

Jinkyu Kim

ASSISTANT PROFESSOR · KOREA UNIVERSITY
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Education

Univ. of California, Berkeley

PH.D. IN COMPUTER SCIENCE (ADVISOR: PROF. JOHN CANNY)

Berkeley, CA, USA

Sep 2015 - Dec 2019

Korea University

MASTER IN ELECTRICAL COMPUTER ENGINEERING (ADVISOR: PROF. SUNGROH YOON)

Seoul, South Korea

Sep 2008 - Aug 2010

Korea University

BACHELOR IN ELECTRICAL ENGINEERING

• *Summa Cum Laude* (GPA: 4.45/4.5) from the College of Engineering

Seoul, South Korea

Mar 2005 - Aug 2008

Current Research Interests

Domain Generalization

Machine learning systems often fail to generalize out-of-sample distribution as they assume that in-samples and out-of-samples are independent and identically distributed – this assumption rarely holds during deployment in real-world scenarios where the data is highly likely to change over time and space. Deep convolutional neural network features are often domain-invariant to low-level visual cues, some studies suggest that they are still susceptible to domain shift.

Publications:

Oct 2022	Seonwoo Min, Nokyoung Park, Siwon Kim, Seunghyun Park, and Jinkyu Kim, “Grounding Visual Representations with Texts for Domain Generalization”	ECCV
Oct 2022	Hyejin Lee, Daehee Kim, Daeun Lee, Jinkyu Kim*, and Jaekoo Lee*, “Bridging the Domain Gap towards Generalization in Automatic Colorization”	ECCV
June 2022	Daehee Kim, Jinkyu Kim, and Jaekoo Lee, “Inter-domain Curriculum Learning for Domain Generalization”	ICT Express
Oct 2021	Daehee Kim, Youngjun Yoo, Seunghyun Park, Jinkyu Kim*, and Jaekoo Lee*, “SelfReg: Self-supervised Contrastive Regularization for Domain Generalization”	ICCV

Self-supervised Learning

In recent years, the AI field has made tremendous progress in developing AI systems that can learn from massive amounts of carefully labeled data. This paradigm of supervised learning has a proven track record for training specialist models that perform extremely well on the task they were trained to do. Unfortunately, there’s a limit to how far the field of AI can go with supervised learning alone. Supervised learning is a bottleneck for building more intelligent generalist models that can do multiple tasks and acquire new skills without massive amounts of labeled data. Practically speaking, it’s impossible to label everything in the world. There are also some tasks for which there’s simply not enough labeled data, such as training translation systems for low-resource languages. If AI systems can glean a deeper, more nuanced understanding of reality beyond what’s specified in the training data set, they’ll be more useful and ultimately bring AI closer to human-level intelligence.

Publications:

Jan 2023	Suhong Moon, Domas Buracas, Seunghyun Park, Jinkyu Kim, and John Canny, “An Embedding-Dynamic Approach to Self-supervised Learning”	WACV
June 2021	Suhong Moon, Domas Buracas, Jinkyu Kim, and John Canny, “BMWReg: Brownian-diffusive, Multiview, Whitening Regularizations for Self-supervised Learning”	ICMLW

Multi-modality

Deep Learning has implemented a wide range of applications and has become increasingly popular in recent years. The goal of multimodal deep learning is to create models that can process and link information using various modalities. Despite the extensive development made for unimodal learning, it still cannot cover all the aspects of human learning. Multimodal learning helps to understand and analyze better when various senses are engaged in the processing of information.

Publications:

Oct 2022	Seung Hyun Lee, Gyeongrok Oh, Wonmin Byeon, Jihyun Bae, Chanyoung Kim, Won Jeong Ryoo, Sang Ho Yoon, Jinkyu Kim*, Sangpil Kim* , “Sound-Guided Semantic Video Generation”	ECCV
June 2022	Yujin Jeong, Seongbeom Park, Suhong Moon, and Jinkyu Kim , “Zero-shot Visual Commonsense Immorality Prediction”	CVPRW
June 2022	Seung Hyun Lee, Wonseok Roh, Wonmin Byeon, Sang Ho Yoon, Chanyoung Kim, Jinkyu Kim* and Sangpil Kim* , “Sound-Guided Semantic Image Manipulation”	CVPR
Dec 2021	Seung Hyun Lee, Nahyuk Lee, Chanyoung Kim, Wonjeong Ryoo, Jinkyu Kim, Sang Ho Yoon*, Sangpil Kim* , “Audio-Semantic Image Synthesis for Artistic Paintings”	NIPSW
Dec 2021	Seung Hyun Lee, Sang Ho Yoon, Jinkyu Kim*, Sangpil Kim* , “Sound-guided Semantic Image Manipulation”	NIPSW

Deep Driving

General perception is still unsolved and is the focus of major efforts within the research community. Perception is much more tractable within the context of autonomous driving. This is due to a number of factors. For example, the number of object classes is smaller, the classes are more distinct, rules offer a strong prior on what objects may be where at any point in time, and expensive, high-quality laser sensing is appropriate. Nevertheless, perception is still very challenging due to the extremely low acceptable error rate.

