

GUANGHAN NING

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[Google Scholar](#) / [Github](#) / [Homepage](#)

EDUCATION

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|---|-----------|
| Ph.D. Candidate, Electrical and Computer Engineering, University of Missouri, Columbia, MO, Supervisor: Prof. Zhihai He (GPA: 3.72/4.0) | 2012-2018 |
| B.S., Communication Engineering, School of Electronic and Information Engineering, Beijing Jiaotong University, Beijing, China | 2008-2011 |

RESEARCH and DEVELOPMENT EXPERIENCE

Research Scientist, JD.COM, Mountain View, CA, Dec '2017 - present

(1) Efficient Multi-Task (Detection, Segmentation, Keypoints) Network on the Go, 10/2018 - present

- Responsible for the design and implementation of the pose estimation head.
- Responsible for the online human pose tracking algorithm.
- Implemented the heatmap version of keypoint head with a light 2-level hourglass branch.
- Built an online human pose tracking prototype with GCN.

(2) OpenSVAI and PoseTrack Challenge, 05/2018 - 10/2018

- Built a library called [OpenSVAI](#) for research use within JD.COM.
- Used this library to participate in the [PoseTrack 2018 Challenge](#) from ECCV 2018, ranking 6th in both human pose estimation and pose tracking.
- Published a [workshop paper](#); filed a US patent.

(3) URFashion for Fashion Recommendation, 01/2018 - 05/2018

- Implemented batch processing of [human parsing](#) on JD.com's fashion data with deeplab v3+. Improved the performance with fashion data from JD's annotation team.
- Classified SKU pictures: distinguish the detailed clothing picture from the main SKU.
- Classified poor parsing results from good parsing results. Improved the display of fashion recommendation results

- Filed two US patents.

(4) MeMeZhao Mobile APP, 12/2017 - 01/2018

- Implemented [two features for this app](#) based on the estimation of human keypoints: (a) Add special effects to the person, e.g., add angle wings; (b) Make the person look slimmer in the photo.
- Implemented the image overlay with Cython to improve post-processing speed by 100x times.

Research Visitor, TCL Research America, San Jose, CA, Dec '2014 – Aug '2016

(1) Face Verification and Person Tracking with Mobile-controlled Drone, 5/2016 – 8/2016

- Built the deep learning kernels for face detection and person verification.
- Built the front-end on the Android side for frame input.

(2) Advanced Driver Assistance System, 1/2016 – 4/2016

- Developed a system with Tensorflow for [object tracking via spatio-temporal analysis](#).
- Filed a US patent, where we incorporate objection detection with lane detection and distance prediction.
- Published a [conference paper](#).

(3) Real-time Object Recognition in Videos on Embedded Systems, 11/2015 – 1/2016

- Realized real-time object recognition on NVIDIA Jetson TX1 development kit, based on YOLOv1.
- Trained various traffic signs for street environment comprehension. It works for both camera input and video input.
- Wrote [an article](#) (blog) on how to train YOLO with customized datasets, and [an article](#) on setting up the environment, both hardware and software.

(4) Violence Scene Detection in Videos, 10/2015-11/2015

- Developed a system to detect violent scenes in videos (offline detection).

(5) Scene Classification and Object Recognition in Still Images, 3/2015 - 9/2015

- Used CNN to do scene classification and fast RCNN for object recognition.
- Wrote scripts to train and test using Caffe.
- Trained scenes with own data and classes.
- Set up a server to process image comprehension request with Flask.

(6) Auto-Encoder for Fast Near-duplicate Image Retrieval, 2/2015-3/2015

- Used Auto-encoder to extract visual features for near-duplicate image retrieval, in a TV channel retrieval project.
- Experimented using auto-encoder to extract semantic features for general image retrieval.

(7) Image Retrieval using Multi-frame Cues, 1/2015- 2/2015

- Experimented various fingerprinting for the VOD (Video on Demand) project.
- Improved precision by evaluating multi-frame results.

(8) Camera Take Detection, 12/2014- 1/2015

- Camera Take is a series of camera shots within a movie taken by one camera set but cut by movie editor into discontinuous shots.
- Improved the camera take detection quality by motion estimation and SIFT matching.

