

Elizabeth M. Hou, PhD

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PROFESSIONAL EXPERIENCE

Systems & Technology Research (STR)

Woburn, MA

Lead Research Scientist

2019 - Present

- Principal investigator (PI) and contributor on numerous proposals for national security and corporate applications focused on statistical machine learning, explainable AI, and anomaly detection
- Member of the AFRL's Autonomy Capability Team (ACT3) and PI of project developing explainable models in NLP
- PI for DARPA's Enabling Confidence Artificial Intelligence Exploration (AIE) program developing techniques for uncertainty quantification of deep learning models
- PI for Air Force Research Laboratory (AFRL) developing metrics quantifying decision complexity in Blue vs Red conflicts
- Technical area lead for DARPA's Modeling Adversarial Activity Program (award of \$3.2mn) developing probabilistic models for aligning knowledge graphs extracted from noisy data

Los Alamos National Laboratory (LANL)

Los Alamos, NM

Graduate Research Associate

2015 - 2018

- Developed a penalized ensemble Kalman Filter for high-dimensional non-linear systems and variational methods for fast approximation of posteriors

University of Michigan

Ann Arbor, MI

DOE-NNSA Consortium for Verification Technology Fellow

2014 - 2019

- Developed statistical estimation, sequential learning, and anomaly detection models with significant contributions to the field of machine learning and applications to nuclear nonproliferation

Research Assistant

2014 - 2015

- Data and time series analyses on sentiment from Twitter data and Survey of Consumers archive (see publications)

Graduate Student Instructor

2013 - 2014

- Prepared, taught, and held office hours for two lab sections (per semester) of Stats 250

Gifford Fong Associates

Lafayette, CA

Quantitative Financial Analyst

2012 - 2013

- Researched and implemented models for valuation of fixed income products, handled client phone calls and emails from major banks about models

University of California, San Francisco

San Francisco, CA

Computational Research Assistant

2011 - 2012

- Developed more computationally efficient code to do pairwise comparisons, with Mutual Information and other distance metrics, in parallel using C and CUDA and OpenCL

EDUCATION

University of Michigan, Ann Arbor, PhD Electrical Engineering and Computer Science, Advisor:

Alfred O. Hero

University of Michigan, Ann Arbor, MA Statistics

University of California, Berkeley, BA Statistics

PUBLICATIONS (Unclassified/Public)

- **E. Hou**, J. Brown, and J. Fisher, “Hierarchical Entity Alignment for Attribute-Rich Event-Driven Graphs”, (2022).
- **E. Hou**, E. Lawrence, and A. Hero, “Penalized Ensemble Kalman Filters for High Dimensional Non-linear Systems”, PloS one 16 (2021).
- **E. Hou**, “Anomaly Detection and Sequential Filtering with Partial Observations”, University of Michigan Deep Blue (2019).
- **E. Hou**, Y. Yilmaz and A. Hero, “Anomaly Detection in Traffic Networks”, IEEE Transactions on Signal Processing (2019).
- F. Conrad, J. Gagnon-Bartsch, R. Ferg, M. Schober, J. Pasek, **E. Hou**, “Social Media as an Alternative to Surveys of Opinions About the Economy”, Social Science Computer Review (2019).
- **E. Hou** and A. O. Hero, “Sequential Maximum Margin Classifiers for Partially Labeled Data”, 2018 IEEE International Conference on Acoustics, Speech and Signal Processing.
- **E. Hou**, K. Sricharan, and A. Hero, “Latent Laplacian Maximum Entropy Discrimination for Detection of High-Utility Anomalies”, IEEE Transactions on Information Forensics and Security (2018).
- **E. Hou**, Y. Yilmaz and A. Hero, “Diversion Detection in Partially Observed Nuclear Fuel Cycle Networks”, ANS Advances in Nuclear Nonproliferation Technology and Policy Conference (2016).
- Y. Yilmaz, **E. Hou** and A. Hero, “Online Diversion Detection in Nuclear Fuel Cycles via Multimodal Observations”, ANS Advances in Nuclear Nonproliferation Technology and Policy Conference (2016).
- J. Arroyo and **E. Hou** (equal contribution), “Efficient Distributed Estimation of Inverse Covariance Matrices”, 2016 IEEE Statistical Signal Processing Workshop (SSP), Palma de Mallorca (2016).
- F. Conrad, M. Schober, J. Pasek, L. Guggenheim, C. Lampe, **E. Hou**, “A “Collective-vs-Self” Hypothesis for When Twitter and Survey Data Tell the Same Story”, Annual Conference of the American Association for Public Opinion Research (2015).

