Bumsub **Ham**

Assistant Professor, Yonsei University

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The 3nd Eng. building,
Yonsei university,
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Seoul, 120-749, Korea

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Languages
Korean, English

Programming
C & C++, Matlab, Python
OpenCV, OpenGL
$\text{\LaTeX}2_\varepsilon$, CSS3

Equipments
IEEE 1394 camera:
Pointgrey Inc. Flea®
Bumblebee®, Ladybug®
Active range sensor:
SwissRanger™SR4000®
Microsoft Kinect®

Interests

Computer vision, computational photography, and machine learning

Education

03/08–08/13 **Ph.D.** School of Electrical & Electronic Engineering   Yonsei University, Seoul, Korea
Revisiting the Relationship Between Adaptive Smoothing and Anisotropic Diffusion: Robust Edge-Preserving Regularization Methods and Its Applications

03/03–02/08 **B. S.** School of Electrical & Electronic Engineering   Yonsei University, Seoul, Korea

Experience

09/16–Now **Yonsei University**   Seoul, Korea
Assistant Professor @ School of Electrical & Electronic Engineering
Research in computer vision, machine learning, and image processing

05/14–07/16 **INRIA & École Normale Supérieure**   Paris, France
Postdoctoral Research Fellow @ WILLOW team
Research in computer vision and machine learning with Prof. Jean Ponce

09/13–04/14 **Yonsei University**   Seoul, Korea
Postdoctoral Research Fellow @ School of Electrical & Electronic Engineering
Work with Prof. Kwanghoon Sohn in depth reasoning from 2D images

09/12–12/12 **University of Illinois at Urbana-Champaign**   Illinois, USA
Research Assistant @ Coordinated Science Lab
Research with Prof. Minh N. Do in probability based image rendering

03/08–08/13 **Yonsei University**   Seoul, Korea
Research Assistant @ Digital Image Media Lab
Participation in several research projects

03/08–12/08 **Yonsei University**   Seoul, Korea
Teaching Assistant
Signal and Systems and Advanced Digital Signal Processing

Awards

2020 **Distinguished Research Award**   Yonsei University
Yonsei University Outstanding Research Award 2019

2020 **Silver Prize (Supervisor)**   Samsung Electronics Co., Ltd.
26th Samsung Human-Tech Prize on Signal Processing

2019 **Silver Prize (Supervisor)**   Samsung Electronics Co., Ltd.
25th Samsung Human-Tech Prize on Signal Processing

2014 **Grand Prize**   Chun-Gang Memorial Foundation
Chun-Gang Outstanding Research Award

2013 **Certificate of Merit**   Yonsei University
Yonsei University Thesis Award Spring

2012	**Grand Prize**	Qualcomm Inc.
	Qualcomm Innovation Fellowship	
2011	**Honor Prize**	Samsung Electronics Co., Ltd.
	17th Samsung Human-Tech Prize on Signal Processing	

Publications

Journals

Deformable Kernel Networks for Joint Image Filtering
Beomjun Kim, Jean Ponce and Bumsub Ham
Int. Jour. Comput. Vis. (**IJCV**), 2020. (accepted)

Learning Semantic Correspondence Exploiting an Object-level Prior
Junghyup Lee*, Dohyung Kim*, Wonkyung Lee, Jean Ponce and Bumsub Ham (*equal contribution)
IEEE Trans. Pattern Anal. Mach. Intell. (**TPAMI**), 2020. (accepted)

Temporally Consistent Depth Prediction with Flow-Guided Memory Units
Chanho Eom, Hyunjong Park, and Bumsub Ham
IEEE Trans. Intell. Transp. Syst. (**TITS**), 2019. (accepted)

OCEAN: Object-Centric Arranging Network for Self-supervised Visual Representations Learning
Changjae Oh, Bumsub Ham, Hansung Kim, Adrian Hilton, and Kwanghoon Sohn
Expert Systems with Applications (**ESWA**), vol. 125 no. 7, pp. 281-292 Jul. 2019.

Structure-Texture Image Decomposition using Deep Variational Priors
Youngjung Kim, Bumsub Ham, Minh N. Do, and Kwanghoon Sohn
IEEE Trans. Image Process. (**TIP**), vol. 28, no. 6, pp. 2692-2704, Jun. 2019.

FCSS: Fully Convolutional Self-Similarity for Dense Semantic Correspondence
Seungryong Kim, Dongbo Min, Bumsub Ham, Stephen Lin, and Kwanghoon Sohn
IEEE Trans. Pattern Anal. Mach. Intell. (**TPAMI**), vol. 41, no. 3, pp. 581-595, Mar. 2019.

