Elizabeth M. Hou, PhD

https://lizardintelligence.net | hou.elizabeth@gmail.com

PROFESSIONAL EXPERIENCE

Systems & Technology Research (STR)   **Arlington, VA**
Lead Research Scientist (Machine Learning)   2019 - Present

- Developing novel solutions / research in the areas of statistical machine learning, semi/self-supervised learning, explainable AI, sequential learning, optimization in Bayesian modeling, and anomaly detection
- Managed multiple research projects with teams of scientists for government (DoD and IC) customers as principal investigator (PI) and technical area lead including:
  - Explainable LLM models for AFRL's Autonomy Capability Team (ACT3)
  - Uncertainty quantification of neural network target detectors for DARPA Enabling Confidence
  - Trajectory models with semi/self-supervised learning of features spaces for IARPA HAYSTAC
  - Probabilistic models for aligning knowledge graphs extracted from noisy data for DARPA MAA
  - Other AI/ML algorithms for Top Secret programs
- Contributed and won numerous multi-million dollar proposals with collaboration from academic partners
- Published novel algorithms and models at premiere AI/ML and signal processing conferences which advanced the field and helped solve real-world problems
- Advised Senate staff and other policymakers on AI/ML for policy, education, and science & technology

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**
Dept. Of Energy 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

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 EECS, Advisor: Alfred O. Hero*
University of Michigan, Ann Arbor, *MA Statistics*
University of California, Berkeley*, BA Statistics*

PUBLICATIONS (Unclassified/Public)

- **E. Hou**, R. Greenwood, P. Kumar, "Machine Learning Models for Improved Tracking from Range-Doppler Map Images", 27th International Conference on Information Fusion (2024).
- **E. Hou**, G. Castanon, "Decoding Layer Saliency in Language Transformers", International Conference on Machine Learning (2023).
- **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**, R. Greenwood, P. Kumar, "Machine Learning Models for Improved Tracking from Range-Doppler Map Images", 27th International Conference on Information Fusion (IEEE FUSION) (2024) *Presenter*.
- A. Tsiligkaridis, Z. Li, and **E. Hou**. "Encoding Agent Trajectories as Representations with Sequence Transformers", Machine Learning for Remote Sensing (ML4RS) Workshop at ICLR (2024).
- **E. Hou**, G. Castanon, "Decoding Layer Saliency in Language Transformers", International Conference on Machine Learning (ICML) (2023) *Presenter*.
- **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. Yılmaz, 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. Yılmaz, 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), Artificial Intelligence and Statistics Conference (AISTATS).
- *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.