

1 Research Interests

Computer vision, machine learning, field robotics, autonomous exploration, semantic perception, Bayesian nonparametrics, surprise detection, data summarization.

2 Education

- McGill University, Montreal, QC, Canada 2014
PhD: Computer Science
Thesis supervisor: Gregory Dudek
- Rensselaer Polytechnic Institute, Troy, NY, USA 2005
MS : Computer Science
Thesis supervisor: Srinivas Akella
- Rensselaer Polytechnic Institute, Troy, NY, USA 2002
BS : Computer Science
Summa Cum Laude

3 Experience

- Postdoc Scholar, Woods Hole Oceanographic Institution, Woods Hole, MA Aug. 2014 -
 - Developed unsupervised computer vision techniques for characterizing underwater habitats and detecting anomalies, using Bayesian nonparametric topic modeling techniques.
 - Developed automated techniques for detection and tracking of wildlife in videos with non-stationary background.
 - Conducted experiments to quantify avoidance behavior of reef fish to mobile video survey platforms.
 - Designed and developed the software architecture of an underwater robot capable of autonomous under-ice operation.
- PhD Candidate / Research Assistant, McGill University, Montreal, Canada Sep. 2007 - July 2014
 - Developed ROST - a realtime online spatiotemporal topic model for streaming audio and video data. <http://cim.mcgill.ca/~yogesh/rost>
 - Developed aquaros - ROS (Robot Operating System) based software tools for controlling Aqua amphibious robot.
 - Developed biowatch - a particle filter based multiple target tracker. This was successfully used to visually track ants in a video for conducting behavior research. Open source implementation available at <https://code.google.com/p/biowatch/>
 - Teaching assistant - COMP417 Introduction to Mobile robotics (2008, 2010).
 - Teaching assistant - COMP765B Spatial Representation and Mobile Robotics (2008, 2010).
- Software Developer, Open Box Technologies, Troy, NY May 2006 - May 2007

- Designed and developed a cross-platform Ruby/C++/OpenGL based toolkit for rapid development of rich vector graphics, video and 3D graphics applications.
- Designed and developed a hierarchical tagging system for organizing and querying media content.
- R&D Engineer, Kitware Inc., Clifton Park, NY May 2005 - Feb 2006
 - Designed and developed algorithms to visualize 3D data, and contributed to open source VTK Visualization Toolkit www.vtk.org.
 - Designed and developed VisualJournal, a tool for visualizing images with geographic information, on a 3D map.
 - Developed GPU implementable approximations to efficiently visualize 3D streamline data.
 - Conducted a workshop on GPU programming, funded by National Alliance for Medical Image Computing (NAMIC).
- Rensselaer Polytechnic Institute, Troy, NY 2002 - 2005
 - Developed a technique for modeling 3D protein folding pathways using Probabilistic Roadmaps (PRM) path planning.
 - Developed a Micro Electro Mechanical Systems (MEMS) simulator and 3D visualizer.
 - Teaching Assistant - 3D Computer Graphics.
 - Teaching Assistant - Data Structures and Algorithms.

4 Scientific Cruises

- Hannibal Bank seamount, Panama, MV Alucia. April 2015
- NOAA Untrawlable Habitat Strategic Initiative cruise, Gulf of Mexico, RV Pelican. Aug. 2014

5 Publications

5.1 Journal publications

- [J.1] **Girdhar, Y.** and Dudek G., Modeling Curiosity in a Mobile Robot using Spatiotemporal Topic Modeling, for Autonomous Exploration and Monitoring. *Autonomous Robots*, 2015 (accepted).
- [J.2] **Girdhar, Y.**, Giguere, P., and Dudek G., Autonomous Adaptive Exploration using Realtime Online Spatiotemporal Topic Modeling. *International Journal of Robotics Research (IJRR)*, vol. 33, no. 4, pp. 645-657.

