

# Elia Amedeo Attardo, Ph.D.

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.

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## 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++ (advanced), CUDA C/C++, Python, MATLAB, Intel MKL, software architecture
  - **Mathematical Modeling:** PDEs, Integral Equations, optimization methods, medical imaging algorithms
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## 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

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### 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

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

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

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## Professional Experience

### Senior Developer - Electromagnetic Solutions

**Siemens Digital Industries Software (Altair Engineering GmbH), Germany** | July 2014 – Present

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

#### Key Contributions & Computational Achievements:

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

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### 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 [MICENE](#) 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 [RADIODY](#) 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
- Published results in peer-reviewed journals demonstrating computational advantages

## **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
  - Member of the [Bioimpedance Research Group](#)
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## **Publications**

### **Selected Publications (Computational & HPC Focus)**

#### **High-Performance Computing & GPU Acceleration**

- ATTARDO E.A., BORSIC A. (2012) – [GPU Acceleration of Algebraic Multigrid for Low-Frequency Finite Element Methods](#) – IEEE APS/URSI, Chicago, doi: 10.1109/APS.2012.6348988
- BORSIC A., ATTARDO E.A., HALTER R. (2012) – Multi-GPU Jacobian Accelerated Computing for Soft Field Tomography, *Physiological Measurements*, Vol.33, 1703, doi: 10.1088/0967-3334/33/10/1703
- ATTARDO E.A., FRANCILLA M.A., VIPIANA F., VECCHI G. (2012) – Investigation on Accelerating FFT-Based Methods for the EFIE on Graphics Processors, *International Journal of Numerical Modelling*, doi: 10.1002/jnm.1867
- BORSIC A., HOFFER E., ATTARDO E.A. (2014) – [GPU-Accelerated Real Time Simulation of Radio Frequency Ablation Thermal Dose](#), Northeast Bioengineering Conference, Boston

#### **Computational Methods & Algorithm Development**

- ATTARDO E.A., VECCHI G., CROCCO L. (2014) – Contrast Source Extended Born Inversion in Noncanonical Scenarios via FEM Modeling, *IEEE Transaction on Antennas and Propagation*, doi: 10.1109/TAP.2014.2336259
- ATTARDO E.A., JAKOBUS U., BINGLE M., VAN TONDER J. (2019) – [Auxiliary Space-based Preconditioner for High Order Finite Element Method](#), IEEE APS/URSI Atlanta

[Full publication list: 30+ papers available at [\[L\]](#)]

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## **Technical Skills**

### **High-Performance Computing**

- **GPU Programming:** CUDA (expert), OpenCL, GPU optimization techniques
- **Parallel Computing:** MPI, OpenMP, multi-threading, distributed computing
- **Performance Tools:** NVIDIA Nsight, Intel VTune, profiling and optimization

## Scientific Computing

- **Numerical Methods:** FEM, BEM, FDTD, spectral methods
- **Linear Algebra:** Sparse/dense matrix solvers, iterative methods, preconditioning
- **Libraries:** Intel MKL, cuBLAS, cuSPARSE, cuSolver, cuDSS, LAPACK, PETSc

## Programming Languages & Tools

- **Languages:** C++ (expert), CUDA C/C++ (expert), Python, MATLAB, Fortran
  - **Development:** Git, CMake, CI/CD, HPC clusters, PBS
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# Professional Certificates

## Blockchain and Web3

- [Blockchain Basics](#)
- [Blockchain Council - Certified Blockchain Expert](#)
- [Blockchain Council - Certified Solidity Developer](#)
- [Smart Contracts](#)

## Deep Learning / AI

- [NVIDIA Getting Started with Deep Learning](#)
  - [Neural Networks and Deep Learning](#)
  - [Supervised Machine Learning: Regression and Classification](#)
  - [Advanced Learning Algorithms](#)
  - [Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization](#)
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# 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
  - Active contributor to scientific computing community
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## Languages

- **English:** Fluent (professional/academic)
- **Italian:** Native
- **German:** Working proficiency