Won Hwa Kim

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RESEARCH INTERESTS

My research interests lie in *multi-resolution analysis* of data for various topics in **Machine Learning, Computer Vision and Brain Imaging**. On the theoratical side, I am particularily interested in applied harmonic analysis in non-Euclidean spaces (e.g., signal processing on graphs) to develop novel methods for statistical analysis of images or image-derived measures. On the application side, I mainly focus on analysis of biomedical data to facilitate understandings of neurodegenerative brain disorders such as Alzheimer's disease (AD) towards mechanisms for diagnosis, discovering new treatments and design of new studies.

APPOINTMENTS

Assistant Professor 2018 - present
Computer Science and Engineering, University of Texas at Arlington, U.S.A.

Researcher 2017 - 2018
Data Science Team, NEC Labs, America, U.S.A.

Research Assistant 2011 - 2017
Wisconsin Alzheimer's Disease Research Center (W-ADRC), U.S.A.
Computer Science/Biostatistics, University of Wisconsin - Madison, U.S.A.

Research Engineer 2010 - 2011
Environmental Tech Center, Hyundai Motors Company, S. Korea

Information Management Officer 2003 - 2005
Headquarter, the 8th U.S. Army Division, S. Korea

EDUCATION

University of Wisconsin - Madison, Madison, Wisconsin, U.S.A. 2011 - 2017
Ph.D, Computer Sciences (Minor in Statistics)
- Thesis: A Multi-resolution Framework for Statistical Analysis of Neuroimaging Data
- Advisor: Vikas Singh

KAIST, Daejon, South Korea 2008 - 2010
M.S., Robotics Program
- Thesis: Diversified Emotions with Mood for Human-like Behaviors of Robots
- Advisor: Myungjin Chung

Sungkyunkwan University, Seoul, South Korea 2001 - 2008
B.S., Electrical Engineering (*Early graduation in 7 semesters*)

HONORS and AWARDS

- NSF CISE CAREER Workshop Travel Award, National Science Foundation (NSF) 2019
- Rising STARs Award, University of Texas System [$250,000] 2017
- Doctoral Consortium Travel Award, Computer Vision and Pattern Recognition (CVPR) 2016
- Student Travel Award, Medical Image Computing and Computer Assisted Intervention (MICCAI) 2013
- Machine Learning Summer School (MLSS) Scholarship, University of California, Santa Cruz 2012
- National Fellowship, S. Korea 2008 - 2010
- Finalist for Best Paper in Biomimetics, International Conference on Robotics and Biomimetics 2009
- Merit Based Scholarship, Sungkyunkwan University 2002, 2003, 2005
- 3rd Place in 12th Grade, Utah Math Contest 2001

GRANTS

• R01 AG059312-01A1 (Subaward through UW-Madison), *Algebraic Formulations for Characterizing Structural Brain Connectivity Changes and Pathology Transmission Networks in Preclinical Alzheimer's Disease*, National Institute of Health (NIH), Role: **Co-Investigator** 2019 - 2021

• Research Enhancement Program (REP), *Convolution Neural Network for Graph Data*, University of Texas at Arlington, Role: **PI** 2018 - 2019

• CTEDD 018-08, *Social Media Analysis for Transportation Assessment*, Center for Equity, Diversity and Dollar (C-TEDD), United States Department of Transportation (USDOT), Role: **PI** 2018 - 2019

PUBLICATIONS

Conference and Journal Publications

Note: Top-tier conferences in computer science are valued as prestigious journals in other areas.

