Spencer Wallace

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Education

University of Washington — Seattle, Washington
PhD Astronomy — *Oct 2015 – Summer 2023 (Expected, flexible)*

University of Arizona — Tucson, Arizona
BS Computer Science, Astronomy and Physics — *Aug 2009 – May 2014*

Work Experience

Simulating the assembly of terrestrial planets

University of Washington, Astronomy Department — *Jan 2018 – Present*

- Designed, proposed and executed a $450,000 research grant project to model the planet formation process (Python, Numpy, Pandas, Git)
- Tested, debugged and ran highly parallel simulations across multiple compute nodes on a variety of national supercomputers (C++, Git, Bash)
- Extended a large-scale hydrodynamics code to model collisions between solid bodies (C++, Git)
- Created and developed set of analysis tools (KeplerOrbit, CollisionTools) to track the evolution of large collections of particles (Python, Numpy, Pandas, Git)
- Led weekly meetings to train and mentor undergraduate researchers to use python data analysis tools, develop modules for our N-body code, and run simulations

Verifying the robustness of galaxy simulation codes

University of Washington, Astronomy Department — *Oct 2015 – Dec 2016*

- Ran and analyzed a set of hydrodynamics simulations to assess the scientific validity of the most commonly used galaxy simulation codes (C++, Python, Numpy, Bash, Git)
- Worked with a mult-national team from over thirty institutions to highlight and understand and reconcile differences between state-of-the-art galaxy simulation codes asked to solve an identical problem

Data synthesis from N-body simulations

University of Washington, eScience Institute — *Jan 2023 – Present*

- Developed a pipeline to construct initial conditions for planet formation models by training a generative adversarial network (GAN) on existing results (Python, PyTorch, Pandas, Numpy, Git)
- Saved over 900,000 CPU hours of computation by using the GAN to skip the first phase of our simulations

Exploring parallel algorithms for spatial tree traversal

University of Illinois Urbana-Champaign, Computer Science Department — *Jun 2019 – Apr 2021*

- Participated in a interdisciplinary collaboration to develop paratreet, a toolkit for quickly testing and tuning parallel spatial tree traversal algorithms (C++, Python, Bash, Git)
- Worked with a team of computer scientists to apply and test their algorithms on a number of real-world astronomy applications and reduce force calculation times for our simulations by a factor of 30

Graduate teaching assistant

University of Washington, Astronomy Department — *Oct 2015 – Jun 2020*

- Led weekly discussion sections, graded assignments, preformed lectures and designed homework exercises for undergraduate students
- Collaborated with a team of other teaching assistants to ensure assignments, quizzes and exams were graded consistently and fairly

Skills

Programming: C++, Python, NumPy, Pandas, PyTorch, scikit-learn, matplotlib, Seaborn, SQL

Communication: 3 first-authored publications, 3 co-authored publications, 7 conference talks, 3 conference posters, 20 pop-sci articles published through astrobites

Leadership: Worked on 5 separate science collaboration teams, Mentored and directed research for 6 undergraduate students

Publications

Wallace, S., Quinn, T., "Planetesimal accretion at short orbital periods", **ApJ**, 954(1):61 (2023).

Hutter, J., Szaday, J., Choi, J., Liu, S., Kale, L., Wallace, S., Quinn, T., "ParaTreeT: A Fast, General Framework for Spatial Tree Traversal", **IEEE IPDPS**, 762-772 (2022).

Wallace, S., Quinn, T., Boley, A., "Collision rates of planetesimals near mean-motion resonances", **MNRAS**, 503(4):5409–5424 (2021).

Wallace, S. and Quinn, T., "N-body simulations of terrestrial planet growth with resonant dynamical friction", **MNRAS**, 489(2):2159–2176 (2019).

Kim, J., Agertz, O., Teyssier, R., Butler, M., Ceverino, D., Choi, J., Feldmann, R., Keller, B., Lupi, A., Quinn, T., Revaz, Y., Wallace, S (and 31 more), "The AGORA High-resolution Galaxy Simulations Comparison Project. II. Isolated Disk Test", **ApJ**, 833(2):202 (2016).