TALKS & PRESENTATIONS (Unclassified/Public)

- **E. Hou**, E. Lawrence, and A. Hero, “A Sparsity Penalized Ensemble Kalman Filter with Application to Aerosol Tracking”, SORMA West (2021).
- **E. Hou**, E. Lawrence, and A. Hero, “Penalized Ensemble Kalman Filters for High Dimensional Non-linear Systems”, Conference on Data Analysis (2020) *Presenter*.
- **E. Hou**, “Anomaly Detection and Sequential Filtering with Partial Observations”, University of Michigan Thesis Defense (2019) *Presenter*.
- **E. Hou**, and A. Hero, “Anomaly Detection and Sequential Filtering Applications to Nuclear Fuel Cycles”, University Program Review (UPR) (2019) *Invited Talk*.
- H. Zhu, **E. Hou**, A. Di Fulvio, S. Pozzi, and A. Hero, “Deep Neural Network for Spectrum Unfolding”, University Program Review (UPR) (2019) *Invited Presenter*.
- **E. Hou**, Y. Yilmaz and A. Hero, “Anomaly Detection in Traffic Networks”, Michigan Student Symposium for Interdisciplinary Statistical Sciences (2019) *Presenter*.
- **E. Hou**, K. Miller, and A. Hero, “Anomaly Detection in the Monitoring of Nuclear Facilities”, Consortium for Verification Technology (CVT) Workshop (2018) *Invited Talk*.

