medical imaging algorithms

Professional Experience

Software Engineer-Advanced

Siemens Digital Industries Software, Germany | January 2026 – Present

Developing high-performance electromagnetic simulation algorithms for Simcenter Feko within the Siemens Xcelerator ecosystem. Combining deep expertise in computational electromagnetics with modern AI-augmented development practices to accelerate innovation in solver technology.

- GPU-accelerated electromagnetic solvers and HPC optimization
- Daily integration of generative AI and LLM-assisted coding for rapid prototyping, code generation, and technical documentation
- Numerical methods development (MoM, FEM, FDTD, hybrid approaches)
- Performance engineering and C++ modernization
- Investigating AI/ML applications in computational electromagnetics workflows

Technologies: *CUDA, C++, Intel MKL, OpenMP, MPI, NVIDIA Nsight, LLM-assisted development tools*

Senior Developer - Electromagnetic Solutions

Altair Engineering GmbH, Germany | July 2014 – December 2025

Developing high-performance algorithms for Altair Feko, a comprehensive computational electromagnetic software used globally for antenna design, electromagnetic compatibility, and radar cross-section analysis.

- Implemented GPU-accelerated ray tracing for electromagnetic optics, achieving **20x performance improvement** compared to single-core CPU

- Developed efficient preconditioners for sparse matrix equation systems, achieving **15x acceleration** compared to sequential code using Intel MKL
- Designed and implemented Discontinuous Galerkin Method for Integral Equations handling non-conformal meshes
- Optimized time-domain solver achieving **10x speedup** relative to sequential implementation
- Developed novel algorithms for metamaterial modeling within the FEM solver framework
- Led C++ development initiatives and code modernization efforts

Technologies: *CUDA, C++, Intel MKL, OpenMP, MPI, GPU profiling tools (NVIDIA Nsight)*

Postdoctoral Research Fellow
Polytechnic University of Turin, Italy | July 2013 – June 2014

- Developed GPU-accelerated algorithms for computational electromagnetic applications in biomedical and industrial contexts
- Implemented fast and reliable solvers integrated into the MICENEA project
- Focus on high-performance computing solutions for real-time medical imaging applications

Researcher
Istituto Superiore Mario Boella, Turin, Italy | January 2011 – June 2014

- Designed and simulated RF devices and antennas in complex media
- Lead computational researcher on RADIODRY industrial project
- Developed numerical models for electromagnetic wave propagation in heterogeneous materials

Early Company Member - Computational Scientist
NE Scientific LLC, Boston, MA, USA | January 2011 – December 2013

- Developed GPU-accelerated sparse linear solver for medical imaging applications
- Achieved **8x speedup** compared to Intel PARDISO MKL on sequential core
- Implemented parallel algorithms for real-time image reconstruction

Research Assistant - High-Performance Computing
Thayer School of Engineering, Dartmouth College, Hanover, NH, USA | January 2011 – August 2011

- Developed HPC algorithms for multi-modal image guidance system (NIH Grant: 1RC1EB011000-01)
- Achieved **20x acceleration** of imaging algorithms using multi-GPU systems
- Implemented parallel computing solutions for real-time prostate biopsy guidance

Education

Ph.D. Electronics and Communications Engineering
Polytechnic University of Turin, Italy | 2008 – 2011

Dissertation: Computational Methods for Microwave Imaging - Biomedical Applications
Focus: GPU-accelerated algorithms, inverse scattering problems, high-performance computing

M.Sc. (Laurea Specialistica), Biomedical Engineering
Polytechnic University of Turin, Italy | 2005 – 2007

Thesis: Microwave Tomography for Breast Cancer Detection
Focus: Computational modeling, signal processing, medical imaging

B.Sc. (Laurea Triennale), Software Engineering
University of Palermo, Italy | 2001 – 2004

Thesis: Noise Reduction in Magnetic Resonance Imaging
Focus: Algorithm development, image processing

Technical Skills

- **High-Performance Computing**: CUDA, OpenCL, MPI, OpenMP, multi-threading, distributed computing, NVIDIA Nsight, Intel VTune
- **Scientific Computing**: FEM, BEM, FDTD, spectral methods, sparse/dense matrix solvers, iterative methods, preconditioning
- **Libraries**: Intel MKL, cuBLAS, cuSPARSE, cuSolver, cuDSS, LAPACK, PETSc
- **Languages & Tools**: C++, CUDA C/C++, Python, Fortran, Git, CMake, CI/CD, HPC clusters

Selected Publications

- **Attardo E.A.**, Delgado C., Van Tonder J., Zhabitskiy I., Garcia E., Jakobus U. (2025) – A High-Performance Multi-Core Hierarchical Preconditioner for Multiscale Electromagnetic Problems with the MLFMM, IEEE URSI Kleinheubacher Tagung 2025
- **Attardo E.A.**, Borsic A. (2012) – GPU Acceleration of Algebraic Multigrid for Low-Frequency Finite Element Methods – IEEE APS/URSI
- Borsic A., **Attardo E.A.**, Halter R. (2012) – Multi-GPU Jacobian Accelerated Computing for Soft Field Tomography, Physiological Measurements
- **Attardo E.A.**, Vecchi G., Crocco L. (2014) – Contrast Source Extended Born Inversion in Noncanonical Scenarios via FEM Modeling, IEEE TAP

Full publication list: 30+ papers available at www.eattardo.info

Certifications

Deep Learning / AI: NVIDIA Getting Started with Deep Learning, Neural Networks and Deep Learning (Coursera), Supervised Machine Learning, Advanced Learning Algorithms

Blockchain: Certified Blockchain Expert, Certified Solidity Developer, Smart Contracts (Coursera)

Professional Activities

- Reviewer for IEEE Transactions on Antennas and Propagation
- Member of Applied Computational Electromagnetics Society (ACES)
- Regular presenter at IEEE APS/URSI and ACES conferences

Languages: English (Fluent), Italian (Native), German (Intermediate)