Proposal Flow: Semantic Correspondences from Object Proposals
Bumsub Ham, Minsu Cho, Cordelia Schmid, and Jean Ponce
IEEE Trans. Pattern Anal. Mach. Intell. (**TPAMI**), vol. 40, no. 7, pp. 1711-1725, Jan. 2018.

Robust Guided Image Filtering Using Nonconvex Potentials
Bumsub Ham, Minsu Cho, and Jean Ponce
IEEE Trans. Pattern Anal. Mach. Intell. (**TPAMI**), vol. 40, no. 1, pp. 192-207, Jan. 2018.

DASC: Robust Dense Descriptor for Multi-modal and Multi-spectral Correspondence Estimation
Seungryong Kim, Dongbo Min, Bumsub Ham, Minh N. Do, and Kwanghoon Sohn
IEEE Trans. Pattern Anal. Mach. Intell. (**TPAMI**), vol. 39, no. 9, pp. 1712-1729, Sep. 2017.

Fast Domain Decomposition for Global Image Smoothing
Youngjung Kim, Dongbo Min, Bumsub Ham, and Kwanghoon Sohn
IEEE Trans. Image Process. (**TIP**), vol. 26, no. 8, pp. 4079-4091, Aug. 2017.

Robust Interactive Image Segmentation Using Structure-Aware Labeling
Changjae Oh, Bumsub Ham, and Kwanghoon Sohn
Expert Systems with Applications (**ESWA**), vol. 79, no. 8, pp. 90-100, Aug. 2017.

Structure Selective Depth Super-Resolution for RGB-D Cameras
Youngjung Kim, Bumsub Ham, Changjae Oh, and Kwanghoon Sohn
IEEE Trans. Image Process. (**TIP**), vol. 25, no. 11, pp. 5227-5238, Nov. 2016.

Real-Time Rear Obstacle Detection Using Reliable Disparity for Driver Assistance
Hunjae Yoo, Jongin Son, Bumsub Ham, and Kwanghoon Sohn

Expert Systems with Applications (**ESWA**), vol. 56, no. 9, pp. 186-196, Sep. 2016.

Depth Analogy: Data-driven Approach for Single Image Depth Estimation using Gradient Samples
Sunghwan Choi, Dongbo Min, Bumsub Ham, Youngjung Kim, Changjae Oh, and Kwanghoon Sohn
IEEE Trans. Image Process. (**TIP**), vol. 24, no. 12, pp. 5953-5966, Dec. 2015.

Unsupervised Texture Flow Estimation Using Appearance-Space Clustering and Correspondence
Sunghwan Choi, Dongbo Min, Bumsub Ham, and Kwanghoon Sohn
IEEE Trans. Image Process. (**TIP**), vol. 24, no. 11, pp. 3652-3665, Nov. 2015.

Visual Fatigue Relaxation for Stereoscopic Video via Nonlinear Disparity Remapping
Changjae Oh, Bumsub Ham, and Kwanghoon Sohn
IEEE Trans. Broadcast. (**TB**), vol. 61, no. 2, pp. 142-153, Jun. 2015.

Depth Super-Resolution by Transduction
Bumsub Ham, Dongbo Min, and Kwanghoon Sohn
IEEE Trans. Image Process. (**TIP**), vol. 24, no. 5, pp. 1524-1535, May 2015.

Fast Global Image Smoothing Based on Weighted Least Squares
Dongbo Min, Sunghwan Choi, Jiangbo Lu, Bumsub Ham, Kwanghoon Sohn, and Minh N. Do
IEEE Trans. Image Process. (**TIP**), vol. 23, no. 12, pp. 5638-5653, Dec. 2014. (Integrated into OpenCV 3.1.)

Mahalanobis Distance Cross-Correlation for Illumination Invariant Stereo Matching
Seungryong Kim, Bumsub Ham, Bongjo Kim, and Kwanghoon Sohn
IEEE Trans. Circuits Syst. Video Technol. (**TCSVT**), vol. 24, no. 11, pp. 1844-1859, Nov. 2014.

Probability-Based Rendering for View Synthesis
Bumsub Ham, Dongbo Min, Changjae Oh, Minh N. Do, and Kwanghoon Sohn
IEEE Trans. Image Process. (**TIP**), vol. 23, no. 2, pp. 870-884, Feb. 2014.

