

# Soonmin Hwang

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## Experience

### External Technical Advisory

42DOT, KOREAN AUTONOMOUS DRIVING COMPANY (ACQUIRED BY HYUNDAI MOTOR GROUP)

*Seoul, South Korea*

*Feb. 2022 - Present*

### Postdoc Researcher

THE ROBOTICS INSTITUTE, CARNEGIE MELLON UNIVERSITY

*Pittsburgh, Pennsylvania, US*

*Sep. 2021 - Present*

### Sr. Machine Learning Scientist

AUTOPILOT TEAM, TESLA

*Palo Alto, California, US*

*May. 2019 - Feb. 2021*

### Full-time Research Intern

COMPUTER VISION GROUP, QUALCOMM RESEARCH

*Vienna, Austria*

*Jul. 2016 - Nov. 2016*

### Full-time Intern

MIXED REALITY LAB. (PROF. JONG-IL PARK)

*Hanyang Univ., Seoul, S.Korea*

*Nov. 2010 - Feb. 2011*

## Education

### KAIST

PH.D. IN ELECTRICAL ENGINEERING

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

*Daejeon, S.Korea*

*Mar. 2014 - Feb. 2019*

### KAIST

M.S. IN ELECTRICAL ENGINEERING

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

*Daejeon, S.Korea*

*Feb. 2012 - Feb. 2014*

### Hanyang University

B.S. IN ELECTRONICS AND COMPUTER ENGINEERING

- Recognize and Play Sheet Music on Android Smartphone

*Seoul, S.Korea*

*Mar. 2007 - Feb. 2012*

## Research Interests

### Perception for Autonomous Driving

- Object Detection, Learning based depth estimation, Semantic segmentation, Image enhancement, 3D scene understanding

### Sensor Fusion for Robust Perception

- RGB camera, Thermal infrared camera, 3D LiDAR / Adaptive fusion

### Path Planning and Navigation

- Social robot navigation in dynamic real world environment

## Projects

### Embedded AI Based Fully Autonomous Driving Software and MaaS Technology Development

KOREA INSTITUTE FOR ADVANCEMENT OF TECHNOLOGY (KIAT)

Apr. 2022 - Present

- Accurate 3D object detection from multiple sensors for embedded system
- Trajectory prediction of dynamic objects through continuous time-series multi-sensor data
- Learning to plan ego-path in dynamic environments

### 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

\* indicates equal contribution.

### Consistent Video Generation from Point Cloud via Controllable Image Diffusion

WORK IN PROGRESS

Zhixuan Liu, **Soonmin Hwang**, Ji Zhang, Jean Oh

### Hyperbolic Monocular Depth Estimation with Coded Classification

WORK IN PROGRESS

Jinhwi Park, Hae-Gon Jeon, Jean Oh, **Soonmin Hwang**

### Panoramic Depth: 360-Degree Dense Depth Estimation from Multiple Cameras

WORK IN PROGRESS

**Soonmin Hwang**, Jean Oh

### T2FPV: Constructing High-Fidelity First-Person View Datasets From Real-World Pedestrian Trajectories

UNDER REVIEW

Benjamin Stoler, Meghdeep Jana, **Soonmin Hwang**, Jean Oh

### UMHE: Unsupervised Multispectral Homography Estimation

UNDER REVIEW

Jeongmin Shin, Jiwon Kim, Seokjun Kwon, Namil Kim, **Soonmin Hwang**, Yookyung Choi

### Instant Domain Augmentation for LiDAR Semantic Segmentation

[Vancouver, Canada](#)

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

Jun. 2023

Kwonyoung Ryu\*, **Soonmin Hwang\***, Jaesik Park

### TransDSSL: Transformer based Depth Estimation via Self-Supervised Learning

IEEE ROBOTICS AND AUTOMATION LETTERS (RA-L)

Aug. 2022

Daechan Han\*, Jeongmin Shin\*, Namil Kim, **Soonmin Hwang**, Yookyung Choi

[Will be presented at IEEE International Conference on Robotics and Automation \(ICRA\) 2023](#)

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

MACHINE VISION AND APPLICATIONS (MVA)

Mar. 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)

Feb. 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

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

[Lake Tahoe, USA](#)

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

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

[New Orleans, USA](#)

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

THE INTERNATIONAL CONFERENCE OF INTELLIGENT ROBOTS AND SYSTEMS (IROS)

[Daejeon, S.Korea](#)

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

INTERNATIONAL CONFERENCE ON UBIQUITOUS ROBOTS AND AMBIENT INTELLIGENCE (URAI)

[Xian, China](#)

Aug. 2016

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

## Thermal-Infrared based Drivable Region Detection

IEEE INTELLIGENT VEHICLES SYMPOSIUM (IV)

[Gothenburg, Sweden](#)

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)

[Goyang, S.Korea](#)

Oct. 2015

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

## Geometrical Calibration of Multispectral Calibration

INTERNATIONAL CONFERENCE ON UBIQUITOUS ROBOTS AND AMBIENT INTELLIGENCE (URAI)

[Goyang, S.Korea](#)

Oct. 2015

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

## ARTRIEVAL: Painting Retrieval Without Expert Knowledge

IEEE INTERNATIONAL CONFERENCE ON IMAGE PROCESSING (ICIP)

[Québec, Canada](#)

Sep. 2015

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

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

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

[Boston, USA](#)

Jun. 2015

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

## Multispectral Pedestrian Detection: Benchmark Dataset and Baselines

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

[Boston, USA](#)

Jun. 2015

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

[Google scholar citation: 706](#)

## 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

## Honors & Awards

|      |                             |   |
|------|-----------------------------|---|
| 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)  |

## Patents

### Single-shot Adaptive Fusion Method and Apparatus for Robust Multispectral Object Detection

KR 10-2431419 (2022.08.08))

Registered

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

KR 10-1947782 (2019.02.07), US 11062470 (2021.07.13)

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 (2018.12.19), US 09443149 (2016.09.13)

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

## Reviewers

IEEE Conference on Computer Vision and Pattern Recognition (CVPR)

IEEE International Conference on Computer Vision (ICCV)

European Conference on Computer Vision (ECCV)

IEEE Winter Conference on Applications of Computer Vision (WACV)

IEEE Transaction on Intelligent Transportation Systems (TITS)

IEEE Transactions on Multimedia (TMM)

IEEE Robotics and Automation Letters (RA-L)

IEEE Transactions on Aerospace and Electronic Systems (TAES)

IEEE Transactions on Cybernetics

Springer The Visual Computer (TCVJ)