Dr. Hyung Jin Chang

Research Associate

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Academic Qualification

Ph.D.

Seoul National University

Electrical Engineering and Computer Science — *2006 - 2013*

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

B.Eng

Seoul National University

Electrical Engineering and Computer Science — *2001 - 2006*

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

Work Experience

Research associate (Co-PI)

Imperial College London

Gaze Following in Multi-Cue Deep Neural Networks — *Oct 2016 – Present*

- 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.

Research associate (Post-Doc)

Imperial College London

Human Action Recognition via Deep Convolutional Network — *Oct 2016 – Present*

- 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.

Research associate (Post-Doc)

Imperial College London

What You Say Is What You Did (WYSIWYD) — *June 2014 – Dec 2016*

- 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.

Research associate (Post-Doc)

Imperial College London

Hand Posture Recognition in Arbitrary View from Single RGBD Frame — *June 2013 – May 2014*

- 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.

Research assistant

Seoul National University

Mobile Object Recognition for Information Sharing Service — *May 2011 – Nov 2011*

- 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.

Research assistant

Seoul National University

Intelligent Visual Surveillance System — *Mar 2008 – Oct 2010*

- 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.

Research assistant

Seoul National University

Semiconductor Manufacturing Fault Detection System — *Aug 2007 – Feb 2008*

- This research was funded by the Small and Medium Business Administration of **Korean Government** and **Nanotek Company**
- I developed an online fault detection method for manufacturing process, which improved a precision of fault detection and enabled detecting the process start/end points. The system is an important module of a commercial product now.

Research assistant — *Seoul National University*

Optical Image Stabilizer (OIS) for Mobile Device Camera — *Jan 2006 – Aug 2006*

- This research was funded by **Samsung Electronics Co., Ltd.**
- I developed a non linear motor controller for optical image stabilisation of mobile device and implemented actual working system. The developed OIS system showed the most accurate and robust image stabilisation performance comparing to other commercial cameras.

Research Grant

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*

Supervision & Teaching Experience

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*

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 coures)	*Seoul National University*

Professional Activity

Conference Committee

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

Invited Presentations

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*

Peer-Review Activities

Journal

IEEE TPAMI, IEEE TCSVT, IEEE TIE, IEEE TCST, IEEE Sensors, MVA

Conference

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

Honours & Awards

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

Position of Responsibility

Student Representative — *Seoul National University*

Perception and Intelligence Laboratory — *Nov. 2009 to Oct. 2010*

- As a representative of laboratory members, I helped the supervisor managing research projects and coordinating laboratory life.

Publications

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 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 major 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 Classificaton 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 Jongwon Choi, Hyung Jin Chang, Sangdoo 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, Sangdoo 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, Songhwai 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. Pejcic, T. Vance, S. McDaniel, A. Lazarevic, H. J. Chang, J. Y. Choi, and R. Miezianko, **Detection of Suspious 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