A Generalized Random Walk with Restart and Its Application to Depth Up-sampling and Interactive Segmentation
Bumsub Ham, Dongbo Min, and Kwanghoon Sohn
IEEE Trans. Image Process. (**TIP**), vol. 22, no. 7, pp. 2574-2588, Jul. 2013.

Space-time Hole Filling with Random Walks in View Extrapolation for 3-D Video
Sunghwan Choi, Bumsub Ham, and Kwanghoon Sohn
IEEE Trans. Image Process. (**TIP**), vol. 22, no. 6, pp. 2429-2441, Jun. 2013.

Revisiting the Relationship between Adaptive Smoothing and Anisotropic Diffusion with Modified Filters
Bumsub Ham, Dongbo Min, and Kwanghoon Sohn
IEEE Trans. Image Process. (**TIP**), vol. 22, no. 3, pp. 1096-1107, Mar. 2013.

Robust Scale Space Filter using Second-Order Partial Differential Equations
Bumsub Ham, Dongbo Min, and Kwanghoon Sohn
IEEE Trans. Image Process. (**TIP**), vol. 21, no. 9, pp. 3937-3951, Sep. 2012.

Conferences
Learning with Privileged Information for Efficient Image Super-Resolution
Wonkyung Lee*, Junghyup Lee*, Dohyung Kim* and Bumsub Ham (*equal contribution)
in Eur. Conf. Comput. Vis. (**ECCV**), Aug. 2020.

Learning Memory-guided Normality for Anomaly Detection
Hyunjong Park*, Jongyoon Noh* and Bumsub Ham (*equal contribution)
in Proc. IEEE Conf. Comput. Vis. Pattern Recognit. (**CVPR**), Jun. 2020.

Relation Network for Person Re-identification
Hyunjong Park and Bumsub Ham

in AAAI Conf. Artificial Intelligence (**AAAI**), Feb. 2020.

Learning Disentangled Representation for Robust Person Re-identification
Chanho Eom and Bumsub Ham
in Adv. Neural Inf. Process. Syst. (**NerulPS**), Dec. 2019.

SFNet: Learning Object-aware Semantic Correspondence
Junghyup Lee*, Dohyung Kim*, Jean Ponce and Bumsub Ham (*equal contribution)
in Proc. IEEE Conf. Comput. Vis. Pattern Recognit. (**CVPR**), Jun. 2019. (**Oral**)

SCNet: Learning Semantic Correspondence
Kai Han, Rafael S. Rezende, Bumsub Ham, Kwan-Yee K. Wong, Minsu Cho, Cordelia Schmid, and Jean Ponce
in Proc. IEEE Int. Conf. Comput. Vis. (**ICCV**), Oct. 2017.

Deep Stereo Confidence Prediction for Depth Estimation
Sunok Kim, Dongbo Min, Bumsub Ham, Seungryong Kim, and Kwanghoon Sohn
in Proc. IEEE Int. Conf. Image Process. (**ICIP**), Sep. 2017.

Unsupervised Stereo Matching using Correspondence Consistency
Sunghun Joung, Seungryong Kim, Bumsub Ham, and Kwanghoon Sohn
in Proc. IEEE Int. Conf. Image Process. (**ICIP**), Sep. 2017.

Convolutional Cost Aggregation for Robust Stereo Matching
Somi Jeong, Seungryong Kim, Bumsub Ham, and Kwanghoon Sohn
in Proc. IEEE Int. Conf. Image Process. (**ICIP**), Sep. 2017.

FCSS: Fully Convolutional Self-Similarity for Dense Semantic Correspondence
Seungryong Kim, Dongbo Min, Bumsub Ham, Sangryul Jeon, Stephen Lin, and Kwanghoon Sohn
in Proc. IEEE Conf. Comput. Vis. Pattern Recognit. (**CVPR**), Jul. 2017.

Point-cut: Interactive Image Segmentation using One-point Supervision
Changjae Oh, Bumsub Ham, and Kwanghoon Sohn
in Proc. Asian Conf. Comput. Vis. (**ACCV**), Nov. 2016.

Proposal Flow
Bumsub Ham, Minsu Cho, Cordelia Schmid, and Jean Ponce
in Proc. IEEE Conf. Comput. Vis. Pattern Recognit. (**CVPR**), Jun. 2016.

Robust Image Filtering Using Joint Static and Dynamic Guidance
Bumsub Ham, Minsu Cho, and Jean Ponce
in Proc. IEEE Conf. Comput. Vis. Pattern Recognit. (**CVPR**), Jun. 2015.

