

# Dr. Hyung Jin Chang

RESEARCH ASSOCIATE

Personal Robotics Laboratory, Department of Electrical and Electronic Engineering,  
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## Academic Qualification

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### Ph.D.

ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

- Thesis title: *Attentional Sampling for Efficient Visual Computing*

Seoul National University

2006 - 2013

### B.Eng

ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

- Thesis title: *Robot Behaviour Learning Model based on Motivation and Hierarchical Emotion*
- Bronze medal awarded in Electronics Fair of SNU, 2004

Seoul National University

2001 - 2006

## Employment

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### Research associate (Post-Doc) & Co-PI

GAZE FOLLOWING IN MULTI-CUE DEEP NEURAL NETWORKS

- This research was funded by the **Samsung Global Research Outreach (GRO)**. The goal of this project is estimating 3D gaze information from third-person view using RGBD camera through a deep neural network pipeline combining multi-cue data and providing a new 3D gaze dataset with eye tracking ground truth information.

Imperial College London

Oct 2016 – Present

### Research associate (Post-Doc)

HUMAN ACTION RECOGNITION VIA DEEP CONVOLUTIONAL NETWORK

- This research was funded by the **Samsung Electronics Co., Ltd.** The goal of this project is developing algorithms for recognising predefined human action classes from RGB video input through a deep convolutional neural network framework.

Imperial College London

Oct 2016 – Present

### Research associate (Post-Doc)

WHAT YOU SAY IS WHAT YOU DID (WYSIWYD)

- This research was funded by the **EU FP7 project WYSIWYD** under Grant 612139. This project will create a new transparency in human robot interaction (HRI) by allowing robots to both understand their own actions and those of humans, and to interpret and communicate these in human compatible intentional terms expressed as a language-like communication channel.
- My contribution to this project is enabling a robot to learn its own body schema and kinematic structure through visual data, and find correspondences between self body structures to others.

Imperial College London

June 2014 – Dec 2016

### Research associate (Post-Doc)

HAND POSTURE RECOGNITION IN ARBITRARY VIEW FROM SINGLE RGBD FRAME

- This research was funded by **Samsung Advanced Institute of Technology**. The goal of the project was developing a comprehensive method for real-time hand posture recognition in arbitrary view from single frame RGBD data.
- I developed a new hand posture estimation method based on a newly proposed latent regression forest method, and presented the method to CVPR as oral.

Imperial College London

June 2013 – May 2014

### Research assistant

MOBILE OBJECT RECOGNITION FOR INFORMATION SHARING SERVICE

- This research was funded by **Samsung Electronics Co., Ltd.** The goal of the project was developing an object information sharing system between mobile platform users and a server via visual object recognition.
- I developed an object recognition server system which communicates with mobile clients.

Seoul National University

May 2011 – Nov 2011

### Research assistant

INTELLIGENT VISUAL SURVEILLANCE SYSTEM

- This research was funded by **Samsung Techwin Co., Ltd.** The goal of this project was developing visual analysis algorithms for intelligent surveillance system.
- I developed a speed boosting algorithm for background subtraction. The algorithm speeded up computational time by six times without performance degradation. One CVPR paper was published and two patents were granted.
- I developed an intelligent visual surveillance platform named as *PIL-EYE system*. The architecture was used for Samsung Techwin's commercial system.

Seoul National University

Mar 2008 – Oct 2010

## Research Grant

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- 2016 **Co-PI [\$100K]**, “Gaze Following in Multi-Cue Deep Neural Networks”  
*The GRO program is Samsung’s prestige academic research collaboration platform. The annual call for proposals is open to the world’s leading universities and is highly competitive.* *Samsung Global Research Outreach (GRO)*
- 2016 **Participated in writing a proposal [£65K]**, “Human Action Recognition via Deep Convolutional Network” *Samsung Electronics Co.,Ltd.*
- 2016 **Young Researchers Travel Grant [\$600]**, *CVPR 2016*

