Yingru Liu

Research Scientist in Facebook Inc.

liu2231665@hotmail.com • www.yingrliu.com

Research Interest

- Recurrent Neural Network, Probabilistic Graphical Models, Generative Models, Multi-task Learning

Education

Stony Brook University (SBU) **Stony Brook, NY, USA**
Phd. in Computer Engineering *Aug. 2015-Jun. 2021 (expected)*
Thesis: Sequential Deep Generative Models for Stochastic Modeling of High-Dimensional Sequential data
GPA: 3.71/4.00

Univ. of Electronic Sci. and Tech. of China (UESTC) **Chengdu, China**
B.S. in Automation Engineering *Sep. 2011-Jun. 2015*
Thesis: Dynamic Modeling and Adaptive Neural Network Control of 3-D Position Mooring System
GPA: 3.88/4.00

Industrial Experience

Facebook, New York, NY, USA **Jul. 2021 - Now**
Research Scientist

- Worked with colleague on designing and deploying deep learning methodologies into real-world applications.

Facebook, Seattle, WA, USA **Jun. 2020 - Aug. 2020**
Software Engineer Intern, Machine Learning (PhD)

- Worked with colleague on designing and deploying deep learning methodologies into real-world applications.

Tencent AI Lab, Shenzhen, China **Jun. 2019 - Aug. 2019**
Research Summer Intern

- Implemented SC-FEGAN for free-form facial editing and a GUI for user interaction.
- Cooperated with colleagues on model acceleration for pix2pixHD-based 2D Broadcaster Synthesis.

Academic Experience

Wireless and Networking Systems Lab, Stony Brook, NY, USA **Aug. 2015 - May. 2021**
Accurate, Scalable and Interpretable Deep Multi-task Learning

- Proposed a scalable and accurate model named Task Adaptive Activation Network (TAAN) for Multi-Task Learning on multiple computer vision problems.
- Designed two regularization methods to automatically discover relation of multiple domains.
- Proved that TAAN has better interpretability and analytical properties than other methods.
- Empirical Evaluation shows that TAAN consistently outperform state-of-the-art Multi-Task Learning models and has extremely lower model complexity in large scale applications.

Generalized Boltzmann Machine with Deep Neural Structures

- Proposed a flexible and efficient approach called Normalizing Flow - Restricted Boltzmann Machines (NF-RBMs) that scale Boltzmann machines to deeper representations.
- Implemented NF-RBMs by Tensorflow for density modeling and feature learning.
- Extended NF-RBMs for stochastic modeling on human motions and music streams.
- Our methods have up to 100% improvement than convetional RBMs in gray-scale image datasets.

Energy-based Recurrent Generative Model for Music Modeling

- Proposed an energy-based deep generative model called Chain-Graph Recurrent Neural Network (CGRNN) to efficiently and accurately model the dynamics of music, which is represented as MIDI or audio sound.
- Impremented state-of-art Recurrent Variational Autoencoders (STORN/VRNN/SRNN), Recurrent Boltzmann Machine (RNN-RBM) and baseline Autoregressive RNN by Tensorflow.
- Empirical Analysis demonstrates that the proposed model outperforms the state-of-the-art generative models on modeling high-dimensional multivariate music sequences. The performance improves up to 18%.

Brookhaven National Laboratory, Upton, NY, USA **Jan. 2020 - Apr. 2021**
Machine Learning for Improving Reliability of Physical Optics Simulations
- design machine learning algorithms to automatically control the physical optics simulations.

Center for Robotics at UESTC, Chengdu, China **Sep. 2013 - July 2015**
Adaptive Neural Network Control Design of a 3-D Position Mooring System
- Deducted the dynamic formulation of a 3-D positioon mooring system via Finite Element Method (FEM).
- Proposed a model-based robust and adaptive boundary controller by incorporating RBF Neural Nework.
- Proved of convergency of the proposed controller via Lyapunov's direct method.
- Conducted empirical evaluation on Matlab to demonstrate the control performance.

Adaptive Control of Offshore Ocean Thermal Energy Conversion System
- Developed an accurate dynamic modeling of an OTEC system via Hamilton's Principle.
- Proposed a model-based robust and adaptive boundary controller via Lyapunov's direct method.
- Conducted empirical evaluation on Matlab to demontrate the control performance.
- The proposed controller efficiently suppresses the vibration of OTEC system and fixes OTEC system to equilibrium position.

Skill

- Programming: Python, C/C++, Matlab
- ML Toolkits: Tensorflow, Pytorch, Scikit-Learn

Publications

Conference

1. X. Yang, H. Zhang, D. Jin, **Y. Liu**, C. Wu, J. Tan, D. Xie, J. Wang, X. Wang, "Fashion Captioning: Towards Generating Accurate Descriptions with Semantic Rewards," in *2020 European Conference on Computer Vision (ECCV 2020)*, Online, 2020
2. **Y. Liu**, X. Yang, D. Xie, X. Wang, L. Shen, H. Huang, N. Balasubramanian. "Adaptive Activation Network and Functional Regularization for Efficient Deep Multi-Task Learning," in *The 34rd AAAI Conference on Artificial Intelligence (AAAI-20)*, New York, US, 2020
3. X. Yang, **Y. Liu**, D. Xie, X. Wang, N. Balasubramanian."Latent Part-of-Speech Sequences for Neural Machine Translation", in *2019 Conference on Empirical Methods in Natural Language Processing (EMNLP 2019)*, Hong Kong, China, 2019.
4. **Y. Liu**, D. Xie, X. Wang, "Energy-based Recurrent Model for Stochastic Modeling of Music", in *IEEE International Conference on Multimedia and Expo (ICME 2019)*, Shanghai, China, 2019
5. **Y. Liu**, D. Xie, X. Wang, "Generalized Boltzmann Machine with Deep Neural Structure", in *The 22nd International Conference on Artificial Intelligence and Statistics (AISTATS 2019)*, Okinawa, Japan, 2019
6. Z. Diao, X. Wang, D. Zhang, **Y. Liu**, K. Xie, S. He, " Dynamic Spatial-Temporal Graph Convolutional Neural Networks for Traffic Forecasting", in *The 33rd AAAI Conference on Artificial Intelligence (AAAI-19)*, Hawaii, US, 2019
7. J. Li, H. Du, **Y. Liu**, K. Zhang, H. Zhou, "Extended Gradient Local Ternary Pattern for Vehicle Detection", in *IEEE 17th International Conference on Computational Science and Engineering (CSE)*, Chengdu, 2014

Journal

1. X. He, W. He, **Y. Liu**, Y. Wang, G. Li, Y. Wang, "Robust Adaptive Control of an Offshore Ocean Thermal Energy Conversion System," in *IEEE Transactions on Systems, Man, and Cybernetics: Systems*