Vikas Dhiman

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Research Interests

Safe Control, Machine Learning, Robotics, Localization, Mapping, and Navigation

Work experience

Postdoctoral Researcher San Diego, CA
Jacobs School of Engineering, University of California San Diego March 2019 - Present
Advisors: Prof. Henrik Christensen and Prof. Nikolay Atanasov
Primary Focus: Improving algorithms for distributed safe control of robots while using learning for mapping and navigation.

Research Assistant Ann Arbor, MI
EECS, University of Michigan Aug 2014 - Dec 2018
Advisor: Prof. Jason J. Corso
Primary Focus: Improving algorithms for localization, mapping, and navigation in mobile robots.

Research Intern Cupertino, CA
NEC Lab America, INC. May 2014 - Aug 2014
Mentor: Prof. Manmohan Chandraker
Project: Investigating occlusion aware models for localization

Research Assistant Buffalo, NY
Dept. of CSE, State University of New York at Buffalo Jan 2012 - May 2014
Advisor: Prof. Jason J. Corso
Primary Focus: Improving algorithms for localization, mapping, and navigation in mobile robots.

Senior IT Engineer Hyderabad, India
D.E. Shaw Software India Private Ltd. 2008 - 2012
Responsibilities: Automation of data collection, scraping, parsing, and visualization jobs.

Education

University of Michigan Ann Arbor, MI
Ph.D. in Electrical and Computer Engineering 2014 - 2018
Advisor: Jason J. Corso
Dissertation title: Towards Better Navigation

State University of New York at Buffalo Buffalo, NY
M.S. in Computer Science and Engineering 2012 - 2014

Indian Institute of Technology Roorkee, India Roorkee, India
B.S. in Electrical Engineering 2004 - 2008

Publications [1]

15. **V. Dhiman***, M. J. Khojasteh*, M. Franceschetti, and N. Atanasov. Control barriers in bayesian learning of system dynamics. *IEEE Transactions on Automatic Control (Under Review)*, 2020 (Submitted)
14. T. Wang, **V. Dhiman**, and N. Atanasov. Inverse reinforcement learning for autonomous navigation via differentiable semantic mapping and planning. *International Journal of Robotics Research (Under Review)*, 2020 (Submitted)
13. M. Shan, **V. Dhiman**, Q. Feng, J. Li, and N. Atanasov. OrcVIO: Object residual constrained visual-inertialodometry. *IEEE Transactions on Robotics (Under Review)*, 2020 (Submitted)

[1] h5-Index (h5) provided by Google Scholar. CVPR, AAAI, IROS and ICRA are premier conferences in computer vision and Robotics. For each, typical number of submissions is around 2000 and the overall acceptance rate is around 25%. CVPR is the highest rated publication venue for computer vision and eighth-highest across all engineering and computer science, according to Google Scholar metrics.

12. M. J. Khojasteh*, **V. Dhiman***, M. Franceschetti, and N. Atanasov. Probabilistic safety constraints for learned high relative degree system dynamics. In *Learning for Dynamics and Control*, pages 781–792. PMLR, 2020
11. T. Wang, **V. Dhiman**, and N. Atanasov. Learning navigation costs from demonstration with semantic observations. In *Learning for Dynamics and Control*. PMLR, 2020
10. T. Wang, **V. Dhiman**, and N. Atanasov. Learning navigation costs from demonstration in partially observable environments. In *ICRA*, pages 4434–4440, 2020 (*h5: 71*)
9. J. Bi, **V. Dhiman**, T. Xiao, and C. Xu. Learning from interventions using hierarchical policies for safe learning. In *AAAI*, volume 34, pages 10352–10360, 2020 (*h5: 56*)
8. **V. Dhiman**, S. Banerjee, J. M. Siskind, and J. J. Corso. Learning goal-conditioned value functions with one-step path rewards rather than goal-rewards. In *(preprint) Open Review*, 2019
7. **V. Dhiman***, S. Banerjee*, B. Griffin, J. M. Siskind, and J. J. Corso. A critical investigation of deep reinforcement learning for navigation. *(preprint) ArXiV*, abs/1802.02274, 2018
6. S. Kumar, **V. Dhiman**, P. A. Koch, and J. J. Corso. Learning compositional sparse bimodal models. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 2017. (*h5: 114*)
5. **V. Dhiman**, Q. Tran, J. Corso, and M. Chandraker. A continuous occlusion model for road scene understanding. In *CVPR*, pages 4331–4339, June 2016. (*h5: 158*)[2]
4. **V. Dhiman**, A. Kundu, F. Dellaert, and J. J. Corso. Modern MAP inference methods for accurate and faster occupancy grid mapping on higher order factor graphs. In *ICRA*, 2014. (*h5: 71*)
3. S. Kumar, **V. Dhiman**, and J. J. Corso. Learning compositional sparse models of bimodal percepts. In *AAAI*, 2014. (*h5: 56*)
2. J. Ryde, **V. Dhiman**, and R. Platt. Voxel planes: Rapid visualization and meshification of point cloud ensembles. In *Proceedings of Intelligent Robots and Systems*, 2013. (*h5: 50*)
1. **V. Dhiman**, J. Ryde, and J. J. Corso. Mutual localization: Two camera relative 6-dof pose estimation from reciprocal fiducial observation. In *IROS*, 2013. (*h5: 50*)