- F. Conrad, J. Gagnon-Bartsch, R. Ferg, M. Schober, J. Pasek, and **E. Hou**, “Social Media as an Alternative to Surveys of Opinions About the Economy”, American Association for Public Opinion Research 74th Annual Conference (2019).
- F. Conrad, J. Gagnon-Bartsch, R. Ferg, M. Schober, J. Pasek, and **E. Hou**, “Social Media as an Alternative to Surveys of Opinions About the Economy”, Summer at Census Seminar, US Census Bureau (2019).
- **E. Hou** and A. Hero, “Sequential Detection of Multi-lingual Documents”, University Program Review (UPR) (2018) *Invited Talk*.
- **E. Hou** and A. Hero, “Sequential Maximum Margin Classifiers for Partially Labeled Data”, Michigan Institute for Data Science (MIDAS) Annual Data Science Symposium (2018) *Presenter*.
- **E. Hou**, K. Sricharan, and A. Hero, “Latent Laplacian Maximum Entropy Discrimination for Detection of High-Utility Anomalies”, Conference on Data Analysis (2018) *Presenter*.
- **E. Hou** and A. Hero, “Sequential Maximum Margin Classifiers for Partially Labeled Data”, Michigan Student Symposium for Interdisciplinary Statistical Sciences (MSSISS) (2018) *Presenter*.
- **E. Hou** and A. Hero, “Sequential Detection of Unusual Documents”, Consortium for Verification Technology (CVT) Workshop (2017) *Invited Talk*.
- **E. Hou** and A. Hero, “Sequential Maximum Margin Classifiers for Partially Labeled Data”, 2018 IEEE International Conference on Acoustics, Speech and Signal Processing *Presenter*.
- **E. Hou**, and E. Lawrence, “Variational Methods for Posterior Estimation of Non-linear Inverse Problems”, LANL Seminar Series (2018) *Presenter*.
- F. Conrad, J. Gagnon-Bartsch, R. Ferg, M. Schober, J. Pasek, and **E. Hou**, “Social Media as an Alternative to Surveys of Opinions About the Economy”, Big Data Meets Survey Science (BigSurv18) (2018).
- J. Arroyo and **E. Hou** (equal contribution), “Efficient Distributed Estimation of Inverse Covariance Matrices”, International Workshop on Perspectives On High-dimensional Data Analysis (HDDA-VII) (2017) *Presenter*.
- **E. Hou**, Y. Yilmaz and A. Hero, “Sparse Network Tomography for Anomaly Detection”, Joint Statistical Meeting (JSM) (2017) *Presenter*.
- **E. Hou** and A. Hero, “Detecting Unusual Transactions from Documents in Nuclear Fuel Cycles”, University Program Review (UPR) (2017) *Invited Talk*.
- **E. Hou**, Y. Yilmaz and A. Hero, “Sparse Network Tomography for Anomaly Detection”, Michigan Institute for Data Science (MIDAS) Annual Data Science Symposium (2017) *Presenter*.
- **E. Hou**, K. Sricharan, and A. Hero, “Latent Laplacian Maximum Entropy Discrimination for Detection of High-Utility Anomalies”, Michigan Institute for Data Science (MIDAS) Annual Data Science Symposium (2016) *Presenter*.
- **E. Hou**, E. Lawrence, and A. Hero, “Penalized Ensemble Kalman Filters for High Dimensional Non-linear Systems”, Michigan Institute for Data Science (MIDAS) Annual Data Science Symposium (2016) *Presenter*.
- **E. Hou**, K. Sricharan, and A. Hero, “Latent Laplacian Maximum Entropy Discrimination for Detection of High-Utility Anomalies”, Michigan Institute for Computational Discovery and Engineering (MICDE) Symposium (2016) *Presenter*.
- J. Arroyo and **E. Hou** (equal contribution), “Efficient Distributed Estimation of Inverse Covariance

