
CURRICULUM VITAE for PETER EDWARD FREEMAN

*Associate Teaching Professor & Director of the Undergraduate Program
Carnegie Mellon University*

Positions

- 2020- *Associate Teaching Professor*, Department of Statistics & Data Science
Carnegie Mellon University (www.stat.cmu.edu)
- 2018-2020 *Assistant Teaching Professor*, Department of Statistics & Data Science
Carnegie Mellon University (www.stat.cmu.edu)
- 2010-2018 *Project Scientist*, Department of Statistics & Data Science
Carnegie Mellon University
- 2004-2010 *Postdoctoral Research Scientist*, Department of Statistics
Carnegie Mellon University (Advisors: Drs. C. Genovese & L. Wasserman)
- 1999-2004 *Computer Specialist*, Chandra X-ray Center
Harvard-Smithsonian Center for Astrophysics
- 1995-1999 *Postdoctoral Research Associate*, Department of Astronomy & Astrophysics
University of Chicago (Advisors: Drs. R. Rosner & D. Q. Lamb)

Education

- 1997 *Ph.D. Astronomy & Astrophysics*, University of Chicago (Thesis Advisor: Dr. D. Q. Lamb)
- 1988 *A.B. Physics*, University of California (Honors Thesis Advisor: Dr. S. M. Kahn)

Honors, Awards, National Positions

- 2027 *Program Chair-Elect*, Section on Statistics in Sports, American Statistical Association
- 2021 *Chair*, Astrostatistics Interest Group, American Statistical Association
- 2020- *Steering Committee*, Working Group on Astroinformatics and Astrostatistics,
American Astronomical Society
- 2003 *Mentor of the Year*, Harvard-Smithsonian Center for Astrophysics
- 1991-1994 *NASA GSRP Fellowship*, University of Chicago
- 1989-1991 *Farr Fellowship*, University of Chicago
- 1985-1988 *Regents Scholarship*, University of California

Current Projects

Probability, for Statistics. The traditional calculus-based mathematical statistics sequence can be termed “probability, then statistics,” an ordering that divorces probabilistic concepts from inferential applications. I am redesigning CMU’s class sequence, implementing a spiral learning structure that brings concepts and applications closer together and enhancing the role of computation.

Modernizing Mathematical Statistics. Traditional textbook approaches to statistical inference feature analytic computation and the use of statistical tables. I am working to modernize these approaches by focusing on numerical computation: root-finding to determine confidence intervals, optimization to determine point estimates, simulations to replace large-sample approximation, etc. These approaches are featured in my textbook, available at mpsibook.github.io.

Bringing Experiential Learning to the Masses. I am developing opportunities for students (and others) to engage in statistical practice using real-life datasets: *Introduction to Statistical Research Methodology*, for CMU sophomores majoring in the data sciences; the Data Science in Society minor within the Statistics & Data Science department; *Overview of Statistical Learning and Modeling*, for CMU graduate students outside statistics; numerous capstone course offerings; and executive education programs, etc.

Education and Outreach Activity

Textbooks

Modern Probability and Statistical Inference: Illustrated with R (P. E. Freeman), in preparation
(mpsiobook.github.io)

Basic Statistic Learning: a Guide for the Perplexed (P. E. Freeman, S. Colando, E. Franke, R. Yurko), in preparation

Publications

Order in the Course: Using Order Statistics to Teach Statistical Inference to Mathematical Statistics Students (P. E. Freeman, Z. Branson), in preparation (intended for *The American Statistician*)

Combining Learning-by-Teaching with Sports Analytics to Provide Enhanced Avenues of Engagement for Statistics Students (P. E. Freeman, M. P. B. Gaullaugh, A. C. Lee, R. H. Lock, J. D. Patrick, I. P. Ramler, R. X. Sturdivant), Teaching Statistics, submitted

Modernizing How Students Compute Interval Estimates in Mathematical Statistics Courses (P. E. Freeman), Journal of Statistics and Data Science Education, submitted

The Future of Statistical Inference in the Classroom: Aligning Theory with Computation (P. E. Freeman), 2026 International Conference on Teaching Statistics, in press

Facilitating Authentic Practice for Early Undergraduate Statistics Students (P. E. Freeman), The American Statistician, v. 75, pp. 433-444 (2021)

Just How Far Away is That Galaxy, Anyway? Estimating Galaxy Distances Using Low-Resolution Photometric Data (P. E. Freeman), Chance, v. 32, pp. 20-26 (2019)

Combining Novel Research and Community-Engaged Learning in an Undergraduate Physiology Laboratory Course (S. K. Woodley, P. E. Freeman, T. Ricketts), Advances in Physiology Education, v. 43, pp. 110-120 (2019)

Astrostatistics: the Final Frontier (P. Freeman, J. Richards, C. Schafer, A. Lee), Chance, v. 21, pp. 31-35 (2008)

Organizational Activity

Why Probability, Then Statistics When It Can Be Probability, For Statistics? New Approaches for Teaching Mathematical Statistics (organizer: invited session), 2022 Joint Statistical Meetings, Washington, DC, August 2022,

(ww2.amstat.org/meetings/jsm/2022/onlineprogram/ActivityDetails.cfm?SessionID=220799)

An Introduction to Statistical Learning for Astronomy: Connecting Statistical Concepts to Algorithms and Applications (organizer/lecturer: four-hour workshop presented with Gwen Eadie [Toronto]), 239th Meeting of the American Astronomical Society, Salt Lake City, UT, January 2022 (accepted and subsequently cancelled along with the entire in-person meeting due to the pandemic)

Undergraduate Research in Statistics (organizer: topic-contributed session), 2019 Joint Statistical Meetings, Denver, CO, July 2019,

(ww2.amstat.org/meetings/jsm/2019/onlineprogram/ActivityDetails.cfm?SessionID=218287)

Jumpstarting Early Undergraduate Research (organizer: birds-of-a-feather session), 2019 Joint Statistical Meetings, Denver, CO, July 2019,

(ww2.amstat.org/meetings/jsm/2019/onlineprogram/ActivityDetails.cfm?SessionID=218994)

Statistical Learning Summer Workshop (organizer and lead presenter for workshop teaching statistical learning to 21 CMU graduate students outside of statistics), Carnegie Mellon University, Pittsburgh, PA, June-July 2019, (pefreeman.github.io/SLSW.2019/)

Invited Talks

Reimagining Mathematical Statistics: a Spiral-Learning Approach, 2022 Joint Statistical Meetings, Washington, DC, August 2022

Assessing Student Performance in Contrasting Mathematical Statistics Classes: a Case Study, 2022 Electronic Conference on Teaching Statistics, May 2022

Introducing Early Undergraduates to Statistical Practice: How You Can (and Why You Should) Provide Such Opportunities at Your Institution, 2019 Joint Statistical Meetings, Denver, CO, July 2019,
(github.com/pefreeman/Early-Statistical-Practice/blob/master/talk.jsm.2019.pdf)

Research Skills for All: Introducing Statistical Research Methodology to Early Undergraduates at Carnegie Mellon, the Electronic Conference On Teaching Statistics (eCOTS 2018), webinar, May 2018,
(www.causeweb.org/cause/ecots/ecots18/breakouts/5)

Invited Lectures

Machine Learning with Random Forest, Summer School in Statistics for Astronomers, Penn State, PA, June 2019-June 2026, (e.g., sites.psu.edu/astrostatistics/su22-program)

Carnegie Mellon Sports Analytics Camp (lecturer for 16 SURE students), Carnegie Mellon University, Pittsburgh, PA, June-July 2019

Statistics I: Issues in Model Fitting in the X-Ray Regime and *Statistics II: Model Comparison and Parameter Estimation*, X-ray Astronomy School, NASA Goddard Space Flight Center, MD, September 2001/August 2002/May 2003

Statistics in the X-ray Regime, CIAO Workshop, Harvard-Smithsonian Center for Astrophysics, MA, November 2001/May 2002/October 2003

