Hao Liu

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EDUCATION

Duke University, Durham, NC, USA *2016.8 - 2017.9*

Full-time Research Intern *2017.2 - 2017.9*

Worked with Prof. Lawrence Carin and Prof. Cynthia Rudin

Exchange Student, Computer Science *2016.8 - 2016.12*

Selected as one of 11 students(out of 91 students total in the Elite Program)

GPA: 4.0/4.0; Courses: Machine Learning(Graduate Level)(A+), Intro High Dim Data Analysis(A+), Undergraduate Research(A), Statistics(A+)

Kuang Yaming Honors School, Nanjing University, Nanjing, China *2014.9 - 2018.7*

Chosen for the Elite Program which selected 91 students from 3400 undergraduates

B.S. in Computer Science

GPA (overall): 4.41/5.0 (88.2/100); Rank: top 10% in class

PUBLICATIONS

[1] Bai Li, Changyou Chen, **Hao Liu**, Lawrence Carin, **"On Connecting Stochastic Gradient MCMC and Differential Privacy,"** submitted to *the 21st International Conference on Artificial Intelligence and Statistics(***AISTATS 2018***)* (3rd Author)

[2] Oscar Li*, **Hao Liu***, Chaofan Chen and Cynthia Rudin, **"Deep Learning for Case-based Reasoning through Prototypes: A Neural Network that Explains its Predictions,"** In Proceedings of *the 32nd AAAI Conference on Artificial Intelligence(***AAAI 2018***)* (Co-1st Author)
Acceptance rate: 24.55% (* *Equal Contribution*)

[3] Chunyuan Li , **Hao Liu**, Changyou Chen, Yunchen Pu, Liqun Chen, Ricardo Henao and Lawrence Carin, **"ALICE: Towards Understanding Adversarial Learning for Joint Distribution Matching,"** In Proceedings of *the 31st Annual Conference on Neural Information Processing Systems(***NIPS 2017***)* (2nd Author)
Acceptance rate: 20.93%

[4] Zhe Gan*, Liqun Chen*, Weiyao Wang, Yunchen Pu, Yizhe Zhang, **Hao Liu**, Chunyuan Li and Lawrence Carin, **"Triangle Generative Adversarial Networks,"** In Proceedings of *the 31st Annual Conference on Neural Information Processing Systems(***NIPS 2017***)* (6th Author)
Acceptance rate: 20.93% (* *Equal Contribution*)

RESEARCH EXPERIENCES

Duke University, Durham, NC, USA *2017.3 - 2017.9*

Research Assistant, Advisor: **Prof. Cynthia Rudin**

Project I: **Deep Learning for Case-based Reasoning through Prototypes** *2017.5 - 2017.9*

- Combined Deep Neural Networks with Case-based Model to make it more interpretable
- Created a special prototype layer to learn the prototypes of the data
- Proposed a novel network architecture for deep learning that naturally explains its own reasoning for each prediction through the learned prototypes
- Contributed to a co-first author paper accepted by *the 32nd AAAI Conference on Artificial Intelligence* (**AAAI 2018**) Acceptance rate: 24.55%

Project II: **Sparse Integer Regression** *2017.3 - 2017.5*

- Engaged in a project which uses random sampling algorithm(sample in an ellipsoidal hypersurface) to solve the convex quadratic integer programming
- Reorganized and optimized the Matlab code

- Ran experiments on synthesized data and Primary Biliary Cirrhosis(PBC) data to prove the feasibility of the algorithm

Duke University, Durham, NC, USA *2016.9 - 2017.9*
Research Assistant, Advisor: **Prof. Lawrence Carin**

Project I: **SG-MCMC and Differential Privacy** *2017.6 - 2017.9*

- Engaged in a project which shows that stochastic gradient Markov chain Monte Carlo (SG-MCMC) satisfies strong differential privacy with carefully chosen step sizes
- Helped design and run the experiments to show the superiority of SG-MCMC, including using SG-MCMC to train logistic regression model for Adult dataset and deep convolution neural network for semi-supervised classification on MNIST and SVHN dataset, both of which achieved better results than other compared methods.
- Contributed to a third-author paper submitted to *the 21st International Conference on Artificial Intelligence and Statistics*(**AISTATS 2018**)

Project II: **Adversarial Zero-shot Learning** *2017.6 - 2017.9*

- Proposed a probabilistic zero shot learning model combining adversarial training method, which represents each seen/unseen class using a class-specific latent-space distribution, conditioned on its provided class attributes
- Reached an accuracy the same as the state of the art on AwA and CUB dataset on the task of inductive zero shot learning