DASC: Dense Adaptive Self-Correlation Descriptor for Multi-modal and Multi-spectral Correspondence
Seungryong Kim, Dongbo Min, Bumsub Ham, Seungchul Ryu, Minh N. Do, and Kwanghoon Sohn
in Proc. IEEE Conf. Comput. Vis. Pattern Recognit. (**CVPR**), Jun. 2015.

Robust Stereo Matching Using Probabilistic Laplacian Surface Propagation
Seungryong Kim, Bumsub Ham, Seungchul Ryu, Seon Joo Kim, and Kwanghoon Sohn
in Proc. Asian Conf. Comput. Vis. (**ACCV**), Nov. 2014.

Local Self-Similarity Frequency Descriptor for Multispectral Feature Matching
Seungryong Kim, Seungchul Ryu, Bumsub Ham, Junhyung Kim, and Kwanghoon Sohn
in Proc. IEEE Int. Conf. Image Process. (**ICIP**), Oct. 2014.

Normalized Tone-mapping Operators for Color Quality Improvement in 3DTV
Donghyun Kim, Kilsoo Jung, Bumsub Ham, Youngjung Kim, and Kwanghoon Sohn
in Proc. IEEE Int. Conf. Industrial Electronics and Applications (**ICIEA**), Jun. 2014.

Visual Fatigue Prediction and Its Visualization
Changjae Oh, Bumsub Ham, and Kwanghoon Sohn
Global 3D Tech Forum, Oct. 2013. (Best Paper Award)

Fast Image Retargeting via Axis-aligned Importance Scaling
Sunghwan Choi, Bumsub Ham, and Kwanghoon Sohn
in Proc. IEEE Int. Conf. Image Process. (**ICIP**), Sep. 2013.

Contextual Information Based Visual Saliency Model
Seungchul Ryu, Bumsub Ham, and Kwanghoon Sohn
in Proc. IEEE Int. Conf. Image Process. (**ICIP**), Sep. 2013.

ABFT: Anisotropic Binary Feature Transform Based on Structure Tensor Space
Seungryong Kim, Hunjae Yoo, Seungchul Ryu, Bumsub Ham, and Kwanghoon Sohn
in Proc. IEEE Int. Conf. Image Process. (**ICIP**), Sep. 2013. (Top 10% of accepted papers)

Disparity Search Range Estimation Based on Dense Stereo Matching
Ruei-Hung Li, Bumsub Ham, Changjae Oh, and Kwanghoon Sohn
in Proc. IEEE Int. Conf. Industrial Electronics and Applications (**ICIEA**), Jun. 2013. (Nominated as Best Paper Award)

Probabilistic Correspondence Matching using Random Walk with Restart
Changjae Oh, Bumsub Ham, and Kwanghoon Sohn
in British Machine Vision Conference (**BMVC**), Sep. 2012.

Hybrid Approach for Accurate Depth Acquisition with Structured Light and Stereo Camera
Sunghwan Choi, Bumsub Ham, Changjae Oh, Hyon-gon Choo, Jinwoong Kim, and Kwanghoon Sohn
in Proc. IEEE Int. Symposium on Broadband Multimedia Systems and Broadcasting (**BMSB**), Jun. 2012.

Joint Radiometric Calibration and Multi-view Matching with Ground Control Points
Changjae Oh, Bumsub Ham, and Kwanghoon Sohn
in Proc. IEEE Int. Workshop on Advanced Image Technology (**IWAIT**), Jan. 2012.

Cost Aggregation with Anisotropic Diffusion in Feature Space for Hybrid Stereo Matching
Bumsub Ham, Dongbo Min, and Kwanghoon Sohn
in Proc. IEEE Int. Conf. Image Process. (**ICIP**), Sep. 2011.

Hole Filling with Random Walks Using Occlusion Constraints in View Synthesis
Sunghwan Choi, Bumsub Ham, and Kwanghoon Sohn
in Proc. IEEE Int. Conf. Image Process. (**ICIP**), Sep. 2011.

Visual Fatigue Evaluation and Enhancement for 2D-plus-Depth Video
Jaeseob Choi, Donghyun Kim, Bumsub Ham, Sunghwan Choi, and Kwanghoon Sohn
in Proc. IEEE Int. Conf. Image Process. (**ICIP**), Sep. 2010.

