

Abhinav Valada

University of Freiburg, Department of Computer Science
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Education

Ph.D. Candidate in Robotics and Artificial Intelligence

UNIVERSITY OF FREIBURG

Advisor: Prof. Wolfram Burgard

Specialization: Deep Learning, Semantic Scene Understanding, State Estimation, Multimodal Learning, Multitask Learning, Self-Supervised Learning, Robot System Design

Freiburg, Germany

Aug. 2014 - Present

M.S. in Robotics

CARNEGIE MELLON UNIVERSITY

Advisors: Prof. George Kantor and Prof. Paul Scerri

Thesis: An Autonomous Robot for Manipulation and Mapping of NFT Installations

Pittsburgh, USA

Jan. 2012 - Dec. 2013

B.Tech in Electronics and Instrumentation Engineering

VIT UNIVERSITY

Advisor: Prof. George Kantor, CMU

Thesis: Design and Development of a Wireless Sensor Network System for Precision Agriculture

Vellore, India

Jun. 2006 - Dec. 2010

Work Experience

Scientific Research Staff

UNIVERSITY OF FREIBURG

Freiburg, Germany

Aug. 2014 - Present

Co-founder & Director of Operations

PLATYPUS LLC

Pittsburgh, USA

Aug. 2012 - Present

Systems Engineer

NATIONAL ROBOTICS ENGINEERING CENTER

Pittsburgh, USA

Jul. 2013 - Jul. 2014

Systems/Software Engineer

FIELD ROBOTICS CENTER, CARNEGIE MELLON UNIVERSITY

Pittsburgh, USA

Nov. 2011 - Jun. 2013

Research Scholar

THE ROBOTICS INSTITUTE, CARNEGIE MELLON UNIVERSITY

Pittsburgh, USA

Jan. 2010 - Oct. 2011

Research Assistant

VIT UNIVERSITY

Vellore, India

Aug. 2008 - Dec. 2009

Research Associate

INDIAN INSTITUTE OF TECHNOLOGY MADRAS

Chennai, India

May. 2009 - Jul. 2009

Research Intern

ABB ROBOTICS

Bangalore, India

Apr. 2008 - Jun. 2008

Honors & Awards

2018 **RSS Pioneer**, Robotics: Science and Systems conference (RSS)

Pittsburgh, USA

2017 **Doctoral Consortium Award**, The International Symposium on Robotics Research (ISRR)

Puerto Varas, Chile

2009 **Chancellor's Scholarship**, VIT University

Vellore, India

Teaching

Deep Learning for Autonomous Driving

SS 2018

UNIVERSITY OF FREIBURG

- Introduction to Deep Learning and ADAS, working with TensorFlow, projects on various self-driving car tasks.

Robot Navigation

WS 2015-17

UNIVERSITY OF FREIBURG

- Seminar course on advanced robot navigation research.

Robot Perception

WS 2015

UNIVERSITY OF FREIBURG

- Seminar course on advanced robot perception research.