Contributed Sessions

Computers are Changing the (Inferential) Game: How You Can Modernize Your Mathematical Statistics Course (organizer/speaker: 30-minute breakout session, 2026 Electronic Conference on Teaching Statistics, June 2026)

Performing Meaningful Assessment in a Modernized Mathematical Statistics Course Sequence (organizer/speaker: 70-minute breakout session presented with J. Green [Michigan St.] & E. Blankenship [Nebraska]), 2022 Electronic Conference on Teaching Statistics, May 2022

Contributed Talks

Statistical Learning: Catering to the Needs of (Non-)Statistical Audiences, 2026 Joint Statistical Meetings, Boston, MA, August 2026

The Future of Statistical Inference in the Classroom: Aligning Theory with Computation, 2026 International Conference on Teaching Statistics, Brisbane, QLD, Australia, July 2026

Modernizing How Interval Estimation is Taught in Undergraduate Statistics Courses, 2025 Joint Statistical Meetings, Nashville, TN, August 2025

Contributed Posters

Multinomial Simulations: Why We Can (and Should) Use Them Instead of the Chi-Square Goodness-of-Fit Test, the U. S. Conference on Teaching Statistics (USCOTS 2025), July 2025 (https://github.com/pefreeman/USCOTS-2025/blob/main/uscots_poster.pdf)

Modernizing the Teaching of Confidence Intervals in Mathematical Statistics Courses, the Electronic Conference On Teaching Statistics (eCOTS 2024), June 2024 (<https://www.causeweb.org/cause/ecots/ecots24/program/posters/53>)

Executive Education

Understanding Regression Models (2-hour lecture, 3-hour workshop), for *Optum Data Science for Business Leaders* (three sessions per year; 2021-2023)

Regression/Classification (2-hour lecture, 2-hour review/lab, 1.5-hour wrapup), for *PNC Data Science Program* (one session per year; 2022-)

Statistical Models for AI Users, for *Moderna AI Academy* (2022)

Public Outreach

Statistics & Data Science Camp for High-School Students (one-week camp; founder and primary organizer), Carnegie Mellon, Pittsburgh, PA, June 2022-June 2026

Making Sense of the Galaxy Menagerie, Allegheny Observatory, Pittsburgh, PA, May 2016

Study Abroad Opportunities

Study Abroad in Costa Rica (4.5-week program at the Monteverde Institute run in partnership with Therese Tardio of the Department of Languages, Culture & Applied Linguistics; founder and primary organizer of statistics program), May/June 2024 - May/June 2026

Publicly Available Software Packages: R

`cdfinv`: estimation of one- and two-sided confidence intervals via the numerical inversion of the cumulative distribution function of a statistic's sampling distribution (v. 0.1.0; April 2025)

Publicly Available Course Materials

Statistical-Learning-Overview: github.com/pefreeman/Statistical-Learning-Overview

Lecture materials for *Overview of Statistical Learning and Modeling* (36-600), CMU, Fall 2021 (Lab materials are not posted but are available upon request.)

36-290: github.com/pefreeman/36-290

Lecture materials and data for *Introduction to Statistical Research Methodology* (36-290), CMU, Fall 2018 – Fall 2021 (Lab materials are not posted but are available upon request.)

SLSW_2019: github.com/pefreeman/SLSW_2019

Lecture/lab materials and data for the 2019 Statistical Learning Summer Workshop, CMU, 24 Jun – 10 Jul 2019

PSU_2019: github.com/pefreeman/PSU_2019

Lecture/lab materials for “Illustrating Machine Learning with Random Forest,” Penn State, 7 Jun 2019

Funding

Summer Data Science Camp, PI, Grable Foundation, \$9,000 (1 year) 1 June 2024 – 31 Nov 2025

SCORE with Data: Building a sustainable national network for developing and disseminating Sports Content for Outreach, Research, and Education in data science,

Senior Personnel – PI R. A. Nugent, NSF – IUSE/EHR, \$1,100,000 (4 years), 2022-2026

Beyond Earth: Dietrich College Grand Challenge Freshman Seminar,

PI (with T. Werner), Dietrich College, \$36,332 (2 years), 1 Jul 2019 – 30 Jun 2020

2019 Statistical Learning Summer Workshop,

PI (with J. Greenhouse), Office of the Vice Provost for Education, \$7,100 (1 year), 24 Jun – 10 Jul 2019

Advising

Ph.D. Students

Co-Advisor: Rafael Izbicki

Ph.D. Committee (S&DS): Yen-Chi Chen, Niccolo Dalmasso, Meg Ellingwood, Stefa Etchegaray, David Friedenberg, Darren Homrighausen, Irwin McNeely, Collin Politsch, Taylor Pospisil, Joey Richards, Michael Stanley, Michael Vespe, Luba Zeifman

Ph.D. Committee (CMU P&A): Arun Kannawadi, Evan Tucker

Ph.D. Committee (CMU Arch): Haipei Bei

Ph.D. Committee (Pitt P&A): Christine Mazzola

ADA Co-Advisor: Mattia Ciollaro, Manjari Das, Xiaoyi Gu, Rafael Izbicki, Ilmun Kim, Han Liu, Robert Lunde, Jining Qin, Jack Rae, Joey Richards, Giuseppe Vinci, Libo Xie

Undergraduate Students

Director of the Undergraduate Program (2021-) (Co-Director 2019-2021)

Summer Undergraduate Research Apprenticeship: Project Coordinator (2020-)

Summer Undergraduate Research Experience: Alister Liao

Senior Honors Thesis: H. Eric Alpert (2015-16), Mary Bollinger (2019-20), Dylan Chou (2022), Corey Emery (2019-20), Andrew Furlong (2021-22), Katy McKeough (2014-15)

Undergraduate Research II (36-491): Divya Rao, Kan Sun, Xun Zhang (Spring 2022)

Early Undergraduate Research (36-297): Jessica Goldring, Vardaan Shah, Colin Yip, Juran Zhang (Fall 2022); Befeker Assefa, Amit Bhattacharjya, Martin Cheong, Liz Chu, Hannah Hayes, Jack Shen (Spring 2023); Elliot Buera, Amanda Lu, Krish Mawalkar, Kyumin Park, Natalie Sarabosing, Shirley Xiang (Fall 2023); Smrithi Krishnaswamy, Zaina Saif, Jennifer Zhao, Jessie Zhou (Fall 2024); Tyler Paek, Natalie Rayce, Anwei Yan, Felicia Zhang (Spring 2025)

Junior/Senior Independent Study: Sage Betko, Isabel Brannan, Brittany Chen, Zixuan Chen, James Eby, Daniel Frank, Tom Goode, Irina Javed, Dorothy Lu, Roochi Shah, Emily Wright, Bo Xia, Qiyang Xu, Kewei Zhang, Yan Zhao

Freshman/Sophomore Independent Study: Joshua Brakensiek, Audrey Callahan, Andersen Chang, Corey Emery, Noah Fatsi, Yitian Feng, Emma Flickinger, Cathy Galdamez, Sally Guo, Malaika Handa, Mekhi Hernandez, David Hua, Frank Kovacs, Xinya Li, Shannon Lu, Krish Mawalkar, Ricardo Roche, Maria Rodriguez, Roochi Shah, Filipp Shelobolin, Christopher Shen, Charles Wang, Bo Xia, Shichen Yang, Boyan Zhang

Project External Advisor: Nick Begalla, Margaret Cartaya, James Kerchenfault, Jessica McMullen; Jeremy Doo, Gregory Hallenbeck, So Young Park, Jason Waddell; Jingyi Mo, Michael Rednor, Kyra Singh; H. Eric Alpert, Ron Yurko; Ian Donovan, Melody Han, Zoeanne Juang, Hua Zhi Situ, Lucy Wang

Undergraduate Students: Meeting of the Minds Oral Presentations

- 2022 – *Quantifying the Relationship Between Economic Crises and Political Unrest* (A. Furlong; Honors Thesis)
- 2016 – *Constraining Stellar Multiplicity with Approximate Bayesian Computation* (H. E. Alpert; Honors Thesis)
- 2015 – *Redshift Dependence of the Power Spectrum for Sloan Digital Sky Survey Data Release 11 Quasars* (K. McKeough; Honors Thesis)

