

# Jiayi Wei

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## Education

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### Beijing University of Posts and Telecommunications

**Sept. 2016 - Mar. 2019**

expected in March 2019

- M.S. in Electrical Engineering
- **Relevant Coursework:** C++ Programming, Data Structures, Fundamentals of Information Theory, Java Programming, Computer Communication & Networks, the Theory of Searching Engine
- **Online Courses:** Introduction of Algorithm (MIT SMA 5503), Machine Learning (Stanford CS229), CNN for Visual Recognition (Stanford CS231n)

### Beijing University of Posts and Telecommunications

**Sept. 2012 - Jul. 2016**

- B.E. in Electrical Engineering

## Skills

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Programming Languages: Python, C++, CUDA, SQL, JavaScript, PHP, HTML, CSS

Tools and Frameworks: Pytorch, Keras, Caffe, Git, OpenCV, Tensorflow, jQuery, QT, Django

## Professional Experience

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### Internship | Autopilot Team, Sensetime

**Sept. 2018 - Present**

#### Advanced Driving Assistance System (ADAS)

Beijing, China

- Improve the performance of detection model on traffic objects, and fuse detection models to reduce the computation cost using shared convolution layers while maintaining the perfect performance
- Used different kinds of strategies to improve the detection performance to make up for the limited computation resource on the deployed device; strategies include modifying the backbone, data augmentation, redesign of the logic of RPN (region proposal network), etc.
- Shared the backbone across detection headers (RPN and Fast-RCNN) for different tasks, such as traffic signs, traffic light and FCW (forward collision warning), because each dataset had only one type of annotation
- Trained the whole model on all tasks at the same time, using various strategies including weighted losses and student-teacher training to maintain the performance
- Deployed the fused model, with faster speed and world-class performance, in Honda autopilot system
- Plan to experiment on model fusion strategies

### Internship | Computer Vision Team, Samsung China

**Aug. 2016 - Dec. 2016**

#### Lane Detection in Video

Beijing, China

- Designed a lane detection system to provide assistance for autonomous driving
- Detected lanes in video frames using Canny Edge detector and stored them with slope and intercept
- Determined the location of lanes for each frame using weighted sum average based on the detection results in the current frame and adjacent frames
- Utilized the Kalman Filter to obtain the stable location of lanes in the videos
- Deployed the lane detection system on Android with packaged program

## Academic Experience

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### Understanding Vehicle Density in Traffic Surveillance

**Jun. 2018 - Aug. 2018**

- Proposed a density prediction model, with better robustness for traffic jam and low-quality video, to obtain the total number of vehicles in real-time
- Designed a FCN (Fully-Convolutional Network) with inception-v3 as backbone to predict density map in Pytorch
- Trained the model with two losses on density map and total number of vehicles respectively
- Achieved 94.2% accuracy in predicting number of vehicles with speed of 20fps and outperformed the detection-based model

### Unsupervised Anomaly Detection for Traffic Surveillance

**Feb. 2018 - Apr. 2018**

Ranked the 2<sup>nd</sup> place in the NVIDIA AI City Challenge; gave an oral presentation in CVPR Workshop 2018 in Salt Lake City

Paper accepted by IEEE CVF, published as "Unsupervised Anomaly Detection for Traffic Surveillance. Based on Background Modeling"

- Designed a novel unsupervised system to detect vehicle anomalies in traffic surveillance videos that could adapt to various scenes without special treatment
- Utilized MOG2 to capture the background frames and implemented Faster-RCNN to detect vehicle in background frames, as the abnormal vehicles stayed in the video background for a long time
- Trained a VGG as the classifier to eliminate false detected bounding boxes
- Trained a ReID model, whose backbone was ResNet, with triplet loss to complete the similarity comparison when meeting camera-movement or vehicles waiting for traffic light
- Designed a decision model to determine whether a detected vehicle belonged to anomaly according to the bounding boxes obtained above
- Achieved 0.81 F1-score and 10.2 RMSE in traffic anomaly detection dataset on NVIDIA AI CITY Challenge

### *License Plates Recognition Based on Segmentation and Multi-Label Classification*

*Nov. 2017 - May. 2017*

- Built a license plate recognition system to detect and recognize multi-oriented Chinese license plate in various scenes in real time with great robustness
- Trained a segmentation model with Pytorch to perform pixel-wise classification and obtained the pure license plate area on wild vehicle images, to avoid the inference of background caused by using detection to locate license plate
- Computed the quadrilateral envelope according to the context hull of the license plate area, and then transform the quadrilateral to rectangle through perspective transformation
- Designed a CNN with CTC loss to recognize license plate characters on rectangular license plate images
- Trained the classification model end-to-end on 100k simulated images and fine-tuned on real data due to the lack of annotation
- Achieved 98.1% recognition accuracy from vehicle image to vehicle ID with speed of 50fps

### *Explosion Remnant Matching system*

*Jul. 2017 - Oct. 2017*

- Designed an online system used on website to match the uploaded images with samples in datasets
- Completed an online image-edit tools inside the system to modify images (rotate, zoom, annotate) before upload
- Developed the front-end website using JavaScript to either upload sample into the dataset or match the explosion remnant with stored samples in the dataset; developed the back-end platform using PHP
- Designed a dataset with MySQL to store the sample data and history matching results
- Deployed the system in China Public Security Dangerous Item Bureau

### *Denosing for Cosmic Microwave Background (CMB) Signal with Auto-Encoder (AE)*

*Mar. 2017 - Aug. 2017*

- Designed an Auto-Encoder Network with Keras using Residual Connection and Dense Connection which could efficiently reduce the background noise
- Trained two models with same architecture with MSE and MAE loss to learn the noise from original images and to learn CMB signal from the noise free images respectively
- Connected the two trained model together using residual connection and fine-tuned the whole model
- Achieved around 450 MSE and 8 MAE on the evaluation dataset and a decent PSD compared with traditional methods

### *Traffic Signs Detection*

*Dec. 2016 - Mar. 2017*

- Designed a traffic sign detection system with high accuracy and fast speed
- Annotated 10K+ bounding boxes on 5k+ images captured in various scenes
- Trained Faster-RCNN detection model with 80% labeled data and achieved 97.4% accuracy on evaluation dataset
- Deployed the traffic sign detection system on Windows using QT and hosted the detection model on Linux server

## **Extracurricular Activities**

### **Deputy-Director | Girls' Division, Student Union, BUPT**

*Sept. 2012-Jun. 2016*

- Planned and organized the on-campus activities empower women and promote gender equality

### **Volunteer | Volunteers' Association, BUPT**

*Jun. 2013 - Dec. 2015*

- Volunteered to guide the book reading for kids in national library
- Volunteered to serve the elders in the nearby nursing home

### **Team Member | Basketball Team, BUPT**

*Oct. 2012 - Jun. 2015*

- Played basketball along with the team members and our team ranked the top 4 at our university

### **Team Member | Flag Football, BUPT**

*Oct. 2013 - Jul. 2015 & Oct. 2016 - Dec. 2017*

- Played flag football in the team, and entered the final round in the college league in 2017

## **Additional Information**

Hobbies: basketball, reading

Languages: Chinese Mandarin (native), English (fluent) TOEFL105 (R30 L27 S20 W28)