Supervision

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

Projects

Unmanned Aerial Vehicles for Rescuing and Recovering Victims

University of Freiburg

FEDERAL MINISTRY OF EDUCATION AND RESEARCH (BMBF) PROJECT

2017-Present

Role: Project and technical leader for AIS; PI: Prof. Wolfram Burgard

Robust Localization Using Deep Landmark Features

University of Freiburg

SAMSUNG GRO PROJECT

2017-18

Role: Project and technical leader for AIS; PI: Prof. Wolfram Burgard

Reliable Lifelong Navigation for Mobile Robots

University of Freiburg

EU PROJECT FP7-IDEAS

2015-16

Role: Research engineer; PI: Prof. Wolfram Burgard

Collaborative Center for Applied Research on Ambient Assisted Living

University of Freiburg

MINISTRY OF SCIENCE AND THE ARTS OF BADEN-WÜRTTEMBERG PROJECT

2014-15

Role: Research engineer; PI: Prof. Wolfram Burgard

Autonomous Haulage System

National Robotics Eng. Center

CATERPILLAR INC. PROJECT

2013-14

Role: Research engineer; PI: Dr. Peter Rander

Enhanced Teleoperation

National Robotics Eng. Center

U.S. ARMY TANK AUTOMOTIVE RESEARCH, DEVELOPMENT AND ENGINEERING CENTER (TARDEC) PROJECT

2013-14

Role: Research engineer; PI: Dr. Peter Rander

Cooperative Robotic Watercraft

Carnegie Mellon University

CMU VISIONARY PROJECT

2010-14

Role: Research engineer and sensors lead; PI: Prof. George Kantor

Subterranean Robotics

Carnegie Mellon University

ANGLO AMERICAN PLC PROJECT

2011-12

Role: Research engineer; PI: Prof. George Kantor

Hydroponic Automation

Carnegie Mellon University

UNITED STATES DEPARTMENT OF AGRICULTURE (USDA) PROJECT

2011-13

Role: Research engineer; PI: Prof. George Kantor

Distributed SensorWebs

Carnegie Mellon University

UNITED STATES DEPARTMENT OF AGRICULTURE (USDA) SCRI-MINDS PROJECT

2010-13

Role: Research engineer; PI: Prof. George Kantor

Invited Talks

Learning Deep Multimodal Features for Reliable Scene Understanding

FIELD ROBOTICS CENTER SEMINAR, CARNEGIE MELLON UNIVERSITY

Pittsburgh, USA

Jul. 2018

Adaptive Semantic Segmentation

NVIDIA GPU TECHNOLOGY CONFERENCE EUROPE

Amsterdam, Netherlands

Sep. 2016

Techniques for Reliable Robot Perception in Unstructured Environments

IROS WORKSHOP ON STATE ESTIMATION AND TERRAIN PERCEPTION

Daejeon, Korea

Oct. 2016

Robust and Real-Time Deep Scene Understanding of Unstructured Environments

FIELD ROBOTICS CENTER SEMINAR, CARNEGIE MELLON UNIVERSITY

Pittsburgh, USA

Jun. 2016

An Autonomous Robot for Manipulation and Mapping of NFT Installations

FIELD ROBOTICS CENTER SEMINAR, CARNEGIE MELLON UNIVERSITY

Pittsburgh, USA

Dec. 2013

Intelligent Irrigation using Wireless Sensor Networks

INTERNATIONAL CONFERENCE OF AGRICULTURAL ENGINEERING

Valencia, Spain

Jul. 2012

Intelligent Environmental Monitoring using Fleets of Autonomous Surface Crafts

VIT ALUMNI LECTURE

Vellore, India

Jun. 2012

Development of the Cooperative Robotic Watercraft

THE INDIAN INSTITUTE OF TECHNOLOGY MADRAS

Chennai, India

Jun. 2012

Development of a Multi-Hop Routing Protocol for Distributed Sensing Applications

FIELD ROBOTICS CENTER SEMINAR, CARNEGIE MELLON UNIVERSITY

Pittsburgh, USA

Sep. 2010

Probabilistic Planning for Mobile Robots

GUEST LECTURE, IEEE RESONANCE, VIT UNIVERSITY

Vellore, India

Jul. 2008

Academic Activities

PROGRAM COMMITTEE

General Co-chair, RSS Pioneers, Robotics: Science and Systems Conference (RSS) 2019

REVIEWING

Journals

International Journal of Robotics Research (IJRR), IEEE Transactions on Neural Networks and Learning Systems (TNNLS), IEEE Robotics and Automation Letters (RA-L), IEEE Transactions on Robotics (T-RO), IEEE Robotics & Automation Magazine, Journal of Field Robotics (JFR), International Journal of Pattern Recognition and Artificial Intelligence (IJPRAI)

Conferences

Robotics: Science and Systems (RSS), Conference on Robot Learning (CoRL), IEEE International Conference on Robotics and Automation (ICRA), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), International Conference on Field and Service Robotics (FSR), International Symposium on Robotics Research (ISRR), European Conference on Mobile Robotics (ECMR), International Conference on Intelligent Robotics and Applications (ICIRA)

DEPARTMENTAL ACTIVITIES

- **HPC cluster administrator**, Autonomous Intelligent Systems, University of Freiburg
- **Web administrator**, Field Robotics Center, Carnegie Mellon University
- **Public spaces committee member**, Field Robotics Center, Carnegie Mellon University
- **Organization committee member**, International Conference on Sensors and Related Networks, 2007