## Teaching & Supervision Experience

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### TEACHING

- Spr 2010 **Teaching Assistant**, Linear System Theory (graduate course) *Seoul National University*
- Fall 2009 **Teaching Assistant**, Convex Optimization (graduate course) *Seoul National University*
- Spr 2009 **Teaching Assistant**, Statistical Learning Theory (graduate course) *Seoul National University*
- Fall 2008 **Teaching Assistant**, Strategy for Management of Technology (graduate course) *Seoul National University*
- Spr 2007 **Teaching Assistant**, Signal and System (undergraduate course) *Seoul National University*
- Fall 2006 **Teaching Assistant**, Circuits and Electronics Laboratory (undergraduate courses) *Seoul National University*

### SUPERVISION

- Jun 2013–  
Present **Co-supervisor**, I have been supervising four PhD students and two MSc students. One journal paper, six conference papers, and two workshop papers were published under my supervision. *Imperial College London*
- 2008–2013 **Co-supervisor**, I supervised three PhD students, two master students, and three undergraduate students. One journal paper, and two conference papers were published under my supervision. *Seoul National University*

## Professional Activity

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### CONFERENCE COMMITTEE

- 2016 **Technical program committee**, IEEE CVPR 2016 Workshop on observing and understanding hands in action (HANDS 2016) *Las Vegas, USA*

### INVITED PRESENTATIONS

- 2017 **Talk**, EEE postdoc research symposium @ Imperial College London *London, UK*
- 2016 **Invited talk**, Hamlyn Centre @ Imperial College London *London, UK*
- 2016 **Invited talk**, Samsung Electronics Software Center *Seoul, S. Korea*
- 2016 **Invited talk**, Electronics and Telecommunications Research Institute (ETRI) *Daejeon, S. Korea*
- 2016 **Invited speaker of the 1st ARRC Colloquium**, KAIST *Daejeon, S. Korea*
- 2015 **Invited talk**, Seoul National University *Seoul, S. Korea*
- 2015 **Invited talk**, Hanyang University *Seoul, S. Korea*
- 2015 **Invited talk**, Dankook University *Jukjeon, S. Korea*
- 2015 **Invited talk**, VTOUCH Inc. *Seoul, S. Korea*
- 2015 **Invited speaker**, Computer Science Workshop @ Loughborough University *Loughborough, UK*

### INTERNATIONAL SCHOOL

- 11-16 July 2011 **International Computer Vision Summer School (ICVSS)**, Registration, Recognition and Reconstruction in Images and Video *Sampieri-Sicily, Italy*

### STUDENT REPRESENTATIVE

- Nov. 2009 to Oct. 2010 **Perception and Intelligence Laboratory**, As a representative of laboratory members, I helped the supervisor managing research projects and coordinating laboratory life. *Seoul National University*

## Peer-Review Activities

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### Journal

IEEE TPAMI, IEEE TCSVT, IEEE TIE, IEEE TCST, IEEE SENSORS, MVA, PATTERN RECOGNITION

### Conference

BMVC 2017, IROS 2017, ICRA 2017, ICRA 2016, IROS 2015, IEEE ICCSIT 2011, IVCNZ 2012, ICPR 2012

## Honours & Awards

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2013	<b>Best Paper Award</b> , CVPR Workshop on Mobile Vision	Portland, US
2012	<b>Doctoral Consortium</b> , IEEE Computer Vision and Pattern Recognition (CVPR)	Providence, US
2012	<b>Excellent research Award</b> , Seoul National University Brain Korea 21	Seoul, S.Korea
2011	<b>Best Paper Award</b> , Information and Control Symposium (ICS)	Seoul, S.Korea
2009	<b>Silver Prize</b> , Samsung Techwin Research Center Conference (CoST-ReC 2009)	S.Korea
2006	<b>Best Paper Award</b> , Information and Control Symposium (ICS)	Seoul, S.Korea
2006	<b>Outstanding Student Scholarship</b> , Seoul National University	Seoul, S.Korea
2004	<b>Bronze Medal</b> , Seoul National University Electronics Fair	Seoul, S.Korea
2002-2004	<b>Departmental Scholarship</b> , Seoul National University	Seoul, S.Korea

