RUNSHENG XU

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SUMMARY

A skilled senior deep learning engineer with 3 years of industrial experience, multiple papers published and over 5 years of software development experience. Particular interested in autonomous driving, image enhancement/denoising, video understanding, face recognition/landmark detection, model compression and AutoML.

SKILLS

C++/C, Python, Java, Matlab, OpenCV, Tensorflow, Pytorch, Caffe, Matlab, AWS, Eigen and on-device deep learning frameworks such as NCNN and TensorRT

EDUCATION

Northwestern University, Evanston   Sep. 2016-Dec.2017
Master of Science in Electrical and Electronics Engineering   GPA: 3.81
Illinois Institute of Technology, Chicago   Aug. 2014-May 2016
Bachelor of Electrical Engineering   GPA: 3.84
North China Electric Power University, Beijing   Sep. 2012-May 2014
Bachelor of Electrical Engineering   GPA:82.19

WORK EXPERIENCE

Mercedes-Benz R&D North America, Sunnyvale   Sep. 2019-Present
Senior Deep Learning Engineer

- Urban Map-less Driving for Autonomous Vehicles[1]:

    - Proposed an novel hierarchical method of real-time online road map extraction that can handle complex road topology to eliminate the dependency on HD Map

    - Developed an end-to-end, image-to-graph, 3-stages convolutional neural network, which takes top-down fashion camera-lidar fused grid map images as input. The network predicts ego vehicle's drivable lanes at the low level, detect the keypoints of road network at the medium level and generate the complete graph representation at the high level

    - Designed a special sparse graph affinity matrix with a learnable space transformation to enable memory-efficient and fast end-to-end neural network training

    - Achieved a latency of 13ms on a single Tesla P100 GPU, a 40-meter detection range and an average of 0.26m offset prediction compared to real-word road topology groundtruth

- Online Stop Line Detection[7](**commercialized**):

    - Proposed a novel occlusion-independent convolutional neural network that utilizes the multi-sensors fused data to reliably predict stop lines for ego-vehicle

    - Came up with a joint learning method that provides continuous directional and spatial proximity information for gradient back-propagation to enhance feature representation

    - Achieved a far detect range up to 50 meters and an average 0.78 f1 score with 0.28m offset under complex urban environment, which exceed the state-of-art methods

    - Utilized TensorRT framework in C++ to implement the model on vehicle with a real-time latency

OPPO US R&D, Palo Alto   June 2018-Aug 2019
Deep Learning Engineer

- OPPO Ultra Dark Mode[2](**commercialized**):

  - Developed and embedded an important commercialized feature in OPPO phones that utilized deep learning methods to help users take high perceptual quality photos under extreme low-light conditions

  - Designed a global information aware convolutional neural network with a specifically designed domain-transferred loss function to perform camera Bayer image denoising and enhancement

  - Applied model pruning, quantization and knowledge distillation techniques to improve model's efficiency. Applied Qualcomm Snapdragon Neural Processing Engine framework to implement the model on Android camera system

- Real-time Instance Segmentation on Mobile Devices:

  - Proposed a lightweight MobileNets-based YOLACT model, which utilizes a linear combination of prototype masks and mask coefficients for mobile instance segmentation

  - Designed a mini Attention-UNet for prototype mask branch, whose encoder shares the same weights with detection branch

  - Applied activation-based attention transfer for knowledge distillation to improve the efficiency of the model

  - Implemented Pytorch-Onx and SNPE framework to migrate model on Android devices. Achieved 25.2 fps on Qualcomm Snapdragon 855 platform and 28.1 mAP on COCO dataset

- Face Landmark Detection

  - Built a robust 68 face landmarks detection system based on modified Global Supervised Descent Method and combined it with Binary Regression Tree method for local refinement. Designed an algorithm for landmark stabilization using optical flow

  - Created an Android application for demo using Android NDK and enabled it running 50 fps on Qualcomm Snapdragon 670 platform

Algomus Inc., Troy   Jan. 2018-June 2018
Computer Vision Engineer

- Built a commercialized real-time virtual makeup achieve a natural virtual makeup transfer result

- Implemented the virtual makeup algorithm on Android devices

PUBLICATIONS

[1] L. Zhang, F. Tafazzoli, G. Krehl, **R. Xu**, T. Rehfeld, M. Schier, A. Seal, "Hierarchical Road Topology Learning for Urban Mapless Driving", *submitted to* NeurIPS 2020

[2] Z. Meng, **R. Xu**, C. M. Ho, "GIA-Net: Global Information Aware Network for Low-light Imaging", Advances in Image Manipulation Workshop and Challenges on Image and Video Manipulation(**ECCV Workshop)**, 2020

[3] A. Zang, **R. Xu**, Z. Li, D, "Lane Boundary Extraction from Satellite Imagery", ACM SIGSPA-TIAL Workshop on HighPrecision Maps and Intelligent Applications for Autonomous Vehicles (AutonomousGIS), 2017, **Best Paper Award**

[4] S. Zhang, Y. Zhao, D. Nguyen, **R. Xu**, S. Sen, J. Hester, and N. Alshurafa, "NeckSense: A Multi-Sensor Necklace for Detecting Eating Activities in Free-Living Conditions", Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies(**Ubicomp**), 2020

[5] S. Zhang, D. Nguyen, G. Zhang, **R. Xu**, N. Maglaveras, N. Alshurafa, "Estimating Caloric Intake in Bedridden Hospital Patients with Audio and Neck-worn Sensors", IEEE/ACM International Conference on Connected Health: Applications, Systems and Engineering Technologies(**CHASE**), 2018

[6] **R. Xu**, A. Lin,P. Xiong,S. Zhang,B. Hecht, "Towards Road-Safety-Aware Navigation Systems:Predicting Road Risks using Public Data", *submitted to* SIGSPATIAL 2020

[7] **R. Xu**, L. Zhang, T. Rehfeld, "Holistic Grid Fusion Based Stop line Estimation", *submitted to* ICPR 2020

PATENTS

Runsheng Xu, Zibo Meng and Chiu Man Ho. Improving Face Landmark Detection by Local Refinement, *Filed*

Runsheng Xu, Fan Deng and Chiu Man Ho. A Multitask system for Enhancing Face Alignment, *Filed*

Zibo Meng, **Runsheng Xu** and Chiu Man Ho. A Low-light Image Enhancement System Implemented on Mobile Devices, *Filed*

Runsheng Xu, Li Zhang and Timo Rehfeld. Stop-line prediction utilizing fusion map, *Filed*

PROFESSIONAL REFERENCES

Timo Rehfeld
Distinguished Engineer/Manager, Mercedes-Benz R&D North America
timo.rehfeld@daimler.com

Chiu Man Ho
Director of AI, OPPO US R&D
Research Assistant Professor, Michigan State University
chiuman@oppo.com

Xin Chen
Head of Central United States, Amazon Machine Learning Solution Lab
Adjunct Associate Professor, Northwestern University
xin.chen1@northwestern.edu

ACADEMIC SERVICE

Reviewer of European Conference on Computer Vision Workshop(ECCVW), 2020

Reviewer of IEEE 16th International Conference on Intelligent Computer Communication and Processing(ICCP), 2020

HONORS AND AWARDS

Outstanding Individuals of OPPO Research Institute, Q2 2019

Performance Excellence Award of OPPO Research Institute, H1 2019

Dean's List, Outstanding Graduate of Illinois Institute of Technology, 2016