Publications

MANUSCRIPTS UNDER REVIEW

- **Self-Supervised Model Adaptation for Multimodal Semantic Segmentation**
Abhinav Valada, Rohit Mohan, Wolfram Burgard
Under Review: International Journal of Computer Vision (IJCV), arXiv preprint arXiv:1808.03833 (AUG. 2018). 2018
- **VLocNet++: Deep Multitask Learning for Semantic Visual Localization and Odometry**
Noha Radwan*, Abhinav Valada*, Wolfram Burgard
Under Review: IEEE Robotics and Automation Letters (RA-L), arXiv preprint arXiv:1804.08366 (APR. 2018). 2018

REFEREED JOURNAL AND CONFERENCE PUBLICATIONS

- **Deep Auxiliary Learning for Visual Localization and Odometry**
Abhinav Valada*, Noha Radwan*, Wolfram Burgard
IEEE International Conference on Robotics and Automation (ICRA), 2018
- **Perspectives on Deep Multimodel Robot Learning**
Wolfram Burgard, Abhinav Valada, Noha Radwan, Tayyab Naseer, Jingwei Zhang, Johan Vertens, Oier Mees, Andreas Eitel, Gabriel Oliveira
International Symposium on Robotics Research (ISRR), 2017
- **SMSnet: Semantic Motion Segmentation using Deep Convolutional Neural Networks**
Johan Vertens*, Abhinav Valada*, Wolfram Burgard
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2017
- **AdapNet: Adaptive Semantic Segmentation in Adverse Environmental Conditions**
Abhinav Valada, Johan Vertens, Ankit Dhall, Wolfram Burgard
IEEE International Conference on Robotics and Automation (ICRA), 2017
- **Deep Spatiotemporal Models for Robust Proprioceptive Terrain Classification**
Abhinav Valada, Wolfram Burgard
The International Journal of Robotics Research (IJRR) 36.13-14 (2017) PP. 15211–1539. 2017, **(INVITED)**
- **Deep Multispectral Semantic Scene Understanding of Forested Environments Using Multimodal Fusion**
Abhinav Valada, Gabriel L. Oliveira, Thomas Brox, Wolfram Burgard
International Symposium on Experimental Robotics (2017) PP. 465–477. 2017
- **Deep Learning for Human Part Discovery in Images**
Gabriel Leivas Olivera, Abhinav Valada, Wolfram Burgard, Thomas Brox
IEEE International Conference on Robotics and Automation (ICRA), 2016
- **Autonomous Indoor Robot Navigation Using a Sketch Interface for Drawing Maps and Routes**
Federico Boniardi, Abhinav Valada, Wolfram Burgard, Gian Diego Tipaldi
IEEE International Conference on Robotics and Automation (ICRA), 2016
- **Deep Feature Learning for Acoustics-based Terrain Classification**
Abhinav Valada, Luciano Spinello, Wolfram Burgard
International Symposium on Robotics Research 2 (SEPT. 2015) PP. 21–37. 2015, **(SELECTED IN TOP 10)**
- **Planning Efficient Paths through Dynamic Flow Fields in Real World Domains**
Christopher Tomaszewski, Abhinav Valada, Paul Scerri
MTS/IEEE OCEANS, 2013
- **An Intelligent Approach to Hysteresis Compensation while Sampling using a Fleet of Autonomous Watercraft**
Abhinav Valada, Christopher Tomaszewski, Balajee Kannan, Prasanna Velagapudi, George A Kantor, Paul Scerri
International Conference on Intelligent Robotics and Applications (ICIRA), 2012
- **Automation of Hydroponic Installations using a Robot with Position Based Visual Feedback**
Niels Tanke, Guoming Alex Long, Dhruv Agrawal, Abhinav Valada, George A Kantor
International Conference of Agricultural Engineering (CIGR-Ageng), 2012
- **Base Station Design and Architecture for Wireless Sensor Networks**
David Kohanbash, Abhinav Valada, George A Kantor
International Conference of Agricultural Engineering (CIGR-Ageng), 2012
- **Development of a Low Cost Multi-Robot Autonomous Marine Surface Platform**
Abhinav Valada, Prasanna Velagapudi, Balajee Kannan, Christopher Tomaszewski, George A Kantor, Paul Scerri
International Conference on Field and Service Robotics (FSR), 2012
- **Real-World Testing of a Multi-Robot Team**
Paul Scerri, Prasanna Velagapudi, Balajee Kannan, Abhinav Valada, Christopher Tomaszewski, John M Dolan, Adrian Scerri, Kumar Shaurya Shankar, Luis Lorenzo Bill-Clark, George A Kantor
11th International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2012
- **DSRP: Distributed SensorWeb Routing Protocol**
Abhinav Valada, David Kohanbash, George A Kantor
21st International Conference on Electronics, Communications and Computers (CONIELECOMP), 2011
- **Development of a Distributed Wireless Sensing System for Agriculture**
David Kohanbash, Abhinav Valada, George A Kantor
International Symposium on Wireless Sensor Network for Agriculture, 2012