## Publications

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### JOURNAL

- 2016 Hyung Jin Chang, Tobias Fischer, Maxime Petit, Martina Zambelli and Yiannis Demiris, **Learning Kinematic Structure Correspondences Using Multi-Order Similarities**. *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, under major revision review.
- 2016 Hyung Jin Chang, and Yiannis Demiris, **Highly Articulated Kinematic Structure Estimation combining Motion and Skeleton Information**. *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, under minor revision.
- 2016 Danhang Tang, Hyung Jin Chang, Alykhan Tejani, and Tae-Kyun Kim, **Latent Regression Forest: Structured Estimation of 3D Hand Poses**, *IEEE Transactions on Pattern Analysis and Machine Learning (TPAMI)*, August, 2016
- 2016 T. Fischer\*, C. Moulin-Frier\*, M. Petit, G. Pointeau, J.-Y. Puigbo, U. Pattacini, S. C. Low, D. Camilleri, P. Nguyen, M. Hoffmann, H. J. Chang, M. Zambelli, A.-L. Mealier, A. Damianou, G. Metta, T. J. Prescott, Y. Demiris, P. F. Dominey, and P. F. M. J. Verschure, **DAC-h3: A Proactive Robot Cognitive Architecture to Acquire and Express Knowledge About the World and the Self**, *IEEE Transactions on Cognitive and Developmental Systems (TCDS)*, under review
- 2016 Hyung Jin Chang\*, Guillermo Garcia-Hernando\*, Danhang Tang, and Tae-Kyun Kim, **Spatio-Temporal Hough Forest for Efficient Detection-Localisation-Recognition of Fingerwriting in Egocentric Camera**, *Computer Vision and Image Understanding (CVIU)*, vol.148, pages 87-96, 2016. (\* indicates equal contribution)
- 2016 Jin Hee Na, and Hyung Jin Chang\*, **Blockwise Collaborative Representation based Classification via  $L_2$ -norm of Query Data for Accurate Face Recognition**, *IET Electronics Letters*, vol.52, no.13, 2016. (\* indicates corresponding author)
- 2015 Kyuhwa Lee\*, Dimitri Ognibene, Hyung Jin Chang\*, Tae-Kyun Kim, and Yiannis Demiris, **STARE: Spatio-Temporal Attention RElocation for Multiple Structured Activities Detection**, *IEEE Transactions on Image Processing (TIP)*, vol.24, no.12, 2015. (\* indicates corresponding author)
- 2015 Youngkyoon Jang, Seung-Tak Noh, Hyung Jin Chang, Tae-Kyun Kim, and Woontack Woo, **3D Finger CAPE: Clicking Action and Position Estimation under Self-Occlusions in Egocentric Viewpoint**, *IEEE Transactions on Visualization and Computer Graphics (TVCG)*, vol.21, no.4, 2015
- 2014 Jungchan Cho, Minsik Lee, Hyung Jin Chang, and Songhwai Oh, **Robust Action Recognition using Local Motion and Group Sparsity**, *Pattern Recognition (PR)*, vol.47, pages 1813-1825, 2014
- 2012 Hyung Jin Chang, Dong Sung Song, Pyo Jae Kim, and Jin Young Choi, **Spatio-temporal Pattern Modeling for Fault Detection and Classification in Semiconductor Manufacturing**, *IEEE Transaction on Semiconductor Manufacturing (TSM)*, Vol.25, No 1, February 2012
- 2012 JinMin Choi, Hyung Jin Chang, Yung Jun Yoo, and Jin Young Choi, **Robust Moving Object Detection against Fast Illumination Change**, *Computer Vision and Image Understanding (CVIU)*, pages 179-193, Vol.116, Issue 2, February 2012
- 2011 Hawook Jeong, Hyung Jin Chang, and Jin Young Choi, **Unsupervised Motion Learning for Abnormal Behavior Detection in Visual Surveillance**, *Journal of the Institute of Electronics Engineers of Korea SC*, Vol.48, Issue 5, pages 45-51, September 2011
- 2009 Hyung Jin Chang, Pyo Jae Kim, Dong Sung Song, and Jin Young Choi, **Optical Image Stabilizing System using Multirate Fuzzy PID Controller for Mobile Device Camera**, *IEEE Transactions on Consumer Electronics (TCE)*, Vol.55, No.2, May 2009