1. Xin Ma, Guorong Wu, **Won Hwa Kim**, "Enriching Statistical Inferences on Brain Connectivity for Alzheimer's Disease Analysis via Latent Space Graph Embedding", *IEEE International Symposium on Biomedical Imaging* (**ISBI**), 2020. [**Oral Presentation**]
2. Anna Philips, Farah Naz, Kate Kyung Hyun, Vivek Patel, Gordon G. Zhang, **Won Hwa Kim**, "Social Media Text Analysis using Multi-kernel Convolution Neural Network for Ride Hailing Service Assessment", *Transportation Research Board (TRB)*, 2020
3. Seong Jae Hwang, Zirui Tao, **Won Hwa Kim***, Vikas Singh*, "Conditional Recurrent Flow: Conditional Generation of Longitudinal Samples with Applications to Neuroimaging", *International Conference on Computer Vision* (**ICCV**), 2019. [acceptance rate: 25%] (*: senior authorship shared)
4. Seong Jae Hwang, Zirui Tao, **Won Hwa Kim***, Vikas Singh*, "Statistical Analysis of Longitudinally and Conditionally Generated Neuroimaging Measures via Conditional Recurrent Flow", *Statistical Deep Learning in Computer Vision* (**ICCV Workshop**), 2019. (*: senior authorship shared)
5. Annie M. Racine, Andrew P. Merluzzi, Nagesh Adluru, Derek Norton, Rebecca L. Koscik, Lindsay R. Clark, Sara E. Berman, Christopher R. Nicholas, Sanjay Asthana, Andrew L. Alexander, Kaj Blennow, Henrik Zetterberg, **Won Hwa Kim**, Vikas Singh, Cynthia M. Carlsson, Barbara B. Bendlin, Sterling C. Johnson "Association of longitudinal white matter degeneration and cerebrospinal fluid biomarkers of neurodegeneration, inflammation and Alzheimer's disease in late-middle-aged adults", *Brain Imaging and Behavior*, 2019. [5yr impact factor: 4.16]
6. **Won Hwa Kim**, Annie M. Racine, Nagesh Adluru, Seong Jae Hwang, Kaj Blennow, Henrik Zetterberg, Cynthia M. Carlsson, Sanjay Asthana, Rebecca L. Koscik, Sterling C. Johnson, Barbara B. Bendlin, Vikas Singh, "Cerebrospinal fluid biomarkers of neurofibrillary tangles and synaptic dysfunction are associated with longitudinal decline in white matter connectivity: a Multi-resolution graph analysis", *NeuroImage:Clinical*, 2019. [5yr impact factor: 4.81]
7. Seong Jae Hwang, Nagesh Adluru, **Won Hwa Kim**, Sterling C. Johnson, Barbara B. Bendlin, Vikas Singh, "Associations between PET Amyloid Pathology and DTI Brain Connectivity in Preclinical Alzheimer's Disease", *Brain Connectivity*, 2019. [impact factor: 3.82]
8. **Won Hwa Kim**, Mona Jalal, Seong Jae Hwang, Sterling C. Johnson, Vikas Singh, "Online Graph Completion: Multivariate Signal Recovery in Computer Vision", *Computer Vision and Pattern Recognition* (**CVPR**), 2017. [acceptance rate: 29.9%]
9. **Won Hwa Kim**, "A Multi-resolution Framework for Statistical Analysis of Neuroimaging Data", *Doctoral Thesis*, 2017.
10. **Won Hwa Kim**, Seong Jae Hwang, Nagesh Adluru, Sterling C. Johnson, Vikas Singh, "Adaptive Signal Recovery on Graphs via Harmonic Analysis for Experimental Design in Neuroimaging", *European Conference on Computer Vision* (**ECCV**), 2016. [acceptance rate: 26.6%]
11. **Won Hwa Kim***, Hyunwoo J. Kim*, Nagesh Adluru, Vikas Singh, "Latent Variable Graphical Model Selection using Harmonic Analysis: Applications to the Human Connectome Project (HCP)", *Computer Vision and Pattern Recognition* (**CVPR**), 2016. [**SPOTLIGHT**, acceptance rate: 9.7%] (*: First authorship shared)
12. **Won Hwa Kim**, Sathya Ravi, Sterling C. Johnson, Ozioma C. Okonkwo, Vikas Singh, "On Statistical Analysis of Neuroimages with Imperfect Registration", *International Conference on Computer Vision* (**ICCV**), 2015. [acceptance rate: 30.9%]