Undergraduate Students: Meeting of the Minds Poster Presentations

Bolded titles: directly advised projects

- 2025 – **The Long-Term Stability of Bird Populations in Monteverde** (M. Hernandez; 36-295)
- **Pittsburgh's Parks in Action: Understanding Public Engagement with PPC** (A. Yan, F. Zhang, N. Rayce, T. Paek; 36-297)
- 2024 – **Detecting Redundancy in Reported CGM Device Issues** (I. Dai, C. Li, S. Nangunuri, N. Neralagi; 36-497)
- 2023 – *Classification of Children's Literature* (S. Xie, C. Liu, Y. Pan, W. Huang; 36-490)
- *How to Increase CMU Advising Survey Response Rate?* (S. Kong, K. Nam, L. Fan, Y. Chen; 36-490)
- *A Disturbance in the Force? Modeling QB Pressure with Force-Based Metrics* (A. Liang, H. Lian, J. Quan, J. Choi; 36-490)
- *Big Data Derby* (W. Deng, S. Mei, F. Wang, L. Wang; 36-490)
- **ACHD: Mon Valley Air Toxics Study** (S. Betko, M. Koo, M. Kwon; 36-497)
- **Investigation of US Drug Overdose Death Rates** (J. Chang, W. Lan, L. Li, H. Wu, A. Zhu; 36-497)
- **Characterizing Pittsburgh Parks Conservancy Donors** (D. Hoque, E. Hu, D. Lu, A. Niu; 36-497)
- 2022 – **Characterizing the Donor Landscape for the Pittsburgh Parks Conservancy** (K. Bian, J. Huang, N. Wang, S. Yoon, Y. Zhu; 36-497)
- **Mapping Particulate Pollution in Allegheny County** (H. Choi, S. Erickson, Yifan Wang, Yilin Wang; 36-497)
- *Exploring Relationships Between Vaccinations, Hospitalizations, and Deaths During the Covid-19 Pandemic* (M. Lim, S. Tavares, A. Wang, H. Zhang; 36-497)
- *Analyzing Gender and Topical Readership in Children's Books* (L. Jang, M. Song, X. Wu; 36-490)
- *CMU Course Landscape Scan - Information and Data Literacy* (T. Hu, M. Moore, W. Shan; 36-490)
- *Mapping High-Impact Practices in Dietrich College* (B. Gu, J. Jung, J. Pak; 36-490)
- *(Dis)Loyal Alliances: A Transnational Cold War Network of Power* (G. Diess, X. Gan, I. Hu, S. Nie; 36-490)
- **Using Data to Support Students** (L. Chen, D. Dinerman, E. Du, A. Zhu; 36-490)
- **Connecting CMU Researchers to Current Grant Opportunities** (D. Rao, P. Sun, L. Zhang; 36-490)
- *Decoding Hewins' Books for the Young* (V. Chang, A. Gong, S. Kim; 36-490)
- **Mercuries and the Machine: London Newsbooks in 1649** (Q. Chen, B. Fafata, E. Huang, A. Pokharel; 36-490)
- *Understanding the Relationship Between Multilingualism and Executive Functions* (Z. Leventhal, M. Wang, C. Ye; 36-490)
- *Mapping Sustainable Goals to CMU Course Offerings* (A. Chen, L. Saito, S. Sun; 36-490)
- *PHIGHT COVID: Effectiveness of State-Level Mask Mandates* (A. Dai, C. Kong, J. Lederman, S. Yang; 36-490)
- **Classification of Active Galaxies Observed by SDSS** (C. Choi, S. Suralikal; 36-290)
- **Classifying BL Lacs with FERMI Data** (S. Bhushan, M. Ehlers, C. Xiong; 36-290)
- **Predicting Redshift Using SDSS and GALEX Data** (E. Gupta, J. Huang, D. Lurie, M. Shou; 36-290)
- **Is it a Planet? Classifying TESS Observations** (M. Farhadi, K. Nam, H. Shane, S. Tang; 36-290)
- **Classification of White Dwarfs Observed by SDSS** (K. Li, R. Shah, C. Wu, B. Xia; 36-290)
- 2021 – **Transforming Unstructured Product Data** (G. Bae, A. Tan, P. Wu, C. Zhang; 36-497)
- *Predicting Wearer Demographics via Integrated Data Sources* (D. Blank, N. Sanderson, A. Sima, A. Ye; 36-497)
- *Comparison of COVID-19 Forecasting Models* (A. Lopata, S. Wong, Q. Yin; 36-497)
- *Modeling Covid-19 in UK* (Y. Chen, A. Hong, L. Qiao, K. Zhao; 36-497)
- **Improving Card-Linked Offers Redemption** (E. Chen, E. Gong, C. Yang, S. Yang, L. Yao; 36-497)
- *Understanding US-China Relations: Text Analysis on Congressional Speeches* (S. Ding, H. Zheng; 36-490)
- **Predicting Banking Crises** (A. Furlong, A. Tang, K. Wagner, Z. Zhang; 36-490)
- *Tracking Political Sentiment on Cold War China in Congressional Speeches* (H. Hu, Y. Lin, Z. Novack; 36-490)
- **Exploring Trends in CMU Grant Data** (K. Balenzano, M. Dy, M. Li, V. Lin; 36-490)
- *Matching Sustainable Goals to CMU Course Offerings* (L. Chawla, J. Guo, P. Wu, C. Yan; 36-490)
- **Leveraging Sections 1A, 7, 7A in 10-K Filings to Analyze Risk Trends** (M. Chen, D. Chou, S. Jakka, A. Pritchard; 36-490)
- *PHIGHT COVID* (M. Ma, A. Pan, T. Wang, B. Yuan; 36-490)
- *Understanding Pesticide and Salt Effects on Developmental Neuroplasticity in Amphibians* (C. Ma, A. Montgomery, E. Oh; 36-490)

