

# Abhinav Valada

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## Research Interests

Perception, Localization, Deep Learning, Scene Understanding,  
Multitask Learning, Machine Learning, Navigation, Mobile Robotics

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## Education

- 2014 – **Ph.D. Candidate**, *University of Freiburg*.  
Current Advisor: Prof. Wolfram Burgard
- 2012 – 2013 **M.S. Robotics**, *Carnegie Mellon University*, GPA: 3.92/4.0.  
Advisor: Prof. George Kantor and Prof. Paul Scerri
- 2006 – 2010 **B.Tech - Electronics and Instrumentation Engineering**, *VIT University*.  
Advisor: Prof. George Kantor, CMU

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## Experience

- Aug 2014 – **Doctoral Researcher**, *Autonomous Intelligent Systems, University of Freiburg*.  
Current Freiburg, Germany
- Aug 2012 – **Director of Operations & Co-founder**, *Platypus, LLC*.  
Current Pittsburgh, USA
- Sep 2013 – **Validation Engineer**, *National Robotics Engineering Center*.  
Jul 2014 Pittsburgh, USA
- Jul 2013 – **Systems Engineer**, *National Robotics Engineering Center*.  
Sep 2013 Pittsburgh, USA
- Nov 2011 – **Systems/Software Engineer**, *Field Robotics Center, Carnegie Mellon University*.  
Jun 2013 Pittsburgh, USA
- Aug 2010 – **Research Assistant**, *The Robotics Institute, Carnegie Mellon University*.  
Oct 2011 Pittsburgh, USA
- Jan 2010 – **Research Scholar**, *The Robotics Institute, Carnegie Mellon University*.  
Jun 2010 Pittsburgh, USA
- Aug 2008 – **Research Assistant**, *VIT University*.  
Dec 2009 Vellore, India
- May 2009 – **Research Associate**, *Indian Institute of Technology*.  
Jun 2010 Chennai, India
- Apr 2008 – **Research Intern**, *ABB Limited, Robotics Division*.  
Jun 2008 Bangalore, India
- Jan 2006 – **Team Leader**, *People First India (P) Ltd*.  
Dec 2007 Bangalore, India

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## Research Projects

- 2017 – **Flying Localization System for Rescuing and Recovering Victims.**  
current Federal Ministry of Education and Research (BMBF) Grant - Germany, University of Freiburg
- 2016 – **Robust Localization Using Deep Landmark Features.**  
current Samsung GRO Grant, University of Freiburg
- 2015 – 2016 **Reliable Lifelong Navigation for Mobile Robots.**  
EU project FP7-IDEAS, University of Freiburg
- 2014 – 2015 **Collaborative Center for Applied Research on Ambient Assisted Living.**  
Ministry of Science and the Arts of Baden-Württemberg Grant, University of Freiburg
- 2013 – 2014 **Autonomous Haulage System.**  
National Robotics Engineering Center, Carnegie Mellon University
- 2013 – 2014 **Enhanced Teleoperation.**  
National Robotics Engineering Center, Carnegie Mellon University
- 2010 – 2014 **Cooperative Robotic Watercraft.**  
Field Robotics Center, Carnegie Mellon University
- 2011 – 2012 **Subterranean Robotics.**  
Field Robotics Center, Carnegie Mellon University
- 2011 – 2013 **Hydroponic Automation.**  
Field Robotics Center, Carnegie Mellon University
- 2010 – 2013 **Distributed SensorWebs.**  
Field Robotics Center, Carnegie Mellon University
- 2008 – 2009 **Automated Motion Planning of Cooperative Manipulators Considering Obstacles and Load Interaction.**  
Indian Institute of Technology (Madras)
- 2007 – 2008 **Detection of Slip in Industrial Robots and its Effects on Automation.**  
ABB Limited, Robotics Division
- 2007 – 2008 **Automated Wireless Irrigation System.**  
VIT University
- 2007 – 2008 **Remotely Operated Vehicle.**  
VIT University

