

Luoluo Liu

Data Scientist, Philips Research North America, Cambridge, MA, USA

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PROFESSIONAL SUMMARY

AI scientist with 10+ years experience specialized in Machine learning and deep learning, Artificial Intelligence for classification, regression, object detection, clustering, time-series, etc. Proficient in Python, MATLAB to develop prototypes and practical solutions. Extensive experience in health-care industry in 3 healthcare companies with 4+ years experience. Capable of working independently as well as with teams. 4 patent application, 8 invention disclosures and 4 grant proposals. Broad AI application areas in images, video, audio, time series, tabular data, and text/ natural language processing. She graduated from Johns Hopkins University with doctoral degree and two masters: Ph.D 19' in Electrical and Computer Engineering, MSE in Applied Math and Statistics, and Electrical and computer engineering. [work samples](#)

WORK EXPERIENCE

Philips Research North America, Cambridge, MA

Jan 2020 - present

Data Scientist

- Currently part of ([RATE](#) team, funding from defense department) for clinical decision support by biomarker study, statistical analysis, hypothesis testing and time-series modeling of opioid, immune response from vaccinations, and respiratory diseases such as asthma, pneumonia, COVID;
- use Electronic Medical Records, physiological signals, labs and continuous monitoring and wearables from respiratory waveform, Capnography, ECG,PPG, as well as audio data: breath sound and heart sound
- natural language models and deep learning in time-series analysis
- Analytic and predictive modelling for Philips Patient Flow Capacity Suite ([PFCS](#))
- Publishing works on [Interpretable top-X comorbidities of recurrent patients,readmission risk](#) Predict Length-of-Stay using LSTM
- Writing invention disclosures and multiple grants proposals
- Leading Philips AI reading group
- Organizing Clinical Consultant sessions

Selux Diagnostics, Boston, MA

May 2019 - Dec 2019

Algorithm Intern, Algorithm Engineer

- Addressing data imbalance and reference noise issues in large-scale machine learning problem
- Developing machine learning in production code (using ETL code and interact with SQL database)

Siemens Healthineers, Princeton, NJ

May - August 2018

Deep Learning Research Intern

- Developed 2-dimensional and 3-dimensional(3D) Neural Networks for quality assessment of volumetric MR images
- Built a 3D motion simulation on volumetric and 3D MR images to generate training data for deep learning [Patent](#)
- Use adversarial training for domain adaptation using Generative Adversarial Networks with team

Johns Hopkins University, Baltimore, MD

September 2013 - December 2019

Research Assistant (with Prof. Trac Tran and Prof. Peter Chin)

- Proposed a framework to improve generalization of neural network to be able to perform images classification using VGG network as well as object detection using Faster R-CNN with arbitrary partial observation ratios
- Employed sparse Dictionary Learning to Thalamus Segmentation from MRI images for automatic segmentation, even on cases that is challenging for human to delineate the thalamus
- Created a novel alternative improved method to sparse recovery: a collaborative scheme from multiple bootstrapping samples to improve the performance of regression and studied the theoretical properties
- Improved the conventional Bagging in sparse regression by reducing the bootstrap ratio and proved the trick theoretically
- Developed an efficient Partial Face Recognition algorithm using Dictionary Learning approach to test on partial image patches without retraining

- Developed the reconstruction algorithm of Random Replicate Mirror Imaging System to perform system calibration and recovery of the scene pictures
- Proposed a novel and robust blind watermarking scheme based on wavelet tree
- Solved the Interference Alignment for MIMO wireless communication problem numerically

Teaching Assistant

September 2014 - May 2018

- Courses: Compressed Sensing & Sparse Recovery; Wavelets & Filter Banks; Intro. to ECE
- Worked with non-experts; Conveyed complicated ideas in simple ways; Coordinated with other TAs and the lab manager

PUBLICATIONS

- **Audio Signals:** Yale Chang, LuoLuo Liu, Corneliu Antonescu, “Heart Murmur and Abnormal Outcome Detection from Phonocardiogram Recordings,” *2nd place in George B. Moody PhysioNet Challenges 2022* pdf

