Joshua J. Taylor

Curriculum Vitæ Summary

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Oden Institute for Computational Engineering and Sciences
The University of Texas at Austin

Academic Appointments

2025–on **Research Associate**, The University of Texas at Austin
Oden Institute for Computational Engineering and Sciences; *Advisor: Offner, S.S.R.*

2021–2025 **Postdoctoral Fellow**, The University of Texas at Austin
Department of Astronomy; *Advisor: Offner, S.S.R.*

2020–2021 **Postdoctoral Researcher**, Rice University
Department of Statistics; *Advisor: Merényi, E.*

2020 **Lecturer**, Rice University, Department of Statistics

Research Affiliations

2024–on **NSF-Simons AI Institute for Cosmic Origins**

2022–on **Center for Scientific Machine Learning**, The University of Texas at Austin

Education

2020 **PhD in Statistics**, Rice University, Houston, Texas
Committee: Merényi, E.; Scott, D.; Subramanian, D.

2017 **MA in Statistics**, Rice University, Houston, Texas

2003 **BA in Mathematics, Computational & Applied Math, English**, Rice University, Houston, Texas

Research Grants

2023– **Institute for Foundations of Machine Learning**
Co-PI, UT Machine Learning Lab Internal Grant ($30,000)
A Flexible Framework for Self-Organizing Dimensionality Reduction

2023–on **U.S. National Aeronautics and Space Administration**, Astrophysics Data Analysis
Co-I, 80NSSC23K0476 ($475,643)
A Data-Driven Machine Learning Method for Source Classification and Spectral Energy Distribution Analysis of Forming Stars

2021–on **U.S. National Science Foundation**, Division Of Astronomical Sciences
Co-I, 2107942 ($413,752)
Harnessing Self-Organizing Maps for the Discovery of Star Formation in Molecular Clouds

Publications

2026 **Vector Quantization for Uncertainty Quantification: The Quantized Infinitesimal Jackknife**.
Taylor, J.; Offner, S.S.R. Springer Nature, IDEAL 2026 proceedings.

in press

2026 **Clustering Spectral Line Cubes: A Multiview Prototype Approach**.
Taylor, J.; Offner, S.S.R.; Friesen, R.; Pineda, J. The Astrophysical Journal.

doi:10.3847/1538-4357/ae96a1

2024 **A Self-Organizing UMAP for Clustering**.
Best Paper Award, WSOM+2024
Taylor, J.; Offner, S.S.R. Springer Lecture Notes in Networks and Systems.

doi:10.1007/978-3-031-67159-3_8

2024 **Setting Vector Quantizer Resolution via Density Estimation Theory**.
Taylor, J.; Offner, S.S.R. Springer Lecture Notes in Networks and Systems.

doi:10.1007/978-3-031-67159-3_13

2022 **Automating t-SNE Parameterization with Prototype-Based Learning of Manifold Connectivity**.
Taylor, J.; Merényi, E. Neurocomputing.

doi:10.1016/j.neucom.2022.07.009

2022 **Turbulence, Coherence, and Collapse: Three Phases for Core Evolution**.
Offner, S.S.R.; Taylor, J.; *et. al*. Monthly Notices of the Royal Astronomical Society.

doi:10.1093/mnras/stac2734

2022 **DM-Pruning CADJ Graphs for SOM Clustering**.
Taylor, J.; Merényi, E. Neural Computing and Applications.

doi:10.1007/s00521-021-05831-z

2021 **A Parameterless t-SNE for Faithful Cluster Embeddings from Prototype-based Learning and CONN Similarity**.
Taylor, J.; Merényi, E. ESANN.

2020 **A Probabilistic Method for Pruning CADJ Graphs with Applications to SOM Clustering**.
Taylor, J.; Merényi, E. Advances in Self-Organizing Maps, Learning Vector Quantization, Clustering and Data Visualization (WSOM 2019).

doi:10.1007/978-3-030-19642-4_5

2019 **Empowering Graph Segmentation Methods with SOMs and CONN Similarity for Clustering Large and Complex data**.
Merényi, E.; Taylor, J. Neural Computing and Applications.

doi:10.1007/s00521-019-04198-6

2018 **Discovery from Hyperspectral ALMA Imagery with NeuroScope**.
Merényi, E.; Isella, A.; Taylor, J. United States National Committee of URSI National Radio Science Meeting.