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## Invited Talks

- Adaptive Semantic Segmentation  
NVIDIA GPU Technology Conference EUROPE, Amsterdam, Netherlands, 2016.
- Techniques for Reliable Robot Perception in Unstructured Environments  
IROS 2016 workshop on State Estimation and Terrain Perception, Daejeon, Korea
- Robust and Real-Time Deep Scene Understanding of Unstructured Environments  
FRC Seminar, The Robotics Institute, Carnegie Mellon University, Pittsburgh, USA
- An Autonomous Robot for Manipulation and Mapping of NFT Installations  
FRC Seminar, The Robotics Institute, Carnegie Mellon University, Pittsburgh, USA
- Intelligent Irrigation using Wireless Sensor Networks  
Invited Speaker, CIGR-Ageng 2012, Valencia, Spain
- Intelligent Environmental Monitoring using Fleets of Autonomous Surface Crafts  
Alumni Lecture 2012, VIT University, Vellore, India

- Development of the Cooperative Robotic Watercraft  
Invited Speaker, The Indian Institute of Technology, Madras, India
- Design and Development of a Multi-Hop Routing Protocol for Distributed Sensing Applications  
FRC Seminar, The Robotics Institute, Carnegie Mellon University, Pittsburgh, USA
- Path Planning of Mobile Robots  
Guest Lecture, IEEE Resonance 2008, VIT University, Vellore, India

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## Students Supervised

- 2018 **Rohit Mohan**, *Internship*.  
Robust Multimodal Segmentation in Challenging Perceptual Conditions
- 2018 **Moritz Mohr**, *Bachelor Thesis*.  
Autonomous Landing of Aerial Vehicles in Rubbles
- 2017 **Jay Patravali**, *Internship*.  
Landmark-based Visual Localization using Deep Convolutional Neural Networks
- 2017 **Louay Abdelgawad**, *Master Project*.  
Room Layout Estimation using Deep Convolutional Neural Networks
- 2017 **Hanna Stellmach**, *Master Project*.  
Multimodal Localization using Deep Convolutional Neural Networks
- 2017 **Mayank Mittal**, *DAAD Internship*.  
Predicting Landing Sites in Aerial Images from Disaster Scenarios
- 2017 **Rohit Suri**, *DAAD Internship*.  
Laser-Camera Label Transfer for Semantic Segmentation
- 2016 **Johan Vertens**, *Master Thesis*.  
Semantic Segmentation of Moving Objects
- 2016 **Ankit Dhall**, *DAAD Internship*.  
Robust Deep Semantic Segmentation using Convolved Mixture of Deep Experts
- 2016 **Julian Kunzelmann**, *Bachelor Thesis*.  
Multimodal Vegetation Segmentation using Up-Convolutional Neural Networks
- 2015 **Gonzalo Nuno Estevez**, *Bachelor Thesis*.  
Navigational Autonomy for Nano-Quadrotors

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## Teaching

- SS 2018 **Co-organizer**, *Deep Learning for Autonomous Driving*.  
Autonomous Intelligent Systems, University of Freiburg
- WS 2017 **Co-organizer**, *Robot Navigation*.  
Autonomous Intelligent Systems, University of Freiburg
- WS 2016 **Co-organizer**, *Robot Navigation*.  
Autonomous Intelligent Systems, University of Freiburg
- WS 2015 **Co-organizer**, *Robot Perception*.  
Autonomous Intelligent Systems, University of Freiburg
- WS 2015 **Co-organizer**, *Robot Navigation*.  
Autonomous Intelligent Systems, University of Freiburg

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## Publications

### Refereed Journals

- Abhinav Valada and Wolfram Burgard, "Deep Spatiotemporal Models for Robust Proprioceptive Terrain Classification", *The International Journal of Robotics Research (IJRR)*, 2017. (Invited)