## INTERNATIONAL CONFERENCE

- 2017** Ruohan Wang, Antoine Cully\*, Hyung Jin Chang\*, Yiannis Demiris, **MAGAN: Margin Adaptation for Generative Adversarial Networks**, *Neural Information Processing Systems (NIPS)* submitted (\* indicates equal contribution) arXiv:1704.03817
- 2017** Jongwon Choi, Hyung Jin Chang, Sangdoon Yun, Tobias Fischer, Yiannis Demiris, Jin Young Choi, **Attentional Correlation Filter Network for Adaptive Visual Tracking**, *IEEE Proc. Computer Vision and Pattern Recognition (CVPR)*, July, 2017
- 2017** YoungJoon Yoo, Sangdoon Yun, Hyung Jin Chang, Yiannis Demiris, Jin Young Choi, **Variational Autoencoded Regression: High Dimensional Regression of Visual Data on Complex Manifold**, *IEEE Proc. Computer Vision and Pattern Recognition (CVPR)*, July, 2017
- 2016** Hyung Jin Chang, Tobias Fischer, Maxime Petit, Martina Zambelli, Yiannis Demiris, **Kinematic Structure Correspondences via Hypergraph Matching**, *IEEE Proc. Computer Vision and Pattern Recognition (CVPR)*, June, 2016
- 2016** Jongwon Choi, Hyung Jin Chang, Jiyeoup Jeong, Yiannis Demiris, Jin Young Choi, **Attention-Modulated Visual Tracker Inspired by Structuralism Cognitive Model**, *IEEE Proc. Computer Vision and Pattern Recognition (CVPR)*, June, 2016
- 2016** Yixing Gao, Hyung Jin Chang, Yiannis Demiris, **Iterative Path Optimisation for Personalised Dressing Assistance using Vision and Force Information**, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, September, 2016. **Oral**
- 2016** Guillermo Garcia-Hernando, Hyung Jin Chang, Ismael Serrano, Oscar Deniz, Tae-Kyun Kim, **Transition Hough Forest for Trajectory-based Action Recognition**, *IEEE Winter Conference on Applications of Computer Vision (WACV)*, March, 2016
- 2015** Yixing Gao, Hyung Jin Chang, Yiannis Demiris, **User Modelling for Personalised Dressing Assistance by Humanoid Robots**, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, September, 2015. **Oral**
- 2015** Hyung Jin Chang and Yiannis Demiris, **Unsupervised Learning of Complex Articulated Kinematic Structures combining Motion and Skeleton Information**, *IEEE Proc. Computer Vision and Pattern Recognition (CVPR)*, June, 2015
- 2015** Youngkyoon Jang, Seung-Tak Noh, Hyung Jin Chang, Tae-Kyun Kim, Woontack Woo, **3D Finger CAPE: Clicking Action and Position Estimation under Self-Occlusions in Egocentric Viewpoint**, *IEEE Virtual Reality (VR)*, March, 2015. [full paper, accept rate=13.8%]
- 2014** Danhang Tang, Hyung Jin Chang\*, Alykhan Tejani\*, Tae-Kyun Kim, **Latent Regression Forest: Structural Estimation of 3D Articulated Hand Posture**, *IEEE Proc. Computer Vision and Pattern Recognition (CVPR)*, June, 2014. **Oral** (\* indicates equal contribution)
- 2013** Kwang Yi, Hawook Jeong, Byeongho Heo, Hyung Jin Chang, Jin Young Choi, **Initialization-Insensitive Visual Tracking Through Voting with Salient Local Features**, *International Conference on Computer Vision (ICCV)*, December, 2013
- 2013** Hyung Jin Chang, Jiyun Kim, Jungchan Cho, Songhwa Oh, Kwang Moo Yi, and Jin Young Choi, **Action Chart: A Representation for Efficient Recognition of Complex Activities**, *British Machine Vision Conference (BMVC)*, September, 2013
- 2013** Tushar Sandhan, Hyung Jin Chang, and Jin Young Choi, **Abstracted Radon Profiles for Fingerprint Recognition**, *International Conference on Image Processing (ICIP)*, September 2013
- 2012** Hyung Jin Chang, Hawook Jeong, and Jin Young Choi, **Active Attentional Sampling for Speed-up of Background Subtraction**, *IEEE Proc. Computer Vision and Pattern Recognition (CVPR)*, June 16-21, 2012
- 2012** Moonsub Byeon, Hyung Jin Chang, and Jin Young Choi, **Hierarchical Feature Grouping for Multiple Object Segmentation and Tracking**, *IVCNZ*, Nov. 26-28, 2012
- 2011** Hyung Jin Chang, Kwang Moo Yi, Shimin Yin, Soo Wan Kim, Young Min Baek, Ho Seok Ahn, and Jin Young Choi, **PIL-EYE: Integrated System for Sustainable Development of Intelligent Visual Surveillance Algorithms**, *IEEE Digital Image Computing: Techniques and Applications (DICTA)*, December 6-8, 2011. **Oral**
- 2011** Hyung Jin Chang, Myoung Soo Park, Hawook Jeong, and Jin Young Choi, **Tracking Failure Detection by Imitating Human Visual Perception**, *IEEE International Conference on Image Processing (ICIP)*, September 11-14, 2011
- 2011** Hawook Jeong, Hyung Jin Chang, and Jin Young Choi, **Modeling of Moving Object Trajectory by Spatio-temporal Learning for Abnormal Behavior Detection**, *IEEE International Conference on Advanced Video and Signal based Surveillance (AVSS)*, Aug 30 - Sep 2, 2011
- 2009** D. Pokrajac, N. Reljin, N. Pejic, T. Vance, S. McDaniel, A. Lazarevic, H. J. Chang, J. Y. Choi, and R. Mieziako, **Detection of Suspicious Activity Using Incremental Outlier Detection Algorithms**, *SPIE Signal and Data Processing on Small Targets 2009 conference*, August, 2009

