

# Pooya Khorrami

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## Education

### University of Illinois at Urbana Champaign

*PhD Electrical and Computer Engineering*

Advisor: Thomas S. Huang

Thesis Title: How Deep Learning Can Help Emotion Recognition

**Urbana, IL**

*Jan. 2014–May 2017*

### University of Illinois at Urbana Champaign

*MS Electrical and Computer Engineering*

Advisor: Thomas S. Huang

**Urbana, IL**

*Aug. 2011–Dec. 2013*

### Carnegie Mellon University

*BS Electrical and Computer Engineering*

Minor: Business Administration

**Pittsburgh, PA**

*Aug. 2007– May 2011*

## Industry Experience

### MIT Lincoln Laboratory

*Technical Staff (Group 52)*

**Lexington, MA**

*Aug. 2017–Present*

- Trained deep convolutional neural networks (CNNs) to do kinship recognition on the Recognizing Families in the Wild (RFIW) dataset
- Developed software to visualize parts of the face that correspond with kinship given a pair of images
- Helped collect and curate a dataset corpus to evaluate automatic machine learning systems
- Trained a CNN to do nuclei detection in electron microscopy images

### MIT Lincoln Laboratory

*Summer Research Intern (Group 52)*

**Lexington, MA**

*June 2015–Aug. 2015*

- Implemented a system for video emotion recognition which would predict the arousal/valence score of a subject using a convolutional neural network (CNN)
- Wrote software to visualize the regions of the face that excited specific neurons in the CNN

### MIT Lincoln Laboratory

*Summer Research Intern (Group 52)*

**Lexington, MA**

*June 2014–Aug. 2014*

- Designed face recognition system that was initialized with unsupervised pre-training and subsequently fine-tuned on a smaller labeled dataset
- Improved existing algorithms used for object detection/recognition with a state-of-the-art convolutional neural network system and verified its performance

### GE Aviation Systems

*EID Intern*

**Grand Rapids, MI**

*June 2011–Aug. 2011*

- Worked on traceability of high-level requirements specified by Boeing to low-level GE generated requirements for 737-Flight Management System (FMS)

### Technosciences Inc. (now McMurdo)

*Student Intern*

**Beltsville, MD**

*June 2009–Aug. 2009*

- Developed a Global Communicator that could function as a GPS tracker or a data transmitter when communicating across cellular networks
- Wrote Python scripts that controlled the Telit GSM Modem on the Global Communicator to send GPS coordinates or user specified data to a central server
- Implemented a multi-threaded server in Visual C#

## Research Experience

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### University of Illinois

*Graduate Research Assistant*

**Urbana, IL**

*Jan. 2012–May 2017*

- **Video / Multi-modal Emotion Recognition:**
  - Trained a single frame CNN and a CNN+RNN network for dimensional emotion recognition (i.e predict arousal/valence score for a person) on the RECOLA dataset.
  - Combined CNN+RNN features with audio features from MIT Lincoln Laboratory and competed in the AV+EC 2016 competition
- **Visual Emotion Recognition:**
  - Trained a CNN to do emotion recognition on images using Theano
  - Showed both quantitatively and qualitatively that the features learned by the CNN corresponded with Facial Action Units (FAUs)
- **Unsupervised Deep Learning:**
  - Developed a deep deconvolutional auto-encoder with rectified linear units for unsupervised learning
  - The network was subsequently fine-tuned to do object recognition on the CIFAR10 and STL-10 datasets
- **Student Engagement Estimation:**
  - Constructed a system that uses face tracking software to estimate the position of a student's gaze on a computer screen
  - Subject would be considered disengaged if their gaze was outside the monitor dimensions for some time
- **Vehicle Detection/Tracking and Crash Prediction:**
  - Wrote MATLAB code to detect vehicles in busy intersections using Robust Principal Component Analysis and wavelet de-noising
  - Tracked the vehicles using Kalman filter and performed accident prediction and recognition
- **Wildlife Detection:**
  - Built a system in MATLAB that could detect animals from camera trap data using Robust Principal Component Analysis and Optical Flow

### University of Illinois

*ECE 110 Teaching Assistant*

**Urbana, IL**

*Aug. 2011–Dec. 2011*

- Led a three hour weekly laboratory session
- Graded laboratory assignments and final design projects

### Carnegie Mellon University

*Undergraduate Research Assistant*

**Pittsburgh, PA**

*June 2010–Aug. 2010*

- Developed MATLAB code to test the performance of a face recognition algorithm that matched low-resolution images to their high-resolution counterparts via linear mappings and eigenvalue decomposition

## Publications

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- [1] **Pooya Khorrami**, Kevin Brady, Mark Hernandez, Lars Gjesteb, Sara Nicole Burke, Damon Lamb, Matthew A. Melton, Kevin Otto, and Laura Brattain. Deep learning-based nuclei segmentation of cleared brain tissue. In *2019 IEEE High Performance Extreme Computing Conference (HPEC)*, 2019.
- [2] Richard Lippmann, Swaroop Vattam, **Pooya Khorrami**, and Cagri Dagli. A new data corpus