### Refereed Conference Papers

- Abhinav Valada\*, Noha Radwan\*, and Wolfram Burgard, "Deep Auxiliary Learning for Visual Localization and Odometry", *In Proc. of the IEEE International Conference on Robotics and Automation (ICRA)*, Brisbane, Australia, 2018.
- Wolfram Burgard, Abhinav Valada, Noha Radwan, Tayyab Naseer, Jingwei Zhang, Johan Vertens, Oier Mees, Andreas Eitel, and Gabriel Oliveira, "Perspectives on Deep Multimodel Robot Learning", *In Proc. of the International Symposium on Robotics Research (ISRR)*, Puerto Varas, Chile, 2017.
- Johan Vertens\*, Abhinav Valada\*, and Wolfram Burgard, "SMSnet: Semantic Motion Segmentation using Deep Convolutional Neural Networks", *In Proc. of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Vancouver, Canada, 2017.
- Abhinav Valada, Johan Vertens, Ankit Dhall, and Wolfram Burgard, "AdapNet: Adaptive Semantic Segmentation in Adverse Environmental Conditions", *In Proc. of the IEEE International Conference on Robotics and Automation (ICRA)*, Singapore, 2017.
- Abhinav Valada, Gabriel Oliveira, Thomas Brox, and Wolfram Burgard, "Deep Multispectral Semantic Scene Understanding of Forested Environments using Multimodal Fusion", *In Proc. of 2016 International Symposium on Experimental Robotics (ISER)*, Tokyo, Japan, 2016.
- Gabriel Oliveira, Abhinav Valada, Wolfram Burgard, and Thomas Brox, "Deep Learning for Human Part Discovery in Images", *In Proc. of the IEEE International Conference on Robotics and Automation (ICRA)*, Stockholm, Sweden, 2016.
- Federico Boniardi, Abhinav Valada, Wolfram Burgard, and Gian Diego Tipaldi, "Autonomous Indoor Robot Navigation Using a Sketch Interface for Drawing Maps and Routes", *In Proc. of the IEEE International Conference on Robotics and Automation (ICRA)*, Stockholm, Sweden, 2016.
- Abhinav Valada, Luciano Spinello, and Wolfram Burgard, "Deep Feature Learning for Acoustics-based Terrain Classification", *In Proc. of the International Symposium on Robotics Research (ISRR)*, Sestri Levante, Italy, 2015. (Selected in the Top 10)
- Christopher Tomaszewski, Abhinav Valada, and Paul Scerri, "Planning Efficient Paths through Dynamic Flow Fields in Real World Domains", *In Proc. of MTS/IEEE OCEANS 13*, September, San Diego, USA, 2013.
- Abhinav Valada, Christopher Tomaszewski, Balajee Kannan, Prasanna Velagapudi, George A. Kantor, and Paul Scerri, "An Intelligent Approach to Hysteresis Compensation while Sampling using a Fleet of Autonomous Watercraft", *In Proc. of the 2012 International Conference on Intelligent Robotics and Applications (ICIRA)*, Montreal, Canada, 2012.
- Niels Tanke, Guoming Alex Long, Dhruv Agrawal, Abhinav Valada, and George A. Kantor, "Automation of Hydroponic Installations using a Robot with Position Based Visual Feedback", *In Proc. of the International Conference of Agricultural Engineering (CIGR)*, Valencia, Spain, 2012.