- 2008** Pyo Jae Kim, Hyung Jin Chang, and Jin Young Choi, **Fast Incremental Learning for One-class Support Vector Classifier using Sample Margin Information**, *19th International Conference on Pattern Recognition (ICPR)*, Tampa, Florida, Dec. 2008. **Oral**
- 2007** Pyo Jae Kim, Hyung Jin Chang, Dong Sung Song, and Jin Young Choi, **Fast Support Vector Data Description Using K-Means Clustering**, *Lecture Notes in Computer Science (LNCS)*, Vol. 4493, *Proceeding of the 4th International Symposium on Neural Networks: Advances in Neural Networks*, pp. 506-514, June 2007
- 2007** Hyung Jin Chang, Pyo Jae Kim, Jung Hwan Choi, and Jin Young Choi, **Support Vector Data Description Using Clustering Method**, *International Technical Conference on Circuits/Systems, Computers and Communications (ITC-CSCC 2007)*, Vol. 3, pp. 1079-1080, July 2007. **Oral**
- 2007** Ho Seok Ahn, Pyo Jae Kim, Jeong Hwan Choi, Bin Mansoor, S., Woo-Sung Kang, Seok Min Yoon, Jin Hee Na, Young Min Baek, Hyung Jin Chang, Dong Sung Song, Jin Young Choi, Hyeong-Seok Ko, **Emotional head robot with behavior decision model and face recognition**, *Control, Automation and Systems, ICCAS*, 2007
- 2007** Hyung Jin Chang, Pyo Jae Kim, Jeong Hwan Choi, and Jin Young Choi, **Support Vector Data Description using Mean Shift Clustering**, *Information and Control Symposium (ICS)*, April, 2007. **Oral**
- 2007** Pyo Jae Kim, Hyung Jin Chang, Dong Sung Song, and Jin Young Choi, **KMSVDD: Support Vector Data Description using K-means Clustering**, *Information and Control Symposium (ICS)*, April, 2007. **Best paper award**