Publications:

Aug 2022	Wonseok Roh, Gysam Chang, Seokha Moon, Giljoo Nam, Chanyoung Kim, Younghyun Kim, Sangpil Kim*, Jinkyu Kim* , “ORA3D: Overlap Region Aware Multi-view 3D Object Detection”	ArXiv
May 2022	Jinkyu Kim*, Reza Mahjourian*, Mayank Bansal, Scott Ettinger, Brandyn White, Ben Sapp, Dragomir Anguelov , “StopNet: Scalable Trajectory and Occupancy Prediction for Urban Autonomous Driving”	ICRA
May 2022	Reza Mahjourian*, Jinkyu Kim*, Mingxing Tan, Ben Sapp, Yuning Chai, Dragomir Anguelov , “Occupancy Flow Fields for Motion Forecasting in Autonomous Driving”	ICRA/RA-L
Apr 2021	Jinkyu Kim and Mayank Bansal , “Towards an Interpretable Deep Driving Network by Attentional Bottleneck”	RA-L
Mar 2020	Ye Xia, Jinkyu Kim, John Canny, Karl Zipser, and David Whitney , “Periphery-Fovea Multi-Resolution Driving Model guided by Human Attention”	WACV
Dec 2018	Ye Xia, Danqing Zhang, Jinkyu Kim, Ken Nakayama, Karl Zipser, and David Whitney , “Predicting Driver Attention in Critical Situations”	ACCV
Nov 2018	Jinkyu Kim, Hyunggi Cho, Myung Hwangbo, John Canny, and Youngwook Paul Kwon , “Deep Traffic Light Detection for Self-driving Cars from a Large-scale Dataset”	IEEE ITSC
Jul 2018	Donghan Lee, Youngwook Paul Kwon, Jinkyu Kim, and Jongsang Suh , “A Novel Trajectory Prediction of Traffic Participants for Autonomous Lane Change Assistance”	AVEC

Advisable AI

Recent success suggests that deep neural control networks are likely to be a key component of self-driving vehicles. These networks are trained on large datasets to imitate human actions, but they lack semantic understanding of image contents. This makes them brittle and potentially unsafe in situations that do not match training data. Here, we propose to address this issue by augmenting training data with natural language advice from a human. Advice includes guidance about what to do and where to attend. We present a first step toward advice giving, where we train an end-to-end vehicle controller that accepts advice. The controller adapts the way it attends to the scene (visual attention) and the control (steering and speed).

Publications:

June 2020	Jinkyu Kim, Suhong Moon, Anna Rohrbach, Trevor Darrell, and John Canny , “Advisable Learning for Self-driving Vehicles by Internalizing Observation-Action Rules”	CVPR
June 2020	Jinkyu Kim, Suhong Moon, Anna Rohrbach, Trevor Darrell, and John Canny , “Advisable Learning for Self-driving Vehicles by Internalizing Observation-Action Rules”	CVPRW
June 2019	Jinkyu Kim, Teruhisa Misu, Yi-Ting Chen, Ashish Tawari, and John Canny , “Grounding Human-to-Vehicle Advice for Self-driving Vehicles”	CVPR

eXplainable AI (XAI)

Deep networks have shown promise for end-to-end control of self-driving vehicles, but such networks are notoriously cryptic. There are no interpretable states or labels in such a network, and representations are fully distributed as sets of activations. Interpretability is important for a number of reasons: (i) user acceptance – self-driving vehicles are a radical technology for users to accept, and require a very high level of trust, (ii) understanding and extrapolation of vehicle behavior – users ideally should be able to anticipate what a vehicle, and to communicate effectively it is important that they understand the reasons for its decisions.