Virtual View Rendering Using Super-Resolution with Multiview Images
Bumsub Ham, Dongbo Min, Jinwook Choi, and Kwanghoon Sohn
in Proc. IEEE Int. Conf. Image Process. (**ICIP**), Nov. 2009.

Spatial and Temporal Up-Conversion Technique for Depth Video
Jinwook Choi, Dongbo Min, Bumsub Ham, and Kwanghoon Sohn
in Proc. IEEE Int. Conf. Image Process. (**ICIP**), Nov. 2009.

Virtual View Rendering Using Multiple Stereo Images
Bumsub Ham, Dongbo Min, and Kwanghoon Sohn
in Proc. IEEE Int. Workshop on Advanced Image Technology (**IWAIT**), Jan. 2009.

Korean Journal & Conference
Conference: 9 papers (in Korean)

Patents

Joint Filtering Device and Method Using Learning
10-2044626, KR, Nov. 2019.

Apparatus and Method of Processing An Image Considering Fatigue
10-1562111, KR, Oct. 2015.

Contents Retargeting Method and Apparatus
10-1511907, KR, Apr. 2015.

Apparatus and Method for Reconstructing Intermediate View, Recording Medium Thereof
10-1429349, KR, Aug. 2014.

Device and Method for Removing Noise of Image
10-1426610, KR, Jul. 2014.

Contents Retargeting Method and Apparatus
9,443,283, US, Sep. 2016.

Projects

(09/19-02/22) FlexNet: Overcoming Limitations of Deep Learning for Flexible Semantic Image Segmentation
National Research Foundation of Korea (NRF), (**PI**)

(10/18-06/23) Deep identification and tracking of missing person in heterogeneous CCTV
National Research Foundation of Korea (NRF)

(01/17-12/21) Development of high-precision AR & VR contents based on smart car sensors
Institute for Information & Communications Technology Promotion (IITP)

(12/18-11/20) N^2OC: Neural-networks-on-chip for real time super-resolution
Samsung Research Funding & Incubation Center for Future Technology, (**PI**)

(09/18-08/20) Deep learning based anomaly detection
Samsung Electronics Co., Ltd., (**PI**)

(03/17-02/20) Dense semantic correspondence based on deep learning: From supervised learning to unsupervised learning
National Research Foundation of Korea (NRF), (**PI**)

(09/17-08/19) Intelligent virtual reality: Deep audio-visual representation learning for multimedia perception and reproduction
National Research Foundation of Korea (NRF)

(05/17-04/19) Deep learning approach to visual correspondence
Yonsei University, (**PI**)

(05/14-07/16) Video world
European Research Council (ERC)

(11/13-04/14) 2D to multiview conversion system
Samsung Electronics Co., Ltd.

(06/10-04/14) Next generation digital TV broadcasting system
ITRC, Ministry of Knowledge Economy

(03/12-03/13) Saliency based realistic 3D representation
Samsung Electronics Co., Ltd.

(03/11-11/11) Image matching technology for depth map optimization
ETRI

(08/10-07/11) Multiview image rendering technology
Samsung Electronics Co., Ltd.

(01/10-01/11) Image enhancement technology with two-lens camera
Samsung Electronics Co., Ltd.

(03/10-11/10) 3D interaction technology based on depth

ETRI

(03/08-12/09) Next generation intelligent broadcasting system
ITRC, Ministry of Knowledge Economy

Scholarship

Brain Korea National Science Scholarship of Korea Research Foundation (2008-2014)
Academic Excellence Scholarship, Yonsei University (2003, 2006, 2007)

Activities

Reviewer
IEEE Trans. Pattern Anal. Mach. Intell. (TPAMI)
IEEE Trans. Image Process. (TIP)
IEEE Trans. Circuits Syst. Video Technol. (TCSVT)
IEEE Trans. Multimedia (TMM)
IEEE Signal Process. Lett. (SPL)
IEEE Trans. Visualization and Computer Graphics (TVCG)
Elsevier Pattern Recognition Letters (PRL)
Elsevier Neurocomputing
Elsevier Signal Processing: Image Communication (SPIC)
Elsevier Digital Signal Processing (DSP)
PLOS ONE
EURASIP Journal on Image and Video Processing (JIVP)
Circuits, Systems, and Signal Processing (CSSP)
ACM SIGGRAPH 2016
ACM SIGGRAPH ASIA 2016
Eurographics 2017
ICCV 2019
AAAI 2020
CVPR 2020
ECCV 2020
NeurIPS 2020

References

Available upon request

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