

Chiho Choi, Ph.D.

Computer Vision | Machine Learning

CONTACT INFORMATION

Honda Research Institute USA Inc.
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[Website](#)
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RESEARCH INTEREST

My research interest lies at the intersection of machine learning and computer vision, focusing on understanding and prediction of human behavior in a highly interactive environment. In this area, I build a new perspective for the safe operation of vehicles and robots designed to cooperate with humans.

- Trajectory Forecast
- Behavior Prediction
- Intention Prediction
- Uncertainty Modeling
- Action Recognition
- Pose Estimation

EDUCATION

Purdue University West Lafayette, IN, USA
Ph.D., Electrical and Computer Engineering January 2018

- Specialization: deep learning, 3D vision, recognition, tracking
- Committee members: Karthik Ramani, Stanley H. Chan, Mireille Boutin, Jeffrey M. Siskind

University of Southern California Los Angeles, CA, USA
M.S., Electrical Engineering May 2013

- Specialization: 3D shape matching, registration
- Advisor: Prof. Suya You, Department of Computer Science

Hanyang University Seoul, Korea
B.S., Electronics and Computer Engineering February 2011

- Minor: Mechanical Engineering

WORK EXPERIENCE

Honda Research Institute USA San Jose, CA, USA
Scientist February 2018 – Present

- Leading multiple projects on recognition and prediction of human action, intention, and future behavior.
- Publications in CVPR (oral), ICCV, ACC, ICRA, IROS, CoRL, and NeurIPS.

HERE Technologies Chicago, IL, USA
Intern May 2017 – August 2017

- Worked on traffic scene understanding for highly automated driving.
- Supervisor: Xiang Ma

PUBLICATIONS

Refereed Papers

- [C13] J. Li*, F. Yang*, M. Tomizuka, and **C. Choi**. “EvolveGraph: Multi-Agent Trajectory Prediction with Dynamic Relational Reasoning”. *Proceedings of the Conference on Neural Information Processing Systems (NeurIPS) 2020*. *arXiv: 2003.13924*
- [C12] **C. Choi**, S. Malla, A. Patil, and J. H. Choi. “DROGON: A Trajectory Prediction Model based on

Intention-Conditioned Behavior Reasoning”. *Proceedings of the Conference on Robot Learning (CoRL) 2020*. *arXiv:1908.00024*

- [C11] I. Dwivedi, S. Malla, B. Dariush, and **C. Choi**. “SSP: Single Shot Future Trajectory Prediction”. *Proceedings of the IEEE International Conference on Intelligent Robots and Systems (IROS) 2020*. *arXiv: 2004.05846*
- [C10] S. Malla, B. Dariush, and **C. Choi**. “TITAN: Future Forecast using Action Priors”. *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2020*, **oral**. *arXiv:2003.13886*
- [C9] S. Bae, D. Saxena, A. Nakhaei, **C. Choi**, K. Fujimura, and S. Moura. “Cooperation-Aware Lane Change Maneuver in Dense Traffic based on Model Predictive Control with Recurrent Neural Network”. *Proceedings of the American Control Conference (ACC) 2020*, to appear. *arXiv:1909.05665*.
- [C8] **C. Choi** and B. Dariush. “Looking to Relations for Future Trajectory Forecast”. *Proceedings of the IEEE International Conference on Computer Vision (ICCV) 2019*.
- [C7] **C. Choi** and B. Dariush. “Learning to Infer Relations for Future Trajectory Forecast”. *In the IEEE Conference on Computer Vision and Pattern Recognition (CVPR) Workshops 2019*.
- [C6] Y. Yao, M. Xu, **C. Choi**, D. Crandall, E. Atkins, and B. Dariush. “Egocentric Vision-based Future Vehicle Localization for Intelligent Driving Assistance Systems”. *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA) 2019*.
- [C5] M. Liu, F. Yao, **C. Choi**, A. Sinha, and K. Ramani. “Deep Learning 3D Shapes Using Alt-az Anisotropic 2-Sphere Convolution”. *Proceedings of the International Conference on Learning Representations (ICLR) 2019*.
- [C4] **C. Choi**, S. Kim, and K. Ramani. “Learning Hand Articulations by Hallucinating Heat Distribution”. *Proceedings of the IEEE International Conference on Computer Vision (ICCV) 2017*.
- [C3] **C. Choi**, S. H. Yoon, C. N. Chen, and K. Ramani. “Robust Hand Pose Estimation during the Interaction with an Unknown Object”. *Proceedings of the IEEE International Conference on Computer Vision (ICCV) 2017*.
- [C2] **C. Choi***, A. Sinha*, and K. Ramani (* Co-first Author, order changed for emphasis). “DeepHand: Robust Hand Pose Estimation by Completing a Matrix Imputed with Deep Features”. *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2016*.
- [C1] **C. Choi**, A. Sinha, J. H. Choi, S. Jang, and K. Ramani. “A Collaborative Filtering Approach to Real-Time Hand Pose Estimation”. *Proceedings of the IEEE International Conference on Computer Vision (ICCV) 2015*.

