Sean C. Lewis

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Skills

Programming Python (Jupyter, Pandas, NumPy, Scikit-learn), SQL, Fortran90, MPI, HTML/CSS, C/C++.
Technical Big Data, Machine Learning, High Performance Computing, Git, Unix.
General Time Management, Teamwork, Problem-solving, Long-Horizon Goals, Communication.

Experience

Data Scientist & Software Engineer
Sept 2023 - Present

Near-Miss Management - Philadelphia, PA

- Produced, maintained, and upgraded impactful risk management software products critical to the operations of a world-wide customer base.
- Collaborated with a small team to develop back-end architecture, data processing methods, and machine learning pipelines in Python.
- Pioneered the development of novel software products which aid to increase safety of chemical manufacturing facilities.
- Developed novel data pipelines for quality assurance testing, building upon interfaces with databases (MongoDB, PostgreSQL).

Research Scientist
Sept 2017 - Sept 2023

Drexel University - Philadelphia, PA

- Co-led a dynamic and highly collaborative multi-national research team.
- Engineered, and documented an extensive Fortran and Python-based multiphysics software suite deployed across 5 supercomputing clusters.
- Slashed computation time of embedded algorithms by employing optimized matrix vectorization and manipulation.
- Published research findings in the Astrophysical Journal after analyzing terabytes of time-series astrophysical simulation data.
- Co-authored several peer-reviewed journal articles, showcasing field-advancing software implementations and simulation analyses.
- Delivered impactful research presentations at several prestigious American Astronomical Society meetings, fostering valuable collaborations.

Education

Ph.D. Physics - Computational Astrophysics
2019 – 2023

Drexel University - Philadelphia, PA

- Supported by or contributed to several National Science Foundation grants. Co-PI of one NSF computational grant.
- Received the Department of Physics Teaching Excellence Award.

M.S. Physics
2017–2019

Drexel University - Philadelphia, PA

- Treasurer and Event Coordinator of the Physics Graduate Student Association.
- **Courses:** Big Data Physics, Mathematical Physics, Statistical Mechanics, Electromagnetic Theory, Quantum Mechanics, Cosmology.

B.S. Physics
2012–2016

California Polytechnic State University - San Luis Obispo, CA

- Observational and statistical astronomy research assistant.
- Treasurer and member of the Physics Honors Society.

Open Source Projects

PythonOpenMPI

Parallel Task-Based Processing Library For HPC Systems

- Designed, deployed, and maintain an efficient python library for data analysis parallelization via task-based methods using MPI.
- Provided significant data processing efficiency improvements of up to 40% when compared with the strong scaling of data-based methods.
- Currently used by and interfaces with software from 3 research groups on several supercomputing clusters. Total data processed: >20 Terabytes.
- **Skills Developed:** Software Design – High Performance Computing – Git

DrexelCodingLessons

Lessons In Python For Graduate Students

- Led a 20 hour series of Python courses for nearly 2 dozen physics graduates students over 2020, 2021, and 2022.
- Taught advanced coding topics including data visualization, paralellization and machine learning.
- Designed Jupyter Notebooks to promote interaction, collaboration, and group-based problem solving.
- **Skills Developed:** Jupyter Notebooks – Communication – Documentation

Research Achievements

Published Journal Articles

Massive Star Cluster Formation I. High Star Formation Efficiency While Resolving Feedback of Individual Stars
B. Polak, M.M. Mac Low, R. Klessen, J.W. Teh, C. Cournoyer-Cloutier, E. Andersson, S. Appel, A. Tran, **Sean C. Lewis**, et al.
submitted to Astronomy & Astrophysics (2024). 2024

Transferring Data from A Voronoi Mesh to An Adaptive Cartesian Grid in Pursuit of Self-consistent Top-down Star Formation
S. C. Lewis, et al.
paper in prep. (2024). 2024

Early Evolution and 3D structure of Embedded Star Clusters
C. Cournoyer-Cloutier, A. Sills, W.E. Harris, S. Appel, **S. C. Lewis**, et al.
MNRAS 521 (2023) pp. 1338–1352. 2023

Modeling protoplanetary disk evolution in young star forming regions
M. J. C. Wilhelm, C. Cournoyer-Cloutier, **S. C. Lewis**, et al.
Proceedings of the International Astronomical Union 16(S362) (2023) pp. 300–305. 2023

Radiation shielding of protoplanetary discs in your star-forming regions
M. J. C. Wilhelm, S. Portegies Zwart, C. Cournoyer-Cloutier, **S. C. Lewis**, et al.
MNRAS 520 (2023) pp. 5331–5353. 2023

Early-forming Massive Stars Suppress Star Formation and Hierarchical Cluster Assembly
S. C. Lewis, et al.
The Astrophysical Journal 944.11 (2023). 2023

Implementing primordial binaries in simulations of star cluster formation with a hybrid MHD and direct N-body method
C. Cournoyer-Cloutier, A. Tran, **S. C. Lewis** et al.
MNRAS 501 (2021) pp. 4464–4478. 2021

Studying the OIII λ5007 emission-line width in a sample of ∼80 local active galaxies: a surrogate for σ
V. N. Bennert, D. Loveland, E. Donohue, M. Cosens, **S. C. Lewis**, et al.
MNRAS 481 (2018) pp. 138–152. 2018

Conference Proceedings

The effects of early forming massive stars and building a bridge between Voronoi mesh and block-structured codes
S. C. Lewis, et al.
American Astronomical Society 241st Conference, 2023, Seattle, WA

The Effects of Early Forming Massive Stars & A Novel Method for Inter-codebase Interpolation
S. C. Lewis, et al.
Clusters Conference, 2022, McMaster Univ. Toronto, Canada

Quantifying the Effects of O-type Star Formation in Embedded Stellar Clusters
S. C. Lewis, et al.
Modest 21a, 2021, Virtual

The Effects of Early Massive Star Formation: Gas Expulsion and Cluster Dynamics
S. C. Lewis, et al.
American Astronomical Society 238th Conference, 2021, Virtual

The effects of O-type star formation in embedded stellar clusters.
S. C. Lewis, et al.
American Astronomical Society 236th Conference, 2020, Virtual

Was the first observed hypervelocity globular cluster, HVGC-1, accelerated by a supermassive binary blackhole?
S. C. Lewis, et al.
American Astronomical Society 233rd Conference, 2019, Seattle, WA

Supporting Grants

NSF Grant AST18-14772
"Collaborative Research: Globular Cluster Formation in Hierarchically Collapsing Clouds as an Origin for Multiple Stellar Populations"
Awarded Aug. 2018 – $182,673 (Drexel University Portion)

Co-PI NSF Accelerate ACCESS Grant PHY22-0160
"Models of Star Cluster Formation Using a Multiphysics Framework"
Awarded Jan. 2023 – 1,675,000 Supercomputing Credits

NSF Grant AST23-07950
"The Untimely Deaths of Star Clusters"
Awarded Jul. 2023 – $546,269

References available upon request.