Soonmin Hwang

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Experience

External Technical Advisory — *Seoul (Remote), South Korea*
42dot (Autonomous Driving Company, acquired by Hyundai Motor Group) — *Feb. 2022 - Present*

Postdoc Researcher — *Pittsburgh, Pennsylvania, US*
The Robotics Institute, Carnegie Mellon University — *Sep. 2021 - Present*

Sr. Machine Learning Scientist — *Palo Alto, California, US*
Autopilot team, Tesla — *May. 2019 - Feb. 2021*

Full-time Intern — *Vienna, Austria*
Computer Vision Group, Qualcomm Research — *Jul. 2016 - Nov. 2016*

Full-time Intern — *Seoul, South Korea*
Mixed Reality Lab. (Prof. Jong-Il Park), Hanyang Univ. — *Nov. 2010 - Feb. 2011*

Education

KAIST — *Daejeon, S.Korea*
Ph.D. in Electrical Engineering — *Mar. 2014 - Feb. 2019*

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

KAIST — *Daejeon, S.Korea*
M.S. in Electrical Engineering — *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. in Electronics and Computer Engineering — *Mar. 2007 - Feb. 2012*

- Recognize and Play Sheet Music on Android Smartphone

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, Object trajectory prediction

Projects

Embedded AI Based Fully Autonomous Driving Software and MaaS Technology Development

Ministry of Trade, Industry and Energy of Korea (MOTIE) *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

* Equal contribution.
† Corresponding author.

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

Towards Universal LiDAR Sementic Segmentation

work in progress

Kwonyoung Ryu, **Soonmin Hwang**, Jinmo Kim, Jaesik Park

T2FPV: Dataset and Method for Correcting First-Person View Errors in Pedestrian Trajectory Prediction

under review (IROS 2023)

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

UMHE: Unsupervised Multispectral Homography Estimation

under review (RA-L 2023)

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

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**, Yukyung Choi

This work 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 Multi-Spectral Day/Night Data Set for Autonomous and Assisted Driving

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

Google scholar citation: 213

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, Hornorable 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*

IEEE/RSJ International Conference on 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
Google scholar citation: 101

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 *Goyang, S.Korea*

International Conference on Ubiquitous Robots and Ambient Intelligence (URAI) *Oct. 2015*

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

Geometrical Calibration of Multispectral Calibration *Goyang, S.Korea*

International Conference on Ubiquitous Robots and Ambient Intelligence (URAI) *Oct. 2015*

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

ARTRIEVAL: Painting Retrieval Without Expert Knowledge *Québec, Canada*

IEEE International Conference on Image Processing **(ICIP)** *Sep. 2015*

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

All-Day Visual Place Recognition: Benchmark Dataset and Baselines *Boston, USA*

IEEE International Conference on Computer Vision and Pattern Recognition Workshops (CVPRW-VPRICE) *Jun. 2015*

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

Multispectral Pedestrian Detection: Benchmark Dataset and Baselines *Boston, USA*

IEEE International Conference on Computer Vision and Pattern Recognition **(CVPR)** *Jun. 2015*

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

Google scholar citation: 754

A Two Phase Approach for Pedestrian Detection *Singapore, Singapore*

Asian Conference on Computer Vision Workshops (ACCV Workshops) *Nov. 2014*

Soonmin Hwang, Tae-hyun Oh, In So Kweon

Evaluation of Vocabulary Trees for Localization in Robot Applications *Gwangju, S.Korea*

International Conference on Control, Automation and Systems (ICCAS) *Oct. 2013*

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

Honors & Awards

2018	**KAIST R&D Report**	Research Highlights of 2017 (IROS'16, AAAI'18)
2018	**Travel Grant**	Research Supporting Program for CVPR 2018, Kakao Corp.($4,300)
2018	**Honorable Mention**	The 24th HumanTech Paper Award, Samsung Electronics Co. Ltd, ($2,000, acceptance rate 6.5%)
2017	**Gold Prize**	The 23rd HumanTech Paper Award, Samsung Electronics Co. Ltd, ($10,000, acceptance rate 0.7%)
2016	**1st Place**	NVidia Deep Learning Contest, NVidia Korea
2016	**Bronze Prize**	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), CN 104346618 (2019.10.25) *Registered*

Reviewers

IEEE Transaction on Intelligent Transportation Systems (TITS)

IEEE Transactions on Multimedia (TMM)

IEEE Transactions on Cybernetics

IEEE Transactions on Aerospace and Electronic Systems (TAES)

IEEE Conference on Computer Vision and Pattern Recognition (CVPR)

: **CVPR 2023 Outstanding Reviewer, 232/7000=3.3%**

IEEE International Conference on Computer Vision (ICCV)

European Conference on Computer Vision (ECCV)

IEEE Winter Conference on Applications of Computer Vision (WACV)

IEEE International Conference on Robotics and Automation (ICRA)

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

IEEE Robotics and Automation Letters (RA-L)

Springer The Visual Computer (TCVJ)