- David Kohanbash, Abhinav Valada, and George A. Kantor, "Base Station Design and Architecture for Wireless Sensor Networks", *In Proc. of the International Conference of Agricultural Engineering (CIGR)*, Valencia, Spain, 2012.
- Abhinav Valada, Prasanna Velagapudi, Balajee Kannan, Christopher Tomaszewski, George A. Kantor, and Paul Scerri, "Development of a Low Cost Multi-Robot Autonomous Marine Surface Platform", *In Proc. of the 8th International Conference on Field and Service Robotics (FSR)*, Miyagi, Japan, 2012.
- Paul Scerri, Prasanna Velagapudi, Balajee Kannan, Abhinav Valada, Christopher Tomaszewski, John M. Dolan, Adrian Scerri, Kumar Shaurya Shankar, Luis Lorenzo Bill-Clark, and George A. Kantor, "Real-World Testing of a Multi-Robot Team", *In Proc. of the 11th International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, Valencia, Spain, 2012.
- Abhinav Valada, David Kohanbash, and George A. Kantor, "DSRP: Distributed SensorWeb Routing Protocol", *In Proc. of the 21st International Conference on Electronics, Communications and Computers*, Puebla, Mexico, 2011.
- David Kohanbash, Abhinav Valada, and George A. Kantor, "Development of a Distributed Wireless Sensing System for Agriculture", *In Proc. of the International Symposium on Wireless Sensor Network for Agriculture*, Beijing, China, 2010.
- Abhinav V, Sourabh Kanwar and Vivekanandan S, "Design of a Biometric Identification and Verification System Using Photoplethysmography and Statistical Analysis in Lab VIEW", *In Proc. of the IEEE International Conference on Electronic Design and Signal Processing*, Manipal, India, 2009.
- Abhinav V, Vaani Madhuran and Swimmi Singh, "An Artificial Intelligence Based Sensory Robot Exhibiting Anthropomorphic Qualities", *In Proc. of the International Conference on Sensors and Related Networks*, Vellore, India, 2009.
- Abhinav V and Vivekanandan S, "Real Time Intelligent Gripping System for Dexterous Manipulation of Industrial Robots", *In Proc. of the World Congress on Engineering*, Vol. II, ISBN:978-988-18210-1-0, London, UK, pp. 1747-1752, 2009.
- Abhinav V and Shlok Kumar, "A Robotic Tentacle for In-Space Exploration", *In Proc. of the SEDS India National Conference*, Vellore, India, 2009.

#### Refereed Workshop Papers

- Abhinav Valada, Ankit Dhall, and Wolfram Burgard, "Convolved Mixture of Deep Experts for Robust Semantic Segmentation", *In IROS Workshop on State Estimation and Terrain Perception for All Terrain Mobile Robots*, Daejeon, Korea, 2016.
- Abhinav Valada, and Wolfram Burgard, "Robust Deep Scene Understanding of Unstructured Environments", *In Deutsche Gesellschaft fur Robotik - Tage 2016 (DGR-Tage 2016)*, Leipzig, Germany, 2016.
- Abhinav Valada, Gabriel Leivas Oliveira, Thomas Brox, and Wolfram Burgard, "Towards Robust Semantic Segmentation using Deep Fusion", *In RSS Workshop on Limits and Potentials of Deep Learning in Robotics*, Michigan, USA, 2016.
- Federico Boniardi, Abhinav Valada, Wolfram Burgard, and Gian Diego Tipaldi, "Autonomous Indoor Robot Navigation Using Sketched Maps and Routes", *In RSS Workshop on Model Learning for Human-Robot Communication*, Rome, Italy, 2015.
- Tarek El-Gaaly, Christopher Tomaszewski, Abhinav Valada, Prasanna Velagapudi, Balajee Kannan, and Paul Scerri "Visual Obstacle Avoidance for Autonomous Watercraft using Smartphones", *Autonomous Robots and Multirobot Systems workshop (ARMS, at AAMAS 2013)*, Minnesota, USA, 2013.

- David Kohanbash, Abhinav Valada, and George A. Kantor, "Irrigation Control Methods for Wireless Sensor Network", *American Society of Agricultural and Biological Engineers Annual Meeting*, Dallas, USA, 2012.
- Paul Scerri, Prasanna Velagapudi, Balajee Kannan, Abhinav Valada, Christopher Tomaszewski, Adrian Scerri, Kumar Shaurya Shankar, Luis Lorenzo Bill-Clark, and George A. Kantor, "Real-World Testing of a Multi-Robot Team", *Autonomous Robots and Multirobot Systems workshop (ARMS, at AAMAS 2012)*, Valencia, Spain, 2012.
- David Kohanbash, Abhinav Valada and George Kantor, "Wireless Sensor Networks and Actionable Modeling for Intelligent Irrigation", *ASABE Annual International Meeting*, Kentucky , USA, 2011.