REFEREED WORKSHOP PUBLICATIONS

- **Incorporating Semantic and Geometric Priors in Deep Pose Regression**
Abhinav Valada, Noha Radwan, Wolfram Burgard
Workshop on Learning and Inference in Robotics: Integrating Structure, Priors and Models at Robotics: Science and Systems (RSS), 2018
- **Learning Reliable and Scalable Representations Using Multimodal Multitask Deep Learning**
Abhinav Valada, Wolfram Burgard
RSS Pioneers at Robotics: Science and Systems (RSS), 2018

- **Convolved Mixture of Deep Experts for Robust Semantic Segmentation**
Abhinav Valada, Ankit Dhall, Wolfram Burgard
Workshop on State Estimation and Terrain Perception for All Terrain Mobile Robots at IEEE International Conference on Intelligent Robots and Systems (IROS), 2016
- **Towards Robust Semantic Segmentation using Deep Fusion**
Abhinav Valada, Gabriel Leivas Olivera, Thomas Brox, Wolfram Burgard
Workshop on Limits and Potentials of Deep Learning in Robotics at Robotics: Science and Systems (RSS), 2016
- **Autonomous Indoor Robot Navigation Using Sketched Maps and Routes**
Federico Boniardi, Abhinav Valada, Wolfram Burgard, Gian Diego Tipaldi
Workshop on Model Learning for Human-Robot Communication at Robotics: Science and Systems (RSS), 2015
- **Visual Obstacle Avoidance for Autonomous Watercraft using Smartphones**
Tarek El-Gaaly, Christopher Tomaszewski, Abhinav Valada, Prasanna Velagapudi, Balajee Kannan, Paul Scerri
Autonomous Robots and Multirobot Systems workshop (ARMS, at AAMAS), 2013
- **Irrigation Control Methods for Wireless Sensor Network**
David Kohanbash, Abhinav Valada, George A Kantor
American Society of Agricultural and Biological Engineers (ASABE) Annual Meeting, 2012
- **Real-World Testing of a Multi-Robot Team**
Paul Scerri, Prasanna Velagapudi, Balajee Kannan, Abhinav Valada, Christopher Tomaszewski, John M Dolan, Adrian Scerri, Kumar Shaurya Shankar, Luis Lorenzo Bill-Clark, George A Kantor
Autonomous Robots and Multi-Robot Systems Workshop at the 11th International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2012
- **Wireless Sensor Networks and Actionable Modeling for Intelligent Irrigation**
David Kohanbash, Abhinav Valada, George A Kantor
American Society of Agricultural and Biological Engineers (ASABE) Annual Meeting, 2011

TECHNICAL REPORTS

- **An Autonomous Robot for Manipulation and Mapping of Hydroponic NFT Installations**
Abhinav Valada
Tech. rep. CMU-RI-TR-28-13, *Carnegie Mellon University*, 2013
- **Design and Development of a Wireless Sensor Network System for Precision Agriculture**
Abhinav Valada, David Kohanbash, George A Kantor
Tech. rep. CMU-RI-TR-10-21, *Carnegie Mellon University*, 2010

