

NICHOLAS RHINEHART

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Last updated: 2020/07/01

CURRENT POSITION

University of California, Berkeley Oct 2019 – Present
Postdoctoral Scholar, EECS Department, Berkeley A.I. Research (BAIR).
Adviser: Sergey Levine

EDUCATION

Carnegie Mellon University, The Robotics Institute of the School of Computer Science Sep 2019
Doctor of Philosophy in Robotics
Adviser: Kris Kitani

Carnegie Mellon University, The Robotics Institute of the School of Computer Science May 2017
Master of Science in Robotics
Advisers: Kris Kitani, Drew Bagnell

Swarthmore College May 2012
Bachelor of Arts in Computer Science, Bachelor of Science in Engineering
Adviser: Matt Zucker

RESEARCH EXPERIENCE

University of California, Berkeley, EECS Department, Berkeley A.I. Research (BAIR) Oct 2019 – Present
Postdoctoral Scholar with Sergey Levine

University of California, Berkeley, EECS Department, Berkeley A.I. Research (BAIR) Jun 2018 – Nov 2018
Visiting Researcher with Sergey Levine

NEC Labs America, Media Analytics Department May 2017 – Sep 2017
Research Assistant with Paul Vernaza

Uber Advanced Technologies Group Jun 2016 – Sep 2016
Research Engineer with Drew Bagnell

University of Tokyo, Institute of Industrial Science Jun 2015 – July 2015
Visiting Researcher with Kris Kitani and Yoichi Sato

Carnegie Mellon University, The Robotics Institute of the School of Computer Science Aug 2014 – Sep 2019
Doctoral Student Researcher with Kris Kitani

Carnegie Mellon University, The Robotics Institute of the School of Computer Science Jan 2013 – Aug 2014
Graduate Student Researcher with Drew Bagnell

ACADEMIC AWARDS

PAPER AWARDS

Best Paper Award, ICML 2019 Workshop on AI for Autonomous Driving 2019
For the paper: PRECOG (Rhinehart et al.)

Best Paper Honorable Mention Award, ICCV 2017 2017
For the paper: First-Person Activity Forecasting (Rhinehart et al.). Awarded to 3 of 2,143 submissions.

FELLOWSHIP AWARDS

- PhD Fellowship, Center for Machine Learning and Health** 2018
Awarded full tuition and funds for *Automatic Forecasting and Understanding of Behavior* research proposal
- IBM PhD Fellowship Finalist** 2017
Nominated as one of three CMU Robotics Institute candidates for the IBM PhD Fellowship
- The Robert E., Elizabeth, and Walter Lamb Scholarship, Swarthmore College** 2011, 2012
Awarded scholarships on the bases of academic merit and financial need.

SERVICE AWARDS

- Top Reviewer Award, ICCV 2019** 2019
Recognized for reviewing contributions.
- Top Reviewer Award, NeurIPS 2019** 2019
Awarded free conference registration for reviewing contributions.

PUBLICATIONS

JOURNAL PUBLICATIONS

- [1] [First-Person Activity Forecasting from Video with Online Inverse Reinforcement Learning](#)
N. Rhinehart, K. M. Kitani.
IEEE Transactions on Pattern Analysis and Machine Intelligence (**TPAMI**), 2018