Graduate Research Assistant, University of Missouri, Columbia, MO, Aug '2012 – May '2018

Research areas: Human pose estimation, license plate detection and recognition, scene text detection, camera calibration. Major research projects include:

(1) 2D Human Pose Estimation, 12/2016 - 12/2017

- Developed a state-of-the-art single-person human pose estimation prototype from scratch. Published a [journal paper](#) on TMM.
- Participated [ICCV 2017 PoseTrack Challenge](#) for multi-person human pose estimation, ranking 4th upon challenge deadline. Published a [workshop paper](#).
- Researched into adversarial training for semantic human pose augmentation.

(2) Visual Object Search, 9/2014- 12/2014

- Built a [baseline for object search](#) with OpenSURF, using SURF as key points descriptor and k-means to build a histogram for each image as its feature, for further similarity computation.

(3) Scene Text Detection, 10/2013- 12/2014

- Developed text detection in natural scenes using a combination of SWT, MSER, Adaptive Binarization and Connected Components, with an SVM classifier with LBP and HOG features.
- Achieved state-of-the-art performance on the ICDAR2003 and ICDAR 2011 dataset.
- Published a [conference paper](#) in ICIP 2015.

(4) Facial landmark detection and localization and face alignment, 10/2013 – 12/2013

- Developed eye-alignment using an optimization method whose fitness function is based on the color information.

(5) Calibration and Distance Measurement Tool, 05/2013 – 5/2014

- Developed a tool to calibrate the scene with board images and stick images, as a collaboration research with biologists researching in wild life animals.
- Developed a tool to measure the distances with the calibrated scene, to help researchers learn the body length and strides of the animals.

(6) License Plate Detection and Recognition, 01/2013 – 10/2013

- Developed a system for license plate detection and recognition, using HOG features and SVM as classifier with a bag-of-words model.
- Using a global alignment method to better align the license plate.

(7) HEVC coding, 08/2012 – 12/2012

- Developed advanced adaptive in-loop filters to improve the encoder efficiency;
- Experimented to predict potential high PSNR increase region, to apply adaptive in-loop filter accordingly.

(8) 3D Deform-able Vehicle model, 01/2012 – 5/2012

- Implemented the 3D Deformable Vehicle model paper from Zhaoxiang Zhang using computational intelligence method to optimize the fitness function of a 3D deformable vehicle model, recognizing the type of the vehicle.

COURSE PROJECTS

(1) 3D Fighting Game Development, 1/2014- 5/2014

- Developed a [3D fighting game](#) using Unity3D and using a fighting game engine, UFE.
- Built a MU campus stage using Autodesk 123D and Maya.
- Built character Rigs and animations with Autodesk MotionBuilder.
- Won the [best project award](#) in the Computer Graphics class.

(2) Big Data Analytics Project, 8/2013- 12/2013

- Developed a Nutch-based Search Engine Running on a Hadoop Cluster with Web Interface, together with one teammate.

(3) Android Game Development, 8/2011- 12/2011

- Developed an Android Multi-player game using WIFI in ad-hoc mode, together with one teammate. I am the side-kick.

PUBLICATIONS

Conference

1. **Guanghan Ning**, Ping Liu, Xiaochuan Fan, Chi Zhang. "A Top-down Approach to Articulated Human Pose Estimation and Tracking", *IEEE European Conference on Computer Vision (ECCV workshop)*, 2018.
2. **Guanghan Ning**, Zhihai (Henry) He. "Dual-path Networks for Human Pose Estimation", *IEEE International Conference on Computer Vision (ICCV workshop)*, 2017.
3. **Guanghan Ning**, Zhi Zhang, Chen Huang, Xiaobo Ren, Haohong Wang, Zhihai (Henry) He. "Spatially Supervised Recurrent Convolutional Neural Networks for Visual Object Tracking", *IEEE International Symposium on Circuits and Systems (ISCAS)*, 2017.
4. **Guanghan Ning**, Zhi Zhang, Xiaobo Ren, Haohong Wang, Zhihai (Henry) He. "Rate-coverage analysis and optimization for joint audio-video multimedia retrieval", *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, 2017.
5. **Guanghan Ning**, Tony Han, Zhihai (Henry) He. "Scene Text Detection Based on Component-level Fusion and Region-level Verification", *IEEE International Conference on Image Processing (ICIP)*, 2015.
6. Haohong Wang, Yaoyuan Fu, Yang Li, **Guanghan Ning**, Zhihai He, Mengwen Liu. "A New TV World for Kids - when ZUI Meets Deep Learning", *IEEE Conference on Multimedia Information Processing and Retrieval (MIPR)*, 2018.

