

Xiang Xu

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Education

University of Houston

PH.D. IN COMPUTER SCIENCE

Face Recognition, Biometrics, Computer Vision, Deep Learning, Machine Learning, Pattern Recognition

Houston, TX, USA

Aug. 2014 - Present

Beijing University of Posts and Telecommunications

B.S. IN TELECOMMUNICATION ENGINEERING

Telecommunication, Application Development

Beijing, China P.R.

Sept. 2009 - June. 2013

Experience

Amazon AWS AI

APPLIED SCIENTIST INTERN

Domain Adaptation for Image Classification. Proposed novel algorithms for domain adaptation for different scenarios and outperforms the state-of-the-art performance by a large margin.

Seattle, WA, USA

May. 2018 - Aug. 2018

University of Houston

RESEARCH ASSISTANT AT COMPUTATIONAL BIOMEDICINE LAB

Houston, TX, USA

Aug. 2014 - Present

- **UR2D Face Recognition Pipeline** Tools: C++, Qt, OpenCV, 3D-AFM, Caffe
Designed and implemented the architecture of UH CBL 3D-2D face recognition pipeline. This system is implemented in C++. The modules include face detection, 2D face alignment, 3D model fitting, and face frontalization. To accelerate computation, it makes use of OpenMP for CPU and CUDA for GPU. The SDK is based on the libraries of OpenCV, Pittpatt5, Dlib, and Caffe. Implemented IO system, file system, dataset utility, Caffe utility, Yahoo multi-view face detector, and integrated face alignment modules into the pipeline. Created several applications such as enrollment and comparison. Lead the team to create live demos to present this pipeline. The details will be presented in paper [C4, J2].
- **3D Face Reconstruction** Tools: Python, MXNet
Proposed a feature aggregation learning network to predict the shape and expression parameters of 3D face model. It leverages the features from different layers from the backbone network such as ResNet-101. With the feature aggregation learning, the network can learn better for both two tasks and achieve 16% improvement on BU-3DFE and 10% improvement on JNU-3D comparing the state-of-the-art [C2].
- **2D Face Analysis** Tools: Python, Tensorflow
Proposed a hierarchical framework to estimate head pose and facial landmarks jointly in a coarse-to-fine manner. It first estimates the coarse head pose and localizes primary landmarks using global CNN features. With this rough head pose estimation and initial landmarks, local CNN features are extracted from images patches to refine the pose estimation and update facial landmark localization. The details are presented in paper [C5].
- **2D Face alignment** Tool: MATLAB
Proposed a novel method for face alignment method on 2D images by combining the facial component classification and cascaded regression. The face component classification is used for deriving a better initialization for regression. An ensemble of random ferns is applied to encode the local facial features for global shape regression. The details are presented in paper [C6].
- **Landmark-free head pose estimation** Tool: MATLAB
Proposed a learning based method to estimate the facial pose and 3D-2D projection matrix; Sparse coding and dictionary learning are applied to estimate the Euler angles of facial pose and initialize the 3D-2D projection matrix. Supervised gradient descent is applied to estimate the projection matrix. The details are presented in paper [C7].

Amazon AWS AI

APPLIED SCIENTIST INTERN

Forecasting with deep learning techniques.

New York, USA

May. 2017 - Aug. 2017

University of Houston

Houston, TX, USA

COURSE PROJECTS

Aug. 2014 - Jun. 2016

- **FaceLock iOS App** Tools: Objective-C, OpenCV
Designed the architecture and interface and developed an iOS app for face-based door access control. This app is designed to unlock the door automatically for authorized users by recognizing their identities through facial image captured. The OpenCV library is used to detect and align faces on 2D images collected from the frontal camera. The Eigenface algorithm is used to recognize the user identity.
- **Database** Tools: JAVA, C++
Normalization: Implemented algorithms to normalize the database. Mini-database: Developed a toy-database system that supports low-level data operations such as inserting data into table, searching data from table, and writing data table in binary file.

Institute of Information Engineering, Chinese Academy of Science

Beijing, China P.R.

RESEARCH ASSISTANT AT NATIONAL ENGINEERING LABORATORY FOR INFORMATION SECURITY TECHNOLOGY

March 2013 - Oct. 2013

- **Image Retrieval System** Tools: C++, OpenCV
Built an image retrieval system using MFC framework and OpenCV library; This system encodes each image using four kinds of features: SIFT, gray histogram, hierarchical gray histogram, and ORB. The tf-idf weighting scheme was employed in the searching procedure.
- **Hypothesis Comparison Guided Cross Validation** Tools: C#, C++, Kinect
Depth data collection with Kinect and gesture segmentation using both depth and skin color. Performed multiple gesture recognition experiments and compared dependent and independent validation, supervised and unsupervised cross-validation adaption, and our proposed hypothesis comparison guided cross validation. The details are presented in paper [J1].

Beijing University of Posts and Telecommunications

Beijing, China P.R.