CONFERENCE PUBLICATIONS

- [2] [Can Autonomous Vehicles Identify, Recover From, and Adapt to Distribution Shifts?](#)
A. Filos*, P. Tigas*, R. McAllister, **N. Rhinehart**, S. Levine, Y. Gal
International Conference of Machine Learning (**ICML**), [22% *accepted*], 2020
- [3] [Generative Hybrid Representations for Activity Forecasting with No-Regret Learning](#)
J. Guan, Y. Yuan, K. M. Kitani, **N. Rhinehart**
Oral Presentation, Computer Vision and Pattern Recognition (**CVPR**), [22% *accepted*], [4.6% *accepted for Oral*], 2020
- [4] [Deep Imitative Models for Flexible Inference, Planning, and Control](#)
N. Rhinehart, R. McAllister, S. Levine
International Conference on Learning Representations (**ICLR**), [27% *accepted*], 2020
- [5] [PRECOG: PREdiction Conditioned On Goals in Visual Multi-Agent Settings](#)
N. Rhinehart, R. McAllister, K. M. Kitani, S. Levine
IEEE International Conference on Computer Vision (**ICCV**), [25% *accepted*], 2019
- [6] [Directed-Info GAIL: Learning Hierarchical Policies from Unsegmented Demonstrations using Directed Information](#)
M. Sharma, A. Sharma, **N. Rhinehart**, K. M. Kitani
International Conference on Learning Representations (**ICLR**), [31% *accepted*], 2019
- [7] [R2P2: A Reparameterized Pushforward Policy for Diverse, Precise Generative Path Forecasting](#)
N. Rhinehart, K. M. Kitani, P. Vernaza
European Conference on Computer Vision (**ECCV**), [32% *accepted*], 2018
- [8] [Learning Neural Parsers with Deterministic Differentiable Imitation Learning](#)
T. Shankar, **N. Rhinehart**, K. Muelling, K. M. Kitani
Conference on Robot Learning (**CoRL**), [31% *accepted*], 2018

- [9] [Human-Interactive Subgoal Supervision for Efficient Inverse Reinforcement Learning](#)
X. Pan, E. Ohn-Bar, **N. Rhinehart**, Y. Xu, Y. Shen, K. M. Kitani
International Conference on Autonomous Agents and Multiagent Systems (**AAMAS**), [25% *accepted*], 2018
- [10] [N2N Learning: Network to Network Compression via Policy Gradient Reinforcement Learning](#)
A. Ashok, **N. Rhinehart**, F. Beainy, K. M. Kitani
International Conference on Learning Representations (**ICLR**), [32% *accepted*], 2018
- [11] [Predictive-State Decoders: Encoding the Future into Recurrent Networks](#)
A. Venkatraman*, **N. Rhinehart***, W. Sun, L. Pinto, M. Hebert, B. Boots, K. M. Kitani, J. A. Bagnell
Neural Information Processing Systems (**NIPS**), [21% *accepted*], 2017
- [12] [First-Person Activity Forecasting with Online Inverse Reinforcement Learning](#)
N. Rhinehart, K. M. Kitani.
Oral, IEEE International Conference on Computer Vision (**ICCV**), [29% *accepted*], [2% *accepted for Oral*], 2017
Best Paper Honorable Mention Award. Awarded to 3 of 2,143 submissions
- [13] [Learning Action Maps of Large Environments via First-Person Vision](#)
N. Rhinehart, K. M. Kitani
Computer Vision and Pattern Recognition (**CVPR**), [30% *accepted*], 2016
- [14] [Visual Chunking: A List Prediction Framework for Region-Based Object Detection](#)
N. Rhinehart, J. Zhou, M. Hebert, J. A. Bagnell
International Conference on Robotics and Automation (**ICRA**), [41% *accepted*], 2015

PRE-PRINTS

- [15] [Unsupervised Sequence Forecasting of 100,000 Points for Unsupervised Trajectory Forecasting](#)
X. Weng, J. Wang, S. Levine, K. Kitani, **N. Rhinehart**
arXiv:2003.08376, 2020
- [16] [SMiRL: Surprise Minimizing RL in Dynamic Environments](#)
G. Berseth, D. Geng, C. Devin, **N. Rhinehart**, C. Finn, D. Jayaraman, S. Levine
arXiv:1912.05510, 2019

