

Nicholas Rhinehart

Email: nrhinehart@berkeley.edu.

Homepage: <http://people.eecs.berkeley.edu/~nrhinehart/>

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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 Aug 2014 – Sep 2019
Doctor of Philosophy in Robotics
Adviser: Kris Kitani

Carnegie Mellon University, The Robotics Institute of the School of Computer Science Jan 2013 – Aug 2014
Master of Science in Robotics
Adviser: Drew Bagnell

Swarthmore College Aug 2008 – May 2012
Bachelor of Arts in Computer Science, Bachelor of Science in Engineering

Work 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

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
Master's 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 Award Honorable Mention, 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.

PROFESSIONAL SERVICE AWARDS

- Top Reviewer Award (Top 8% of Reviewers), NeurIPS 2021** 2021
Recognized for reviewing contributions.
- Top Reviewer Award (Top 10% of Reviewers), ICML 2021** 2021
Recognized for reviewing contributions.
- Top Reviewer Award, ICCV 2019** 2019
Recognized for reviewing contributions.
- Top Reviewer Award, NeurIPS 2019** 2019
Recognized for reviewing contributions.

Publications

CONFERENCE AND JOURNAL PUBLICATIONS

- [22] Intrinsic Control of Variational Beliefs in Dynamic Partially-Observed Visual Environments
N. Rhinehart, J. Wang, G. Berseth, JD Co-Reyes, D. Hafner, C. Finn, S. Levine
Neural Information Processing Systems (**NeurIPS**), 2021. [26% accepted]
- [21] RECON: Rapid Exploration for Open-World Navigation with Latent Goal Models
D. Shah, B. Eysenbach, N. Rhinehart, S. Levine
Oral Presentation, Conference on Robot Learning (**CoRL**), 2021. [39% accepted] [6.5% accepted as Oral]
- [20] Contingencies from Observations: Tractable Contingency Planning with Learned Behavior Models
N. Rhinehart*, J. He*, C. Packer, M. A. Wright, R. McAllister, J. E. Gonzalez, S. Levine
International Conference on Robotics and Automation (**ICRA**), 2021. [48% accepted]
- [19] ViNG: Learning Open-World Navigation with Visual Goals
D. Shah, B. Eysenbach, G. Kahn, N. Rhinehart, S. Levine
International Conference on Robotics and Automation (**ICRA**), 2021. [48% accepted]
- [18] Parrot: Data-Driven Behavioral Priors for Reinforcement Learning
A. Singh*, H. Liu*, G. Zhou, A. Yu, N. Rhinehart, S. Levine
Oral Presentation, International Conference on Learning Representations (**ICLR**), 2021. [29% accepted] [1.8% accepted as Oral]
- [17] SMiRL: Surprise Minimizing RL in Dynamic Environments
G. Berseth, D. Geng, C. Devin, N. Rhinehart, C. Finn, D. Jayaraman, S. Levine
Oral Presentation, International Conference on Learning Representations (**ICLR**), 2021. [29% accepted] [1.8% accepted as Oral]
- [16] Conservative Safety Critics for Exploration
H. Bharadhwaj, A. Kumar, N. Rhinehart, S. Levine, F. Shkurti, A. Garg
International Conference on Learning Representations (**ICLR**), 2021. [29% accepted]

- [15] [Inverting the Forecasting Pipeline with SPF2: Sequential Pointcloud Forecasting for Sequential Pose Forecasting](#)
X. Weng, J. Wang, S. Levine, K. Kitani, **N. Rhinehart**
Conference on Robot Learning (**CoRL**), 2020. [34% *accepted*]
- [14] [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**), 2020. [22% *accepted*]
- [13] [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**), 2020. [22% *accepted*] [4.6% *accepted as Oral*]
- [12] [Deep Imitative Models for Flexible Inference, Planning, and Control](#)
N. Rhinehart, R. McAllister, S. Levine
International Conference on Learning Representations (**ICLR**), 2020. [27% *accepted*]
- [11] [PRECOC: 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**), 2019. [25% *accepted*]
- [10] [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**), 2019. [31% *accepted*]
- [9] [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.
- [8] [R2P2: A Reparameterized Pushforward Policy for Diverse, Precise Generative Path Forecasting](#)
N. Rhinehart, K. M. Kitani, P. Vernaza
European Conference on Computer Vision (**ECCV**), 2018. [32% *accepted*]
- [7] [Learning Neural Parsers with Deterministic Differentiable Imitation Learning](#)
T. Shankar, **N. Rhinehart**, K. Muelling, K. M. Kitani
Conference on Robot Learning (**CoRL**), 2018. [31% *accepted*]
- [6] [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**), 2018. [25% *accepted*]
- [5] [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**), 2018. [32% *accepted*]
- [4] [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 (**NeurIPS**), 2017. [21% *accepted*]
- [3] [First-Person Activity Forecasting with Online Inverse Reinforcement Learning](#)
N. Rhinehart, K. M. Kitani.
Oral Presentation, IEEE International Conference on Computer Vision (**ICCV**), 2017. [29% *accepted*] [2% *accepted as Oral*]
Best Paper Award Honorable Mention. Awarded to 3 of 2,143 submissions
- [2] [Learning Action Maps of Large Environments via First-Person Vision](#)
N. Rhinehart, K. M. Kitani
Computer Vision and Pattern Recognition (**CVPR**), 2016. [30% *accepted*]

- [1] [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), 2015. [41% accepted]

PRE-PRINTS

- [1] [Explore and Control with Adversarial Surprise](#)
A. Fickinger*, N. Jaques*, S. Parajuli, M. Chang, N. Rhinehart, G. Berseth, S. Russell, S. Levine
arXiv, 2021.