## INTERNATIONAL WORKSHOP

- 2016** Martina Zambelli, Tobias Fischer, Maxime Petit, Hyung Jin Chang, Antoine Cully, Yiannis Demiris, **Towards Anchoring Self-Learned Representations to Those of Other Agents**, *IROS Workshop on Bio-inspired Social Robot Learning in Home Scenarios*, September, 2016. **Oral**
- 2016** Yixing Gao, Hyung Jin Chang, Yiannis Demiris, **Personalised Assistive Dressing by Humanoid Robots using Multi-modal Information**, (*IEEE ICRA Workshop on Human-Robot Interfaces for Enhanced Physical Interactions*), May, 2016.
- 2015** Hyung Jin Chang, Guillermo Garcia-Hernando, Danhang Tang, and Tae-Kyun Kim, **Spatio-Temporal Hough Forest for Efficient Detection-Localisation-Recognition of Fingerwriting in Egocentric Camera**, *CVPR Workshop on Observing and understanding hands in action (HANDS 2015)*, June, 2015
- 2015** Danhang Tang, Hyung Jin Chang\*, Alykhan Tejani\*, Tae-Kyun Kim, **Latent Regression Forest: Structural Estimation of 3D Articulated Hand Posture**, *CVPR Workshop on Observing and understanding hands in action (HANDS 2015)*, June, 2015. (\* indicates equal contribution)
- 2013** Kwang Moo Yi, Kimin Yun, Soo Wan Kim, Hyung Jin Chang, Hawook Jeoung, and Jin Young Choi, **Detection of Moving Objects with Non-Stationary Cameras in 5.8ms: Bringing Motion Detection to your Mobile Device**, *CVPR Workshop on Mobile Vision*, June 2013. **Best paper award**

## PATENTS

- US Patent** [Granted] [US9256958B2](#) Active Attentional Sampling Method for Accelerating Background Subtraction
- US Patent** [Granted] [US8009971](#) Hand-Shake Correction Method and Apparatus of Camera Module for Use in Mobile Device
- US Patent** [Granted] [US7979143](#) Apparatus and Method for Proportional-Integral-Derivative Control
- US Patent** [Granted] [US9311713 B2](#) Estimator Training Method and Pose Estimating Method using Depth Image
- EU Patent** [Granted] [EP1936956](#) Hand-Shake Correction Method and Apparatus of Camera Module for Use in Mobile Device
- EU Patent** [Granted] [EP1956447](#) Apparatus and Method for Proportional-Integral-Derivative Control
- CN Patent** [Granted] [CN101236307 B](#) Hand-Shake Correction Method and Apparatus of Camera Module for Use in Mobile Device
- CN Patent** [Granted] [CN101241352 B](#) Apparatus and Method for Proportional-Integral-Derivative Control
- KR Patent** [Granted] [10-14688610000](#) Active Attentional Sampling Method for Accelerating Foreground Detection from Video, and Computer-Readable Recording Medium for the same
- KR Patent** [Granted] [10-0819301](#) Method and apparatus for optical image stabilizer on mobile camera module (PCT: EU, China)
- KR Patent** [Granted] [10-0866213](#) Proportional-integrate-derivative control apparatus and method (PCT: EU, China)

**KR Patent** [Granted] [10-0980603](#) Fault detection method using sequential one class classifier chain.

**KR Patent** [Granted] [1014384510000](#) Method of Providing Fast Detection of Moving Objects from Non-stationary Camera Video by Dual-mode SGM, and Computer-readable Recording Medium for the same