Publications:

Dec 2021	Jinkyu Kim, Anna Rohrbach, Zeynep Akata, Suhong Moon, Teruhisa Misu, Yi-Ting Chen, Trevor Darrell, John Canny, “Towards Explainable and Advisable Model for Self-driving Cars”	<i>AI Letters</i>
Jun 2020	Jinkyu Kim and Mayank Bansal, “Attentional Bottleneck: Towards an Interpretable Deep Driving Network”	<i>CVPRW</i>
Oct 2018	Jinkyu Kim and John Canny, “Explainable Deep Driving by Visualizing Causal Attention”	<i>The Springer Series on Challenges in Machine Learning</i>
Sep 2018	Jinkyu Kim, Anna Rohrbach, Trevor Darrell, John Canny, and Zeynep Akata, “Textual Explanations for Self-Driving Vehicles”	<i>ECCV</i>
Dec 2017	Jinkyu Kim, Anna Rohrbach, Trevor Darrell, John Canny, and Zeynep Akata, “Show, Attend, Control, and Justify: Interpretable Learning for Self-Driving Cars”	<i>NeurIPS Symposium</i>
Oct 2017	Jinkyu Kim and John Canny, “Interpretable Learning for Self-Driving Cars by Visualizing Causal Attention”	<i>ICCV</i>

Projects:

Berkeley DeepDrive

DEVELOP NEW AND EMERGING TECHNOLOGIES WITH REAL-WORLD APPLICATIONS IN THE AUTOMOTIVE INDUSTRY.

UC Berkeley

Sep 2016 - Dec 2019

eXplainable AI (XAI)

PRODUCE MORE EXPLAINABLE MODELS, WHICH ENABLE END-USERS TO UNDERSTAND ITS RATIONALE

DARPA

Sep 2017 - Dec 2019

Previous Research Interests

1. Collaborative Analytics

As a great deal of data has been accumulated in various disciplines, the need for the integrative analysis of separate but relevant data sources is becoming more important. Combining data sources can provide global insight that is otherwise difficult to obtain from individual sources. Because of privacy, regulations, and other issues, many large-scale data repositories remain closed off from the outside, raising what has been termed the data silo issue. The huge volume of today's big data often leads to computational challenges, adding another layer of complexity to the solution.

Publications:

May 2016	Jinkyu Kim, Heonseok Ha, Byung-Gon Chun, Sungroh Yoon, and Sang K. Cha, “Collaborative Analytics for Data Silos”	<i>IEEE ICDE</i>
Dec 2015	Heonseok Ha, Jinkyu Kim, and Sungroh Yoon, “Distributed Ensemble Learning for Analyzing Nationwide Health-Insurance Databases”	<i>NeurIPS workshop</i>

2. Bioinformatics

Capillary electrophoresis (CE) of nucleic acids is a workhorse technology underlying high-throughput genome analysis and large-scale chemical mapping for nucleic acid structural inference. Despite the wide availability of CE-based instruments, there remain challenges in leveraging their full power for quantitative analysis of RNA and DNA structure, thermodynamics, and kinetics. In particular, the slow rate and poor automation of available analysis tools have bottlenecked a new generation of studies involving hundreds of CE profiles per experiment.

Publications:

Jul 2011	Sungroh Yoon, Jinkyu Kim, Justine Hum, Hanjoo Kim, Seunghyun Park, Wipapat Kladwang and Rhiju Das, “HiTRACE: High-throughput robust analysis for capillary electrophoresis”	<i>Bioinformatics</i> (IF: 5.481)
May 2011	Jinkyu Kim, Hanjoo Kim, Hyeyoung Min and Sungroh Yoon, “Constructing Accurate Contact Maps for Hydroxyl Radical Cleavage Based High-Throughput RNA Structure Inference”	<i>IEEE TBME</i> (IF: 4.288)
May 2009	Jinkyu Kim, Seunghak Yu, Byonghyo Shim, Hanjoo Kim, Hyeyoung Min, Eui-Young Chung, Rhiju Das and Sungroh Yoon, “A Robust Peak Detection Method for RNA Structure Inference by High-Throughput Contact Mapping”	<i>Bioinformatics</i> (IF: 5.481)

3. Others

Econophysics | Computational Imaging | Computational Displays

May 2016	Jinkyu Kim*, Xuaner Zhang*, Laura Waller, Brian A. Barsky, and Ren Ng, “Free Your Eyes: Retinal Image Deblurring Display with Enlarged Viewing Zone” (*equally contributed)	<i>IEEE ICCP</i>
Jan 2014	Jinkyu Kim, Wonyeol Lee, Jeonghoon Seo and Euiyeol Oh, “An OLED Driving Currents Compensation Method with a CCD Camera”	<i>IEEE ICCE</i>
Jan 2013	Jinkyu Kim, Gunn Kim, Sungbae An, Young-Kyun Kwon and Sungroh Yoon, “Entropy-Based Analysis and Bioinformatics-Inspired Integration of Global Economic Information Transfer”	<i>PLOS ONE</i>

