

# Soonmin Hwang

PH.D.

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## Summary

I worked for Tesla, Palo Alto, CA, United States, as a Senior Machine Learning Scientist. I received my M.S and Ph.D. degrees in Electrical Engineering from KAIST, Korea in 2014 and 2019 respectively. During my graduate study, I worked at the Robotics and Computer Vision Lab under the supervision of Prof. In So Kweon. In 2016, I worked for Qualcomm Research, Vienna, Austria, as a Research Intern. I received Samsung Human-Tech Paper Awards(Gold prize in 2017, honorable mention in 2018) and the 1st place at NVidia Korea Deep learning Contest in 2016. I received my B.S degree in Electronics and Computer Engineering from Hanyang University, Korea in 2012. My research area includes computer vision, deep learning, and sensor fusion.

## Education

### KAIST (Korea Advanced Institute of Science and Technology)

*Daejeon, S.Korea*

PH.D. *Mar. 2014 - Feb. 2019*

- Dissertation: Learning based Adaptive Visual Sensor Fusion for Robust Pedestrian Detection
- Advisor: Prof. In So Kweon

### KAIST (Korea Advanced Institute of Science and Technology)

*Daejeon, S.Korea*

M.S. *Feb. 2012 - Feb. 2014*

- Thesis: A Hierarchical Classifier Model based on Deformable Part Models and Random Forest for Robust Pedestrian Detection
- Advisor: Prof. In So Kweon

### Hanyang University

*Seoul, S.Korea*

B.S. *Mar. 2007 - Feb. 2012*

- Recognize and Play Sheet Music on Android Smartphone

## Research Interests

### Computer vision for self-driving cars

- Object detection (e.g. pedestrians, cars)
- Learning based depth estimation / Semantic segmentation
- Image enhancement / 3D scene understanding

### Deep learning for computer vision

- Dynamic neural network
- Domain adaptation

### Sensor fusion

- RGB camera + Thermal camera (Long wavelength IR)
- RGB camera + 3D LiDAR
- Adaptive fusion

## Work experience

### Sr. Machine Learning Scientist

*Palo Alto, California, US*

AUTOPILOT TEAM, TESLA *May. 2019 - Feb. 2021*

- Train/Develop neural networks for autopilot

### Full-time Research Intern

*Vienna, Austria*

COMPUTER VISION GROUP, QUALCOMM RESEARCH *Jul. 2016 - Nov. 2016*

- Lane detection using deep neural network

### Full-time Intern

*Hanyang Univ., Seoul, S.Korea*

MIXED REALITY LAB. (PROF. JONG-IL PARK) *Nov. 2010 - Feb. 2011*

- Development of view morphing system for relics

## Projects

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### Automatic Emergency Braking for Pedestrian Protection

MINISTRY OF TRADE, INDUSTRY AND ENERGY OF KOREA (MOTIE)

Jun. 2013 - Jun. 2018

- Accurate pedestrian detection using multiple sensor fusion

### Personal Plug and Play DigiCar (P3 DigiCar)

NATIONAL RESEARCH FOUNDATION OF KOREA

Mar. 2012 - Feb. 2017

- Robust pedestrian detection using monocular camera

### DATMO: Detection and Tracking Moving Object using 3D LiDAR

LIG-NEX1 CO. LTD, S.KOREA

Apr. 2015 - Nov. 2015

- On-road object detection and tracking (pedestrian, car) using 3D-LiDAR
- Camera & 3D LiDAR fusion

### Monocular Vision based Natural Feature Extraction for Cognitive Model

MINISTRY OF KNOWLEDGE ECONOMY OF KOREA

Sep. 2012 - Dec. 2013

- Porting developed natural feature algorithm to embedded system

## Publications

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\* indicates equal contribution.

### Gated Bidirectional Feature Pyramid Network for Accurate One Shot Detection

MACHINE VISION AND APPLICATIONS (MVA)

2019

Sanghyun Woo, **Soonmin Hwang**, Ho-Deok Jang, In So Kweon

### KAIST Multispectral Recognition Dataset in Day and Night

IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS (TITS)

2018

Yukyung Choi, Namil Kim, **Soonmin Hwang**, Kibaek Park, Jae Shin Yoon, Kyunghwan An, In So Kweon

### StairNet: Top-Down Semantic Aggregation for Accurate One Shot Detection

[Lake Tahoe, USA](#)

IEEE WINTER CONF. ON APPLICATIONS OF COMPUTER VISION (WACV)

Mar. 2018

Sanghyun Woo, **Soonmin Hwang**, In So Kweon

[The 24th HumanTech Paper Award, Samsung Electronics, Honorable Mention \(\\$2,000\)](#)

### Multispectral Transfer Network: Unsupervised Depth Estimation for All-day Vision

[New Orleans, USA](#)

THE THIRTY-SECOND AAAI CONFERENCE ON ARTIFICIAL INTELLIGENCE (AAAI)

Feb. 2018

Namil Kim\*, Yukyung Choi\*, **Soonmin Hwang**, In So Kweon

[The 23th HumanTech Paper Award, Samsung Electronics, Gold Prize \(\\$10,000\)](#)

[KAIST R&D Report, Research Highlights of 2017](#)

### Thermal Image Enhancement using Convolutional Neural Network

[Daejeon, S.Korea](#)

THE INTERNATIONAL CONFERENCE OF INTELLIGENT ROBOTS AND SYSTEMS (IROS)

