

# Zheng (Thomas) Tang

RESEARCH SCIENTIST · COMPUTER VISION EXPERT

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## Summary

Current Research Scientist at Amazon · Ph.D. in Electrical & Computer Engineering from the University of Washington (Advisor: Prof. Jenq-Neng Hwang) · Research interests in computer vision and machine learning · 9 months internship at NVIDIA working on city-scale vehicle tracking and ReID with papers accepted at CVPR'19 and ICCV'19 · Leader of the winning team at the 2nd AI City Challenge Workshop in CVPR'18 · Organizing committee member of the 4th AI City Challenge Workshop in CVPR'20 · Finalist best student paper awards in ICPR'16

## Education

### UW (University of Washington)

PH.D. IN ELECTRICAL & COMPUTER ENGINEERING

Seattle, WA, USA

Sep. 2014 - Jun. 2019

- Advised by Prof. Jenq-Neng Hwang (IEEE Fellow) at the Information Processing Lab
- Dissertation topic: Robust Video Object Tracking via Camera Self-Calibration

### UW (University of Washington)

M.S. IN ELECTRICAL ENGINEERING

Seattle, WA, USA

Sep. 2014 - Mar. 2016

- GPA: 3.83/4.0

### BUPT (Beijing University of Posts and Telecommunications)

B.S. IN TELECOMMUNICATIONS ENGINEERING WITH MANAGEMENT (JOINT PROGRAMME)

Beijing, China

Sep. 2010 - Jun. 2014

- GPA: 88.73/100

### QMUL (Queen Mary University of London)

B.S. IN TELECOMMUNICATIONS ENGINEERING WITH MANAGEMENT (JOINT PROGRAMME)

London, UK

Sep. 2010 - Jun. 2014

- First Class Honours

## Work Experience

### Amazon.com

RESEARCH SCIENTIST

Seattle, WA, USA

Jul. 2019 - PRESENT

- Working on a new project directed by **Prof. Gérard Medioni** at the **physical store technology team** that developed Amazon Go

### NVIDIA

INTELLIGENT VIDEO ANALYTICS INTERN

Santa Clara, CA, USA

Jun. 2018 - Mar. 2019

- Created **CityFlow**, a city-scale benchmark for multi-target multi-camera (MTMC) vehicle tracking and ReID, accepted at **CVPR'19 (oral)**
- Proposed **PAMTRI**, a pose-aware multi-task network for vehicle ReID using highly randomized synthetic data, accepted at **ICCV'19**
- Supported the **3rd AI City Challenge Workshop** in **CVPR'19** that attracted 334 academic and industrial research teams from 44 countries
- Joined the organizing committee of the **4th AI City Challenge Workshop** in **CVPR'20**, in charge of the MTMC tracking and ReID tracks

### University of Washington

RESEARCH ASSISTANT

Seattle, WA, USA

Dec. 2014 - Jun. 2018

- Developed evolutionary camera calibration and clustering-based data association for vehicle tracking using fusion of visual and semantic features that achieved rank #1 in **Track 1 (Traffic Flow Analysis)** of the **2nd AI City Challenge Workshop** in **CVPR'18**
- Designed multi-camera tracking based on fusion of adaptive appearance models, CNN features and license plate information that achieved rank #1 in **Track 3 (Multi-camera Vehicle Detection & ReID)** of the **2nd AI City Challenge Workshop** in **CVPR'18**
- Proposed multi-kernel vehicle tracking based on 3D deformable models that outperformed the state-of-the-art object tracking methods, selected as the winning method of **Track 2 (AI City Applications)** at the **1st AI City Challenge Workshop** in **SmartWorld'17**
- Developed a 3D casualty pose estimator to enable overlaying AR for medical simulation under 6-DoF camera motion, where a two-step evolutionary pose optimization for camera and humans (2EPOCH) is proposed (funded by ArchieMD Inc.)
- Implemented multi-view 3D tracking of soccer players and the ball that enabled real-time soccer analytics (funded by a startup company)
- Developed single-camera people tracking that is robust against occlusion and cluttered background to provide useful features for object ReID across multiple cameras (funded by Madrona Venture Group)

### Prism Skylabs

ENGINEERING INTERN

San Francisco, CA, USA

Jul. 2015 - Aug. 2015

- Developed adaptive segmentation and tracking based on multi-kernel feedback that achieved top single-camera tracking accuracy (**74.82%**) on the **NLPR\_MCT** benchmark
- Developed evolutionary camera self-calibration from tracking of humans to automatically back project 2D trajectories into 3D, which received **2 Finalist Best Student Paper Awards** in **ICPR'16**

