

## RESEARCH INTERESTS

- **Computer Vision** - Action and behavior generation, Video diffusion, Vision-language models
- **Robotics** - Trajectory prediction, Crowd modeling, Autonomous vehicle
- **Machine Learning** - Deep learning, Graph neural network

## EDUCATION

### Gwangju Institute of Science and Technology

Ph.D. in AI Graduate School, GPA: 4.5/4.5 (100/100)

- Advisor: Prof. Hae-Gon Jeon
- Dissertation: "A Triad of Crowd Behavior Modeling: Recognition, Generation and Reproduction"

Gwangju, S. Korea  
Sep 2021 – Present

### Gwangju Institute of Science and Technology

M.S. in Electrical Engineering and Computer Science, GPA: 4.2/4.5 (96/100)

- Advisor: Prof. Hae-Gon Jeon
- Thesis: "Disentangled Multi-Relational Graph Convolutional Network for Pedestrian Trajectory Prediction"

Gwangju, S. Korea  
Mar 2020 – Aug 2021

### Daegu Gyeongbuk Institute of Science and Technology

B.E. in Convergence Engineering, GPA: 3.9/4.3 (95/100)

- Advisor: Prof. Gyeungho Choi and Prof. Yongseob Lim
- Thesis: "An Urban Autodriving Algorithm Based on a Sensor-Weighted Integration Field with Deep Learning"

Daegu, S. Korea  
Mar 2016 – Feb 2020

### Korea Advanced Institute of Science and Technology

Winter Sessions

Daejeon, S. Korea  
Dec 2018 – Jan 2019

### University of California, Berkeley

Summer Sessions

Berkeley CA, USA  
Jul 2017 – Aug 2017

## PUBLICATIONS

- [1] **I. Bae**, J. Lee, and H.-G. Jeon, "Can language beat numerical regression? language-based multimodal trajectory prediction", in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, Jun. 2024.
- [2] **I. Bae**, Y.-J. Park, and H.-G. Jeon, "Singulartrajectory: Universal trajectory predictor using diffusion model", in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, Jun. 2024.
- [3] J. Lee, H. Jung, J.-H. Park, **I. Bae**, and H.-G. Jeon, "Geometry-aware projective mapping for unbounded neural radiance fields", in *Proceedings of the International Conference on Learning Representations (ICLR)*, May 2024.
- [4] **I. Bae**, J. Oh, and H.-G. Jeon, "Eigentrajjectory: Low-rank descriptors for multi-modal trajectory forecasting", in *Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV)*, Oct. 2023.
- [5] J.-H. Park, J. Choe, **I. Bae**, and H.-G. Jeon, "Learning affinity with hyperbolic representation for spatial propagation", in *Proceedings of the Fortieth International Conference on Machine Learning (ICML)*, Jul. 2023.
- [6] **I. Bae** and H.-G. Jeon, "A set of control points conditioned pedestrian trajectory prediction", *Thirty-Seventh AAAI Conference on Artificial Intelligence (AAAI)*, [Oral presentation], Feb. 2023.
- [7] **I. Bae**, J.-H. Park, and H.-G. Jeon, "Learning pedestrian group representations for multi-modal trajectory prediction", in *Proceedings of the European Conference on Computer Vision (ECCV)*, Oct. 2022.
- [8] **I. Bae**, J.-H. Park, and H.-G. Jeon, "Non-probability sampling network for stochastic human trajectory prediction", in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, Jun. 2022.
- [9] **I. Bae** and H.-G. Jeon, "Disentangled multi-relational graph convolutional network for pedestrian trajectory prediction", *Thirty-Fifth AAAI Conference on Artificial Intelligence (AAAI)*, Feb. 2021.
- [10] M. Oh\*, B. Cha\*, **I. Bae\***, G. Choi, and Y. Lim, "An urban autodrivng algorithm based on a sensor-weighted integration field with deep learning", *Electronics*, vol. 9, no. 1, 2020.
- [11] **I. Bae\***, M. Oh\*, B. Cha\*, Y. Lim, and G. Choi, "Deep learning based steering angle correction system using vanishing point for autonomous vehicle", in *SOI/mC*, Nagoya, Japan, 2019.
- [12] M. Oh, B. Cha, **I. Bae**, H. Choi, J. Cho, J. Jeong, K. Park, G. Koo, D. Choi, T. Kim, G. Shin, Y. Kim, J. Hwan, Y. Kim, G. Choi, and Y. Lim, "Adaptive urban auto-driving algorithm based on sensor weighted integration field", in *The Fall Conference of Korea Automotive Safety Association*, Jeju, Korea, 2019.