5.2 Peer reviewed conference publications

- [C.1] **Girdhar, Y.**, and Dudek, G., Exploring Underwater Environments with Curiosity. *Canadian Conference on Computer and Robot Vision*, 2014, pp. 104-110.
- [C.2] **Girdhar, Y.**, Whitney, D. & Dudek, G., Curiosity Based Exploration for Learning Terrain Models. *IEEE International Conference on Robotics and Automation (ICRA)*, 2014, pp. 578-584.
- [C.3] Kalmbach, A., **Girdhar, Y.**, & Dudek, G., Unsupervised Environment Recognition and Modeling using Sound Sensing. In *IEEE International Conference on Robotics and Automation (ICRA)*, 2013, pp. 2699-2704.
- [C.4] Giguere, P., **Girdhar, Y.**, & Dudek, G., Wide-Speed Autopilot System for a Swimming Hexapod Robot. In *Canadian Conference on Computer and Robot Vision (CRV)*, 2013, pp. 9-15.

- [C.5] Shkurti, F., Xu, A., Meghjani, M., Higuera, J. C. G., **Girdhar, Y.**, Giguere, P., . . . , Dudek, G., Multi-Domain Monitoring of Marine Environments using a Heterogeneous Robot Team. In Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2012, pp. 1747-1753.
- [C.6] **Girdhar, Y.**, & Dudek, G., Efficient on-line data summarization using extremum summaries. In IEEE International Conference on Robotics and Automation (ICRA), 2012, pp. 3490-3496.
- [C.7] **Girdhar, Y.**, Giguere, P., & Dudek, G., Autonomous Adaptive Underwater Exploration using Online Topic Modelling. In International Symposium on Experimental Robotics (ISER), 2012.
- [C.8] **Girdhar, Y.**, & Dudek, G., Offline Navigation Summaries. In IEEE International Conference on Robotics and Automation (ICRA), 2011, pp. 5769-5775.
- [C.9] **Girdhar, Y.**, & Dudek, G., Online Visual Vocabularies. In CRV 11: Proceedings of the 2011 Canadian Conference on Computer and Robot Vision. IEEE Computer Society, 2011, pp. 191-196.
- [C.10] **Girdhar, Y.**, Xu, A., Dey, B. B., Meghjani, M., Shkurti, F., Rekleitis, I., & Dudek, G., MARE: Marine Autonomous Robotic Explorer. In Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2011, pp. 5048-5053.
- [C.11] **Girdhar, Y.**, & Dudek, G., ONSUM: A System for Generating Online Navigation Summaries. In Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2010, pp. 746-751. [**Best Application Paper Award Finalist**]
- [C.12] **Girdhar, Y.**, & Dudek, G., Online Navigation Summaries. In IEEE International Conference on Robotics and Automation (ICRA), 2010, pp. 5035-5040.
- [C.13] **Girdhar, Y.**, & Dudek, G., Optimal Online Data Sampling or How to Hire the Best Secretaries. In CRV 09: Proceedings of the 2009 Canadian Conference on Computer and Robot Vision, pp. 292-298.
- [C.14] Sattar, J., Dudek, G., Chiu, O., Rekleitis, I., Giguere, P., Mills, A., Plamondon, N., Prahacs, C., **Girdhar, Y.**, Nahon, M., Lobos, J.-P., Enabling Autonomous Capabilities in Underwater Robotics. In Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems, (IROS), 2008, pp. 3628-3634.

5.3 Non-refereed contributions

- [O.1] Rabinovich, M., & **Girdhar, Y.**, Gaining Insight Into Films Via Topic Modeling & Visualization. Parsons Journal for Information Mapping (PJIM), 2015, vol. 7, no. 1.
- [O.2] **Girdhar, Y.**, & Dudek, G., Topic Modeling for Robots. Neural Information Processing Systems (NIPS) demonstration, 2013, Lake Tahoe, Nevada.
- [O.3] **Girdhar, Y.**, Adam, R. & Dudek, G., Realtime Online Spatiotemporal Topics for Navigation Summaries. 7th Annual Machine Learning Symposium, 2012, The New York Academy of Sciences, New York, NY. [**Spotlight Presentation 3rd Prize**]
- [O.4] **Girdhar, Y.**, Xu, A., Shkurti, F., Camilo, J., Higuera, G., Meghjani, M., Dudek, G., Monitoring Marine Environments using a Team of Heterogeneous Robots. In RSS 2012 Workshop on Robotics for Environmental Monitoring. Sydney, Australia.
- [O.5] Rabinovich, M., & **Girdhar, Y.**, SoYummy: real-time temporal semantic compression to further the Synopticon, Subtle Technologies Festival, 2011, Toronto. Poster.
- [O.6] **Girdhar, Y.**, Bystroff, C., & Akella, S., Efficient sampling of protein folding pathways using HMM-STR and probabilistic roadmaps. In IEEE Computational Systems Bioinformatics Conference, 2005, pp. 222 - 223. Workshops and Poster Abstracts.