13. **Won Hwa Kim**, Nagesh Adluru, Moo K. Chung, Ozioma C. Okonkwo, Sterling C. Johnson, Barbara B. Bendlin, Vikas Singh, "Multi-resolution Statistical Analysis of Brain Connectivity Graphs in Preclinical Alzheimer's Disease", *NeuroImage*, 118:103-117, 2015. [5yr impact factor: 6.91]
14. **Won Hwa Kim**, Barbara B. Bendlin, Moo K. Chung, Sterling C. Johnson, Vikas Singh, "Statistical Inference Models for Image Datasets with Systematic Variations", *Computer Vision and Pattern Recognition* (**CVPR**), 2015. [acceptance rate: 28%]
15. **Won Hwa Kim**, Vikas Singh, Moo K. Chung, Nagesh Adluru, Barbara B. Bendlin, Sterling C. Johnson, "Multi-resolution Statistical Analysis on Graph Structured Data in Neuroimaging", *IEEE International Symposium on Biomedical Imaging* (**ISBI**), 2015. [Invited paper/ **Oral presentation**]
16. **Won Hwa Kim**, Vikas Singh, Moo K. Chung, Chris Hinrichs, Deepti Pachauri, Ozioma C. Okonkwo, Sterling C. Johnson, "Multi-resolutional Shape Features via non-Euclidean Wavelets: Applications to Statistical Analysis of Cortical thickness", *NeuroImage*, 93:107-123, 2014. [5yr impact factor: 6.91]
17. A. Pasha Hosseinbor, **Won Hwa Kim**, Nagesh Adluru, Amit Acharya, Houri K. Vorperian, Moo K. Chung, "The 4D Hyperspherical Diffusion Wavelet: a New Method for the Detection of Localized Anatomical Variation", *Medical Image Computing and Computer Assisted Intervention* (**MICCAI**), 2014. [acceptance rate: 30%]
18. **Won Hwa Kim**, Nagesh Adluru, Moo K. Chung, Sylvia Charchut, Johnson J. GadElkarim, Lori Altshuler, Teena Moody, Anand Kumar, Vikas Singh, and Alex D. Leow, "Multi-resolutional Brain Network Filtering and Analysis via Wavelets on Non-Euclidean Space", *Medical Image Computing and Computer Assisted Intervention* (**MICCAI**), 2013. [acceptance rate: 33%]
19. **Won Hwa Kim**, Moo K. Chung, Vikas Singh, "Multi-resolution Shape Analysis via Non-Euclidean Wavelets: Applications to Mesh Segmentation and Surface Alignment Problems", *Computer Vision and Pattern Recognition* (**CVPR**), 2013. [acceptance rate: 25.2%]
20. **Won Hwa Kim**, Deepti Pachauri, Charles Hatt, Moo K. Chung, Sterling C. Johnson, Vikas Singh, "Wavelet Based Multi-scale Shape Features on Arbitrary Surfaces for Cortical Thickness Discrimination", *Advances in Neural Information Processing Systems* (**NeurIPS**), 2012. [acceptance rate: 25.2%]
21. **Won Hwa Kim**, Jeong Woo Park, Woo Hyun Kim, Won Hyong Lee, Myung Jin Chung, "Proposal of 2D Mood Model for Human-like Behaviors of Robot", *The Journal of Korea Robotics Society*, 2010.
22. **Won Hwa Kim**, Jeong Woo Park, Won Hyong Lee, Woo Hyun Kim, Myung Jin Chung, "Stochastic Approach on a Simplified OCC Model for Uncertainty and Believability", *IEEE International Conference on Computational Intelligence in Robotics and Automation (CIRA)*, 2009.
23. Jeongwoo Park, **Won Hwa Kim**, Won Hyong Lee, Myung Jin Chung, "A Robot Simulator 'FRESi' for Dynamic Facial Expression", *International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)*, 2009.
24. Jeongwoo Park, Woo Hyun Kim, Won Hyong Lee, **Won Hwa Kim**, Myung Jin Chung, "Lifelike Facial Expression of Mascot-type Robot based on Emotional Boundaries", *International Conference on Robotics and Biomimetics (ROBIO)*, 2009. [Finalist for the best paper]
25. Woo Hyun Kim, Jeongwoo Park, Won Hyong Lee, **Won Hwa Kim**, Myung Jin Chung, "Synchronized Multimodal Expression Generation using Editing Toolkit for a Human-friendly robot", *International Conference on Robotics and Biomimetics (ROBIO)*, 2009.

