

# Farley Lai

ENGINEER/RESEARCHER

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## Work Experience

### NEC Laboratories America, Inc.

Princeton, NJ and San Jose, CA

FROM SR. ASSOCIATE RESEARCHER TO RESEARCHER

Aug. 2017 - Mar. 2022

- 2022 SOTA video retrieval using self-supervised representation learning with cascade positive example mining on UCF101/HMDB51
- 2022 SOTA group activity recognition using ONLY keypoints on the Volleyball dataset with improvement up to 5.4%
- 2021 SOTA compositional reasoning about object permanence on the Cater dataset with Top-1 73.2%
- Designed and deployed a real-time multi-stream action recognition framework for a retail surveillance POC
- Designed and deployed a customizable rule based engine in regular languages to support compositional action detection
- 2020 SOTA multi-person tracking in the PoseTrack challenge
- 2019 contextual grounding outperforming previous SOTA on Flickr30K Entities by 1.67%
- Proposed a novel visual entailment task and dataset with baseline 71.16%, engaging the community with followup research
- Proposed a multi-context approach to unsupervised manufacturing defect detection, improving from 60% to more than 80%
- 4 US patents issued, 12 in application

### Computer Science, University of Iowa

Iowa City, IA

RESEARCH ASSISTANT

June. 2016

- Compile-time energy predictions with error < 9% for mobile sensing apps including activity recognition and speaker identification

### NEC Laboratories America, Inc.

Princeton, NJ

RESEARCH ASSISTANT - INTERNSHIP

Spring, 2016

- Designed hybrid data and model parallel deep neural networks as well as alternative direction method of multipliers (ADMM) for large-scale distributed deep learning in Lua/C++/OpenMP
- Speedup from 145 images/s on one machine baseline to 1500 images/s on a cluster of eight 16-core machines@2.2GHz over InfiniBand
- Memory savings by up to 67% with hybrid model parallelism evaluated with CFAR-10 on a VGG variant

### Computer Science, University of Iowa

Iowa City, IA

RESEARCH AND TEACHING ASSISTANT

2011 - 2015

- Optimized the memory management of stream programs through code analysis with experimental results outperforming the MIT StreamIt by up to 8.7X in various benchmarks while saving memory usage by up to 96%
- Developed CSense, a stream processing toolkit for Android, that ensures leak and race free as well as integration with MATLAB code through JNI, boosts performance by up to 19X, and reduces 45% CPU usage compared with baseline
- Developed mobile sensing applications based on CSense including AudioSense to capture listening context for hearing aid, ActiSense to recognize human activities and SpeakerIdentifier to identify speakers in conversations
- Giving two full-length lectures on filesystems in CS:3620 Operating Systems

### Uniform Industrial Corporation

New Taipei City, Taiwan

PROJECT LEADER AND ADVANCED ENGINEER

2004 - 2009

- Practiced eXtreme Programming to lead a project of developing multi-channel video management software in MFC for Windows and browser ActiveX/DirectShow plugins in a one-month tight schedule
- Developed an embedded Perl web server to improve rendering server pages from seconds to the blink of an eye for video conferencing products, and a video player adapted from VLC displaying private event information for IP surveillance cameras
- Independently assigned to transpire Magnetic Ink Character Recognition sources from Moto68K assembly to C for U.S. check readers

## Education

### University of Iowa (UIowa)

Iowa City, IA

PH.D. AND MCS IN COMPUTER SCIENCE WITH 3.83 CGPA

2011 - 2017

- Relevant courses: knowledge discovery, pattern recognition, big data technologies, artificial intelligence, distributed systems
- Engineering courses: image processing, signal processing, formal methods

### Nation Central University (NCU)

Taoyuan, Taiwan

M.S. IN COMPUTER SCIENCE AND INFORMATION ENGINEERING WITH 4.0 GPA

2002 - 2004

- Relevant courses: cluster analysis, neural networks, distributed fault-tolerance computing, network security

## Skills

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- Programming: Python, C/C++, Java/Scala/Groovy, Lua, MATLAB
- Toolkits: PyTorch, TensorFlow, Spark, GASPI/GPI, OpenMP, Gradle, Conda, Docker
- AWS: Kinesis Video/Data Streams, ECS, Lambda, Cognito
- Development: Android, Linux, Windows

## Publications

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### COMPOSER: Compositional Learning of Group Activity in Videos

*Under review*

HONGLU ZHOU, ASIM KADAV, AVIV SHAMSIAN, SHIJIE GENG, [FARLEY LAI](#), LONG ZHAO, TING LIU, MUBBASIR KAPADIA, HANS PETER GRAF

2022

### Self-supervised Video Representation Learning with Cascade Positive Retrieval

*L3D-IVU@CVPR*

CHENG-EN WU, [FARLEY LAI](#), YU HEN HU, ASIM KADAV

2022

### SplitBrain: Hybrid Data and Model Parallel Deep Learning

*arXiv*

[FARLEY LAI](#), ASIM KADAV, ERIK KRUUS

2021

### Learning Higher-order Object Interactions for Keypoint-based Video Understanding

*SRVU@ICCV*

YI HUANG, ASIM KADAV, [FARLEY LAI](#), DEEP PATEL, HANS PETER GRAF

2021

### Hopper: Multi-hop Transformer for Spatiotemporal Reasoning

*ICLR*

H. ZHOU, A. KADAV, [FARLEY LAI](#), A. NICULESCU-MIZIL, M. RENQIANG MIN, M. KAPADIA, HANS PETER GRAF

2021

### 15 Keypoints Is All You Need

*CVPR*

MICHAEL SNOWER, ASIM KADAV, [FARLEY LAI](#), HANS PETER GRAF

2020

### Contextual Grounding of Natural Language Phrases in Images

*ViGIL@NeurIPS*

[FARLEY LAI](#), NING XIE, DEREK DORAN, ASIM KADAV

2019

### Visual Entailment Task for Visually-Grounded Language Learning

*ViGIL@NeurIPS*

NING XIE, [FARLEY LAI](#), DEREK DORAN, ASIM KADAV

2018

### Workload Shaping Energy Optimizations with Predictable Performance for Mobile Sensing

*IoTDI*

[FARLEY LAI](#), MARJAN RADI, OCTAV CHIPARA, WILLIAM G. GRISWOLD

2018

### Static Memory Management for Efficient Mobile Sensing Applications

*EMSOFT*

[FARLEY LAI](#), DANIEL SCHMIDT, OCTAV CHIPARA

2015

### CSense: A Stream-Processing Toolkit for High-Rate Mobile Sensing Applications

*IPSN*

[FARLEY LAI](#), SYED SHABIH HASAN, AUSTIN LAUGESSEN, OCTAV CHIPARA

2014

### AudioSense: Enabling Real-time Evaluation of Hearing Aid Technology In-Situ

*CBMS*

SYED SHABIH HASAN, [FARLEY LAI](#), OCTAV CHIPARA, YI-HSIEN WU

2013

### Optimal Alternators with Reduced Space Complexity

*Master Thesis@NCU*

[FARLEY LAI](#), SHING-TSSAN HUANG

2004

- Proved a theorem on distributed mutual exclusion and scheduling fairness