CARLOS **CRUZ**

Alexandria, USA 22315 | (703) 405-4721 | carlos.a.cruz@nasa.gov | **WWW:** https://cacruz.github.io/

Skills

- High-performance computing
- Python, Fortran, C/C++
- Earth system modeling
- TensorFlow, Keras, Scikit-Learn

- Software development
- Data visualization
- Mentoring junior staff
- Technical documentation

Summary

Computational Scientist at NASA/GSFC with deep expertise in high-performance computing and Earth system modeling. Led and contributed to impactful projects in climate simulation, AI frameworks, and scientific visualization. Proven ability to develop innovative software solutions, foster collaboration, and mentor junior scientists. Driven to advance scientific research through scalable, high-impact technology.

Education

Ph.D.: **Climate Dynamics**   **12/2010**
George Mason University   Fairfax, VA

Master of Science: **Physics**   **05/1996**
George Mason University   Fairfax, VA

Bachelor of Science: **Physics**   **05/1988**
George Mason University   Fairfax, VA

Experience

Chief Scientific Programmer Analyst   **05/2012 to Current**
SSAI Inc @ NASA/GSFC   **Greenbelt, MD**

- Lead software engineer for the NASA Unified Weather Research and Forecasting (**NU-WRF**) system, optimizing performance and extensibility of regional Earth system simulations.
- Designed and developed *eViz*, a modular visualization toolkit for Earth system modeling data, enabling scientists to explore complex outputs interactively and efficiently.
- Contributed to the development of **CREST**, a reusable AI-first framework for building Earth System Models and Digital Twins; led integration into the **TERRAHydro** land surface model.
- Refactored and tested the NASA-GISS **ModelE** climate model to improve maintainability and long-term sustainability; implemented software engineering best practices for a modular codebase.
- Built *reg*, a Python-based regression testing framework, is deployed in both ModelE and NU-WRF development pipelines.
- Mentored junior developers and researchers; led technical onboarding, and provided project guidance across interdisciplinary teams. Helped to organize and train scientists and engineers in NASA's Training Boot Camps.

Physicist IV   **01/2007 to 04/2012**
Northop Grumman IT @ NASA/GSFC   **Greenbelt, MD**

- Co-developed a high-performance giga-particle trajectory model in C++ with MPI parallelization, which enabled large-scale simulation of stratospheric processes.
- Collaborated on the Moving Objects Database (MOD) to automate the identification of meteorological phenomena from observational data.
- Ported legacy scientific codes to NASA computing platforms in support of the Earth science mission.
- Authored and maintained the **GEOS-5 GCM User's Guide** on NASA's Modeling Guru platform.
- Created Perl-based component analysis tools and Java-driven workflow scripts to support GEOS-5 modeling.
- Aligned GEOS-5 modules with **ESMF** (Earth System Modeling Framework) standards to ensure cross-component interoperability.

Senior Member of Technical Staff   **03/2000 to 12/2006**
Northop Grumman IT @ NASA/GSFC   **Greenbelt, MD**

- Integrated GEOS-5 AGCM with NOAA/NCEP/EMC's GSI atmospheric data assimilation system, enhancing predictive weather modeling capabilities.
- Led architecture and development efforts for Part III of the ESMF Data Assimilation project, focusing on efficient data structures and algorithm design.
- Developed a predictive analytics prototype tool to forecast climate-sensitive, vector-borne disease outbreaks.
- Established task objectives and conducted literature review.
- Automated modeling workflows through robust Unix scripting and system configuration.

Programmer   **08/1998 to 03/2000**
SAIC Inc @ US Bureau of the Census   **Suitland, MD**
- Designed and implemented a **genetic algorithm-based** module for solving a map coloring problem in census data processing.
- Enhanced and maintained C-based software in a UNIX environment, streamlining code updates and feature integration.
- Supported full lifecycle software development, including change request implementation and codebase refactoring.

Selected Publications

- Xue et al. (2024): *CLIAv1 Coupled Lake-Ice-Atmosphere Model*, GMD
- Nazarenko et al. (2022): *SSP Scenario Climate Projections with GISS-E2.1*, JAMES
- Notaro et al. (2021): *NU-WRF Model Performance in the Great Lakes*, JHM
- Clune & Cruz (2017): *pFLogger: Parallel Fortran Logging for HPC*, SE-HPC Workshop
- Zhou et al. (2012): *Accelerating Simulations with Hybrid Computing*, Concurrency Computat.

Languages

Spanish:

Native/ Bilingual

Teaching and Mentoring

- **Adjunct Assistant Professor** @ George Mason University (2018 – present): Modeling and Simulation, Elements of HPC, Computing for Scientists
- **Instructor**: GSFC Python Bootcamps, GSFC Fortran Trainings, GSFC Git Trainings, Langley Workshops
- **Mentor**: Mentored NASA interns on visualization tools and software engineering best practices

Awards and Affiliations

Awards
- Robert H. Goddard Team Award, 2010
- Northrop Grumman TAP Award, 2011
- Computational Sciences Fellowship, 1997–98

Affiliations
- American Geophysical Union (AGU)
- American Meteorological Society (AMS)
- Sigma Xi: The Scientific Research Society

References

References available upon request.