# Teaching Experience

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## University of Washington

TEACHING ASSISTANT OF EE 508: STOCHASTIC PROCESSES IN ENGINEERING

Seattle, WA, USA

Mar. 2019 - Jun. 2019

- Designed topics for final projects, provided tutorials on hidden Markov model and held weekly office hours

# Publications

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## JOURNAL ARTICLES

MOANA: An online learned adaptive appearance model for robust multiple object tracking in 3D

Zheng Tang, Jenq-Neng Hwang

*IEEE Access* 7.1 (2019) pp. 31934–31945. 2019

ESTHER: Joint camera self-calibration and automatic radial distortion correction from tracking of walking humans

Zheng Tang, Yen-Shuo Lin, Kuan-Hui Lee, Jenq-Neng Hwang

*IEEE Access* 7.1 (2019) pp. 10754–10766. 2019

Online-learning-based human tracking across non-overlapping cameras

Young-Gun Lee, Zheng Tang, Jenq-Neng Hwang

*TCSVT* 28.10 (2018) pp. 2870–2883. 2018

## CONFERENCE PAPERS

PAMTRI: Pose-aware multi-task learning for vehicle re-identification using highly randomized synthetic data

Zheng Tang, Milind Naphade, Stan Birchfield, Jonathan Tremblay, William Hodge, Ratnesh Kumar, Shuo Wang, Xiaodong Yang

*Proc. ICCV*, pp. 211–220, 2019, Seoul, Korea

CityFlow: A city-scale benchmark for multi-target multi-camera vehicle tracking and re-identification

Zheng Tang, Milind Naphade, Ming-Yu Liu, Xiaodong Yang, Stan Birchfield, Shuo Wang, Ratnesh Kumar, David Anastasiu, Jenq-Neng Hwang

*Proc. CVPR*, pp. 8797–8806, 2019, Long Beach, CA, USA

Joint multi-view people tracking and pose estimation for 3D scene reconstruction

Zheng Tang, Renshu Gu, Jenq-Neng Hwang

*Proc. ICME*, pp. 1–6, 2018, San Diego, CA, USA

Single-camera and inter-camera vehicle tracking and 3D speed estimation based on fusion of visual and semantic features

Zheng Tang, Gaoang Wang, Hao Xiao, Aotian Zheng, Jenq-Neng Hwang

*Proc. CVPR Workshops*, pp. 108–115, 2018, Salt Lake City, UT, USA

Self-calibration of traffic surveillance cameras based on moving vehicle appearance and 3-D vehicle modeling

Na Wang, Haiqing Du, Yong Liu, Zheng Tang, Jenq-Neng Hwang

*Proc. ICIP*, pp. 3064–3068, 2018, Athens, Greece

Inter-camera tracking based on fully unsupervised online learning

Young-Gun Lee, Zheng Tang, Jenq-Neng Hwang, Zhijun Fang

*Proc. ICIP*, pp. 2607–2611, 2017, Beijing, China

Multiple-kernel adaptive segmentation and tracking (MAST) for robust object tracking

Zheng Tang, Jenq-Neng Hwang, Yen-Shuo Lin, Jen-Hui Chuang

*Proc. ICASSP*, pp. 1115–1119, 2016, Shanghai, China

Camera self-calibration from tracking of moving persons

Zheng Tang, Yen-Shuo Lin, Kuan-Hui Lee, Jenq-Neng Hwang, Jen-Hui Chuang, Zhijun Fang

*Proc. ICPR*, pp. 260–265, 2016, Cancún, México

# Honors & Awards

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2019 **People's Choice Award**, Code for the Kingdom (C4TK) Hackathon

Seattle, WA, USA

2018 **Winner of Track 1 (Traffic Flow Analysis)**, 2nd AI City Challenge Workshop in CVPR'18

Salt Lake City, UT, USA

2018 **Winner of Track 3 (Multi-camera Vehicle Detection & ReID)**, 2nd AI City Challenge Workshop in CVPR'18

Salt Lake City, UT, USA

2017 **Winner of Track 2 (AI City Applications)**, 1st AI City Challenge Workshop in SmartWorld'17

San Francisco, CA, USA

2016 **Finalist IBM Best Track 3 Student Paper Award**, ICPR'16

Cancún, México

2016 **Finalist Intel Best Track 3 Student Paper Award**, ICPR'16

Cancún, México

# Skills

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**Programming** C/C++ (expert), Python (expert), Java (proficient), MATLAB (expert), Linux (expert), React (proficient),  $\text{\LaTeX}$  (expert)

**Deep Learning** PyTorch (expert), TensorFlow (expert), Caffe (proficient)

**Languages** English (proficient), Mandarin (native), Cantonese (native), Spanish (elementary)