Reviewed Abstracts

1. Xin Ma, Guorong Wu, **Won Hwa Kim**, "Multi-resolution Graph Neural Network for Detecting Variations in Brain Connectivity", *Interaction of Geometry and Topology in Biomedical Imaging* (**ISBI Workshop**), 2020.
2. Xin Ma, Guorong Wu, **Won Hwa Kim**, "Enriching Statistical Inferences on Brain Connectivity via Latent Space Graph Embeddings', *Organization for Human Brain Mapping* (**OHBM**), 2020.
3. Xin Ma, Guorong Wu, **Won Hwa Kim**, "Multi-resolution Graph Neural Network to Identify Disease Relevant Variations in Brain Connectivity", *Organization for Human Brain Mapping* (**OHBM**), 2020.
4. **Won Hwa Kim**, Noelle Fields, Ling Xu, and Chen Kan, "Missing Value Imputation via Graph Completion in Questionnaires of Persons with Dementia", *Gerontological Society of America (GSA) Annual Scientific Meeting*, 2019.
5. Zachary Bailey, Xin Ma, Martin Hirsch, **Won Hwa Kim**, Juhyun Lee, "Development of an Auto-segmentation Technique using a Convolution Neural Network for the Segmentation of the Vantricular Cavity in Zebrafish", *Basic Cardiovascular Sciences*, 2019.

6. **Won Hwa Kim**, Hyunwoo J. Kim, Nagesh Adluru, Vikas Singh, "Multi-resolution Analysis for Sparse Inverse Covariance Matrix Estimation", *International Conference on Brain Informatics (BI)*, 2018.
7. Tuan Dinh, Sathya Ravi, **WonHwa Kim**, Nagesh Adluru, Rebecca Koscik, Cynthia Carlsson, Sterling C. Johnson, Vikas Singh, "Graph Imputation techniques for estimating amyloid positivity from longitudinal cognitive and MRI measurements for efficient secondary prevention trials", *Clinical Trials on Alzheimer's Disease (CTAD)*, 2017
8. **Won Hwa Kim**, Seong Jae Hwang, Nagesh Adluru, Stering C. Johnson, Vikas Singh, "Graph Completion: a generalization of Netflix prize problem to design cost-effective neuroimaging trials in preclinical AD", *Alzheimer's Association International Conference (***AAIC***)*, 2017.
9. Seong Jae Hwang, **Won Hwa Kim**, Barbara B. Bendlin, Nagesh Adluru, Vikas Singh, "Multi-Resolution Analysis of DTI-Derived Brain Connectivity and the Influence of PET-Derived Alzheimer's Disease Pathology in a Preclinical Cohort", *Alzheimer's Association International Conference (***AAIC***)*, 2016.
10. **Won Hwa Kim**, Nagesh Adluru, Moo K. Chung, Ozioma C. Okonkwo, Sterling C. Johnson, Barbara B. Bendlin, Vikas Singh, "A Framework for Performing Multi-Resolution Statistical Analysis of Brain Connectivity Graphs for Preclinical Alzheimer's Disease", *Alzheimer's Association International Conference (***AAIC***)*, 2015

PATENT

1. **Won Hwa Kim**, Seong Jae Hwang, Nagesh Adluru, Sterling C. Johnson, Vikas Singh, "Computerized System for Efficient Augmentation of Data Sets", *US Patent App. 15/333,688*, 2018

INVITED TALKS

Graph Data Analysis for Bio-data Processing using Machine Learning — Jan. 7, 2019
Electrical Engineering Seminar, University of Seoul (UOS)

Multi-resolution Analysis for Graphs and Images on Graphs,
1) Gwangju Institute of Science and Technology (GIST) — Dec. 30, 2019
2) Electronics and Telecommunications Research Institute (ETRI) — Jan. 5, 2019

Multi-resolution Analyses of Neuroimaging Data on Graph for AD Studies, — Nov. 15, 2019
Medical Applications of Engineering (BE1105), University of Texas at Arlington