STUDENT

Sept 2009 - Jun. 2013

- **Interactive Sketchpad Android App** Tools: JAVA, Android SDK
Created an Android App for interactive and cooperative sketch between two Android phones. This app can be used for family entertainment and teaching children to draw, which helps encourage interactions and improve the relation between parents and children; I studied the children behaviors and designed the app elaborately to make it easy for children to use; I created an innovative way for children to draw lines using gravity and ego-motion. This app won the **3rd place nationally** in the **2nd Google Android Application Development Challenge** and received good comments in China Mobile App Store.
- **Pupil & Iris Localization** Tool: MATLAB
Proposed a novel method to predict the location of pupil and iris. A Bayesian model was trained on the mean of gradient features to predict the accurate pupil and iris location; Our method improves the accuracy by about 3 points in percentage for pupil localization and achieves similar accuracy for iris localization. The details are described in paper [C3].
- **iSee** Tool: C++
Developed a software aimed at helping reduce suicide rate caused by stress and depression. The software predicts user emotion by facial expression recognition and promotes different interactions accordingly. Gabor filters and principle component analysis are applied to extract image features and build a statistical model and the K-nearest neighbor algorithm is employed to recognize facial expressions; Achieved an accuracy of 70%+ for recognizing each of six different facial expressions.

Publications

JOURNAL

- J1 Y. Zhou, X. Yang, Y. Zhang, **X. Xu**, Y. Wang, X. Chai, and W. Lin. Unsupervised adaptive sign language recognition based on hypothesis comparison guided cross validation and linguistic prior filtering. *Neurocomputing*, 149(C): 1604-1612, 2015.
- J2 **X. Xu**, P. Dou, H. Le, and I. A. Kakadiaris. When 3D-Aided 2D Face Recognition Meets Deep Learning: An extended UR2D for Pose-Invariant Face Recognition. *IEEE Transaction on Biometrics, Behavior, and Identity Science* (In preparation).

CONFERENCE

- C1 N. Sarafianos, **X. Xu**, and I. A. Kakadiaris, Deep Imbalanced Attribute Classification using Visual Attention Aggregation, In *Proc. Europe Conference of Computer Vision*, 2018.
- C2 **X. Xu**, H. Le, and I. A. Kakadiaris. On the Importance of Feature Aggregation for Face Reconstruction, *Winter Conference on Applications of Computer Vision*, 2018 (Under review).
- C3 L. Shi, **X. Xu**, and I. A. Kakadiaris, SSFD: A Face Detector using a Single-scale Feature Map, In *Proc. The 9th IEEE International Conference on Biometrics: Theory, Applications, and Systems*, Los Angeles, CA, USA, 2018.
- C4 **X. Xu**, Ha Le, P. Dou, Y.Wu, and I. A. Kakadiaris. Evaluation of a 3D-aided Pose Invariant 2D Face Recognition System. In *Proc. International Joint Conference on Biometrics*, Denver, CO, Oct. 1-4, 2017.
- C5 **X. Xu** and I. A. Kakadiaris. Joint Head Pose Estimation and Face Alignment Framework using Global and Local CNN Features. In *Proc. 12th IEEE Conference on Automatic Face and Gesture Recognition*, Washington, DC, May 30-June 3, 2017.

- C6 **X. Xu**, S. K. Shah, and I. A. Kakadiaris. Face alignment via an ensemble of random ferns. In *Proc. IEEE International Conference on Identity, Security and Behavior Analysis*, Sendai, Japan, Feb. 29 - Mar. 2, 2016 (Oral).
- C7 Y. Wu, **X. Xu**, and I. A. Kakadiaris. Towards fitting a 3D dense facial model to 2D image without landmarks. In *Proc. 7th International Conference on Biometrics: Theory, Applications and Systems*, Arlington, VA, Sept. 8 - 11, 2015.
- C8 **X. Xu**, X. Zhu and W. Deng. Accurate Eye Localization by Fusing Local, Global and Context Information. In *International Conference on Multimedia and Human-Computer Interaction*, Canada, 2013 (Accepted).

Professional Service

- Reviewer**, International Journal of Computer Vision, Neurocomputing, Computer Vision and Pattern Recognition,
 2018 European Conference on Computer Vision, International Conference of Image Processing, Automatic Face and Gesture Recognition
- Reviewer**, Computer Vision and Pattern Recognition, Automatic Face and Gesture Recognition, Medical Image
 2017 Computing and Computer Assisted Intervention
- Reviewer**, Computer Vision and Pattern Recognition, Medical Image Computing and Computer Assisted Intervention
 2016
- Reviewer**, Computer Vision and Pattern Recognition
 2015
- Reviewer**, Asian Conference on Pattern Recognition
 2014

Skills

Programming C/C++, Python, MATLAB, JAVA, Lua, Objective-C, SQL

Tools MxNet/Gluon, Tensorflow, Pytorch/Torch, Caffe, OpenCV, Qt, Git, OpenBR

Honors & Awards

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| 2017 | Doctoral Consortium , IJCB 2017 | Denver, USA |
| 2017 | Doctoral Consortium Travel Grant , FG 2017 | Washington, DC, USA |
| 2013 | Special Prize (11/10k+, 1%) , Campus group, China mobile application developing competition | Beijing, China P.R. |
| 2013 | 3rd Award (8/142, 6%) , BUPT Imagine Award | Beijing, China P.R. |
| 2011 | 3rd Award , National area, Google Android Application Development Challenge | Beijing, China P.R. |
| 2011 | 3rd Award , BUPT Mobile Internet Creative Competition | Beijing, China P.R. |
| 2011 | 2nd Award , Beijing area, Google Android Application Development Challenge | Beijing, China P.R. |