Project III: **Adversarial Learning for Joint Distribution Matching** *2017.2 - 2017.6*

- Raised the non-identifiability issues in bidirectional adversarial learning
- Proposed ALICE algorithms: a conditional entropy framework to remedy the issues
- Unified ALI/BiGAN, CycleGAN/DiscoGAN/DualGAN and Conditional GAN as joint distribution matching
- Contributed to a second-author paper accepted by *the 31st Annual Conference on Neural Information Processing Systems* (**NIPS 2017**) Acceptance rate: 20.93%

Project IV: **Triangle Generative Adversarial Network** *2017.2 - 2017.6*

- Participated in the brain storm and helped shape the core idea of having more than one discriminator in the Triple GAN setting
- Tested the algorithm on the task of image-to-image translation such as Car2Car and Edge2Shoes
- Contributed to a sixth-author paper accepted by *the 31st Annual Conference on Neural Information Processing Systems* (**NIPS 2017**) Acceptance rate: 20.93%

Project V: **Chinese Character Handwriting Classification** *2016.9 - 2016.12*

- Implemented C++ and python program to process CASIA online Chinese handwriting data
- Implemented several latest deep neural network models for this task
- Proposed a new way to use stroke information in this task by applying Hierarchical Recurrent Neural Network
- Completed a poster presentation on **Chinese Handwriting Writer Identification Using Neural Networks** in Duke's ECE Department **Undergraduate Research Poster Session** 2016

Duke University, Durham, NC, USA *2017.3 - 2017.6*
Independent Researcher, Collaborator: **Dr. Kai Fan**(Statistical Department)

Project: **Gaussian Attention for Machine Translation** *2017.3 - 2017.6*

- Used one-dimensional Gaussian distribution as the attention to replace the traditional soft attention
- Modified the base code of Tensorflow to implement this
- Achieved better results than that of the traditional soft attention on English-French translation

Duke University, Durham, NC, USA *2017.2 - 2017.5*
Research Assistant, Advisor: **Prof. Ricardo Henao**

Project: **Deep Learning for Electronic Health Record Prediction** *2017.2 - 2017.5*

- Preprocessed the data from the orginal electronic health record data file
- Used data augmentation and normalization to improve prediction performance
- Implemented different kinds of deep learning techniques, such as seq2seq, one-dimensional Convolution Nerual Networks, and one-dimensional Residual Network to solve a specific kind of prediction task and visualized the data to show the result

Nanjing University, Nanjing, China *2015.9 - 2016.7*
Research Assistant, Advisor: **Prof. Yufeng Li**

- Researched multi-label learning
- Helped perform data analysis for the Chinese South Pole Science Discover Team

ACADEMIC ACTIVITIES

2017.6 Presentation on **Bidirectional GAN**, Prof. Lawrence Carin's Reading Group
2017.6 Sub Reviewer of NIPS 2017
2017.4 Sub Reviewer of ICML 2017
2016.12 Joined Stanford Scholar Initiative to help make CS research more publically accessible
2016.2 Undertook 8-day academic exchange in HKUST, CUHK, and HKU
2015.11 Attended The 13th China Workshop on Machine Learning and Applications(MLA 13)

SKILLS & OTHERS

Programming Proficient in C/C++, MATLAB, Python,
Familiar with LaTeX, R, Lua, HTML/CSS and Verilog ,
Rich experience in Pytorch, Tensorflow, Theano, Keras
Language Mandarin Chinese (Native), English (Fluent)
Interests Soccer Team Captain from 2015 to 2016, Kuang Yaming Honors School, NJU.
Amateur 3 Dan player of Go(WeiQi)

HONORS & AWARDS

2017 Elite Program Scholarship for Academic Exchange
2016 Duke Exchange Program Scholarship
2016 Silver Medal in NJU ACM Local Programming Contest (top 10%)
2016 Citi Financial Innovation Application Contest Excellence Award (National top 12)
2015 People's Award for Outstanding Academic Performance
2015 National Top Student Program Scholarship

LANGUAGE PROFICIENCY

English Excellent listening, speaking, reading and writing abilities
- TOEFL iBT 104/120 (Reading 28, Listening 27, Speaking 24, Writing 25)
- GRE Verbal 155/170, Quantitive 170/170, Analytical Writing 3.5/6.0