Non-Refereed Papers

- [T5] **C. Choi**. “Shared Cross-Modal Trajectory Prediction for Autonomous Driving”. *arXiv preprint arXiv: 2004.00202, 2020*.
- [T4] S. Su, C. Peng, J. Shi, and **C. Choi**. “Potential Field: Interpretable and Unified Representation for Trajectory Prediction”. *arXiv preprint arXiv:1911.07414, 2019*.
- [T3] S. Malla, I. Dwivedi, B. Dariush, and **C. Choi**. “NEMO: Future Object Localization Using Noisy Ego Priors”. *arXiv preprint arXiv:1909.08150, 2019*.
- [T2] **C. Choi**, S. Kim, J. H. Choi, and K. Ramani. “Embedding Compressive Layers in Deep Neural Networks”. <http://www.chihochoi.me/embedding.pdf>, May 2017.
- [T1] **C. Choi** and S. You. “Dense and Reliable Shape Matching using 3D Particle Filtering”. *CGIT Lab Technical Report, University of Southern California, May 2013*.

Thesis

- [D1] **C. Choi**. “Computational Learning for Hand Pose Estimation”. *Ph.D. Dissertation, Purdue University, Jan 2018*.

PATENT APPLICATIONS

- [P16] S. Malla and **C. Choi**. “System and Method for Spatio-Temporal Multi-Modal Future Trajectory Forecast”. Application pending.
- [P15] **C. Choi**. “System and Method for Shared Cross-Modal Trajectory Prediction”. Application pending.
- [P14] J. Li and **C. Choi**. “System and Method for Trajectory Prediction with Evolving Interaction Graphs”. Application pending.
- [P13] I. Dwivedi, S. Malla, **C. Choi**, and Behzad Dariush. “System for Single Shot Prediction using Composite Fields and Method Thereof”. Application pending.
- [P12] S. Malla, **C. Choi**, and Behzad Dariush. “System and Method for Future Forecasting using Action Priors”. Application pending.
- [P11] S. Su and **C. Choi**. “System and Method For Providing an Interpretable and Unified Representation for Trajectory Prediction”. Application pending.
- [P10] S. Malla and **C. Choi**. “System and Method For Providing Future Object Localization Using Noisy Ego Priors”. Application pending.
- [P9] A. Nakhaei, **C. Choi**, K. Fujimura, S. Bae, D. Saxena. “System and Method For Providing Cooperation-Aware Lane Change Control in Dense Traffic”. Application pending.
- [P8] **C. Choi**. “Trajectory Prediction”. Application pending.
- [P7] **C. Choi**. “Methods and Apparatuses for Future Trajectory Forecast”. No. 16372058
- [P6] Y. Yao, M. Xu, **C. Choi**, and B. Dariush. “System and Method for Egocentric-vision based Future Vehicle Localization”. Publication No. 20200086858
- [P5] X. Chen, X. Ma, S. Sood, and **C. Choi**. “Semi-automatic Training Data Selection based on High-dimensional Data Projection to Subspaces”. Application pending.
- [P4] X. Chen, X. Ma, S. Sood, and **C. Choi**. “Deep Neural Machine for Lane Marking Style Classification based on Unwrapped Perspective Images”. Application pending.
- [P3] X. Chen, X. Ma, S. Sood, and **C. Choi**. “Deep Neural Machine for Lane Marking Color and Material Classification based on Image Patches”. Application pending.
- [P2] A. Sinha, **C. Choi**, J. H. Choi, and K. Ramani. “Method of training neural networks for hand pose detection”. Patent No. US10503270
- [P1] A. Sinha, **C. Choi**, J. H. Choi, and K. Ramani. “Method and System for Hand Pose Estimation”. Patent No. US10318008