- **Predicting Galaxy Mass from Sky Coordinates and Brightness** (N. Choudhari, C. Hua, E. Huang, J. Yao; 36-290)
- **Predicting BCG Mass from Brightness and Shape** (A. Dai, M. Raavicharla, B. Zheng; 36-290)
- **Classifying ROSAT X-ray Sources** (L. Janicke, J. Lee, P. Qiu, J. Shan; 36-290)
- 2019 – **Predicting Future Returns of Factor Portfolios** (J. Pu, E. Wang, S. Xu; 36-497)
- **Real Estate Total Return Forecasting** (A. Dong, J. Min, Y. Xie; 36-497)
- **Sovereign Ratings** (M. Han, L. Jiang, D. Lim; 36-497)
- **Regime Modeling** (R. Jia, Z. Liao, Q. Weng; 36-497)
- *Characterizing Incidents at Black & Veatch* (A. Adler, I. Javed, S. Lu, S. Prakash; 36-497)
- *Predicting Brands for a Market Research Firm* (Y. W. Doe, S. Jahanian, K. Rao, H. Yoo; 36-497)
- *Receipt Classification* (C. Ehman, J. Parker, A. Tucker, Y. Wu; 36-497)
- **Tinder for Brands: A Statistical Approach to Identifying Celebrities for Brand Endorsements** (C. Manaog, J. Pakala, P. Patro; 36-497)
- **Identifying Progenitors of Observed Galaxies** (S. Prakash; 36-495)
- *Utilizing Infant EEG Brain Patterns to Predict Childhood ADHD* (J. Kim, Y. Wen, J. W. Yoon, W. Zhao; 36-490)
- **Do Streamlined Books Improve Young Students' Reading Comprehension?** (G. Cao, Y. D. Kim, X. Shi, T. Yannekis; 36-490)
- **Identifying Luminous Red Galaxies in Large Galaxy Catalogs** (R. W. S. Tse, M. Yudin, S. Zebar; 36-490)
- **What Makes Shakespeare Different? A Textual Analysis of ODNB Entries** (M. Fan, J. S. Lee; 36-490)
- **Relating Galaxy Masses to Their Brightnesses and Distances** (I. Brannan, S. Ding, S. Mallipedi, Y. Zhang; 36-290)
- **Classifying Stars versus Luminous Red Galaxies Using Optical and Infrared Data** (G. Bae, H. Douglas, A. Gu, V. Kalinovich; 36-290)
- **Classification of Kepler Objects of Interest** (P. Liu, Z. Liu, A. Ramakrishnan, M. Raman; 36-290)
- **Predicting Galaxy Mass and Star Formation Rate from Emission Line Spectra** (P. Meyyappan, H. Rockwell, F. Shelobolin; 36-290)
- 2018 – **Bellagos Redevelopment of Long Term Care Insurance Program** (I. Donovan, M. Han, Z. Juang, H. Z. Situ, L. Wang; Society of Actuaries)
- **Investigating the Relationship Between Photometric Redshift and Galaxy Properties** (I. Javed; 36-495)
- **Galaxy Emission Lines and Their Relationship to Morphology** (C. Galdamez; 36-198)
- **Predicting Galaxy Properties Given Those of Their Dark Matter Halos** (C. Shao; 36-198)
- **Determining the Proportion of Multiple Star Systems using APOGEE Radial Velocity Data** (S. Lu; 36-198)
- 2017 – **Time Series Modeling of Medical Emergencies in Pittsburgh** (T. Goode; 36-495)
- **Uncovering the Relationship Between a Galaxy's Structure and its Mass and Star-Formation Rate** (Z. Chen; 36-495)
- **Template Selection for Photometric Redshift Estimation** (Q. Xu; 36-495)
- **Learning Relationships From Summary Statistics of Simulated Galaxies to Predict Galaxy Mass** (F. Kovacs; 36-198)
- **Identifying Contact Binaries in the Catalina Real-Time Transient Survey** (R. Roche; 36-198)
- **Analyzing Changes in Galaxy Morphologies as the Universe Ages** (C. Emery; 36-198)
- **Linking the Masses of Galaxies to their Morphologies** (M. Rodriguez; 36-198)
- **Predicting Galaxy Mergers from Physical Characteristics** (M. Handa; 36-198)
- **Galaxy Morphology and Environment Density: Detecting a Relationship** (E. Flickinger; 36-198)
- 2016 – **Galaxy Morphology and Synthesis: Application for the Large Synoptic Sky Telescope** (J. Brakensiek; External)
- **Classification: Star or Galaxy?** (Y. Zhao; 36-495)
- **Identifying Clusters in the Draco Dwarf** (D. Hua; 36-198)
- **Comparing Statistics between Observed and Simulated Galaxy Data** (X. Li; 36-198)
- **Inferring the Relationship Between Galaxy Morphology Statistics and Redshift** (S. Yang, B. Zhang; 36-198)
- **Modeling the Alignment of BCG in Galaxy Clusters** (C. Wang; 36-198)
- **Differentiating Stars and Galaxies in SDSS and WISE Data** (S. Guo; 36-198)
- 2015 – **Predicting Galaxy Ellipticity From Other Galaxy Properties** (B. Chen; 36-495)
- **Predicting the Masses of Galaxy Clusters Using Weighted Linear Regression** (J. Eby; 36-495)
- **Classifying Kepler Objects of Interest** (H. E. Alpert, R. Yurko; 36-490)
- **Detecting Connected Pairs of Galaxies** (Y. Feng; 36-198)
- 2014 – **Evaluating Statistics of Galaxy Cluster Detection** (K. McKeough; 36-495)
- **Cosmic Variance: Spatial Bootstrapping** (N. Fatsi; 36-198)
- **Estimating Cosmic Variance** (A. Callahan; 36-198)
- **Modeling Cosmic Variance** (A. Chang; 36-198)

- 2013 – **A Non-Parametric Method for Interpolating Telescope Point-Spread Functions**
(K. McKeough; 36-295)
- 2011 – **The Ultra-High-Energy Cosmic Ray – Active Galactic Nucleus Connection** (K. Zhang; 36-495)
– **The Connection Between Ultra High Energy Cosmic Rays and Active Galactic Nuclei**
(J. Mo, M. Rednor, K. Singh; 36-490)
- 2009 – **Galaxy Classification** (D. Frank; 36-495)
- 2008 – **Detection of X-Ray Sources** (J. Doo, G. Hallenbeck, S. Y. Park, J. Waddell; 36-490)
– **Detecting Sources in Astronomical X-Ray Images**
(M. Cartaya, J. Kerchenfaut, J. McGillen, N. Segalla; 36-490)

Undergraduate Students: Departmental Poster Presentations (During Covid-19 Pandemic)

- 2020 – *Natural Language Processing for Receipt Classification* (R. Chun, A. Gu, M. Khan, T. Kim, E. Zhong; 36-497)
– *Predicting Customer Segmentation from Transactional Data* (R. Ahuja, H. Chai, A. Jain, C. Zhang; 36-497)
– *Zero Harm Initiative Project* (D. Hu, R. Kang, E. Ouyang, W. Qin, L. Zhang; 36-497)
– *A Pipeline for Characterizing Fashion Items' Online Popularity*
(L. Han, A. Huang, L. Li, J. Moon, D. Tan; 36-497)
– *Text Analysis of U.S. Congressional Records* (A. Behnke, J. Mahler, P. Meyyappan, Y. Song; 36-490)
– *How Children Inspect Visually Available Information During Language Comprehension*
(K. Chen, G. Kawkye, R. Yang, Q. Yin; 36-490)
– *Capturing Individual Differences in Children's Knowledge Organization* (T. Kim, J. Lee, Y. Zhang; 36-490)
– **Simple Neural Network Exploration of the Mechanisms of Human Speech Adaptation**
(W. J. Cha, Y. Hu, M. Raman, D. Xu; 36-490)
– **Investigating Speech Adaptation with Convolutional Neural Networks**
(E. Ahn, S. Goyal, Y. Y. Lam, L. Lyu; 36-490)
– **So You're a Star – But How Hot Are You?** (L. Lu, K. Phelps, T. Prakash, A. Trivedi; 36-290)
– **Predicting Galaxy Mass from Sky Location and Brightness** (C. Qu, S. Wang, P. Wu, G. Zhao; 36-290)
– **Classifying Kepler Objects of Interest** (A. Furlong, J. Lederman, L. Pancholly, A. Vasudev; 36-290)
– **Predicting Quasar Redshifts Given Brightness** (M. Chen, P. Qin, M. Wang; 36-290)

Undergraduate Students: Summer Undergraduate Research Apprenticeship

- 2024 – *Books for the Young Data-Gathering Project* (E. Lai, J. Peng, J. Scharpf, Z. Xu, W. Zhou)
– *Bulletin of the Center for Children's Books Data Collection*
(J. Chang, V. Huai, Y. J. Kim, K. Korrapati, R. Orth, S. Yoon)
– *Course Material Costs at CMU* (A. Kundu, J. Liu, B. Qu, J. Wu)
- 2023 – *Books for the Young* (J. Deng, C. Jestin, A. Lee, M. Perry, J. Xu, I. Ye, A. Zhang, T. Zhang)
– *Data Visualization: a Landscape Scan* (M. Paz Parra)
– *Collaboratory Against Hate: Data Collection and Processing* (P. Chen, E. Dagnachew, B. Liao, M. Visco)
- 2022 – *A Meta-Analysis of Racial Representation in Children's Books* (M. Dai, H. Kwon, Y. Shavialenka, J. Yu)
– *Books for the Young* (K. H. Chen, E. Chung, C. Inacio)
- 2021 – *Using a Survey Dataset to Identify Factors that Influence Data Reuse Behavior in Research*
(A. Ai, X. Liu, B. Valentovich, B. Xia)
– *The Efficacy of Human Rights Sanctions: Exploring the Economic Links Between Sanctions and Government Repression* (J. Huang, M. Ray, R. Shah, S. Tang)
- 2020 – *CMU Libraries - Project 1* (M. Lim, A. Pan)
– *CMU Libraries - Project 2* (A. Dai, R. Dasika, W. S. Jiang, P. Li)