2017 **SOM-Empowered Graph Segmentation for Fast Automatic Clustering of Large and Complex Data**.
Merényi, E.; Taylor, J. 12th International Workshop on Self-Organizing Maps and Learning Vector Quantization, Clustering and Data Visualization (WSOM).

doi:10.1109/WSOM.2017.8020004

2016 **Deep Data: Discovery and Visualization. Application to Hyperspectral ALMA Imagery**. Merényi, E.; Taylor, J.; Isella, A. Proceedings of the International Astronomical Union.
doi:10.1017/S1743921317000175

2016 **Mining Complex Hyperspectral ALMA Cubes for Structure with Neural Machine Learning**. Merényi, E.; Taylor, J.; Isella, A. IEEE Symposium Series on Computational Intelligence.
doi:10.1109/SSCI.2016.7849952

Recent Talks & Presentations

OCT–2026 **Quantizing the Infinitesimal Jackknife**
4th annual SciML Workshop on Scientific Machine Learning (UT-Austin)

JUL–2026 **SOUMAP Clustering for Large-Scale YSO Classification in SESNA**
2nd annual Cosmic Horizons Conference (CosmicAI, Charlottesville, VA)

MAY–2026 **Clustering the High (N, d, ϵ) Regime with MPEC**
NSF-Simons CosmicAI Visit (Austin, TX)

APR–2026 **Time Series Modeling of High-Resolution Radio Spectra**
SciML Seminar (Austin, TX)

DEC–2025 **Multivew Clustering for Radio Spectral Imagery**
2025 Star and Planet Formation in the Southwest Conference (Austin, TX)

OCT–2025 **Time Series Modeling of High-Resolution Radio Spectra**
NSF-Simons AI Institute for Cosmic Origins Seminar

SEP–2025 **Prototype Learning in Weakly Signaled Astronomical Settings** (poster pres.)
NSF-Simons Open SkAI Conference (Chicago, IL)

SEP–2025 **ARIMA-based Decomposition of High-Resolution Astronomical Spectra** (poster pres.)
NSF-Simons Open SkAI Conference (Chicago, IL)

MAY–2025 **Sizing Vector Quantizers for Large and Noisy Data**
1st annual Cosmic Horizons Conference (CosmicAI, Austin, TX)

MAY–2025 **Identifying Structure in Spectral Cubes via Multiview Prototype Embedding & Clustering** (poster pres.)
1st annual Cosmic Horizons Conference (CosmicAI, Austin, TX)

JAN–2025 **Multiview Prototype Embedding & Clustering**
NSF-Simons AI Institute for Cosmic Origins Seminar

Student Mentorship

2024 **Jake Ridenbaugh** (U), NSF-Research Experience for Undergraduates, UT-Austin
Project: *Imputing SESNA with Galaxy Spectral Energy Distributions*
Current: Phyics PhD student at UC-Santa Barbara

2022 **Sammy Sharief** (U), NSF-Research Experience for Undergraduates, UT-Austin
Project: *Exploring Star Formation with Unsupervised Machine Learning*
Current: Physics PhD student at Université Paris-Saclay

2022 **Sang Kook** (U), Department of Mathematics, UT-Austin
Project: *Clustering Molecular Clouds with CADJ Graph Degree Linkage*
Current: MS student (Data Science), The University of Michigan

Teaching

2022–2024 **NSF REU Machine Learning Workshop** UT-Austin Astronomy

SUM 2020 **Elementary Applied Statistics** STAT 280 (U), Rice University

TA **Regression and Linear Models** STAT 615 (G: F2014, F2015, F2016) Rice University

Neural Machine Learning I STAT 502 (G: S2016) Rice University

Probability in Bioinformatics STAT 623 (G: S2015), Rice University

Probability & Statistics STAT 310 (U: F2013), Rice University

Service

2024 **Program Committee** WSOM+ 2024
15th Workshop on Self-Organizing Maps and Learning Vector Quantization (Mittweida, Germany)

2022,2024 **NSF Research Experience for Undergraduates** UT-Austin Astronomy

2016 **Organizing Committee** WSOM 2016
11th Workshop on Self-Organizing Maps and Learning Vector Quantization (Houston, Texas)

Professional Experience

2004–2011 **Senior Analyst, Analyst**, Direct Energy (Centrica plc).
Houston, Texas

2003,2004 **Research Assistant**, Schlumberger Technology Corporation.
Sugar Land, Texas