Professional Activities

Reviewer

AAAI, CVPR, ECCV, NeurIPS, ICCV, ICLR, ICML, IEEE ITSC, IROS, IV, T-IFS, T-PAMI, T-IM

Organizer

CVPR WORKSHOP ON HUMAN-CENTERED INTELLIGENT SERVICES SAFETY AND TRUSTWORTHY

New Orleans

June 2022

Advisor

LG INNOTEK, LG ELECTRONICS

Seoul

June 2022-

Work Experience

Korea University

ASSISTANT PROFESSOR

- Department of Computer Science Engineering

Seoul, South Korea

03/01/2021 -

Waymo LLC

RESEARCH SCIENTIST (FULL-TIME)

- Conditional Behavior Prediction for Self-driving Vehicles

Mountain View, CA, USA

01/27/2020 - 02/19/2021

Waymo LLC

RESEARCH INTERN (FULL-TIME)

- Explainable Learning for Self-driving Vehicles

Mountain View, CA, USA

05/20/2019 - 08/23/2019

Honda Research Institute

RESEARCH INTERN (FULL-TIME)

- Advisable Learning for Self-driving Vehicles

Mountain View, CA, USA

05/14/2018 - 08/17/2018

Honda Research Institute

RESEARCH INTERN(PART-TIME)

- Advisable Learning for Self-driving Vehicles

Mountain View, CA, USA

09/27/2018 - 12/14/2018

Phantom AI Inc. (Start-up for Self-driving Vehicles)

RESEARCH INTERN (FULL-TIME)

- Low Latency Deep Neural Perception for Self-driving Cars

San Mateo, CA, USA

05/15/2017 - 08/11/2017

Phantom AI Inc. (Start-up for Self-driving Vehicles)

RESEARCH INTERN (PART-TIME)

- Low Latency Deep Neural Perception for Self-driving Cars

San Mateo, CA, USA

09/19/2017 - 12/15/2017

Samsung SDS

RESEARCH INTERN @ANALYTICS LAB

- Deep Anomalies Detection for Manufacturing Process

Seoul, South Korea

07/06/2015 - 07/24/2015

Seoul National University

RESEARCH ASSISTANT @SNU DATA SCIENCE & ARTIFICIAL INTELLIGENCE LAB

- Collaborative Analytics by Ensemble Learning for Resolving Data-Silo issues

Seoul, South Korea

07/01/2014 - 05/31/2015

LG Display Co. Ltd.

RESEARCH ENGINEER @RESEARCH CENTER

- Display Device Image Quality Optimization & SW Algorithm Development
- For the fulfillment of three years of mandatory military service in South Korea

Seoul, South Korea

11/30/2010 - 03/14/2014

Collaborators

- 2021- **CLOVA AI**, NAVER, Korea
- 2021- **Algorithm Team**, LG Display, Korea
- 2021- **Autonomous Driving Group**, 42dot, Korea
- 2021- **Autonomous Driving Team**, Hyundai Autonomous Driving Center, Korea
- 2019- **Applied Research Team**, Waymo LLC, USA
- 2018- **Human-Machine Interaction Research Team**, Honda Research Institute, USA
- 2017- **Zeynep Group**, Univ. of Amsterdam Computer Science
- 2017- **Darrell Group**, Berkeley Computer Science
- 2017- **Whitney Group**, Berkeley Psychology
- 2017- **Deep Perception Team**, Phantom AI Inc, USA
- 2016- **Computational Imaging Research Group**, Berkeley Computer Science

Scholarship & Awards

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|------|---|--------------------|
| 2016 | Frank and Margaret Lucas Scholarship , UC Berkeley | <i>Scholarship</i> |
| 2015 | Samsung Scholarship , Samsung Foundation | <i>Scholarship</i> |
| 2015 | Fulbright Graduate Program Award (<i>Declined</i>) , Fulbright | <i>Scholarship</i> |
| 2013 | CEO Award (Best Research Engineer) , LG Display Co., Ltd. | <i>Award</i> |
| 2009 | STX Scholarship , STX Foundation | <i>Scholarship</i> |
| 2008 | Summa Cum Laude , Korea University | <i>Award</i> |
| 2008 | STX Scholarship , STX Foundation | <i>Scholarship</i> |
| 2005 | Undergraduate Scholarship , Korea University | <i>Scholarship</i> |