5.4 Book chapters

- [B.1] **Girdhar, Y.**, & Dudek, G., A surprising problem in navigation. In L. R. Harris & M. R. M. Jenkin (Eds.), Vision in 3D Environments. 2011, Cambridge University Press.

5.5 Thesis

- [T.1] **Girdhar, Y.**, Unsupervised Semantic Perception, Summarization, and Autonomous Exploration for Robots in Unstructured Environments, PhD Thesis, McGill University, 2014.
- [T.2] **Girdhar, Y.**, Efficient Sampling of Protein Folding Funnels using HMMSTR, and Pathway Generation using Probabilistic Roadmaps, MS Thesis, Rensselaer Polytechnic Institute, 2005.

5.6 Patent applications

- [P.1] Brain, C., Rabinovich, M., Di-Cianno, A., Andkjar, A., **Girdhar, Y.**, Media transaction system. US Patent App. 11/392,261, 2006.

6 Awards

- The CIPPRS Doctoral Dissertation Award 2014 Honorable Mention. 2015
- Postdoc Scholar Award, Woods Hole Oceanographic Institution. 2014
- Postdoc Fellowship, Fonds de recherche du Québec - Nature et technologies. 2014
- Google Spotlight Presentation 3rd Prize, 7th Annual Machine Learning Symposium, New York Academy of Sciences, New York. Oct 2012
- Best Application Paper Award Finalist, 2010 IEEE/RSJ International Conference on Intelligent Robots and Systems, Taipei, Taiwan. Oct 2010
- Principal's Graduate Fellowship, McGill University. Sep 2008
- Paul A. McGloin Prize for most outstanding academic achievement in Computer Science, Rensselaer Polytechnic Institute. May 2002
- Certificate of Achievement in recognition of a perfect 4.0 academic record, Rensselaer Polytechnic Institute. May 2002
- Founders Award of Excellence, RPI Fall 2001
- Dean's List, RPI
- 17th LITEC Invitational Robotics Competition, RPI - Second Prize. Spring 2001
- RPI/ACM Programming Competition - Third Prize. Spring 2001
- Rensselaer Dean's Scholar Award. Fall 1999

7 Programming skills

C++, Python, Boost, OpenCV, ROS, LCM, Qt, scipy, scikit-learn, VTK.

8 Invited Talks

- Graduate School of Oceanography, University of Rhode Island, RI. Feb 2015
- CSAIL, Massachusetts Institute of Technology, Cambridge, MA. Jan 2014
- Woods Hole Oceanographic Institution, Falmouth, MA. Jan 2014

9 Other activities

- Program committee member - ICRA 2014 Workshop on “Robots in Homes and Industry: Where to Look First?” June 2014
- Panelist, NSERC Canadian Field Robotics Network (NCFRN) ROS Workshop, Toronto. Apr 2013
- Volunteer for International Symposium on Experimental Robotics (ISER). June 2012
- Managed a week long robotics field trial event in Barbados involving marine and aerial vehicles, and a team of over 20 students and researchers . The results of this field trial were published in IROS2011 and IROS2012. Jan 2011
- McGill high school summer camp: “Be A Computer Scientist for a Week”
 - Designed and delivered a summer workshop on robotics for high school students. June 2010,2011
 - Keynote speaker: robotics and computer vision. June 2013
- Judge for final robotic design projects presented by students of ECSE211: Design Principles and Methods. 2011,2012
- Computational Astrobiology Summer School, University of Hawaii NASA Astrobiology Institute, 2011.
- Mentoring:
 - David Whitney - Modeling curiosity using a pan-tilt camera.
 - Arnold Kalmbach - Topic modeling of ambient sound using ROST for place recognition.
 - Raheem Adam - Using Amazon Mechanical Turk to evaluate video summarization algorithms.
 - Ouais Alsharif - Evaluating ROST for Place Recognition.
- Volunteer for ICML/UAI/COLT conference. 2009

10 Media Coverage

- Astrobiology Magazine, March 9, 2015.
- Oceanus Magazine, January 16, 2014.
- McGill Reporter, November 3, 2011.

11 Citizenship

Canadian