Maurizio Ungaro

Scientific CV

Staff Scientist, Jefferson Lab | Nuclear physicist and simulation software developer
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Profile

Nuclear physicist and simulation software developer at Jefferson Lab working on Geant4-based detector simulations, GEMC, CLAS12 production workflows, detector systems, and nucleon-structure research. My work connects physics analysis, detector operations, and simulation infrastructure, with a focus on making Geant4 workflows easier to build, run, document, and share.

Current Position

Staff Scientist 2011–present
Jefferson Lab, Experimental Hall-B, Newport News, VA
Hall-B and CLAS12 detector operations, simulation software, Geant4 support, LTCC calibration and performance, distributed simulation production, and nucleon-structure analysis.

Previous Positions

Postdoctoral Research Associate and Research Associate 2004–2011
University of Connecticut, Storrs, CT
CLAS analyses, meson electro-production, detector software, and CLAS12 simulation and reconstruction development.

Adjunct Assistant Professor of Physics 2011
Christopher Newport University, Newport News, VA
Undergraduate physics laboratory instruction.

Education

2003 Ph.D. in Nuclear Physics, Rensselaer Polytechnic Institute, Troy, NY. Thesis: pi0 electro-production from Delta(1232) at high momentum transfer.
1999 Laurea in Fisica, Universita degli Studi di Genova, Genoa, Italy.

Research and Technical Leadership

- Nucleon-structure measurements using meson electro-production and CLAS/CLAS12 data.
- Development and support of GEMC, a database-driven Geant4 simulation workflow.
- CLAS12 simulation releases, geometry tags, and production workflows through CLAS12 Simulations.
- Distributed simulation production using HTCondor and Open Science Grid resources.
- CLAS12 Low Threshold Cherenkov Counter operation, maintenance, calibration, and detector-performance studies.
- Geant4 at JLab tutorials, examples, and user support for Jefferson Lab users.

Selected Projects

GEMC: Database-driven Geant4 simulations with a Python-friendly workflow.
https://gemc.github.io/home/

Geant4 at JLab: Tutorials, examples, and support material for Jefferson Lab users.
https://jeffersonlab.github.io/g4home/

CLAS12 Simulations: Tagged CLAS12 geometry and simulation releases.
https://github.com/gemc/clas12Tags

CLAS12 on OSG: Distributed CLAS12 simulation production workflows.
https://maureeungaro.github.io/home/osg/osg

Low Threshold Cherenkov Counter: CLAS12 forward detector work for pion/kaon discrimination.
https://maureeungaro.github.io/home/ltcc/ltcc

Selected Collaborations and Facilities

- Jefferson Lab and Jefferson Lab Hall-B: current laboratory and experimental program.
- Heavy Photon Search: dark-sector search collaboration at Jefferson Lab.
- SPring-8: prior experimental work in Japan through LEPS/SPring-8 collaboration.

Teaching and Mentoring Experience

- Adjunct Assistant Professor of Physics, Christopher Newport University, 2011.
- Instructor, PHYS 105 Elementary Physics Laboratory, Christopher Newport University, 2011.
- Instructor, PHYS 152 Intermediate Physics Laboratory, Christopher Newport University, 2011.
- Teaching Assistant, Physics I, Rensselaer Polytechnic Institute, Spring 2000.
- Teaching Assistant, Electromagnetic Theory, Rensselaer Polytechnic Institute, Fall 2000.
- Supervised undergraduate and graduate students on Jefferson Lab data analysis, detector calibration, and CLAS/CLAS12 physics analyses.
- Mentored student projects in meson electro-production, semi-inclusive reactions, target-spin asymmetries, quark propagation in nuclei, and detector simulation.

Selected Approved Proposals and Experimental Programs

- Hard exclusive electroproduction of π^0 and η with CLAS12, E12-06-108, spokesperson.
- Beyond the Born Approximation: precise comparison of e^+p and e^-p elastic scattering in CLAS, E07-005.
- Heavy Photon Search at Jefferson Laboratory, E12-11-006.
- Meson spectroscopy with low-Q^2 electron scattering in CLAS12, E12-11-005.
- Nucleon resonance studies with CLAS12, E12-09-003.
- Deeply Virtual Compton Scattering with CLAS at 11 GeV, E12-06-119.

Selected Plenary and Invited Talks

- Electromagnetic $N \to N^*$ excitations, Photonuclear Reactions Gordon Research Conference, Tilton, NH, August 2010.
- CLAS data and progress in the investigation of electro-excitation of nucleon resonances, 4th Workshop on Exclusive Reactions at High Momentum Transfer, Newport News, VA, May 2010.
- π^0 electro-production from $\Delta(1232)$ at high Q^2, QCD 2008, Montpellier, France, July 2008.
- π^0 electro-production from $\Delta(1232)$ at high Q^2, Baryons 2007, Seoul, Korea, June 2007.

- The two-photon exchange mechanism, Research Centre for Nuclear Physics, Osaka, Japan, November 2006.
- N^* at Jefferson Lab: exploring the high-Q^2 regime, Structure of Hadrons, Athens, Greece, June 2006.
- The $N \to \Delta$ transition, Jefferson Lab Workshop, Newport News, VA, June 2005.

Technical Skills

Simulation and analysis: Geant4, GEMC, CLAS12 simulations, ROOT, detector geometry, digitization workflows, PyVista visualization.

Programming and infrastructure: C++, Python, shell scripting, Git, GitHub, CI, Docker, Meson, CMake, SCons.

Scientific computing: HTCondor, Open Science Grid, SQLite, CSV/JSON/ROOT workflows, reproducible environments, documentation.

Communication: tutorials, technical writing, presentations, mentoring.

Selected List of Publications

- **M. Ungaro**. "Geant4 Monte-Carlo (GEMC): A database-driven simulation program." *EPJ Web of Conferences 295, 05005 (2024).* doi:10.1051/epjconf/202429505005.
- **M. Ungaro et al.**. "The CLAS12 Geant4 simulation." *Nucl. Instrum. Meth. A 959 (2020).* doi:10.1016/j.nima.2020.163422.
- **M. Ungaro et al.**. "The CLAS12 Low Threshold Cherenkov detector." *Nucl. Instrum. Meth. A 957 (2020).* doi:10.1016/j.nima.2020.163420.
- **M. Ungaro, K. Joo et al.**. "Measurement of the $N \to \Delta(1232)$ transition at high momentum transfer by π^0 electroproduction." *Phys. Rev. Lett. 97, 112003 (2006).* doi:10.1103/PhysRevLett.97.112003.
- **I. G. Aznauryan, K. Joo, M. Ungaro et al.**. "Electroexcitation of nucleon resonances from CLAS data on single pion electroproduction." *Phys. Rev. C 80, 055203 (2009).* doi:10.1103/PhysRevC.80.055203.
- **F. X. Girod, K. Joo, M. Ungaro et al.**. "Deeply virtual Compton scattering beam-spin asymmetries." *Phys. Rev. Lett. 100, 162002 (2008).* doi:10.1103/PhysRevLett.100.162002.
- **K. Joo, M. Ungaro et al.**. "Beam spin asymmetry measurements from deeply virtual meson production." *AIP Conf. Proc. 915, 607 (2007).* doi:10.1063/1.2750854.
- **M. Ungaro, K. Joo and P. Stoler**. "$\gamma^* N \to \Delta$ at JLab: Exploring the high-Q^2 regime." *AIP Conf. Proc. 904, 232 (2007).* doi:10.1063/1.2734308.

Online Profiles

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