REFEREED WORKSHOP AND SYMPOSIA PUBLICATIONS

- [17] [Robust Imitative Planning: Planning from Demonstrations Under Uncertainty](#)
P. Tigas, A. Filos, R. McAllister, **N. Rhinehart**, S. Levine, Y. Gal
Neural Information Processing Systems (**NeurIPS**) Workshop on Machine Learning for Autonomous Driving, 2020
- [18] [PRECOG: PREDiction Conditioned On Goals in Visual Multi-Agent Settings](#)
N. Rhinehart, R. McAllister, K. M. Kitani, S. Levine
International Conference on Machine Learning (**ICML**), AI for Autonomous Driving, **Best Paper Award**, 2019
Bay Area Machine Learning Symposium (**Baylearn**), **Oral Presentation**, 2019
- [19] [Deep Imitative Models for Flexible Inference, Planning, and Control](#)
N. Rhinehart, R. McAllister, S. Levine
Neural Information Processing Systems (**NeurIPS**), Prob. RL & Structured Control, **Oral (top 6 of 27 papers)**, 2018
Neural Information Processing Systems (**NeurIPS**), MLITS, **Oral (top 3 of 25 papers)**, 2018
- [20] [Learning Gibbs-Regularized Pushforward Density Estimators with a Symmetric KL Objective](#)
N. Rhinehart, A. Liu, K. Sohn, P. Vernaza
Bay Area Machine Learning Symposium (**Baylearn**), 2018

- [21] R2P2: A Reparameterized Pushforward Policy for Diverse, Precise Generative Path Forecasting
N. Rhinehart, K. M. Kitani, P. Vernaza
European Conference on Computer Vision (ECCV), Anticipating Human Behavior, 2018
- [22] Learning Hierarchical Policies from Unsegmented Demonstrations using Causal Information
M. Sharma, A. Sharma, N. Rhinehart, K. M. Kitani
Robotics: Science and Systems (RSS), Causal Imitation in Robotics, 2018
- [23] Human-Interactive Subgoal Supervision for Efficient Inverse Reinforcement Learning
X. Pan, E. Ohn-Bar, N. Rhinehart, Y. Xu, Y. Shen, K. M. Kitani
International Joint Conference on Artificial Intelligence (IJCAI), Autonomy in Teams, 2018
- [24] Predictive-State Decoders: Encoding the Future into Recurrent Networks
N. Rhinehart*, A. Venkatraman*, W. Sun, L. Pinto, M. Hebert, B. Boots, K. M. Kitani, J. A. Bagnell
Conference on Robot Learning (CoRL), [33% accepted], 2017
- [25] Fine-Grained Detection via Efficient Extreme Classification
N. Rhinehart, J. Zhou, M. Hebert, J. A. Bagnell
Neural Information Processing Systems (NIPS) Workshop on Extreme Classification, 2013
Mid-Atlantic Computer Vision (MACV) Poster, 2014

PATENTS

- [26] Generative Adversarial Inverse Trajectory Optimization for Probabilistic Vehicle Forecasting
P. Vernaza, W. Choi, N. Rhinehart
US20190095731A1, Pending, 2019
- [27] Traffic prediction with reparameterized pushforward policy for autonomous vehicles
P. Vernaza, N. Rhinehart
US20190287404A1, Pending, 2019
- [28] Balancing diversity and precision of generative models with complementary density estimators
P. Vernaza, N. Rhinehart, A. Liu, Kihyuk Sohn
US20190355134A1, Pending, 2019

FUNDING AWARDS

T.R.I. Research Grant, Co-Investigator. \$375k per annum.	2021–2024
Fellowship, CMU Center for Machine Learning and Health. \$85k covering full tuition, stipend, and discretionary funds.	2019
Travel Grants (5): NeurIPS (2), CMU Provost (2), ICRA Financial conference travel support.	{2018, 2015}, {2017, 2016}, 2017
Hardware Grant: NVIDIA Granted GPU.	2014

ACADEMIC AND PROFESSIONAL TALKS

INVITED WORKSHOP KEYNOTES

CVPR 2020, Precognition: Seeing through the Future, Seattle, Washington Jun 2020

INVITED WORKSHOP TALKS

ICCV 2019, Workshop on Autonomous Driving - Beyond Single Frame Prediction, Seoul, South Korea Oct 2019
CVPR 2018, Tutorial on Human Activity Forecasting, Salt Lake City, Utah Jun 2018
ACCV 2018, Attention/Intention Understanding Workshop, Perth, Australia Dec 2018

TUTORIALS

CVPR 2018, Organizer and Speaker, Tutorial on Inverse RL for Computer Vision, Salt Lake City, Utah Jun 2018

CONTRIBUTED CONFERENCE TALKS

CVPR 2020, Oral Paper Presentation, Seattle, Washington Jun 2020
Baylearn 2019, Single-Track Oral Paper Presentation, San Francisco, California Oct 2019
ICCV 2017, Single-Track Oral Paper Presentation, Venice, Italy Oct 2017