PATENTS

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

Funding Awards

- Toyota Research Institute, Co-Investigator.** 2021–2024
\$375,000 per year to study “Unified Predictive Representations for Multi-agent Modeling, Tracking, Forecasting, and Control”.
- Fellowship, CMU Center for Machine Learning and Health.** 2019
\$85,000 (tuition, stipend, and discretionary funds) to study “Automatic Forecasting and Understanding of Behavior”.
- Travel Grants (5):** NeurIPS (2), CMU Provost (2), ICRA {2018, 2015}, {2017, 2016}, 2017
Financial conference travel support.
- Hardware Grant: NVIDIA** 2014
Granted GPU.

Academic and Professional Talks

INVITED WORKSHOP TALKS

- ICRA 2021, Long-term Human Motion Prediction, Xi’an, China [Remote], Jun 2021
- CVPR 2020, Precognition: Seeing through the Future, Seattle, Washington [Remote], Jun 2020
- ICCV 2019, Workshop on Autonomous Driving - Beyond Single Frame Prediction, Seoul, South Korea, Oct 2019
- ACCV 2018, Attention/Intention Understanding Workshop, Perth, Australia, Dec 2018

INVITED TUTORIAL TALKS

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

CONTRIBUTED CONFERENCE TALKS

- ICLR 2021, Oral Paper Presentation of SMiRL (non-speaking), Vienna, Austria [Remote] May 2021
- ICLR 2021, Oral Paper Presentation PARROT (non-speaking), Vienna, Austria [Remote] May 2021
- CVPR 2020, Oral Paper Presentation (Last author, non-speaking), Seattle, Washington [Remote] 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 , Infer2Control: Probabilistic RL and Structured Control Workshop, Montreal, Canada	Dec 2018
NeurIPS 2018 , ML for Intelligent Transportation Systems Workshop, Montreal, Canada	Dec 2018
MACV 2016 , Mid-Atlantic Computer Vision Workshop, Baltimore, Maryland	May 2016
PANELS	
ICCV 2019 , Workshop on Autonomous Driving - Beyond Single Frame Prediction, Seoul, South Korea	Oct 2019
INVITED INDUSTRY TALKS	
Uber ATG , Toronto, Canada [Remote]	Oct 2020
Scale AI , San Francisco, California	Oct 2019
Tesla , Palo Alto, California	Oct 2019
Argo AI , Pittsburgh, Pennsylvania	Jul 2019
iSee , Pittsburgh, Pennsylvania	May 2019
Zoox , San Francisco, California	Jan 2019
Google Waymo , Mountain View, California	Nov 2018
SEMINARS	
Applied RL Seminar , Digital	Dec 2020
U.C. Berkeley, Berkeley Deep Drive Group , Berkeley, California	Aug 2018
U.C. Berkeley, RAIL Lab , Berkeley, California	Jun 2018
NEC Labs America , Cupertino, California	Jun 2017
The University of Tokyo IIS, Sato Laboratory , Tokyo, Japan	Jun 2015
CMU , Misc-Read Vision Group, Pittsburgh, PA	Nov 2015
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

Academic Activity & Service

TEACHING

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

Charles Packer (UC Berkeley PhD student). Co-authored ICRA '21 paper with Charles.	2020–
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Dhruv Shah (UC Berkeley PhD student). Co-authored ICRA '21 paper and CoRL '21 paper with Dhruv.	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 CoRL '20 paper with Xinshuo.	2019–
Tanmay Shankar (CMU MS RI, now at FAIR). Co-authored CORL '18 paper with Tanmay.	2018
Arjun Sharma (CMU MS RI, now at Vicarious). Co-authored ICLR '19 paper with Arjun.	2018
Mohit Sharma (CMU MS RI, now PhD at CMU). Co-authored ICLR '19 paper with Mohit.	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

Daniel Shin (UC Berkeley undergrad). Co-authored ICRA '22 submission with Daniel.	2021–
Nitish Dashora (UC Berkeley undergrad). Co-authored ICRA '22 submission with Nitish.	2020–
Jeff He (UC Berkeley undergrad). Co-authored ICRA '21 paper with Jeff.	2020–
Jenny Wang (UC Berkeley undergrad). Co-authored NeurIPS '21 paper with Jenny.	2020–
Jiaqi Guan (Tsinghua University visitor, now PhD at UIUC). Last-authored CVPR '20 paper (Oral) with Jiaqi.	2018 – 2019

PROFESSIONAL SERVICE

Organizer

NeurIPS '21 Workshop on Machine Learning for Autonomous Driving	2021
NeurIPS '20 Workshop on Machine Learning for Autonomous Driving	2020
NeurIPS '19 Workshop on Machine Learning for Autonomous Driving	2019
ICML '19 Workshop on Imitation, Intent, and Interaction (I3)	2019
CVPR '18 Tutorial on Inverse RL for Computer Vision [recording has >5,000 views]	2018

Conference and Journal Reviewing

CoRL '21, CVPR '21, ICCV '21, ICLR '21, ICML '21, ICRA '21, NeurIPS '21, RA-L '21	2021
CoRL '20, ICLR '20, 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 SERVICE

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 Represented and liaised between Robotics graduate students and the Graduate Student Assembly	2015 – 2017
Co-Chair , Swarthmore Philanthropy Council Assist in coordinating alumni fundraising efforts	2011 – 2012
Class Treasurer , Swarthmore College Manage the collective finances of the Class of 2012	2011 – Present

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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