Soonmin **Hwang**

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Experience

External Technical Advisory   *Seoul, South Korea*

42 DOT (KOREAN AUTONOMOUS DRIVING COMPANY, HTTPS://42DOT.AI)   *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 Research Intern   *Vienna, Austria*

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

Full-time Intern   *Hanyang Univ., Seoul, S.Korea*

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

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)

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

Education

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

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.

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, 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*

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 *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: 554

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

Pat**ents**

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*