# Igor Z. Palubski

(641) 814 6480 • ipalubsk@uci.edu • ipalubski.github.io
https://github.com/ipalubski

## Education

**University of California, Irvine** — **Irvine, CA**
*Ph.D in Physics (Computational/Theoretical)* — *September 2024*

**Iowa State University** — **Ames, IA**
*B.S in Physics (with minors in Math and Astronomy)* — *Awarded 2017*

**Programming Languages:** Python • C • C++ • Matlab • TypeScript
**Frameworks and Tools:** PyTorch • Matplotlib • Scikit-Learn • Pandas • Numpy • Scipy • React • Jupyter • VSCode • Git • Docker
**Systems and Practices:** Linux Systems • High-Performance Computing
**Natural Languages:** English (fluent) • Polish (fluent)
**Related Coursework:** Graduate level training in ML/AI: CNNs, RNNs, Transformers and other ML methods

## Professional Experience

**Personal Projects**

• Built a modern snake game in React/TypeScript, integrating a websocket-based server for training an AI agent using a deep Q-learning algorithm. Deployed an AI training system using websocket communication between the game client and a Python-based training server, enabling real-time data exchange and model updates. Currently optimizing the AI for competitive gameplay; app to be released on the App Store in mid 2025.

**University of California, Irvine - Graduate Student Researcher** — **Irvine, CA**
Astrophysics Theory — *November 2020 - September 2024*
Software development and analysis of cosmological, hydrodynamical simulations for Dark Matter studies.

• Enhanced a widely adopted C-based hydrodynamical simulation framework used for cosmological simulations (GIZMO) addressing critical limitations in simulating high energy phenomena and improving simulation accuracy by $20\%$ while preserving computational efficiency. Implemented new physics routines: a variety of particle scattering models, an evolving baryon gravitational potential, and model verification tools.
• Engineered analysis tools in Python for multivariate analysis of terabyte-scale data generated from N-body simulations of isolated self-interacting dark matter (SIDM) halos.
• Discovered an empirical relation that predicts the evolution of dark matter halos under any particle physics model.
• Run a hands-on seminar at UC Irvine on compiling/running C software on supercomputers. Containerized GIZMO for hands-on exercises and running simulations in a unix environment.

**Shields Center for Exoplanet Climate and Interdisciplinary Education** — **Irvine, CA**
Atmospheric Physics — *August 2018 - November 2020*
Extrasolar planet climate studies using a hierarchy of numerical models of varying complexity.

• Investigated the effects of orbital dynamics on planetary habitability by creating a parallelized 1-Dimensional Energy Balance Model in MATLAB for extensive parameter scans on supercomputers, revealing significant habitable zones on extreme planetary orbits. However, retaining water on such planets may prove a challenge due to increased levels of high-energy radiation.
• Designed a Fortran tool that generates initial climatic conditions for synchronously rotating planets with desired spatial resolution, contributing to the development of sophisticated 3D Global Circulation Models (GCMs) for climate simulation on extrasolar planets.

## Select Publications

**Publications**

- Gravothermal Evolution of SIDM Halos - Monotonic and Resonant Cross Sections. (in-prep)
- Numerical Challenges in Modeling Gravothermal Collapse in Self-Interacting Dark Matter Halos link
- Terminator Habitability: the Case for Limited Water Availability on M-dwarf Planets link
- The Eccentric Habitable Zone: Habitability and Water Loss Limits on Eccentric Planets link
- Global Energy Budgets for Terrestrial Extrasolar Planets link