

## **Weikang Wang**

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### **Educations**

#### **Beihang University**

Bachelor of Engineering in Automation Science (The Outstanding Graduate)

**Beijing, CN.**

**09/2013-06/2017**

#### **Columbia University**

Master of Science in Electrical Engineering

**New York, NY.**

**08/2017-12/2018**

### **Publications**

- **Wang, W.**, Zhang, B., Qin, R., Yan, Q., Jiang, H. A New VC Dimension Based on Probability. 2016 International Conference on Artificial Intelligence and Computer Science (AICS 2016). ISSN: 2475-8841. ISBN: 978-1-60595-411-0. DOI: 10.12783/dtce/aics2016/8239.
- Qin, R., Wang, T., Jiang, H., Yan, Q., **Wang, W.**, & Snoussi, H. (2016). Cooperative target searching and tracking via UCT with probability distribution model. IEEE International Conference on Digital Signal Processing (pp.560-564). IEEE.

### **Course Projects**

#### **Face recognition based on deep learning and embedded platform**

**Beijing, CN.**

Undergraduate graduation thesis

**09/2016-06/2017**

**Advisor:** Professor B. Zhang, School of Automation Science and Electrical Engineering, Beihang University

I designed a face recognition system based on deep learning and embedded system.

Main Contributions:

- Used DSP chip, TMS320DM642 to capture face image from image flow before uploading to computer.
- Extracted features of face image by using deep convolutional neural network (CNN) and local binary pattern (LBP) operator.
- Used the features to obtain the identity of the input image by the sparse representation classifier (SRC).

#### **Emotion Detector Machine**

**New York, NY.**

Course Project of Digital Signal Processing

**09/2017-12/2017**

**Lecturer:** Professor John Wright, Dept. of Electrical Engineering, Columbia University

**Co-worker:** Q. Zheng, M. Li and J. Peng, Graduate Students of Dept. of Electrical Engineering, Columbia University

We designed an Emotion Detector Machine that can identify the emotion of the input human face by facial expression recognition.

Main Contributions:

- Used three different classifiers: K-nearest classifier, support vector machine (SVM) classifier based on HOG and Landmark feature operators and convolutional neural network (CNN) separately to do the emotion detection and compare their results.
- Adopted Principle Component Analysis (PCA) to do dimension reduction and test the effects of PCA by using SVM classifier on the original dataset and dimension-reduced dataset.

#### **Multi-Digits Recognition based on CNN**

**New York, NY.**

Course Project of Neural Network & Deep Learning

**09/2017-12/2017**

**Lecturer:** Professor Zoran Kostic, Dept. of Electrical Engineering, Columbia University

**Co-worker:** J. Li, Graduate Student of Dept. of Electrical Engineering, Columbia University

We designed architecture that inputs images with multi-digits and outputs the identities of them.

Main Contributions:

- Adopted a mixture probability model to represent the length of digits in the original image and every identity of those digits.
- Built a deep neural network with 8 convolutional layers and 3 fully connected layers by using

- TensorFlow.
- Trained and tested the deep neural network with The Street View House Numbers (SVHN) Dataset. Finally we got a 73.998% testing accuracy.

**Is sparse representation a good and profound explanation for face recognition?** **New York, NY.**

Course Project of Sparse Representation & High Dimensional Geometry **01/2018-05/2018**

**Lecturer:** Professor John Wright, Dept. of Electrical Engineering, Columbia University

I aimed to figure out whether the sparse representation is a good and profound explanation for face recognition problem.

Main Contributions:

- Analyzed Sparse-representation-based algorithm and did experiment on YaleB dataset.
- Confirmed that the sample space consisting of human face images with different illumination conditions and facial expressions is low-dimensional by calculating the singular values of one sample matrix consisting of images from one arbitrary identity in AR dataset.
- Did experiment of the Sparse-representation-based algorithm based on AR dataset corrupted by area-sparsed corruptions and showed that the query that the both collaborative representation and  $l_1$  norm minimization are essential to the success of this algorithm.

## **Research Experiences**

**Internship in Institute of Automation, Chinese Academy of Science** **Beijing, CN.**

**Advisor:** Dr. Stan Li. Center for Biometrics and Security Research (CBSR), National Laboratory of Pattern Recognition of China **09/2016-11/2016**

- Merged Megaface datasets, MS-Celeb-1M datasets and CASIA Face Image database into the biggest face datasets in the world at that time;
- Used CNN (Convolutional Neural Network) to extract features of every identity in three data sets;
- Constructed evaluation matrix to evaluate the similarity of every two identities from two datasets in order to merge the same identity.

**A New VC Dimension Based on Probability** **Beijing, CN.**

**Advisor:** Professor B. Zhang, Beihang University, MACHINE PERCEPTION LAB (mpl.buaa.edu.cn) **03/2016-06/2016**

- Broadened the definition of original VC dimension created by Vapnik into a new VC dimension based on probability through considering the factors including the distribution of data sets, the range of confidence interval and the training error;
- Put forward new VC bound based on probability;
- Solved paradox between the range of confidence intervals and size of the hypothesis set.

**Cooperative target searching and tracking via UCT with probability distribution model** **Beijing, CN.**

**Advisor:** Dr. T. Wang, School of Automation Science and Electrical Engineering, Beihang University **07/2015-12/2015**

- Applied the knowledge of quantum mechanics into searching algorithm and proposed quantum probability model of UVA'S searching algorithm;
- Set probability transfer rule (PTR) for the new algorithm and proved the new model will still keep the probability distribution rule valid in theory.

## **Honors**

- The Third Class Prize Scholarship of Beihang University **2014**
- The Second Class Prize of the Chinese Mathematics Competition (CMC) **2014**
- The Second Class Prize Scholarship of Beihang University **2015**
- The Outstanding Graduate of Beihang University **2017**

## **Skills**

- Programming language: Python, Matlab, R, C;