- [13] **I. Bae**, B. Cha, M. Oh, H. Choi, J. Cho, J. Jeong, K. Park, G. Koo, D. Choi, T. Kim, G. Shin, Y. Kim, J. Hwang, Y. Kim, G. Choi, and Y. Lim, “Sparse spatial cnn for traffic lane recognition on urban road environments”, in *The Fall Conference of Korea Automotive Safety Association*, Jeju, Korea, 2019.
- [14] K. Park, G. Ko, Y. Kim, Y. Kim, T. Kim, **I. Bae**, G. Shin, M. Oh, J. Jeong, J. Cho, B. Cha, D. Choi, H. Choi, J. Hwang, G. Choi, and Y. Lim, “Development of collision-free path planning algorithm considering moving path of dynamic obstacles in artificial potential field for autonomous vehicles”, in *The Fall Conference of Korea Automotive Safety Association*, Jeju, Korea, 2019.
- [15] **I. Bae**, Y. Kim, T. Kim, M. Oh, H. Ju, S. Kim, G. Shin, S. Yoon, C. Lee, Y. Lim, and G. Choi, “Improved environment recognition algorithms for autonomous vehicle control”, *Journal of Auto-Vehicle Safety Association*, vol. 11, no. 1, pp. 35–43, 2019.
- [16] **I. Bae**, T. Kim, M. Oh, H. Ju, Y. Kim, Y. Lim, and G. Choi, “Improved environment recognition and integrated control algorithms for autonomous vehicle”, in *The Fall Conference of Korea Automotive Safety Association*, Wonju, Korea, 2018.

## PATENTS

- [1] H.-G. Jeon, J. Lee, H. Jung, J.-H. Park, and **I. Bae**, “Radiance field implementation method and system using adaptive mapping function”, *KR Patent App. 10-2024-0044389*, Apr. 2024.
- [2] H.-G. Jeon, **I. Bae**, and Y.-J. Park, “Integrated trajectory estimation method and system based on generative model”, *KR Patent App. 10-2024-0037757*, Mar. 2024.
- [3] H.-G. Jeon, **I. Bae**, and J. Lee, “Trajectory prediction method and system using a large language model”, *KR Patent App. 10-2024-0037756*, Mar. 2024.
- [4] H.-G. Jeon and **I. Bae**, “Pedestrian trajectory prediction apparatus”, *KR Patent No. 10-2591707*, Oct. 2023.
- [5] H.-G. Jeon and **I. Bae**, “Pedestrian trajectory prediction apparatus”, *KR Patent No. 10-2537381*, May. 2023.
- [6] H.-G. Jeon, **I. Bae**, and J.-H. Park, “Pedestrian trajectory prediction method using non-probability sampling”, *US Patent App. 18/174,716*, Feb. 2023.
- [7] H.-G. Jeon and **I. Bae**, “Pedestrian trajectory prediction method using trajectory descriptors representing actual walking patterns”, *KR Patent App. 10-2023-0027247*, Feb. 2023.
- [8] H.-G. Jeon and **I. Bae**, “Pedestrian trajectory prediction apparatus”, *US Patent App. 17/680,023*, Oct. 2022.
- [9] H.-G. Jeon, J.-H. Park, and **I. Bae**, “Image convolutional method in hyperbolic space”, *US Patent App. 17/813,963*, Jul. 2022.
- [10] H.-G. Jeon, J.-H. Park, and **I. Bae**, “Image convolutional method in hyperbolic space”, *KR Patent No. 10-2388760*, Apr. 2022.
- [11] H.-G. Jeon, **I. Bae**, and J.-H. Park, “Pedestrian trajectory prediction method using grouping pedestrian”, *KR Patent App. 10-2022-0052202*, Apr. 2022.
- [12] H.-G. Jeon, **I. Bae**, and J.-H. Park, “Pedestrian trajectory prediction method using non-probability sampling”, *KR Patent App. 10-2022-0032099*, Mar. 2022.