CONTRIBUTED WORKSHOP TALKS

NeurIPS 2018, Probabilistic RL and Structured Control Workshop, Montreal, Canada Dec 2018
NeurIPS 2018, ML for Intelligent Transportation Systems Workshop, Montreal, Canada Dec 2018
MACV 2016, Oral Presentation, Baltimore, Maryland May 2016
NeurIPS 2013, Workshop on Extreme Classification, Lake Tahoe, Nevada Dec 2013

PANELS

ICCV 2019, Workshop on Autonomous Driving - Beyond Single Frame Prediction, Seoul, South Korea Oct 2019

GUEST LECTURES

CMU, Guest Lecture in Statistical Techniques of Robotics, Pittsburgh, Pennsylvania May 2019
CMU, Guest Lecture in Deep RL and Control (10-703), Pittsburgh, Pennsylvania Nov 2018
CMU, Introduction to Computer Vision, Guest Lecture, Pittsburgh, Pennsylvania Apr 2018
CMU, Graduate Statistical Techniques in Robotics, Guest Lecture, Pittsburgh, Pennsylvania Apr 2018
CMU, Graduate Statistical Techniques in Robotics, Guest Lecture, Pittsburgh, Pennsylvania Sep 2017

INVITED RESEARCH TALKS

Scale AI, Invited talk, San Francisco, California Oct 2019
Tesla, Invited talk, Palo Alto, California Oct 2019
Argo AI, Invited talk, Pittsburgh, Pennsylvania Jul 2019
iSee, Invited talk, Pittsburgh, Pennsylvania May 2019
Zoox, Invited talk, San Francisco, California Jan 2019
Google Waymo, Invited talk, Mountain View, California Nov 2018
U.C. Berkeley, Invited talk at the Robotic Artificial Intelligence and Learning Lab, Berkeley, California Jun 2018
U.C. Berkeley, Invited talk at the Berkeley Deep Drive Group, Berkeley, California Aug 2018

INTERNAL TALKS

CMU, PhD Thesis Defense, Pittsburgh, Pennsylvania Aug 2019
CMU, PhD Thesis Proposal, Pittsburgh, Pennsylvania Jun 2018
NEC Labs America, Research highlight, Cupertino, California Jun 2017
The University of Tokyo IIS, Sato Laboratory, Tokyo, Japan Jun 2015
CMU, Misc-Read Vision Group, Pittsburgh, PA Nov 2015

ACADEMIC ACTIVITY & SERVICE

TEACHING

Tutorials and Guest Lectures

Statistical Techniques in Robotics (16-831), CMU. Instructor: Kris Kitani Spring 2019
Deep RL and Control (10-703), CMU. Instructors: K. Fragkiadaki, T. Mitchell Fall 2018

Organizer and Speaker at CVPR '18 Tutorial on Inverse Reinforcement Learning for Computer Vision	Summer 2018
Computer Vision (16-720), CMU. Instructor: Kris Kitani	Spring 2018
Statistical Techniques in Robotics (16-831), CMU. Instructor: David Held	Spring 2018
Statistical Techniques in Robotics (16-831), CMU. Instructor: Kris Kitani	Fall 2017

Teaching Assistance

Geometry-based Methods in Vision (16-822), CMU.	Fall 2016
Data Structures and Algorithms (CPSC 035), Swarthmore College.	Fall 2011
Data Structures and Algorithms (CPSC 035), Swarthmore College.	Spring 2011
Introduction to Computer Science (CPSC 021), Swarthmore College.	Spring 2010

Tutoring

Fundamentals of Digital Systems (ENGR 015, CS 038), Swarthmore College	Fall 2011
Grade 6–12 Mathematics and Physics	Spring 2009 – Spring 2012