- Matrices”, 2016 IEEE Statistical Signal Processing Workshop (SSP), Palma de Mallorca (2016) *Presenter.*
- **E. Hou**, E. Lawrence, and A. Hero, “Penalized Ensemble Kalman Filters for High Dimensional Non-linear Systems”, Consortium for Verification Technology (CVT) Workshop (2016) *Invited Presenter.*
 - **E. Hou**, Y. Yilmaz and A. Hero, “Diversion Detection in Partially Observed Nuclear Fuel Cycle Networks”, ANS Advances in Nuclear Nonproliferation Technology and Policy Conference (2016) *Presenter.*
 - Y. Yilmaz, **E. Hou** and A. Hero, “Online Diversion Detection in Nuclear Fuel Cycles via Multimodal Observations”, ANS Advances in Nuclear Nonproliferation Technology and Policy Conference (2016) *Presenter.*
 - M. Schober, F. Conrad, **E. Hou**, J. Pasek, and L. Guggenheim, “Treating social media as discourse: When can tweets accurately characterize public opinion?” 26th Annual Meeting of the Society for Text & Discourse (2016).
 - **E. Hou**, Y. Yilmaz and A. Hero, “Diversion Detection in Partially Observed Nuclear Fuel Cycle Networks”, University & Industry Technical Interchange (UITI) Program & Technical Review Meeting (2016) *Invited Presenter.*
 - Y. Yilmaz, **E. Hou** and A. Hero, “Diversion Detection in Nuclear Fuel Cycles from Multi-Modal Observations”, University & Industry Technical Interchange (UITI) Program & Technical Review Meeting (2016).
 - **E. Hou**, E. Lawrence, and A. Hero, “Penalized Ensemble Kalman Filters for High Dimensional Non-linear Systems”, From Industrial Statistics to Data Science (2015) *Presenter.*
 - **E. Hou**, Y. Yilmaz, T. Van, T. Banerjee, and A. Hero, “Event Correlation & Anomaly Detection”, University & Industry Technical Interchange (UITI) Program & Technical Review Meeting (2015) *Invited Presenter.*
 - Y. Yilmaz, **E. Hou**, T. Banerjee, and A. Hero, “Quickest Change Detection in Nuclear Fuel Cycles”, University & Industry Technical Interchange (UITI) Program & Technical Review Meeting (2015).
 - **E. Hou**, E. Lawrence, “Kalman Filter Models for Data Assimilation”, LANL Seminar Series (2015) *Presenter.*
 - J. Pasek, F. Conrad, **E. Hou**, M. Schober, C. Lampe, and L. Guggenheim, “Using Twitter Data to Calibrate Retrospective Assessments in Surveys”, Sixth Conference of the European Survey Research Association (2015)
 - M. Schober, F. Conrad, J. Pasek, L. Guggenheim, and **E. Hou**, “A “Collective-vs-Self” Hypothesis for When Twitter and Survey Data Tell the Same Story”, Sixth Conference of the European Survey Research Association (2015).
 - **E. Hou**, E. Lawrence, and A. Hero, “Penalized Ensemble Kalman Filters for High Dimensional Systems”, Consortium for Verification Technology (CVT) Workshop (2015) *Invited Presenter.*
 - J. Pasek, **E. Hou**, M. Schober, F. Conrad, C. Lampe, and L. Guggenheim, “Using Twitter Data to Calibrate Retrospective Assessments in Surveys”, American Association for Public Opinion Research 70th Annual Conference (2015).
 - F. Conrad, M. Schober, J. Pasek, L. Guggenheim, C. Lampe, and **E. Hou**, “A “Collective-vs-Self”

Hypothesis for When Twitter and Survey Data Tell the Same Story”, American Association for Public Opinion Research 70th Annual Conference (2015).

- **E. Hou**, Y. Yilmaz, T. Van, T. Banerjee, and A. Hero, “Event Correlation & Anomaly Detection”, Consortium for Verification Technology (CVT) Workshop (2014) *Invited Presenter*.

AWARDS

- Department of Energy National Nuclear Security Administration (DOE-NNSA) Consortium for Verification Technology (CVT) Fellowship (2014-2019).
- Best Oral Presentation, Michigan Student Symposium for Interdisciplinary Statistical Sciences (MSSISS) (2019).
- University of Michigan Electrical Engineering and Computer Science (EECS) Department Fellowship (2017).
- Honorable Mention, Network Science & Nuclear Nonproliferation Idea Challenge (2017).
- 1st Place in Poster Competition, Michigan Institute for Computational Discovery and Engineering (MICDE) Symposium (2016).
- IEEE Signal Processing Society Travel Grant (2016).
- University of Michigan Rackham Graduate School Conference Travel Grant (2015-2019).

PROFESSIONAL ACTIVITIES

- *Conference Reviewer*: Neural Information Processing Systems (NeurIPS), International Conference on Machine Learning (ICML), International Conference on Learning Representations (ICLR).
- *Journal Reviewer*: IEEE Transactions on Signal Processing (TSP), IEEE Transactions on Information Theory (TIFS), IEEE Transactions on Neural Networks and Learning Systems (TNNLS), IEEE Transactions on Network and Service Management (TNSM), IEEE Internet of Things (IoT), PloS One, SIAM Statistical Analysis & Data Mining, IET Intelligent Transport Systems.

SKILLS

Programming Languages: Python, MATLAB, R, C/C++, Rust, SQL, SPARQL, CUDA, OpenCL, OpenMP, VBA, Bloomberg

Languages: Conversationally Fluent in Shanghainese, Mandarin Chinese