Soonmin **Hwang**

Ph.D.

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Summary

I am a research scholar at Carnegie Mellon University, Pittsburgh, PA, United States. 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 HumanTech 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

Sensor fusion

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

Experience

Research Scholar — *Pittsburgh, Pennsylvania, US*

Carnegie Mellon University, The Robotics Institute — *Sep. 2021 - Current*

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

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

Current citation: 399

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

Patents

Apparatus and Method for Depth Estimation Based on Thermal Image, and Neural Network Learning Method — *Registered*

KR 10-1947782 (2019.02.07)

Apparatus and Method for Thermal Image Enhancement — *Registered*

KR 10-1821285 (2018.01.17)

Method and Apparatus for Detecting Smoke from Image — *Registered*

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

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

KR 10-2016-0122950 (2016.09.26)

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 23th 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)

Reviewers

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

Languages	Python, MATLAB, C/C++
Libraries	PyTorch, Caffe, OpenCV, QT, PCL, MFC, and others