RESEARCH MENTORING

Graduate students

Dhruv Shah (UC Berkeley PhD student)	2020–
Angelos Filos (Oxford PhD student). Co-authored ICML '20 paper with Angelos.	2019–
Panos Tigas (Oxford PhD student). Co-authored ICML '20 paper with Panos.	2019–
Xinshuo Weng (CMU RI PhD student). Last-authored arXiv '20 paper with Xinshuo.	2019–
Yifei Huang (UTokyo I.I.S. PhD visitor). Co-authored CORL '19 submission with Yifei.	2019
Mohit Sharma (CMU MS RI, now PhD at CMU). Co-authored ICLR '19 paper with Mohit.	2018
Arjun Sharma (CMU MS RI, now at Vicarious). Co-authored ICLR '19 paper with Arjun.	2018
Tanmay Shankar (CMU MS RI, now at FAIR). Co-authored CORL '18 paper with Tanmay.	2018
Anubhav Ashok (CMU MS CV, now at Niantic). Co-authored ICLR '18 paper with Anubhav.	2017
Xinlei Pan (UC Berkeley PhD EECS visitor). Co-authored AAMAS '18 paper with Xinlei.	2017

Undergraduate students

Jeff He (UC Berkeley undergrad)	2020–
Jenny Wang (UC Berkeley undergrad)	2020–
Jiaqi Guan (Tsinghua University visitor, now PhD at UIUC). Last-authored CVPR '20 paper (Oral) with Jiaqi.	2018 – 2019

Industry visitors

Teerapat Rojanaarpa (DENSO Corp.)	2018
Ryozo Yamashita (DENSO Corp.)	2017 – 2018

PROFESSIONAL ACTIVITY

Organizer

<i>Co-organizer:</i> NeuRIPS '19 Workshop on Machine Learning for Autonomous Driving	2019
<i>Primary organizer:</i> ICML '19 Workshop on Imitation, Intent, and Interaction (I3)	2019
<i>Primary organizer:</i> CVPR '18 Tutorial on Inverse RL for Computer Vision [recording has >5,000 views]	2018

Conference and Journal Reviewing

ICML '20, ICRA '20, ECCV '20, HRI '20, JAIR '20, NeurIPS '20, TPAMI '20	2020
BMVC 19, CVPR '19, ICML '19, ICCV '19, ICRA '19, NeurIPS '19, TPAMI '19, IJCV '19	2019
CVPR '18, ECCV '18, IJCV '18, IJRR '18, IROS '18	2018
CVPR '17, ICCV '17	2017
CVPR '16	2016

Workshop Reviewing

CVPR '20 Precognition: Seeing through the Future	2020
ICML '19 Exploration in RL, CVPR '19 Precognition: Seeing through the Future, ICCV '19 EPIC	2019
NeurIPS '18 Deep Reinforcement Learning, NeurIPS '18 Imitation Learning and Robotics	2018
ECCV '18 EPIC, ECCV '18 Anticipating Human Behaviors	2018
ICML '18 Exploration in RL, ACCV '18 Attention/Intention Understanding, ACM IUI SymCollab '18	2018
WACV '17 Human Activity Analysis, CVPR '16 Egocentric Behavior	2016 – 2017

UNIVERSITY ACTIVITY

BAIR Undergraduate Mentoring , UC Berkeley	2020
Mentored undergraduates from underrepresented groups to foster participation in AI research	
Ph.D. Admissions Committee , CMU Robotics Institute	2017
Evaluated Ph.D. applications as part of small committee	
M.S. Admissions Committee , CMU Robotics Institute	2015, 2016
Evaluated M.S. applications as part of small committee	
Robotics Institute Representative , CMU Graduate Student Association	2015 – 2017
Represented and liaised between Robotics graduate students and the Graduate Student Assembly	
Co-Chair , Swarthmore Philanthropy Council	2011 – 2012
Assist in coordinating alumni fundraising efforts	
Class Treasurer , Swarthmore College	2011 – Present
Manage the collective finances of the Class of 2012	

THESIS COMMITTEES

M.S. Robotics, CMU

Tanmay Shankar, Learning Neural Parsers with Deterministic Differentiable Imitation Learning	2018
Arjun Sharma, Integrating Structure with Deep Reinforcement and Imitation Learning	2018
Mohit Sharma, Inverse Reinforcement Learning with Conditional Choice Probabilities	2018

CONSULTING EXPERIENCE

Machine Learning Consultant , University of Pittsburgh Department of Biology	Jan 2019 – Present
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