Sudeep Pillai

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Contact Information

32-23x, 32 Vassar St, Cambridge, MA, USA
Marine Robotics Group
Computer Science and Artificial Intelligence Laboratory (CSAIL)
Massachusetts Institute of Technology

Education

Massachusetts Institute of Technology, Cambridge, MA 2014 – 2017
Doctor of Philosophy, Electrical Engineering and Computer Science
Thesis: SLAM-Aware, Self-Supervised Perception in Mobile Robots
Advisor: John J. Leonard

Massachusetts Institute of Technology, Cambridge, MA 2011 – 2014
Master of Science, Electrical Engineering and Computer Science
Thesis: Learning Articulated Motions from Visual Demonstration

University of Michigan, Ann Arbor, MI 2005 – 2008
Bachelor of Science in Engineering, Mechanical Engineering
Advisor: Ryan Eustice

Research Experience

Massachusetts Institute of Technology, Cambridge, MA
Research Assistant, Marine Robotics Group, CSAIL 2014 – 2017
My research focuses on developing perception and inference algorithms that enable *life-long visual experience learning from semantic and geometric scene understanding in robots*. I am particularly interested in understanding the capabilities at the intersection of scene understanding and spatial awareness (SLAM) that can potentially support self-supervised perceptual learning in mobile robots.

Research Assistant, Robotics, Vision & Sensor Networks, CSAIL 2011 – 2014
Developed a supervised method to learn and predict the articulations in objects from user-provided visual demonstrations of object actuation in unstructured environments.

Selected Publications

Pillai et al. "Self-Supervised Visual Place Recognition Learning in Mobile Robots", *IROS '17 (Wkshp)*.

Pillai et al. "Towards Visual Ego-motion Learning in Robots", *IROS '17*.

Moll, O. al. "Vroom: An Engine for Big Volume Robot Sensor Data", *VLDB '17 (Demo Track)*.

Fourie et al. "Centralized Graph Databases for Mobile Robotics", *ICRA '17*.

Pillai et al. "High-Performance and Tunable Stereo Reconstruction", *ICRA '16*.

Pillai et al. "Monocular SLAM Supported Object Recognition", *RSS '15*.

Ramalingam et al. "Line-Sweep: Cross-Ratio for Wide-Baseline Matching & Recons.", *CVPR '15*.

Pillai et al. "Learning Articulated Motions from Visual Demonstration", *RSS '14*.

Professional Experience

Mitsubishi Electric Research Laboratories, Cambridge, MA
Research Intern - Spatial Analysis Summer 2014
Developed next-generation computer vision technologies for autonomous vehicles

Key Technologies: Real-time applications for autonomous vehicles; Stereo Mapping and Reconstruction; Software stack for rapid-prototyping and evaluation of computer vision applications.

PhaseSpace Motion Capture, San Leandro, CA
Computer Vision & Software Developer 2009 – 2011
Assist with the development of a state-of-the-art computer vision stack to support motion-capture technologies with real-time performance considerations

Key Technologies: Sub-pixel accurate fiducial tracker for robust 6-DOF pose estimation; Real-time facial expression transfer and synthesis; n-View camera calibration and correspondence engine; SIMD/GPU optimization for high-throughput, real-time image processing; Sensor-fusion of Inertial Measurement Units (IMUs) with passive motion-capture camera data for occlusion-resilient skeletal tracking.

Segway Inc., Manchester, NH
R & D Engineer Intern - Product Development and Future Technologies Summer 2008
Conceptualized upcoming prototypes amongst a highly skilled product design team

Key Technologies: Frequency stability analysis for low-cost MEMS IMUs; Time-critical control algorithms for stability low-cost automatic control on embedded systems.

Patents (Provisional)

High-Speed and Tunable Scene Reconstruction Method Using Stereo Imagery *2016*

Invited Talks

Mar '17: NVIDIA Research	*Santa Clara, CA*
Feb '17: Microsoft Analog Research and Development	*Seattle, WA*
Apr '16: CSAIL Advisory Board Meeting	*Cambridge, MA*
Jan '16: Boston Imaging and Vision Meetup	*Cambridge, MA*
Jan '16: Energy-Efficient Multimedia Systems Group, RLE, MIT EECS	*Cambridge, MA*
Jan '15: Association for the Advancement of Artificial Intelligence (AAAI '15)	*Austin, TX*

Academic Duties

Tutorial / Workshop Co-organizer:
- Learning for Mapping Workshop, IEEE IROS 2017 2017
- Geometric and Semantic 3D Reconstruction Tutorial, IEEE CVPR 2017 2017

Program Committee:
- Robotics Science and Systems (RSS) 2016

Journals:
- IEEE Robotics and Automation Letters (RA-L) 2016-Present
- Autonomous Robots (AURO) 2016-Present

Conferences:
- IEEE International Conference on Robotics and Automation (ICRA) 2014 - Present
- IEEE International Conference on Intelligent Robots and Systems (IROS) 2015 - Present
- Robotics Science and Systems (RSS) 2016
- Robotics Science and Systems Workshops (RSS) 2017
- International Conference on Computer Vision (ICCV) 2017

Media

"Object recognition for robots", *MIT News* 2015
"Robots that can recognize objects? A SLAM dunk", *MIT CSAIL News* 2015
"Terminator-like vision could help robots do our dishes", *Popular Science* 2015
"Attacking Bitcoin's anonymity with graph analytics", *Linkurious Blog* 2014

Past Projects

MIT DARPA Robotics Challenge Team, *Member, Perception Sub-Team* 2012 – 2013
Assisted in developing the perception framework to take on the visual challenges in the DARPA Robotics Challenge

UM::Autonomy, *Perception Lead / Co-founder* 2007 – 2008
Co-founded a team of multidisciplinary students to build an autonomous vehicle to compete in the ONR AUVSI ASV Competition, and developed machine vision architecture for vision-based SLAM and navigation using a synchronized multi-camera setup

Programming

Programming Languages: C, C++, Python, CUDA, SIMD/SSE, MATLAB, Bash, Emacs Lisp, SQL.
Software / Libraries: TensorFlow, Caffe, Ceres Solver, OpenCV, Eigen, PCL, LCM/ROS/Gazebo, ISAM/GTSAM, CGAL, OpenGL, Boost, OpenMP, GDB, Valgrind, Linux
Python: Keras, Scikit-Learn, NumPy, Boost-Python, Cython, Pandas, SciPy, PyTables, NetworkX, graph-tool, Numba, Anaconda

Keywords: Machine Learning, Deep Learning, Semantic Scene Understanding, Computer Vision, Simultaneous Localization and Mapping (SLAM), Structure-from-Motion (SfM), Self-driving cars, Autonomous Robots, Robot Perception, Object Recognition, Localization, Mapping, Probabilistic Graphical Models, Self-supervised Learning, Semi-Supervised Learning, Learning from Demonstration, Sensor Fusion.