Courses Taught

- 2025 (Fall) *Engineering Statistics and Quality Control (36-220) [*]* (71 students)
- 2025 (Fall) **Probability and Statistical Inference I (36-236)** (183 students)
- 2025 (Fall) **Applications of Real-World Data Science: A Capstone Experience (36-644: online certification)** (10 students; co-taught with R. Nugent)
- 2025 (Sum) **Gaining Insights through Statistical Modeling and Machine Learning (36-641: online certification)** (17 students)
- 2025 (Sum) **Probability & Statistics for Data Science (36-640: online certification)** (17 students)
- 2025 (Sum) **Study Abroad Experience in Statistics and Data Science (99-520Q)**
(4 students; co-taught with W. Townes)
- 2025 (Spr) **Probability and Statistical Inference II (36-236)** (158 students)
- 2025 (Spr) *Statistical Computing (36-350) [**]* (143 students)
- 2024 (Fall) **Probability and Statistical Inference I (36-235)** (170 students)
- 2024 (Fall) **Overview of Statistical Learning and Modeling (36-600)** (56 students)

2024 (Fall) **Gaining Insights through Statistical Modeling and Machine Learning (36-641: online certification)** (12 students)

2024 (Fall) **Probability & Statistics for Data Science (36-640: online certification)** (16 students)

2024 (Sum) **Study Abroad Experience in Statistics and Data Science (36-390)** (5 students)

2024 (Spr) **Probability and Statistical Inference II (36-236)** (150 students)

2024 (Spr) **Gaining Insights through Statistical Modeling and Machine Learning (36-641: online certification)** (2 students)

2024 (Spr) **Probability & Statistics for Data Science (36-640: online certification)** (2 students)

2023 (Fall) **Probability and Statistical Inference I (36-235)** (174 students)

2023 (Fall) **Overview of Statistical Learning and Modeling (36-600)** (39 students)

2023 (Spr) **Probability and Statistical Inference II (36-236)** (134 students)

2023 (Spr) *Statistical Practice (36-726)* (36 students; co-taught with V. Ventura and N. Niezink)

2022 (Fall) **Probability and Statistical Inference I (36-235)** (151 students)

2022 (Fall) **Overview of Statistical Learning and Modeling (36-600)** (41 students)

2022 (Fall) *Undergraduate Research (36-490)* (16 students; co-taught with J. McGovern)

2022 (Fall) *Corporate Capstone Project (36-497)* (7 students; co-taught with J. McGovern)

2022 (Spr) **Beyond Earth (66-122)** – DC Grand Challenge Freshman Seminar (38 students; co-taught with T. Werner)

2022 (Spr) *Introduction to Statistical Inference (36-226)* (184 students)

2022 (Spr) *Undergraduate Research (36-490)* (17 students; co-taught with J. McGovern)

2022 (Spr) *Corporate Capstone Project (36-497)* (9 students; co-taught with J. McGovern)

2021 (Fall) **Introduction to Statistical Research Methodology (36-290)** (18 students)

2021 (Fall) *Undergraduate Research (36-490)* (20 students; co-taught with J. McGovern)

2021 (Fall) *Corporate Capstone Project (36-497)* (12 students; co-taught with J. McGovern)

2021 (Fall) **Overview of Statistical Learning and Modeling (36-600)** (23 students)

2021 (Spr) **Beyond Earth (66-122)** – DC Grand Challenge Freshman Seminar (38 students; co-taught with T. Werner)

2021 (Spr) *Introduction to Statistical Inference (36-226)* (170 students)

2021 (Spr) *Undergraduate Research (36-490)* (16 students)

2020 (Fall) **Introduction to Statistical Research Methodology (36-290)** (11 students)

2020 (Fall) *Statistical Computing (36-350)* (89 students)

2020 (Fall) *Undergraduate Research (36-490)* (14 students)

2020 (Spr) *Sports Analytics Capstone (36-493)* (15 students; co-taught with R. Nugent)

2020 (Spr) *Undergraduate Research (36-490)* (19 students)

2020 (Spr) *Statistical Computing (36-350)* (142 students)

2020 (Spr) **Beyond Earth (66-122)** – DC Grand Challenge Freshman Seminar (32 students; co-taught with T. Werner)

2019 (Fall) *Corporate Capstone Project (36-497)* (32 students; co-taught with R. Nugent)

2019 (Fall) *Undergraduate Research (36-490)* (3 students)

2019 (Fall) *Introduction to Probability Theory (36-225)* (256 students)

2019 (Fall) **Introduction to Statistical Research Methodology (36-290)** (16 students)

2019 (Spr) *Corporate Capstone Project (36-497)* (12 students; co-taught with R. Nugent)

2019 (Spr) *Undergraduate Research (36-490)* (13 students)

2019 (Spr) *Statistical Computing (36-350)* (102 students)

2018 (Fall) *Introduction to Probability Theory (36-225)* (235 students)

2018 (Fall) **Introduction to Statistical Research Methodology (36-290)** (15 students)

2018 (Fall) *Industry Research Project (36-497)* (25 students; co-taught with R. Nugent)

2017 (Fall A2) *Introduction to Probability Theory (36-225)* (178 students)

2017 (Fall) *Statistical Computing (36-350)* (two sections; 177 students overall)

2017 (Spr A4) **Astrostatistics (36-494)** (20 students)

2016 (Fall) *Introduction to Probability Theory (36-225)* (two sections; 292 students overall)

2016 (Spr) **Where is Everybody? (36-147)** (DC freshman seminar, 16 students)

2015 (Fall) *Introduction to Probability Theory (36-225)* (244 students)

2015 (Spr) **Astronomy in the Era of Big Data (36-149)** (DC freshman seminar, 15 students)

2015 (Spr) *Statistical Computing (36-650/36-750)* (12 students; co-taught with Chris Genovese)

2014 (Fall) *Introduction to Probability Theory (36-225)* (214 students)

2014 (Spr) **Astronomy in the Era of Big Data (36-149)** (DC freshman seminar, 15 students)

2013 (Fall) *Introduction to Probability Theory (36-225)* (165 students)

2013 (Spr) *Engineering Statistics and Quality Control (36-220)* (164 students)

2012 (Fall) *Engineering Statistics and Quality Control (36-220)* (115 students)

2012 (Spr) **Astronomy in the 21st Century (36-149)** (H & SS freshman seminar, 14 students)

2011 (Fall) *Introduction to Probability Theory (36-225)* (185 students)

2011 (Spr) *Engineering Statistics and Quality Control (36-220)* (146 students)

2010 (Fall) **Astrostatistics (36-148)** (H & SS freshman seminar, 7 students)

2009 (Spr)	<i>Engineering Statistics and Quality Control (36-220)</i> (135 students)
2007 (Fall)	<i>Engineering Statistics and Quality Control (36-220)</i> (105 students)
2007 (Spr)	<i>Engineering Statistics and Quality Control (36-220)</i> (65 students)
1999	<i>Stellar Structure</i> (10 students; Arizona State University)
1998	<i>Astronomy I: Solar System</i> (35 students; Mesa Community College)
1996	<i>Astronomy II: Galaxies/Cosmology</i> (50 students; Arizona State University)

Bolded course titles indicate courses I developed.

[*] Redesigned previously course in its entirety.

[**] Assisted in redesigning course to incorporate **Python**; taught Weeks 12-14.

Note that this list does not include the advising of individualized research in 36-198, 36-295, 36-297, 36-495, and senior honors theses.

