

GUANGHAN NING

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EDUCATION

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

RESEARCH and DEVELOPMENT EXPERIENCE

Intern, 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

- Wrote a US patent, where we incorporate real-time objection recognition technology with lane detection and distance prediction.
- Developed a system with Tensorflow for Object Tracking via Temporal-Spatial Analysis.

(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. The chip is expected to be used in smart vehicles.
- Trained various traffic signs for street environment comprehension, using deep learning methods. It works for both camera input and video input.

(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.

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

- Used Autoencoder to extract visual features for near-duplicate image retrieval, in a TV channel retrieval project.
- Experimented using autoencoder 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 - present

Research areas: action recognition and motion analysis, license plate detection and recognition, scene text detection, camera calibration, HEVC video coding. Major research projects include:

(1) 2D Single-Person Human Pose Estimation, 12/2016 - present

- Developed a state-of-the-art human pose estimation prototype from scratch.

(2) 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 of 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 the SVM (support vector machine) as classifier with a bag-of-words model.
- Using a global alignment method to well 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, in order 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 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.

PUBLICATIONS

Conference

1. **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.
2. **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*, 2017.
3. **Guanghan Ning**, Zhi Zhang, Xiaobo Ren, Haohong Wang, Zhihai (Henry) He. "Joint Audio-Video Multimedia Retrieval Using Rate-Coverage Optimization", *IEEE International Conference on Acoustics, Speech, and Signal Processing*, 2017.

Journal

4. Zhihai He¹, Roland Kays², Zhi Zhang¹, **Guanghan Ning**¹, Chen Huang¹, Tony Han¹, Josh Millsbaugh³, Tavis Forrester⁴, and William McShea⁴, "Visual Informatics Tools for Supporting Large-Scale Collaborative Wildlife Monitoring with Citizen Scientists", *IEEE circuits and systems magazine* (2015).
5. **Guanghan Ning**, Zhi Zhang, Zhihai (Henry) He. "Knowledge-Guided Deep Fractal Neural Networks for Human Pose Estimation", submitted to *IEEE Transactions on Multimedia*.
6. 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

7. **Guanghan Ning**, Zhi Zhang, Haohong Wang, "Method And System For Content Retrieval Based On Rate-Coverage Optimization", 00155.0048.00US, Sep 2015
8. Zhi Zhang, **Guanghan Ning**, Haohong Wang, "Mobile Search-Ready Smart Display Technology Utilizing Optimized Content Fingerprint Coding and Delivery", 00155.0057.00US, Dec 2015
9. **Guanghan Ning**, Haohong Wang, Wenqiang Bo, Xiaobo Ren, "Deep Learning-Based Road Situation Analysis", Mar 2016
10. **Guanghan Ning**, Haohong Wang, Xiaobo Ren, "Optimized Wake-up Strategy via Sleeping Stage Prediction with Recurrent Neural Networks", May 2016
11. Haohong Wang, Xiaobo Ren, Wenqiang Bo, **Guanghan Ning**, Lifan Guo, "Experience-Aware Anomaly Processing System", July 2016

Thesis

12. **Guanghan Ning**, “License Plate Detection and Recognition”, M.S. thesis, Dept. ECE, University of Missouri, 2013.

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).

PROGRAMMING SKILLS

- C/C++ (60+ months)
- Python (24+ 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, OpenCV, VLFeat
- *Computer Graphics:*
 - Maya, OpenGL, FLTK, GLUT, Unity3D, MotionBuilder
- *Web Development Frameworks:*
 - Flask for Python, Express for Node.js

REFERENCE

Available upon request.