- **Time-series and Operational Research:**

LuoLuo Liu, Dennis Swearingen, Eran Simhon, Chaitanya Kulkarni, David Noren, Ronny Mans, “Interpretable Identification of Comorbidities Associated with Recurrent ED and Inpatient Visits,” *EMBC 2022* pdf

Eran Simhon, **LuoLuo Liu** “Improvements of readmission risk score,” *talk in AMIA, CIC 2022* slides

LuoLuo Liu, “Deep Predictive model for next day median Emergency Department Length of Stay,” *accepted by AMIA, CIC 2023* slides

- **Image Processing and computer vision (natural images, medical, OCT images):**

Gouthamaan Manimaran, Urmila Aisang, Soumabha Bhowmick, Abhijith Girin, **LuoLuo Liu**, Carol Lane, Dheepak S, Celine Firtion, Pallavi Vajinepalli, Kumar T. Rajamani, “Evaluation Tool to Diagnose Faults and Discrepancy in Semi-Automated or Manual Annotations in Ultrasound Cine Loops (Videos),” *EMBC 2022*

Jasper R. Stroud, **LuoLuo Liu**, Sang P. Chin, Trac D. Tran, Mark A. Foster, “High speed optical coherence tomography using real time compression to achieve 72 MHz A-scan rates,” *Optical Express, 2020*

Dung N. Tran*, **LuoLuo Liu***, Trac D. Tran, Sang P. Chin, Jeffery Korn, Eric T. Hoke, “Compressive Coding via Random Replicate Mirror,” *GlobalSip 2016* (Joint first authors) pdf

Arun Nair*, **LuoLuo Liu***, Akshay Rangamani, Sang P. Chin, Muyinatu A L. Bell, Trac D. Tran, “Reconstruction-free Deep Convolutional Neural Networks for Partially Observed Images,” *GlobalSip 2018* (Joint first authors) ppt, pdf

Silvia Arroyo-Camejo, Benjamin Odry, Xiao Chen, Kambiz Nael, **LuoLuo Liu**, David Grodzki, Mariappan S. Nadar, “Towards Contrast-Independent Automated Motion Detection Using 2D Adversarial DenseNets,” *International Society for Magnetic Resonance in Medicine (ISMRM 2019)*

LuoLuo Liu, Xiao Chen, Silvia Bettina Arroyo Camejo, Benjamin L. Odry, Mariappan S. Nadar, “Motion Determination for Volumetric Magnetic Resonance Imaging using a Deep Machine-learning Model,” *US Patent*

LuoLuo Liu, “Jeffrey Glaister, Xiaoxia Sun, Aaron Carass, Trac D. Tran, Jerry L. Prince, Segmentation of Thalamus from MR Images via Task-Driven Dictionary Learning,” *SPIE medical Imaging 2016* pdf

LuoLuo Liu, Trac D. Tran, Sang P. Chin, “Partial Face Recognition: A Sparse Representation-based Approach,” *IEEE Conf. on Acoustics, Speech and Signal Processing (ICASSP), 2016* pdf

- **Ensemble Methods on sparsity optimization:**

LuoLuo Liu, Sang P. Chin, Trac D. Tran, “JOBS: Joint-Sparse Optimization from Bootstrap Samples,” <https://arxiv.org/abs/1810.03743>, *arxiv, submitted to Information Theory* pdf

LuoLuo Liu, Sang P. Chin, Trac D. Tran, “JOBS: Joint-Sparse Optimization from Bootstrap Samples,” *IEEE International Symposium on Information Theory (ISIT), 2019*

LuoLuo Liu, Sang P. Chin, Trac D. Tran, “Reducing Sampling Ratios and Increasing Number of Estimates Improve Bagging in Sparse Regression,” *Accepted at 53rd Annual Conference on Information Science and Systems (CISS), 2019 [invited paper]* pdf

COMPUTER SKILLS

- Expertise in Python, MATLAB, R for modeling, simulation, and developing optimization algorithms; data processing and visualization.
- Proficient in Pandas, Numpy, Scikit-learn, Matplotlib
- Proficient in PyTorch, Keras, TensorFlow
- Experienced with Pyspark, SQL
- Experienced with Bash script for jobs management in school-owned SLURM cluster and AWS
- Experienced with SVN, Git
- Word and L^AT_EX for technical writing; Powerpoint for presentations