Service and Synergistic Activities

College Service

- 2022 Faculty Representative — Hiring Committee for *Associate Dean for Student Success*
2021-2022 Co-Chair of *Data Literacy Core Competency Group*
2019- Departmental Representative to DC *College Council*

Departmental Service

- 2022- *Organizer: Statistics & Data Science Camp for High-School Students*
2021- *Director of the Undergraduate Program*
2019- *Undergraduate Outreach Committee (Chair)*
2019- *Academic Programs Committee*
2019-2021 *Co-Director of the Undergraduate Program*
2018-2019 *Assistant Director of the Undergraduate Program*
2017- *Undergraduate Advisor (Statistics Core Major)*
2016- *Undergraduate Committee*
2011-2019 *Computing Committee (Chair)*
2009-2011 *Computing Committee*

Professional Service

- 2027 *Program Chair-Elect, Section on Statistics in Sports, American Statistical Association*
2021- *Mentor, Section on Statistics and Data Science Education, American Statistical Association*
2021 *Chair, Astrostatistics Interest Group, American Statistical Association*

Research Collaborations

- 2016- *Large Synoptic Survey Telescope Dark Energy Science Collaboration*
2013- *Hubble Space Telescope Cosmic Assembly Near-infrared Deep Extragalactic Legacy Survey*
2009- *Large Synoptic Survey Telescope Informatics and Statistics Science Collaboration*

Professional Organizations

- 2018- *International Astronomical Union*
2014- *Astrostatistics Interest Group of the American Statistical Association*
2013- *American Statistical Association*
1990- *American Astronomical Society*

Journal Editing

- 2021- Associate Editor: *Annals of Applied Statistics*

Journal Refereeing

Ad hoc reviewer for *Journal of Statistics and Data Science Education*, *The Astrophysical Journal*, *The Astronomical Journal*, *Astronomy & Computing*, *Advances in Data Analysis and Classification*, *Monthly Notices of the Royal Astronomical Society*, and *Physical Review*

Publicly Available Software

CDESB: github.com/pefreeman/CDESB

Code for conditional density estimation in a selection bias setting

DataLinker: github.com/pefreeman/DataLinker

Code for linking two datasets using diffusion map

galmorph: github.com/pefreeman/galmorph

Code for extracting features from galaxy postage-stamp images

ltst: github.com/pefreeman/ltst

Code for carrying out local two-sample testing with random forest

wavdetect: cxc.harvard.edu/ciao/ahelp/wavdetect.html

Source detection software for use with Chandra X-ray Telescope data (primary developer)

Sherpa: <http://cxc.harvard.edu/sherpa/>

Modelling software for use with Chandra X-ray Telescope data (major contributor)

Research Publications

First Author

- Local Two-Sample Testing: a New Tool for Analysing High-Dimensional Astronomical Data* (P. E. Freeman, I. Kim, & A. B. Lee), *Monthly Notices of the Royal Astronomical Society*, v. 471, pp. 3273-3282 (2017)
- A Unified Framework for Constructing, Tuning and Assessing Photometric Redshift Density Estimates in a Selection Bias Setting* (P. E. Freeman, R. Izbicki, & A. B. Lee), *Monthly Notices of the Royal Astronomical Society*, v. 468, pp. 4556-4565 (2017)
- New Image Statistics for Detecting Disturbed Galaxy Morphologies at High Redshift* (P. E. Freeman, R. Izbicki, A. B. Lee, J. A. Newman, C. J. Conselice, A. M. Koekemoer, J. M. Lotz, & M. Mozena), *Monthly Notices of the Royal Astronomical Society*, v. 434, pp. 282-295 (2013)
- Photometric Redshift Estimation Using Spectral Connectivity Analysis* (P. E. Freeman, J. A. Newman, A. B. Lee, J. W. Richards, & C. M. Schafer), *Monthly Notices of the Royal Astronomical Society*, v. 398, pp. 2012-2021 (2009)
- Examining the Effect of the Map-Making Algorithm on Observed Power Asymmetry in WMAP Data* (P. E. Freeman, C. R. Genovese, C. J. Miller, R. C. Nichol, & L. Wasserman), *The Astrophysical Journal*, v. 638, pp. 1-19 (2006)
- A Wavelet-Based Algorithm for the Spatial Analysis of Poisson Data* (P. E. Freeman, V. Kashyap, R. Rosner, & D. Q. Lamb), *The Astrophysical Journal Supplements*, v. 138, pp. 185-218 (2002)
- Statistical Analysis of Spectral Line Candidates in Gamma-Ray Burst GB870303* (P. E. Freeman, C. Graziani, D. Q. Lamb, T. J. Loredo, E. E. Fenimore, T. Murakami, & A. Yoshida), *The Astrophysical Journal*, v. 524, pp. 753-771 (1999)
- Resonant Cyclotron Radiation Transfer Model Fits to Spectra from Gamma-Ray Burst GB870303* (P. E. Freeman, D. Q. Lamb, J. C. L. Wang, I. Wasserman, T. J. Loredo, E. E. Fenimore, T. Murakami, & A. Yoshida), *The Astrophysical Journal*, v. 524, pp. 772-793 (1999)

Other

- A Captive Unmanaged Population of Coqui Frogs (*Eleutherodactylus coqui*) in a Pennsylvanian Plant Conservatory* (H. J. Moore, K. S. Bischof, S. J. McClelland, M. Wheeler-Dubas, S. L. States, P. E. Freeman, & S. K. Woodley), *Herpetological Review*, revision submitted (2022)
- Deep Generative Models for Galaxy Image Simulations* (F. Lanusse, R. Mandelbaum, S. Ravanbakhsh, C.-L. Li, P. Freeman, & B. Poczos), *Monthly Notices of the Royal Astronomical Society*, v. 504, pp. 5543-5555 (2021)
- The Close Binary Fraction as a Function of Stellar Parameters in APOGEE: A Strong Anti-Correlation With α Abundances* (C. N. Mazzola, C. Badenes, M. Moe, S. Koposov, M. Kounkel, K. Kratter, K. Covey, M. G. Walker, T. A. Thompson, B. Andrews, P. E. Freeman, B. Anguiano, J. K. Carlberg, N. M. De Lee, S. Majewski, D. Nidever, C. Nitschelm, A. M. Price-Whelan, A. Roman-Lopes, K. G. Stassun, & N. W. Troup), *Monthly Notices of the Royal Astronomical Society*, v. 499, pp. 1607-1626 (2020)
- Evaluation of probabilistic photometric redshift estimation approaches for LSST* (S. J. Schmidt, A. I. Malz, J. Y. H. Soo, I. A. Almosallam, M. Brescia, S. Cavioti, J. Cohen-Tanugi, A. J. Connolly, J. DeRose, P. E. Freeman, M. L. Graham, K. G. Iyer, M. J. Jarvis, J. B. Kalmbach, E. Kovacs, A. B. Lee, G. Longo, C. B. Morrison, J. A. Newman, E. Nourbakhsh, E. Nuss, T. Pospisil, H. Tranin, R. H. Wechsler, R. Zhou, R. Izbicki, & the LSST Dark Energy Science Collaboration), *Monthly Notices of the Royal Astronomical Society*, v. 499, pp. 1587-1606 (2020)
- Conditional Density Estimation Tools in Python and R with Applications to Photometric Redshifts and Likelihood-Free Cosmological Inference* (N. Dalmasso, T. Pospisil, A. B. Lee, R. Izbicki, P. E. Freeman, A. I. Malz), *Astronomy & Computing*, 30:100362 (2020)
- Automated Distant Galaxy Merger Classifications from Space Telescope Images using the Illustris Simulation* (G. F. Snyder, V. Rodriguez-Gomez, J. M. Lotz, P. Torrey, A. C. N. Quirk, L. Hernquist, M. Vogelsberger, P. E. Freeman), *Monthly Notices of the Royal Astronomical Society*, v. 486, pp. 3702-3720 (2019)
- Stellar Multiplicity Meets Stellar Evolution And Metallicity: The APOGEE View* (C. Badenes, C. Mazzola, T. A. Thompson, K. Covey, P. E. Freeman, M. G. Walker, M. Moe, N. Troup, D. Nidever, C. Allende Prieto, B. Andrews, R. H. Barbá, T. C. Beers, J. Bovy, J. K. Carlberg, N. De Lee, J. Johnson, H. Lewis, S. R. Majewski, M. Pinsonneault, J. Sobeck, K. G. Stassun, G. Zasowski), *The Astrophysical Journal*, v. 854, id. 147 (2018)
- Intrinsic Alignments in redMaPPer Clusters – II. Radial Alignment of Satellites Toward Cluster Center* (H.-J. Huang, R. Mandelbaum, P. E. Freeman, Y.-C. Chen, E. Rozo, & E. Rykoff), *Monthly Notices of the Royal Astronomical Society*, v. 474, pp. 4772-4794 (2018)
- Prediction of Galaxy Ellipticities and Reduction of Shape Noise in Cosmic Shear Measurements* (R. A. C. Croft, P. E. Freeman, T. S. Schuster, & C. M. Schafer), *Monthly Notices of the Royal Astronomical Society*, v. 469, pp. 4422-4427 (2017)
- Photo-z Estimation: An Example of Nonparametric Conditional Density Estimation Under Selection Bias* (R. Izbicki, A. B. Lee, & P. E. Freeman), *Annals of Applied Statistics*, v. 11, pp. 698-724 (2017)
- Characterizing and Modeling Variation of the Hypothalamic-Pituitary-Adrenal/Interrenal Axis in Free-Living Salamanders* (J. R. Thomas, A. J. Magyan, P. E. Freeman, & S. K. Woodley), *Journal of Experimental Biology*, v. 220, pp. 1210-1221 (2017)