TEACHING EXPERIENCE

PhD Students Supervised / Mentored

- Jiachen Li, from University of California Berkeley September 2019 – Present
- Shan Su, from University of Pennsylvania July 2019 – Present
- Sangjae Bae, from University of California Berkeley June 2019 – September 2019
- Yu Yao, from University of Michigan May 2018 – August 2018

Teaching Assistant

- Purdue University January 2015 – May 2015
ME 444: Computer-aided Design and Rapid Prototyping
Introduction to advanced computer-aided design (CAD) for product design, modeling, and prototyping.
- University of Southern California August 2012 – December 2012
CSCI-588 Specification and Design of User Interface Software (graduate-level course)
A design and implementation of user interface software relating to human/computer interaction.

INVITED TALKS

Guest Lecturer, Purdue University

December 2017

- Introduction to Pose Estimation – Probabilistic models in computer vision

ACADEMIC SERVICES

Publication Committee

- Honda Research Institute USA

February 2020 – Present

Program Committee / Reviewer

- IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2018, 2019, 2020, 2021
- Association for Advancement of Artificial Intelligence (AAAI) 2020, 2021
- International Conference on Learning Representations (ICLR) 2021
- IEEE Winter Conference on Applications of Computer Vision (WACV) 2021
- Asian Conference on Computer Vision (ACCV) 2018, 2020
- Neural Information Processing Systems (NeurIPS) 2020
- European Conference on Computer Vision (ECCV) 2020
- IEEE Intelligent Vehicles Symposium 2020
- IEEE Transactions on Intelligent Vehicles 2020
- IEEE International Conference on Computer Vision (ICCV) 2019
- ACM CHI Conference on Human Factors in Computing Systems 2019
- IEEE Transactions on Image Processing 2018
- IEEE Transactions on Multimedia 2017

HORNORS

National Science and Technology Scholarship

2003 – 2010

from *Ministry of Education, Science and Technology*, Korea

SKILLS

Programming Languages

Python, C/C++

Deep Learning Frameworks

TensorFlow, PyTorch, Caffe, MatConvNet

Graphic Tools

Unity, Blender

MCU Tools

CodeVision, Code Composer Studio

CAD Tools

PTC Creo Parametric, CATIA

MEDIA COVERAGE

- [Looking to Relations for Future Trajectory Forecast](#), ICCV Daily Magazine, October 30 2019.
- [AI Can Predict the Future Location of Vehicles](#), NVIDIA NEWS Center, September 27 2018.
- [Freeing Our Fingers: Handing Over VR's Toughest Challenge to GPUs](#), NVIDIA Blog, August 24 2016.
- [AI and VR: New Experiments at Purdue University](#), ENGINEERING.com, June 30 2016
- [DeepHand motion tracking enters the VR arms race](#), New Atlas, June 23 2016
- [New tool for virtual and augmented reality uses 'deep learning'](#), Purdue News, June 22 2016.
<https://youtu.be/RhIjq-MxcW0>

REFERENCES

Available Upon Request