#### Technical Reports

- Abhinav Valada, "An Autonomous Robot for Manipulation and Mapping of NFT Installations", tech. report CMU-RI-TR-28-13, Robotics Institute, Carnegie Mellon University, December, 2013.
- Abhinav Valada, David Kohanbash, and George A. Kantor, "Design and Development of a Wireless Sensor Network System for Precision Agriculture", tech. report CMU-RI-TR-10-21, Robotics Institute, Carnegie Mellon University, June, 2010.

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#### Poster Presentations

- Abhinav V, Vaani Madhuran and Swimmi Singh, "A Subsumption Architecture Based Behavioral Robot Using Synthetic Psychology", National technical symposium GraVITas, India, September, 2009.
- Abhinav V, "Wireless Soil Moisture Control System", My Idea Program, Technology Business Incubator, VIT University, India, February, 2009.
- Abhinav V, "Sensory Slip Control Gripper for Industrial Robots", International technical symposium Kshtij, India, January, 2009.
- Abhinav V and Shlok Kumar, "Tactile Sensing and Control of Robotic Manipulators", National technical symposium Sadhana, India, September, 2008.
- Abhinav V, "Real Time Sensory Anti-slip Gripper for Industrial Robots", My Idea Program, Technology Business Incubator, VIT University, India, October, 2008.
- Abhinav V, "Real Time Intelligent Force/Position Control Mechanism for Dexterous Manipulation", National technical symposium Techtatva, India, October, 2008.
- Abhinav V, "Sensory Gripping System for Variable Products", National technical symposium Techtatva, India, October, 2008.
- Abhinav V, "Intelligent Sensory Slip Control for Industrial Robots", National technical symposium efusion, India, October, 2008.

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#### Achievements and Awards

- RSS Pioneer - Robotics: Science and Systems conference (RSS), 2018.
- Doctoral Consortium Award - The International Symposium on Robotics Research (ISRR), 2017.
- Chancellor's Scholarship for Semester Abroad Programme 2009, VIT University, Vellore, India.
- Best Paper Award at the National technical symposium Techtatva 2008, India.

- Best Design Award for building an Underwater Robot at the National technical symposium efusion 2009, India.
- First position in My Idea Program 2008 organised by Lemelson Recognition and Mentoring Programme (L-Ramp) and The Department of Science and Technology, Govt. of India.
- First position in the National coding competition organised by CSI (Computer Society of India) and ISTE (Indian Society for Technical Education), India.
- First position in the National robotic racing competition 2009, VIT University, Vellore, India.
- First position in the National robotic racing competition 2008, VIT University, Vellore, India.
- Runner up for the best paper award in the National technical symposium graVITas 2009, India.
- Second position in the Business Plan competition for presenting a plan entitled "Wireless Automated Irrigation System" at the National technical symposium Greenon 2009, India.
- Third position in Electroutsav 2008 for building a Remotely Operated Vehicle (ROV), India.
- Finalist for the best paper award in the International technical symposium Kshtij 2009, India.

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## Professional Activities

- **Reviewer (Journals)**  
Int. Journal of Pattern Recognition and Artificial Intelligence (IJPRAI); Journal of Field Robotics (JFR); IEEE Robotics & Automation Magazine; IEEE Robotics and Automation Letters (RA-L); IEEE Transactions on Robotics (T-RO)
- **Reviewer (Conferences)**  
IEEE Int. Conf. on Robotics and Automation (ICRA); IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS); Robotics: Science, and Systems Conference (RSS); Int. Conf. on Field and Service Robotics (FSR); Int. Conf. on Intelligent Robotics and Applications (ICIRA)
- **Website Administrator**  
Field Robotics Center (FRC), Carnegie Mellon University
- **Public Spaces Committee**  
Field Robotics Center (FRC), Carnegie Mellon University
- **Organizing Team Member**  
International Conference on Sensors and Related Networks 2007

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## Professional Affiliations

- IEEE RAS - IEEE Robotics and Automation Society
- IAENG - International Association of Engineers
- ISOI - Instrumentation Society of India