Sajad Azizi

Computational Physicist

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About Me

Theoretical and computational physicist, boasting over 7 years of expertise in programming with **C++** and **Python**.
My proficiency extends to **computational physics**, **numerical analysis**, **optics**, and quantum physics.
I excel in simulating complex systems using parallel CPU and GPU methods, including **MPI**, **SYCL** and **Kokkos**.

Languages

- German
- English (fluent)
- Persian (Native)

Skills Summary

- C/C++, Pyhton
- Fortran, Java, PHP, Julia
- MPI, SYCL, OpenMP, Kokkos, Hybrid
- TensorFlow, Sklearn, Keras
- Eigen, Lapack, FFTW, intel-oneAPI, GSL
- JavaScript, WordPress, MySQL, Photoshop

Soft Skills

- problem solving
- time management
- work under pressure
- work individually & team
- communication skills
- adaptability & learning

Selected Projects

SPION: electron-molecule scattering *C++, OpenMP, MPI, SYCL* Source Code: under request

- Designed and developed an *ab initio* molecular calculation:
  - continuum Hartree-Fock equation for electron-molecule scattering
  - DFT for molecular orbital energies and coefficients
  - calculate highly accurate scattering states using the Numerov approach
  - Optimizing the code using **GPU-SYCL**.
- publication related to this package is here .

Coupled-channel Schrödinger equation *C++, Eigen, OpenMP, GSL* Source Code: under request

- Designed and developed the coupled-channel Schrödinger equation in 2D and 3D.
- Precisely calculating bound state energies for any model molecular potentials.
- Optimising the code using **OpenMP**.
- publication related to this package is here .

Time-dependent Schrödinger equation *C++, MPI, OpenMP, FFTW* Source Code: under request

- Solving a full 3D TDSE using the highly accurate **Numerov** method for the weak and strong laser fields.
- Optimasation using Hybrid (**MPI-OpenMP**) parallelization technique.
- up to **10** times faster in solving the equation for arbitrary laser pulses.
- publication related to this package can be found here and here .

Machine Learning *Python, TensorFlow, Keras, Sklearn* Source Code

- Studying the correlation between two-photon and net zero-photon electron spectrum using **ML algorithms**.

Work Experience

May 2024-present — **High performance computing expert** *Leibniz Supercomputing Centre (LRZ)*
- user support
- maintainer of Kokkos package; responsible for Kokkos course at LRZ
- benchmarking and supporting:
  - Athenak (astrophysics)
  - openCPMD (molecular dynamics)
  - CP2K (molecular dynamics)

Oct 2023-April 2024 — **Postdoc Researcher** *Max-Planck Institute for the Physics of Complex Systems*
- Considering an electron in a cube in Perfluorobutane molecule and calculating attosecond photoionization time delay.
- The work includes both (partly heavy) numerical calculations and the development of models.
- Deriving the relevant equations and writing, based on these analytical expressions, my own computer codes.

2019 – 2023 — **PhD Researcher** *Max-Planck Institute for the Physics of Complex Systems*
- Theoretical Quantum Mechanics modeling.
- Developing algorithms for simulating atomic and molecular systems.
- Coding and simulation with HPC programming such as C++ and Python.
- Optimizing using parallelization methods including MPI and OpenMP.
- Analyzing and visualizing data using Python.
- Writing scientific articles.

Education

2019 – 2023 — **Doctor of Philosophy (Ph.D.) in Physics**
Max-Planck Institute for the Physics of Complex Systems (MPI-PKS), Dresden-Germany
Supervisors: Prof. Dr. Jan-Michael Rost, Prof. Dr. Ulf Saalmann

Ph.D. Thesis Grade: Magna cum laude
Three Aspects of Photoionization in Attosecond Laser Pulses

2013 – 2016 — **Master of Science (M.Sc.) in Photonics**
Institute for Advanced Study in Basic Science (IASBS), Zanjan-Iran
Supervisors: Dr. Shahpoor Saeidian

M.Sc. Thesis Grade: Summa cum laude
Quantum Monte Carlo Study of Quantum Dynamics of Ultracold Atoms in a Harmonic Waveguide

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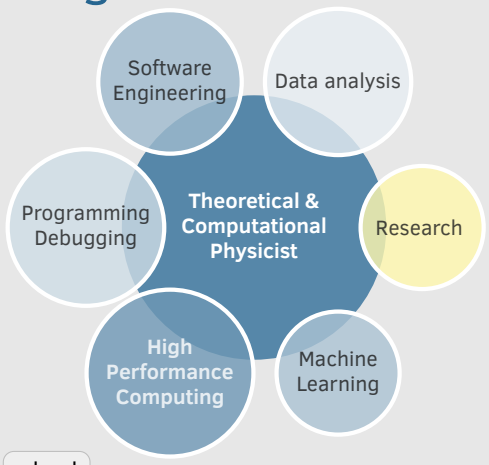
Communication Skills