Recommendation System using AI, — Oct. 27, 2018
Korean-American Scientists and Engineers Association (KSEA) Seminar - North Texas Chapter

Multi-resolution Analysis for Inverse Covariance Matrix Estimation,
1) Electronics and Telecommunications Research Institute (ETRI) — Jul. 17, 2018
2) NAVER Tech Talk, NAVER — Jul. 30, 2018

Online Graph Completion: Multivariate Signal Recovery in Computer Vision,
1) Computer Vision Seminar (EE), Sungkyunkwan University — Jul. 6, 2017
2) Data Science Seminar (Math), Sungkyunkwan University — Jul. 6, 2017

Multi-resolution Analysis for Inverse Covariance Matrix Estimation, — Feb. 12, 2016
Operator Theory Seminar, Seoul National University

Statistical Analysis of Neuroimages with Imperfect Registration, — Jan. 26, 2016
IBS Seminar, Sungkyunkwan University

Multi-resolution Statistical Analysis on Graph Structured Data in NeuroImaging, — Jun. 30, 2015
Medical Image Analysis Seminar, Sungkyunkwan University

Multi-scale Representation of Cortical Thickness using Wavelet for Group Analysis, — Mar. 13, 2013
Brain Food, Waisman Center

Wavelet Based Multi-scale Shape Descriptors on Arbitrary Surfaces,
1) Power Electronics Seminar, Sungkyunkwan University — Jan. 15, 2013

2) Artificial Intelligence Seminar (AISEM), University of Wisconsin - Madison Oct. 18, 2012

TEACHING EXPERIENCE

Instructor, Computer Science and Engineering, University of Texas at Arlington, U.S.A.
- CSE5334: Data Mining 2020S
- CSE6367: Computer Vision 2019F
- CSE4334/5334: Data Mining 2018F, 2019S
- CSE6363: Machine Learning 2018S

Teaching Assistant, Computer Sciences, University of Wisconsin - Madison, U.S.A.
- CS767: Computational Methods in Medical Image Analysis 2016F
- CS767: Computational Methods in Medical Image Analysis 2015S
- CS638: Statistical Methods for Medical Image Analysis 2014S

Teaching Assistant, Robotics Program, KAIST, S. Korea.
- RE510: Intelligent Robot Design Lab. Fall, 2009

SERVICES

Reviewer, Transnational Neurodegeneration 2019
Ad-hoc reviewer, National Science Foundation 2019
Reviewer, Brain and Behavior 2019
Program Committee, AAAI Conference on Artificial Intelligence (AAAI) 2019
Reviewer, International Conference on Computer Vision (ICCV) 2019
Reviewer, Medical Image Computing and Computer Assisted Intervention (MICCAI) 2014, 2016, 2019
Reviewer, Entropy 2019
Reviewer, Neurobiology of Aging 2019
Reviewer, Alzheimer's and Dementia 2019
Review panel, National Science Foundation 2018
Reviewer, Neural Information Processing Systems (NIPS) 2018
Reviewer, Computer Vision and Pattern Recognition (CVPR) 2018
Reviewer, NeuroImage 2017, 2018
Reviewer, International Conference on Machine Learning (ICML) 2017
Reviewer, European Conference on Computer Vision (ECCV) 2012, 2016
Reviewer, IEEE Transactions on Medical Imaging (TMI) 2014

OPEN SOURCE SOFTWARE

- Cortical Thickness Analysis (CTA) Toolbox
(`https://www.nitrc.org/projects/cta_toolbox`)
- Multi-resolution Brain Connectivity Analysis (MBCA) Toolbox
(`http://ranger.uta.edu/~wonhwa/mbca_toolbox.html`)

EXTRA ACTIVITIES

Student Representative, Robotics Program, KAIST, S. Korea 2009
Volunteer, International Federation of Automatic Control (IFAC), COEX, S. Korea 2008
Volunteer, International Workshop on Operator Theory and Applications (IWOTA), Seoul National University, S. Korea 2006

PERSONAL REFERENCES

Available upon request.