## RESEARCH EXPERIENCE

### Carnegie Mellon University

Visiting Researcher

- Bot Intelligence Group, The Robotics Institute
- Advisor: Prof. Jean Oh

Pittsburgh PA, USA

Sep 2022 – Dec 2022

### Daedong Industrial Co., Ltd.

Sponsored Researcher

- Consignment research for autonomous driving rice transplanter and tractor software
- Real-time environment detection and segmentation using stereo camera, LiDAR and GPS

Daegu, S. Korea

Jan 2019 – Dec 2019

### SONNET.ai

Software Engineer

- Autonomous Cooperative Driving on Urban Roads
- Urban environment SLAM and 3D mapping with ROS and Autoware

Daegu, S. Korea

May 2019 – Sep 2019

### Daegu Gyeongbuk Institute of Science and Technology

Full-time Intern

- Visual Computing Lab, Departments of Information and Communication Engineering
- Image super-resolution, Advisor: Sunghyun Cho

Daegu, S. Korea

Summer 2018

### Convergence Research Institute

Research Intern

- Research Departments of Division of Automotive Technology, DGIST
- Survey research on self-driving car technologies, Advisor: Dr. Soon Kwon

Daegu, S. Korea

Winter 2017

## HONORS AND AWARDS

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### Awards

- Excellent Paper Award, International Workshop on Frontiers of Computer Vision (IW-FCV 2023). Feb 2023
- Finalist, [2022 Qualcomm Innovation Fellowship Korea](#), [Qualcomm Technologies](#), Inc. Nov 2022
- Bronze Prize, [27th HumanTech Paper Award](#), [Samsung Electronics Co., Ltd.](#) Feb 2021
- Excellence Prize, Oral Presentation Session, 1st Convergence University Academic Symposium, DGIST. Sep 2019
- Bronze Prize, International Autonomous Driving Competition, Competition on Korea Autonomous Driving Experiment City (K-City), Korea Transportation Safety Authority. Sep 2019
- First Prize, Best Bachelor Thesis Award, Part of Undergraduate Group Research Curriculum, DGIST. Jan 2019
- First Prize, International Student Green Car Competition, Autonomous Vehicle Technical Report, Korea Transportation Safety Authority & Korea Auto-Vehicle Safety Association. May 2018
- Bronze Prize, International Autonomous Driving Competition, Competition on Korea Autonomous Driving Experiment City (K-City), Korea Transportation Safety Authority. May 2018

### Honors

- CVPR 2024 Doctoral Consortium, Seattle WA, USA. Mar 2024
- 1st Place, RA Student Research Achievement Scholarship, AI Graduate School, GIST. Dec 2023
- 10th Sunseom Scholarship, Development Foundation, GIST. Nov 2023
- Outstanding Reviewer, International Conference on Computer Vision, Paris, France. Oct 2023
- Travel Scholarship Funding, AAAI-23 student scholarship and volunteer program, Association for the Advancement of Artificial Intelligence, Washington, DC, USA. Dec 2022
- 2nd Place, RA Student Research Achievement Scholarship, AI Graduate School, GIST. Dec 2022
- Overseas Internship Program Scholarship Funding, AI Graduate School, GIST. Sep 2022
- International Computer Vision Summer School (ICVSS 2022), Sicily, Italy. Jul 2022
- RA Student Academic Grade Scholarship, School of Electrical Engineering and Computer Science, GIST. Nov 2020
- World Friends ICT Volunteer, Education service of programming language (Python), Photoshop, and Video Editing, Volunteered in Can Tho University (CTU), Vietnam. Jul 2016 – Aug 2016

## RESEARCH PROJECTS

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### Video Diffusion Models

- Text description guided kinetic typography generation Nov 2023 – Present
- Related publications: Under-Review

### Vision and Language

- Combining visual information with natural language processing May 2023 – Present
- Related publications: CVPR'24 [1], Under-Review

### Trajectory Prediction

- Studies about autonomous navigation and social robots in human environments Jan 2020 – Present
- Related publications: CVPR'24 [1-2], ICCV'23 [4], AAAI'23 [6], ECCV'22 [7], CVPR'22 [8], AAAI'21 [9]

### Geometric Cues

- Hyperbolic geometry and stereographic projection for low-level vision and view synthesis May 2021 – Sep 2023
- Related publications: ICLR'24 [3], ICML'23 [5]

### Autonomous Driving

- Hardware & software for autonomous vehicles in urban environments Dec 2017 – Dec 2019
- Related publications: Electronics [10], SOItrmc [11], KASA [12-16]

## ACADEMIC SERVICES

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### Conference Reviewer

- IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) - 2023, 2024
- IEEE/CVF International Conference on Computer Vision (ICCV) - 2023 (**Outstanding Reviewer**)
- IEEE International Conference on Robotics and Automation (ICRA) - 2024

### Journal Reviewer

- IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)
- IEEE Transactions on Intelligent Transportation Systems (T-ITS)
- IEEE Transactions on Circuits and Systems for Video Technology (TCSVT)
- IEEE Transactions on Intelligent Vehicles (T-IV)

### Social Service

- Military Service (Korea Army Training Center) - 2023