Oct. 2016

Namil Kim\*, Yukyung Choi\*, **Soonmin Hwang\***, In So Kweon

[Deep Learning Contest, NVidia Korea, 1st Place](#)

[KAIST R&D Report, Research Highlights of 2017](#)

### Fast Multiple Objects Detection and Tracking Fusing Color Camera and 3D LIDAR for Intelligent Vehicles

[Xian, China](#)

INTERNATIONAL CONFERENCE ON UBIQUITOUS ROBOTS AND AMBIENT INTELLIGENCE (URAI)

Aug. 2016

**Soonmin Hwang\***, Namil Kim\*, Yukyung Choi, Seokju Lee, In So Kweon

### Thermal-Infrared based Drivable Region Detection

[Gothenburg, Sweden](#)

IEEE INTELLIGENT VEHICLES SYMPOSIUM (IV)

Jun. 2016

Jae Shin Yoon, Kibaek Park, **Soonmin Hwang**, Namil Kim, Yukyung Choi, In So Kweon

## Low-Cost Synchronization for Multispectral Cameras

INTERNATIONAL CONFERENCE ON UBIQUITOUS ROBOTS AND AMBIENT INTELLIGENCE (URAI)

**Soonmin Hwang**, Yukyung Choi, Namil Kim, Kibaek Park, Jae Shin Yoon, In So Kweon

[Goyang, S.Korea](#)

Oct. 2015

## Geometrical Calibration of Multispectral Calibration

INTERNATIONAL CONFERENCE ON UBIQUITOUS ROBOTS AND AMBIENT INTELLIGENCE (URAI)

Namil Kim, Yukyung Choi, **Soonmin Hwang**, Kibaek Park, Jae Shin Yoon, In So Kweon

[Goyang, S.Korea](#)

Oct. 2015

## ARTRIEVAL: Painting Retrieval Without Expert Knowledge

IEEE INTERNATIONAL CONFERENCE ON IMAGE PROCESSING (ICIP)

Namil Kim, Yukyung Choi, **Soonmin Hwang**, In So Kweon

[Québec, Canada](#)

Sep. 2015

## All-Day Visual Place Recognition: Benchmark Dataset and Baselines

IEEE INTERNATIONAL CONFERENCE ON COMPUTER VISION AND PATTERN RECOGNITION WORKSHOPS (CVPRW-VPRICE)

Yukyung Choi, Namil Kim, Kibaek Park, **Soonmin Hwang**, Jae Shin Yoon, In So Kweon

[Boston, USA](#)

Jun. 2015

## Multispectral Pedestrian Detection: Benchmark Dataset and Baselines

IEEE INTERNATIONAL CONFERENCE ON COMPUTER VISION AND PATTERN RECOGNITION (CVPR)

**Soonmin Hwang**, Jaesik Park, Namil Kim, Yukyung Choi, In So Kweon

[Current citation: 359](#)

[Boston, USA](#)

Jun. 2015

## A Two Phase Approach for Pedestrian Detection

ASIAN CONFERENCE ON COMPUTER VISION WORKSHOPS (ACCV WORKSHOPS)

**Soonmin Hwang**, Tae-hyun Oh, In So Kweon

[Singapore, Singapore](#)

Nov. 2014

## Evaluation of Vocabulary Trees for Localization in Robot Applications

INTERNATIONAL CONFERENCE ON CONTROL, AUTOMATION AND SYSTEMS (ICCAS)

**Soonmin Hwang**, Chaehoon Park, Yukyung Choi, Donggeun Yoo, In So Kweon

[Gwangju, S.Korea](#)

Oct. 2013

## Patents

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### Apparatus and Method for Depth Estimation Based on Thermal Image, and Neural Network Learning Method

KR 10-1947782 (2019.02.07)

[Registered](#)

### Apparatus and Method for Thermal Image Enhancement

KR 10-1821285 (2018.01.17)

[Registered](#)

### Method and Apparatus for Detecting Smoke from Image

KR 10-1932543 (2015.02.03), US 20150030203 (2015.01.29), CN 104346618 (2015.02.11)

[Registered](#)

### Pattern Board for Geometrical Calibration in Multi-Spectral Camera System, Calibration Apparatus, and Calibration Method Thereof

KR 10-2016-0122950 (2016.09.26)

[Pending](#)

## Honors & Awards

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2018	<b>KAIST R&amp;D Report</b>	Research Highlights of 2017 (IROS'16, AAAI'18)
2018	<b>Travel grant</b>	Research Supporting Program for CVPR 2018, Kakao Corp.(\$4,300)
2018	<b>Honorable mention</b>	The 24th HumanTech Paper Award, Samsung Electronics Co. Ltd, (\$2,000, acceptance rate 6.5%)
2017	<b>Gold prize</b>	The 23th HumanTech Paper Award, Samsung Electronics Co. Ltd, (\$10,000, acceptance rate 0.7%)
2016	<b>1st Place</b>	NVIDIA Deep Learning Contest, NVIDIA Korea
2016	<b>Bronze prize</b>	Korea Invention Patent Exhibition (KINPEX)

## Reviewers

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IEEE Winter Conference on Applications of Computer Vision (WACV)

IEEE Transaction on Intelligent Transportation Systems (TITS)

IEEE Transactions on Aerospace and Electronic Systems (TAES)

IEEE Transactions on Cybernetics

Springer The Visual Computer (TCVJ)

## Skills

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**Languages** Python, MATLAB, C/C++

**Libraries** PyTorch, Caffe, OpenCV, QT, PCL, MFC, and others