Software

Control Barriers in Bayesian Learning of System Dynamics
`github.com/wecacuee/Bayesian_CBF`

A critical investigation of Deep-Reinforcement Learning for Navigation
`github.com/umrobotslang/does-drl-learn-to-navigate`

Learning compositional sparse bimodal models
`bitbucket.org/surenkum/bimodal_sparse`

Modern MAP inference methods for occupancy grid mapping on higher order factor graphs.
`github.com/wecacuee/modern-occupancy-grid`

Voxel Planes: Rapid visualization and meshification of point cloud ensembles
`bitbucket.org/wecacuee/voxelplanes`

Mutual Localization: Two camera relative 6-dof pose estimation from reciprocal fiducial observation.
`github.com/wecacuee/mutual_localization`

Teaching

Lecture on SLAM Oct 2019
`bit.ly/2W2rrfZ`
A lecture on Simultaneous Localization and Mapping with slides adapted from Prof Henrik Christensen. I developed a simple jupyter notebook example of EKF implementation as a part of exposure to SLAM concepts.

Lecture on Probabilistic graphical models Nov 2017
`vikasdhiman.info/eecs442/20171109.html`
A lecture on the basics of probabilistic graphical models in class on introduction to computer vision. The students had limited background in machine learning and probability.

Lecture on OpenGM2: Library for Probabilistic graphical models Jan 2015
`github.com/wecacuee/opengmdemo`
A lecture on the usage of the library OpenGM2 with an in class demo of OpenGM2 library applied to a simple problem. This gave the students a quick start on their course projects.

Xplore Engineering: Computer Vision and Pinhole cameras Jun 2015, 2016
`vikasdhiman.info/xplore-workshop/pinhole.pdf`
Organized a workshop for middle school students to create interest in sciences and the field of computer vision and explain modern cameras through pinhole cameras.

Service as reviewer

- IEEE Control Systems Letters Submission 2020
- IEEE American Control Conference 2020
- IEEE Robotics and Automation Letters 2019
- International Conference on Robotics and Automation 2014, 2016 - 18, 2020
- IEEE/RSJ International Conference on Intelligent Robots and Systems 2013, 2016, 2020
- IEEE Conference on Computer Vision and Pattern Recognition 2014, 2016
- Indian Conference on Computer Vision, Graphics and Image Processing 2014, 2016
- Association for the Advancement of Artificial Intelligence 2015
- International Journal of Computer Vision 2014
- International Journal of Robotics Research 2016

Reference List

Jason J. Corso (Ph.D. Advisor) jjcorso@umich.edu
Associate Professor, EECS, University of Michigan, Ann Arbor, MI.

Henrik Christensen `hichristensen@ucsd.edu`
Director, Institute of Contextual Robotics, University of California San Diego, San Diego, CA.

Nikolay Atanasov `natanasov@ucsd.edu`
Assistant Professor, ECE, University of California, San Diego, CA.