- Detecting Effects of Filaments on Galaxy Properties in the Sloan Digital Sky Survey III* (Y.-C. Chen, S. Ho, R. Mandelbaum, N. A. Bahcall, J. R. Brownstein, P. E. Freeman, C. R. Genovese, D. P. Schneider, & L. Wasserman), Monthly Notices of the Royal Astronomical Society, v. 466, pp. 1880-1893 (2017)
- Intrinsic Alignments in redMaPPer Clusters – I. Central Galaxy Alignments and Angular Segregation of Satellites* (H.-J. Huang, R. Mandelbaum, P. E. Freeman, Y.-C. Chen, E. Rozo, E. Rykoff, & E. J. Baxter), Monthly Notices of the Royal Astronomical Society, v. 463, pp. 222-244 (2016)
- Cosmic Web Reconstruction through Density Ridges: Catalogue* (Y.-C. Chen, S. Ho, J. Brinkmann, P. E. Freeman, C. R. Genovese, D. P. Schneider, & L. Wasserman), Monthly Notices of the Royal Astronomical Society, v. 461, pp. 3896-3909 (2016)
- Beyond Spheroids and Discs: Classification of CANDELS Galaxy Structure at $1.4 < z < 2$ via Principal Component Analysis* (M. A. Peth, J. M. Lotz, P. E. Freeman, C. McPartland, S. A. Mortazavi, G. F. Snyder, N. A. Grogin, Y. Guo, S. Hemati, J. S. Karteltepe, D. D. Kocevski, A. M. Koekemoer, D. H. McIntosh, H. Nayyeri, C. Papovich, J. R. Primack, R. C. Simons, A. van der Wel), Monthly Notices of the Royal Astronomical Society, v. 458, pp. 963-987 (2016)
- Investigating Galaxy-Filament Alignments in Hydrodynamic Simulations using Density Ridges* (Y.-C. Chen, S. Ho, A. Tenneti, R. Mandelbaum, R. Croft, T. DiMatteo, P. E. Freeman, C. R. Genovese, & L. Wasserman), Monthly Notices of the Royal Astronomical Society, v. 454, pp. 3341-3350 (2015)
- Cosmic Web Reconstruction through Density Ridges: Method and Algorithm* (Y.-C. Chen, S. Ho, P. E. Freeman, C. R. Genovese, & L. Wasserman), Monthly Notices of the Royal Astronomical Society, v. 454, pp. 1140-1156 (2015)
- Diverse Structural Evolution at $z > 1$ in Cosmologically Simulated Galaxies* (G. F. Snyder, J. Lotz, C. Moody, M. Peth, P. Freeman, D. Ceverino, J. Primack, & A. Dekel), Monthly Notices of the Royal Astronomical Society, v. 451, pp. 4290-4310 (2015)
- Environmental acidification is not associated with altered plasma corticosterone levels in the stream-side salamander, *Desmognathus ochrophaeus** (S. K. Woodley, P. E. Freeman, & L. Ricciardella), General & Comparative Endocrinology, v. 201, pp. 8-15 (2014)
- Nonparametric 3D Map of the IGM Using the Lyman-alpha Forest* (J. Cisewski, R. A. C. Croft, P. E. Freeman, C. R. Genovese, N. Khandai, M. Özbek, & L. Wasserman), Monthly Notices of the Royal Astronomical Society, v. 440, pp. 2599-2609 (2014)
- Prototype Selection for Parameter Estimation in Complex Models* (J. W. Richards, A. B. Lee, C. M. Schafer, & P. Freeman), The Annals of Applied Statistics, v. 6, pp. 383-408 (2012).
- Semi-supervised Learning for Photometric Supernova Classification* (J. W. Richards, D. Homrighausen, P. E. Freeman, C. M. Schafer, & D. Poznanski), Monthly Notices of the Royal Astronomical Society, v. 419, pp. 1121-1135 (2012)
- An Unbiased Method of Modeling the Local Peculiar Velocity Field with Type Ia Supernovae* (A. Weyant, M. Wood-Vasey, L. Wasserman, & P. Freeman), The Astrophysical Journal, v. 732, pp. 65-81 (2011)
- On Computing Upper Limits to Source Intensities* (V. L. Kashyap, D. A. van Dyk, A. Connors, P. Freeman, A. Siemiginowska, J. Xu, & A. Zezas), The Astrophysical Journal, v. 719, pp. 900-914 (2010)
- Accurate Parameter Estimation for Star Formation History in Galaxies using SDSS Spectra* (J. W. Richards, P. E. Freeman, A. B. Lee, & C. M. Schafer), Monthly Notices of the Royal Astronomical Society, v. 399, pp. 1044-1057 (2009)
- The XMM Cluster Survey: Forecasting cosmological and cluster scaling-relation parameter constraints* (M. Sahlén, P. T. P. Viana, A. R. Liddle, A. K. Romer, M. Davidson, M. Hosmer, E. Lloyd-Davies, K. Sabirli, C. A. Collins, P. E. Freeman, M. Hilton, B. Hoyle, S. T. Kay, R. G. Mann, N. Mehrrens, C. J. Miller, R. C. Nichol, S. A. Stanford, & M. J. West), Monthly Notices of the Royal Astronomical Society, v. 397, pp. 577-607 (2009)
- Inference for the Dark Energy Equation of State Using Type Ia Supernovae Data* (C. R. Genovese, P. Freeman, L. Wasserman, R. C. Nichol, & C. Miller), Annals of Applied Statistics, v. 3, pp. 144-178 (2009)
- Exploiting Low-Dimensional Structure in Astronomical Spectra* (J. W. Richards, P. E. Freeman, A. B. Lee, & C. M. Schafer), The Astrophysical Journal, v. 691, pp. 32-42 (2009)
- Revealing Components of the Galaxy Population Through Nonparametric Techniques* (S. P. Bamford, A. L. Rojas, R. C. Nichol, C. J. Miller, L. Wasserman, C. R. Genovese, & P. E. Freeman), Monthly Notices of the Royal Astronomical Society, v. 391, pp. 607-616 (2008)
- Deconvolution in High-Energy Astrophysics: Science, Instrumentation, and Methods* (D. A. van Dyk, A. Connors, D. Esch, P. Freeman, H. Kang, M. Karovska, V. Kashyap, A. Siemiginowska, & A. Zezas), Bayesian Analysis, v. 1, pp. 189-236 (2006)
- Chandra Observations of MBM12 and Models of the Local Bubble* (R. K. Smith, R. J. Edgar, P. P. Plucinsky, B. J. Wargelin, P. E. Freeman, & B. A. Biller), The Astrophysical Journal, v. 623, pp. 225-234 (2005)
- Chandra Multi-Wavelength Project. II. First Results of X-Ray Source Properties* (D.-W. Kim, B. J. Wilkes, P. J. Green, R. A. Cameron, J. J. Drake, N. Evans, P. Freeman, T. J. Gaetz, H. Ghosh, F. R. Harnden, Jr., M. Karovska, V. Kashyap, P. Maksym, P. W. Ratzlaff, E. M. Schlegel, J. D. Silverman, H. Tananbaum, & A. Vikhlinin), The Astrophysical Journal, v. 600, pp. 59-69 (2004)
- Chandra Multi-Wavelength Project. I. First X-Ray Source Catalog* (D.-W. Kim, R. A. Cameron, J. J. Drake, N. Evans, P. Freeman, T. J. Gaetz, H. Ghosh, P. J. Green, F. R. Harnden, Jr., M. Karovska, V. Kashyap, P. Maksym, P. W. Ratzlaff, E. M. Schlegel, J. D. Silverman, H. Tananbaum, A. Vikhlinin, & B. J. Wilkes), The Astrophysical Journal Supplements, v. 150, pp. 19-41 (2004)

