# Boyu Liu

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GitHub: https://github.com/bliuag Homepage: https://bliuag.github.io

## EDUCATION

**Carnegie Mellon University** **2018-present**
*M.S. in Machine Learning*

**The Hong Kong University of Science and Technology** **2014-2018**
*B.S., double major in Computer Science & Mathematics* | GPA: 4.164/ 4.3 | Major GPA: 4.260/4.3

**Cornell University** **Spring 2017**
*Undergraduate Exchange Program* | GPA: 4.069

**Stanford University** **Summer 2016**
*International Honor Program (summer)* | *Certificate of Intensive Study in Computer Science*

## AREAS OF INTEREST

- Machine Learning
- Computer Vision

## RESEARCH & PROJECTS

**Object tracking with Neighborhood-Component-Analysis (CV, Deep Learning)** **Summer 2018**
*Research Intern (with Zhirong Wu and Jifeng Dai in Microsoft Research Asia)*
- Based on Siamese network for tracking, integrated background information by using neighborhood-component-analysis (NCA). NCA has a well-defined probability description of the object being the target, and provides a natural way for online updating.
- We have made a huge improvement comparing to the baseline, and expect 15% performance boost over Siamese-FC and achieves state-of-the-art. This work is still under progress and preparation for CVPR2019.

**Semantic Segmentation (CV, Deep Learning)** **Winter 2017**
*R&D Intern (under supervision of Professor Yu-Wing Tai, Tencent Youtu Lab)*
- I was in charge of projects by applying semantic segmentation to segment humans and identifying skylines, using deep learning with small networks. The models have been integrated to internal libraries.

**Memory Augmented Tracking (CV, Deep Learning)** **Summer & Fall 2017**
*Research Assistant (under supervision of Professor Chi-Keung Tang and Yu-Wing Tai, Hong Kong University of Science and Technology)*
- Inspired by Neural Turing Machine, built a system to conduct visual object tracking using deep neural network augmented with an external memory module, which was a one-shot learning method that did not need back-propagation to refine network during tracking.
- Performed better than state-of-the-art trackers in cases like occlusion, large-scale shape change, confusing backgrounds. Achieved good results in VOT2016 benchmark.

**3D Face Reconstruction (CV, Deep Learning)** **Summer 2017**
*Research Intern (intern in SenseTime Group Limited)*
- Used VGG and LSTM to reconstruct a pose-invariant, expression-invariant identity 3D face from a set of 2D photos of an individual. On-going project with a two-stage coarse-to-fine structure.
- The results using LSTM showed great improvement than just using single photo for reconstruction. Results were better than state-of-the-art in synthetic data, producing identifiable 3D face with details from real photos.

**Sentiment Lexicon Induction (Machine Learning, NLP)** **Spring 2017**
*Research Assistant (under supervision of Professor Claire Cardie, Cornell University)*
- Used semi-supervised learning to generate Sentiment Lexicon for certain domains of Chinese corpus.
- Made use of commonly used features such as word embedding, as well as unique features for Chinese like character-level and radical-level similarity between Chinese words.
- Implemented and analyzed the unsupervised learning method and features.

**Sentiment and Market Prediction (Deep Learning, NLP)** **Fall 2016**
*Research Assistant (Undergraduate Research Opportunity Program, under supervision of Professor Qiang Yang, Hong Kong University of Science and Technology)*
- Implemented a News Sentiment Analysis System on Chinese News with Convolutional Neural Network as a Deep Learning method, and used the system to predict the Stock market.
- Achieved a prediction Accuracy of 57+% on the testing stock market data.

## PUBLICATIONS

**MAVOT: Memory-Augmented Video Object Tracking**

- Arxiv: https://arxiv.org/abs/1711.09414
- Project page: https://bliuag.github.io/MAVOT-Project-Page/

## OTHER PROJECTS & IMPLEMENTATIONS

**Computer Vision Related Projects(GitHub) (CV)**

- Intelligent Scissors: An image processing tool like Photoshop Magnetic Lasso. (SIGGRAPH 95')
- Face Detection: Used HoG and SVM to detect faces with different sizes. (CVPR 05')
- Single-View Metrology: Reconstructed a 3D model from single image, with user guidance in GUI. (ICCV 99')
- Dense Photometric Stereo: Reconstructed 3D model from 2D pictures of different view. (CVPR 05')

**CodeIT Competition– A system for Automation Stock Operation (GitHub) (Software)**

- First Place in CodeIT Competition, for great result and architecture. Awarded by Credit Suisse.
- Collaborated with four students to develop a system for arbitrage within 24 hours, with an efficient architecture using parallel process and task distribution. Used NodeJS for back-end, AngularJS for front-end, and Firebase for database.

**Software Engineering – Team Forming (Web and IOS) (Software)**

- Leader in a group of 8 students. Built a platform for team forming in Web and IOS. Implemented with AngularJS, Firebase and Ionic, tested with Unit Testing.

## COMPETITIONS

- First Place in CodeIT Suisse Coding Challenge *(held by Credit Suisse)* **2016**
- ACM-ICPC Regional Contest Shanghai Station Bronze Award **2015**
- ACM-ICPC Regional Contest Taiwan Station Ninth Place **2015**

## HONORS and AWARDS

- First Class Honor *(HKUST)* **2018**
- Dean's List *(HKUST)* **2014-2018**
- Cheung On Tak Charity Foundation Scholarship **2014-2018**
- Full Recruitment Scholarship *(less than ten awardees)* **2014-2018**
- China Merchants Scholarship **2017**
- HKSAR Government Scholarship Fund - Reaching Out Award **2016**
- HKSAR Government Scholarship Fund - Talent Development Scholarship **2016**

## WORK EXPERIENCE and ACTIVITIES

- Research internship (*computer vision and deep learning*) in Microsoft Research Asia **Summer 2018**
- R&D internship (*computer vision and deep learning*) in Tencent Youtu Lab **Winter 2017**
- Research internship (*computer vision and deep learning*) in SenseTime Group Limited **Summer 2017**
- Vice President of Microsoft Student Club, HKUST Chapter **Fall 2016**
- Teaching helper for Computer Science courses **Spring 2016**
- Executive Committee in China Entrepreneur Network, HKUST Chapter **2015**

## SKILLS

- **Language:** C++ (GUI and OpenGL) | Java (including Android) | Python | MATLAB
- **Algorithm and Data Structure:** participated in ACM-ICPC contests | Common algorithms and data structures
- **Machine Learning:** Traditional methods (SVM, KNN, Decision-tree) | Theoretical ML knowledge
- **Deep Learning:** CNN | RNN, LSTM | NTM | GAN | Framework: Caffe, TensorFlow, Pytorch
- **Selected Course:** Computer Vision (graduate-level) | Machine Learning (Cornell) | Advanced Artificial Intelligence (graduate-level) | Computer Graphics (Stanford) | Image Processing | Honor Design and Analysis of Algorithms | Operating System | Honors Software Engineering | Linear Algebra | Probability and Random Process