

# Yingru Liu

Research Scientist in Facebook Inc.

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## Research Interest

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

## Education

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### **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

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### **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

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### **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.
- Implemented 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 position mooring system via Finite Element Method (FEM).
- Proposed a model-based robust and adaptive boundary controller by incorporating RBF Neural Network.
- 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 demonstrate the control performance.
- The proposed controller efficiently suppresses the vibration of OTEC system and fixes OTEC system to equilibrium position.

## Skill

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

## Publications

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- 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 34th 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*