- to promote more complete autonomous machine learning pipelines. *2018 Neural Information Processing Systems Workshop (NeurIPS-W)*, 2018.
- [3] Prajit Ramachandran, Tom Le Paine, **Pooya Khorrami**, Mohammad Babaeizadeh, Shiyu Chang, Yang Zhang, Mark A Hasegawa-Johnson, Roy H Campbell, and Thomas S Huang. Fast generation for convolutional autoregressive models. *2017 International Conference on Learning Representations (ICLRW)*, 2017.
  - [4] Tom Le Paine, **Pooya Khorrami**, Shiyu Chang, Yang Zhang, Prajit Ramachandran, Mark A Hasegawa-Johnson, and Thomas S Huang. Fast wavenet generation algorithm. *arXiv preprint arXiv:1611.09482*, 2016.
  - [5] Kevin Brady, Youngjune Gwon, **Pooya Khorrami**, Elizabeth Godoy, William Campbell, Charlie Dagli, and Thomas S Huang. Multi-modal audio, video and physiological sensor learning for continuous emotion prediction. In *Proceedings of the 6th International Workshop on Audio/Visual Emotion Challenge*, pages 97–104. ACM, 2016.
  - [6] James R Williamson, Elizabeth Godoy, Miriam Cha, Adrienne Schwarzentruher, **Pooya Khorrami**, Youngjune Gwon, Hsiang-Tsung Kung, Charlie Dagli, and Thomas F Quatieri. Detecting depression using vocal, facial and semantic communication cues. In *Proceedings of the 6th International Workshop on Audio/Visual Emotion Challenge*, pages 11–18. ACM, 2016.
  - [7] Vuong Le, **Pooya Khorrami**, Usman Tariq, Hao Tang, and Thomas Huang. *Face Processing and Applications to Distance Learning*. World Scientific, 2016.
  - [8] Wei Han, **Pooya Khorrami**, Tom Le Paine, Prajit Ramachandran, Mohammad Babaeizadeh, Honghui Shi, Jianan Li, Shuicheng Yan, and Thomas S Huang. Seq-nms for video object detection. *arXiv preprint arXiv:1602.08465*, 2016.
  - [9] **Pooya Khorrami**, Tom Le Paine, Kevin Brady, Charlie Dagli, and Thomas S Huang. How deep neural networks can improve emotion recognition on video data. In *2016 IEEE International Conference on Image Processing (ICIP)*, pages 619–623, 2016.
  - [10] **Pooya Khorrami**, Tom Le Paine, and Thomas Huang. Do deep neural networks learn facial action units when doing expression recognition? In *Proceedings of the IEEE International Conference on Computer Vision Workshops (ICCVW)*, pages 19–27, 2015.
  - [11] Tom Le Paine, **Pooya Khorrami**, Wei Han, and Thomas S Huang. An analysis of unsupervised pre-training in light of recent advances. *2015 International Conference on Learning Representations (ICLRW)*, 2015.
  - [12] Kai-Hsiang Lin, **Pooya Khorrami**, Jiangping Wang, Mark Hasegawa-Johnson, and Thomas S Huang. Foreground object detection in highly dynamic scenes using saliency. In *2014 IEEE International Conference on Image Processing (ICIP)*, pages 1125–1129, 2014.
  - [13] **Pooya Khorrami**, Vuong Le, John C Hart, and Thomas S Huang. A system for monitoring the engagement of remote online students using eye gaze estimation. In *2014 IEEE International Conference on Multimedia and Expo Workshops (ICMEW)*, pages 1–6, 2014.
  - [14] Shiyu Chang, Wei Han, Xianming Liu, Ning Xu, **Pooya Khorrami**, and Thomas S. Huang. Multimedia classification. *Data Classification: Algorithms and Applications*, page 337, 2014.
  - [15] Thomas S. Huang, Vuong Le, Thomas Paine, **Pooya Khorrami**, and Usman Tariq. Visual media: History and perspectives. *IEEE MultiMedia*, 21(2):4–10, 2014.

- [16] **Pooya Khorrami**, Jiangping Wang, and Thomas S. Huang. Multiple animal species detection using robust principal component analysis and large displacement optical flow. In *ICPR Workshop on Visual Observation and Analysis of Animal and Insect Behavior (VAIB)*, 2012.

## Technical Skills

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**Programming Languages (Proficient):** Python, MATLAB

**Programming Languages (Familiar):** C/C++, C#

**Libraries:** Tensorflow, Theano, Lasagne, Scikit-Learn, OpenCV, Caffe

**Tools:** git, vim, Visual Studio, LaTeX, MPLAB, CodeWarrior

## Professional Activities

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**Program Committee Member:**

- AAAI Conference on Artificial Intelligence (AAAI)
- IEEE Workshop on Analysis and Modeling of Faces and Gestures (AMFG)

**Reviewer:**

- ACM Multimedia RFIW Workshop (ACM MM RFIW)
- IEEE International Workshop on Faces in Multimedia (FacesMM)
- IEEE Winter Conference on Applications of Computer Vision (WACV)
- IEEE Symposium on Technologies for Homeland Security (HST)
- IEEE Transactions on Systems, Man, and Cybernetics: Systems (TSMCA)
- IEEE Transactions on Neural Networks and Learning Systems (TNNLS)
- IEEE Transactions on Multimedia (TMM)
- IEEE Transactions on Affective Computing (TAC)
- IEEE Signal Processing Letters (SPL)
- IEEE Access
- Elsevier Pattern Recognition
- Workshop on Bringing Semantic Knowledge into Vision and Text Understanding (IJCAI-TUSION)

## Awards and Honors

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- James Henderson Fellowship - 2012
- Andrew Carnegie Society Scholar - 2011
- Xerox Technical Minority Scholarship - 2009, 2010
- Carnegie Institute of Technology Dean's List - 2007-2012

## Other Information

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- U.S. Citizen