Undergraduate Activities

SELECTED COMPETITIONS

2009	Runner up, Best Paper Award , International Technical Symposium Kshtij	<i>Kharagpur, India</i>
2009	Runner up, Best Paper Award , National Technical Symposium GraVITas	<i>Vellore, India</i>
2009	Best Robot Design Award , National Technical Symposium Efusion	<i>Vellore, India</i>
2009	Winner, National Mobile Robot Racing Competition , VIT University	<i>Vellore, India</i>
2009	Second Place, Business Plan Competition , National Technical Symposium Greenon	<i>Vellore, India</i>
2008	Best Paper Award , National Technical Symposium Techtatva	<i>Manipal, India</i>
2008	Winner, My Idea Program , Lemelson Recognition and Mentoring Programme and DST Govt. of India	<i>Vellore, India</i>
2008	Winner, National Coding Competition , Computer Society of India and Indian Society for Tech. Education	<i>Vellore, India</i>
2008	Winner, National Mobile Robot Racing Competition , VIT University	<i>Vellore, India</i>
2008	Third Place, AUV Design Competition , National Technical Symposium Electroutsav	<i>Vellore, India</i>

SELECTED POSTER PRESENTATIONS

- **A Subsumption Architecture Based Behavioral Robot Using Synthetic Psychology**
Abhinav Valada, Vaani Madhuram, Swimmi Singh
National Technical Symposium GraVITas, 2009
- **Wireless Soil Moisture Control System**
Abhinav Valada
My Idea Program, Technology Business Incubator, VIT University, 2009
- **Sensory Slip Control Gripper for Industrial Robots**
Abhinav Valada
International Technical Symposium Kshtij, 2009
- **Tactile Sensing and Control of Robotic Manipulators**
Abhinav Valada, Shlok Kumar
National technical symposium Sadhana, 2008
- **Real Time Sensory Anti-slip Gripper for Industrial Robots**
Abhinav Valada
My Idea Program, Technology Business Incubator, VIT University, 2008

- **Real Time Intelligent Force/Position Control Mechanism for Dexterous Manipulation**
Abhinav Valada
National Technical Symposium Techtatva, 2008
- **Sensory Gripping System for Variable Products**
Abhinav Valada
National Technical Symposium Techtatva, 2008
- **Intelligent Sensory Slip Control for Industrial Robots”, National technical symposium efusion**
Abhinav Valada
National Technical Symposium Efusion, 2008

Software & Datasets

Semantic Scene Understanding

<http://deepscene.cs.uni-freiburg.de>

- Live demo of the state-of-the-art unimodal and multimodal semantic segmentation using AdapNet and AdapNet++ on various benchmarks.
- Freiburg Forest Dataset - Pixel-level semantic labels of unstructured forested environments.

Semantic Visual Localization

<http://deeploc.cs.uni-freiburg.de>

- Live demo of the state-of-the-art multi-task visual localization, semantic segmentation and odometry estimation using VLocNet and VLocNet++.
- DeepLoc Dataset - Pixel-level semantic labels and 6-DoF camera poses for images.

Semantic Motion Segmentation

<http://deepmotion.cs.uni-freiburg.de>

- State-of-the-art SMSnet models that jointly predict the pixel-level semantic object class and motion status.
- Cityscapes Motion Dataset - Pixel-level semantic and motion annotations of images from the Cityscapes benchmark.
- KITTI Motion Dataset - Pixel-level semantic and motion annotations of images from the KITTI benchmark.

Acoustics-based Terrain Classification

<http://deepterrain.cs.uni-freiburg.de>

- Live demo of the state-of-the-art terrain classification using only audio signals of vehicle-terrain interactions.
- AudioTerrain Dataset - Over 6 hours of annotated audio clips of vehicle-terrain interactions on 9 different indoor and outdoor terrains.

Semantic Segmentation of Human Body Parts

<http://aisdatasets.cs.uni-freiburg.de>

- Freiburg People in Disaster Dataset - Pixel-level semantic annotations of human body parts in an environment that mimics a disaster scenario with clutter and heavy occlusion.
- Range Segmentation Dataset - Pixel-level semantic annotations of human body parts at different distances from the camera.

Media Coverage

Robotic Crocodiles

Discovery Channel, 2015

Crocodile Robot Dodges Hippo ... for Science!

NBC News, 2014

Robots: A Fun Context for Learning

Grow a Generation, 2014

For Surveying Dangerous Hippo Pools, Platypus Robots Go Where People Can't

Environmental Monitor, 2014

Dirty and Dangerous

Cary Institute, 2014

Platypus Floats Idea of Affordable Environmental Robotics

Business Times, 2012

Cooperative Robotic Watercraft

Robots.net, 2012

CMU's Team Develops Environmental Robotics

Business Journal, 2012

CMU startup adds robotics to water

Pittsburgh Business Times, 2012