Is RX J1856.5-3754 a Quark Star? (J. J. Drake, H. L. Marshall, S. Dreizler, P. E. Freeman, A. Fruscione, M. Juda, V. Kashyap, F. Nicastro, D. O. Pease, B. J. Wargelin, & K. Werner), *The Astrophysical Journal Letters*, v. 572, pp. 996-1001 (2002)

The Capella Giants and Coronal Evolution Across the Hertzsprung Gap (O. Johnson, J. J. Drake, V. Kashyap, N. S. Brickhouse, A. K. Dupree, P. Freeman, P. R. Young, & G. A. Kriss), *The Astrophysical Journal Letters*, v. 565, pp. 97-100 (2002)

Chandra Observations of the Open Cluster NGC 2516 (F. R. Harnden, Jr., N. R. Adams, F. Damiani, J. J. Drake, N. R. Evans, F. Favata, E. Flaccomio, P. Freeman, R. D. Jeffries, V. Kashyap, G. Micela, B. M. Patten, N. Pizzolato, J. F. Schachter, S. Sciortino, J. Stauffer, S. J. Wolk, & M. V. Zombeck), *The Astrophysical Journal Letters*, v. 547, pp. 141-145 (2001)

RXTE Observations of Proxima Centauri (B. Haisch, V. Kashyap, J. Drake, & P. Freeman), *Astronomy & Astrophysics Letters*, v. 335, pp. L101-L105 (1998)

EXOSAT Observations of Cyg X-2 Continuum and Line Spectra (L. Chiappetti, A. Treves, G. Branduardi-Raymont, A. L. Ciapi, E. N. Ercan, P. E. Freeman, S. M. Kahn, L. Maraschi, F. B. S. Paerels, & E. G. Tanzi), *The Astrophysical Journal*, v. 361, pp. 596-606 (1990)

Research Presentations

Organizational Activity

Statistical Challenges in Modern Astronomy VI (chair: local organizing committee), Pittsburgh, PA, June 2016

Invited Talks

Data Exploration via Local Two-Sample Testing, Data Visualization and Exploration in the LSST Era, Champaign, IL, June 2018

Uncovering the Morphological Properties of Galaxies at High Redshift, Center for Time-Domain Informatics (UC Berkeley), Berkeley, CA, March 2012, and CHASC Workshop (Imperial College), London, August 2012

The Chandra X-ray Observatory: Overview and Statistical Issues in Spectral Line Fitting, Case Studies in Bayesian Statistics Workshop VII, Pittsburgh, PA, September 2003

The Statistical Challenges of Wavelet-Based Source Detection, Statistical Challenges in Modern Astronomy III, State College, PA, July 2001

Opening the Black Box: Current (and Future) Parameter-Estimation Techniques in Sherpa, 197th meeting of the American Astronomical Society, San Diego, CA, January 2001

Contributed Talks

Nonparametric Estimation of CMB Foreground Emission, Astronomical Data Analysis V, Heraklion, Greece, May 2008, and Great Lakes Cosmology Workshop, Pittsburgh, PA, June 2008

Optimal Inferences for the Dark Energy Equation of State, Data Analysis in Cosmology 2007, Santander, Spain, July 2007

Sherpa: a Mission-Independent Data Analysis Application, SPIE Conference 4477: Astronomical Data Analysis, San Diego, CA, July 2001

BATSE SD Observations of Hercules X-1, Third Huntsville Gamma-Ray Burst Workshop, Huntsville, AL, October 1995

Cyclotron Resonant Scattering Model Fits to the Spectra From Gamma-Ray Burst GB870303, High Velocity Neutron Stars, San Diego, CA, February 1995

Research Proposals

Funded Proposals

From Complexity to Clarity: Nonparametric Procedures that Exploit Structured Data and Models, SI – PI: A. B. Lee, NSF – DMS, 1521786, \$450,000, 1 Sep 2015 – 31 Aug 2018

Cosmic Web Reconstruction: A Unique Opportunity on the Cosmic Structure of the Universe, SI – PI: S. Ho, NSF – AST, 1517593, \$436,453, 1 Sep 2015 – 31 Aug 2018

Machine Learning Algorithms for Matching Theories, Simulations, and Observations in Cosmology, SI – PI: J. Schneider, DOE, \$1,649,202, 1 Jan 2014 – 31 Dec 2016

An Astrostatistical Approach to Distant Galaxy Morphology, Co-PI – PI J. Lotz, HST Cycle 20 Archival Research, 12856, \$72,121, 1 Nov 2012 – 31 Oct 2015

Nonparametric Inference for Complex Physical Models, SP – PI C. Schafer, NSF – DMS, 1106956, \$100,000, 15 Aug 2011 – 14 Aug 2013

Sparse Representation and Efficient Inference for Astronomical Spectra, Co-PI – PI A. Lee, NSF MSPA, 0707059, \$240,003, 1 Sep 2007 – 31 Aug 2010

Stochastic Models for High-Dimensional, Nonstandard Data,

Co-PI – PI C. Schafer, NASA AISR, NNX09AK59G, \$251,229, 1 Sep 2009 – 31 Aug 2011

Advanced Statistical Techniques for Studying the CMB Temperature and Polarization Fields with WMAP Data,

PI, NASA Astrophysics Data Analysis, NNX07AH61G, \$303,982, 1 Apr 2007 – 31 Mar 2010

Submitted Proposals

Compressing Galaxy SEDs for Photometric Redshifts and AGN Identification,

Collab – PI B. Andrews, NASA – Astrophysics Data Analysis Program, \$609,176 (3 years), 2022

Other Proposals

Collaborative Research: Tackling Complex Data Challenges,

SP – PI A. B. Lee, NSF – HDR/Frameworks, \$1,781,137 (2 years), 2019

Collaborative Research: Finding the Double Sunsets – Stellar Multiplicity in the Milky Way Halo,

Co-PI – PI M. G. Walker, NSF – AST, \$302,980 (3 years), 2017

Nonparametric Tools for Complex Data and Simulations,

SI – PI A. B. Lee, NSF – DMS, \$575,143 (3 years), 2017

New Statistical Tools for Analyzing High-Dimensional Galaxy Morphology Distributions,

PI, HST Cycle 23 Archival Research, Phase 1/No Budget (2 years), 2015

Testing Fundamental Symmetries through Cosmological Data,

Co-PI – PI: T. Kahniashvili, NASA – ADAP, \$648,894 (3 years), 2015

Approximate Likelihoods for Complex Models: Methods and Implementation in Astronomy,

SI – PI: J. Cisewski, NSF – DMS, \$409,000 (3 years), 2014

Testing the Cosmological Principle,

Co-PI – PI: T. Kahniashvili, NASA – ADAP, \$530,147 (3 years), 2014

Collaborative Research: Astrostatistics and Informatics Network,

SI – PI: G. J. Babu, NSF – DMS, \$240,000 (3 years), 2013

Next Generation Source Detection,

Co-PI – PI: V. Kashyap, NASA – ADAP, \$332,046 (3 years), 2012