Journal

7. Zhihai He¹, Roland Kays², Zhi Zhang¹, **Guanghan Ning**¹, Chen Huang¹, Tony Han¹, Josh Millspaugh³, Tavis Forrester⁴, and William McShea⁴, "Visual Informatics Tools for Supporting Large-Scale Collaborative Wildlife Monitoring with Citizen Scientists", *IEEE circuits and systems magazine* (2015).
8. **Guanghan Ning**, Zhi Zhang, Zhihai (Henry) He. "Knowledge-Guided Deep Fractal Neural Networks for Human Pose Estimation", *IEEE Transactions on Multimedia*, 2017.
9. Zhi Zhang, **Guanghan Ning**, Zhihai (Henry) He. "Knowledge Projection for Effective Design of Thinner and Faster Neural Networks", submitted to *IEEE Transactions on Circuits and Systems for Video Technology*.

Patent

10. Haohong Wang, **Guanghan Ning**, Zhi Zhang, "Method And System For Content Retrieval Based On Rate-Coverage Optimization", US9836535B2, Sep 2015
11. Zhi Zhang, **Guanghan Ning**, Haohong Wang, "Mobile Search-Ready Smart Display Technology Utilizing Optimized Content Fingerprint Coding and Delivery", US9807453B2, Dec 2015

12. **Guanghan Ning**, Haohong Wang, Wenqiang Bo, Xiaobo Ren, "Method and System for vision-centric deep learning based road situation analysis", US9760806B1, Mar 2016
13. **Guanghan Ning**, Haohong Wang, Xiaobo Ren, "Optimized Wake-up Strategy via Sleeping Stage Prediction with Recurrent Neural Networks", US20180060507A1, May 2016
14. Haohong Wang, Xiaobo Ren, Wenqiang Bo, **Guanghan Ning**, Lifan Guo, "Experience-Aware Anomaly Processing System", US20180039908A1, July 2016

Thesis

15. **Guanghan Ning**, "License Plate Detection and Recognition", M.S. thesis, Dept. ECE, University of Missouri, 2013.
16. **Guanghan Ning**, "Learning Human Poses in Natural Scenes", Phd Dissertation, Dept. ECE, University of Missouri, 2018.

Preprints

17. Zhi Zhang, **Guanghan Ning**, Zhihai He, "Knowledge projection for deep neural networks", preprint arXiv:1710.09505
18. Zhi Zhang, **Guanghan Ning**, Yigang Cen, Yang Li, Zhiqun Zhao, Hao Sun, Zhihai He, "Progressive Neural Networks for Image Classification", preprint arXiv:1804.09803

RELEVANT COURSEWORK

Computer Graphics (A); Cognitive Computer Vision (A); Digital Image Processing (A); Computational Intelligence (A); Supervised Learning (A-); Big Data Analytics (A); VHDL and Programmable Logic Devices (A); Algorithms (A); Computational Neural Science (A).

SELECTED HONORS

- Leeds Sports (LSP), Single-person Human Pose Estimation, [Rank 2nd](#)
- ICCV 2017 PoseTrack Challenge, Multi-person Pose Estimation, [Rank 2nd](#)
- ECCV 2018 PoseTrack Challenge, Multi-person Pose Tracking, [Rank 6th](#)

PROGRAMMING SKILLS

- C/C++ (60+ months)
- Python (36+ months)
- Java (24+ months)
- MATLAB (48+ months)
- Objective C (5+ months)
- Embedded Computing (6+ months)
- Hardware Programming Languages: VHDL (12+ months)
- Hadoop Configuration, Pig, Hive, HBase (6+ months)
- HTML, CSS, JQuery (3+ months)

OTHER SKILL SETS

- *Computer Vision and Deep Learning:*
 - Tensorflow, Caffe, Darknet, Mxnet, Pytorch, OpenCV, VLFeat
- *Computer Graphics:*
 - Maya, OpenGL, FLTK, GLUT, Unity3D, MotionBuilder
- *Web Development Frameworks:*
 - Flask for Python

REFERENCE

Available upon request.