- **Presentations**:
  - More than 5 talks and 10 posters at conferences and seminars
  - participating in more than 10 international schools and conferences
- **Collaborations**: research groups
  - Northwest Missouri State University
  - University of Bremen

Diagrams



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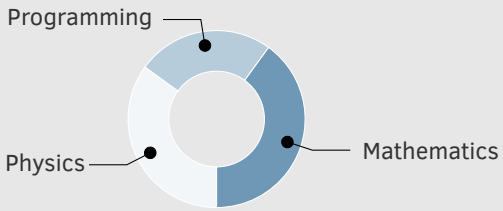

Interests & Expertise

Quantum computing | Numerical Analysis | Machine Learning | Light-matter Interaction | Computational physics | Software development | scientific modeling | Project Management

Honors & Awards

- **Ph.D** Fund awarded 2019-2022
  - Deutsche Forschungsgemeinschaft (DFG) through QUTIF.
- **Ranked 1st** among M.Sc. student
  - 30 M.Sc. students in 2016
- **Ranked 3rd** among B.Sc. students
  - 50 B.Sc. students in 2013

References

Potential references are available on request!

Publications

- Daniel Hammerland* and Thomas Berglitsch*, **Sajad Azizi***,.., Hans Jakob Wörner *"Effect of Orbital Delocalization on Attosecond Ionization Delays in Unsaturated Hydrocarbons". submitted in science advances* (2025); ****contributed equally**(I did the theoretical part).*
- **Sajad Azizi**, M. El-Amine Madjet, Zheng Li, Jan M Rost and Himadri Chakraborty *"Diffraction patterns in attosecond photoionization time delay".* arXiv:2412.08204 (2024) (submitted in PRL)
- **Sajad Azizi**, Ulf Saalmann and Jan M Rost *"Zero-Energy Photoelectric Effect".* Phys Rev Lett.134.103201 (2025)
- **Sajad Azizi**, Ulf Saalmann and Jan M Rost *"Non-adiabatic ionization with tailored laser pulses".* Journal of Physics B: Atomic, Molecular and Optical Physics, Volume **54**, Number 13 (2021)
- **Sajad Azizi** and Shahpoor Saeidian *"Investigation of Confinement Induced Resonance in Atomic Waveguides with Different Geometries by Quantum Monte Carlo Methods".* arXiv:1610.09425 (2016)

recent talk

June 2025	"*Introduction to Kokkos - heterogeneous programing"* (Ludwig Maximilian University of Munich)

Selected schools

May 2025	"*School on New Computational Methods for Attosecond Molecular Processes"* (Campus Río Ebro, Universidad de Zaragoza, Spain) May 26, 2025 - May 30, 2025
Spring 2021	"*Division of Atomic, Molecular and Optical Physics Meeting"* (College Park, United States) 31 May- 04 Jun 2021
Summer 2019	"*ICFO School on the Frontiers of Light*", ICFO, Castelldefels (Barcelona), Spain, 08 July - 10 July 2019
Winter 2016	"*4th Workshop on Advanced Techniques for Scientific Programming and Management of Open source Software Packages* ", ICTP, Miramare-Trieste, Italy, 7-24 March 2016

Additional technical skills

Programming	C/C++(professional), Python/Cython(professional), PHP(well experienced), Fortran(Good knowledge), JAVA(experienced), UNIX Shell Scripting(well experienced), JULIA(experienced), and Web Development(well experienced)
Parallelization	MPI, OpenMP, Hybrid (MPI-OpenMP), GPU-SYCL, KoKKOS
Scientific Softwares	Mathematica, Matlab, Matplotlib, Gnuplot
Scientific Pakages	Eigen, Lapack, QuTip, GSL, FEniCS
Machine Learning	Pattern recognition and classification using Python packages, such as TensorFlow, Keras, and Sklearn
Optimization	Multidimensional optimization using packages such as GSL and M-loop
Write & Edit	LaTeX, Doxygen, Docker, Microsoft Word and Powerpoint
O.S.	Linux, Mac, Microsoft Windows
Tools	VIM, Visual Studio, Jupyter, Eclipse, NetBeans IDE, XAMPP, Git, Atom
Web Design	JavaScript (jQuery), HTML/HTML5, CSS/CSS3, Photoshop, MySQL, WordPress

Certifications

- Heterogeneous Programming with Kokkos *"KU Leuven University Hall"*. (2025).
- Node-Level Performance Engineering *"NHR@FAU".* (3–5 December 2024)
- Introduction to one API, SYCL 2020, and OpenMP offloading *"High-Performance Computing Center Stuttgart (HLRS)".* (September 23 to 25, 2024)
- Deep Learning and GPU Programming Workshop *"LRZ and NVIDIA Deep Learning Institute (DLI)".* (9–12 September 2024)

September 13, 2025 **Sajad Azizi**