

# ANKIT V. MANERIKAR

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## ❖ EDUCATIONAL QUALIFICATIONS:

Purdue University, USA	<b>Doctor of Philosophy (PhD)</b> Major: Electrical and Computer Engineering	-	May 2021 (Expected)
Purdue University, USA	<b>Master of Science</b> Major: Electrical and Computer Engineering	3.84/4.00	Aug 2017
D. J. Sanghvi College of Engineering, University of Mumbai	<b>Bachelor of Engineering</b> Major: Electronics Engineering Division: First Class with Distinction	81.52% (1 <sup>st</sup> Rank)	July 2015
Shri Baghubhai Mafatlal Polytechnic, Mumbai	<b>Pre-University Course (Engineering Diploma)</b> Major: Industrial Electronics Engineering Division: First Class with Distinction	89.26% (1 <sup>st</sup> Rank)	July 2012

## ❖ WORK/TEACHING EXPERIENCE:

- **Robot Vision Lab** August 2017 - Present  
*Designation: Research Assistant* **West Lafayette**
  - Project Member, BAA-1703 Contract on Dual Energy ATR for Airport Security: A DoHS (Department of Homeland Security) project to research machine learning methods for Dual Energy X-ray based threat detection in airport checkpoint security.
  - Project Member, ALERT TO-7 AATR Initiative: An ALERT-sponsored project on Adaptive Automatic Target Recognition (AATR) for CT-based Threat Object Detection Systems for airport baggage screening.
  - Designed *DEBISim* – a CT simulator for dataset synthesis/augmentation for security scanners to test and implement machine learning algorithms for threat detection.
  - Developed Deep-Learning based Metal Artifact Reduction Frameworks for X-ray Tomography.
  - Developed 3D Object detection classifiers and reconstruction/decomposition algorithms for Dual Energy Computed Tomography.
  - Developed Robot Motion Planning Algorithms in a ROS environment using RRT and CHOMP techniques.
- **Gade Autonomous Systems** June 2016 - July 2016  
*Designation: Intern: Machine Learning, Firmware & Robotics* **Mumbai/Frankfurt**
  - Headed the team for Cortex-based Firmware development of smart devices for fitness/automotive applications.
  - Designed HMM Machine Learning Algorithms for smart networks with inertial and IR sensing systems.
- **Citizen Scales India (P) Ltd.** Dec 2011 - May 2012  
*Designation: Research Intern/Co-op* **Mumbai**
  - Collaborated with a team of Firmware Engineers for design of a Moisture Analysis Device on an ARM7 platform.
  - Implemented Regression-based algorithms for Temperature Compensation in Micro-Precision Weighing Scales.
- **Technophilia Systems** June 2010 – Nov 2010  
*Designation: Robotics Intern /Co-op* **Mumbai**
  - Designed a Partial Gait Model for the Autonomous Navigation of a Biped.
  - Designed navigation algorithms for a four-wheel drive robot with a centroid-based object-tracking algorithm.
- Teaching Experience:
- **Purdue University – West Lafayette** Jan 2016 – May 2017  
*Designation: Graduate Teaching Assistant* **West Lafayette**
  - Assisted students for the course *Feedback System Analysis and Design* for their coursework and design assignments.

## ❖ RESEARCH EXPERIENCE:

- **DEBISim - A Simulation Software for Material Detection using Multi-energy X-ray Inspection Systems:**  
(DoHS Graduate Research Assistantship – Robot Vision Lab, Purdue University)
  - Research and development for a CT Simulation pipeline (DEBISim) for X-ray image data/dataset generation designed to aid the training and testing of Single-/Dual-energy CT based object detection systems for non-destructive testing applications.
- **Classifier Design for 3D Segmentation using Dual Energy X-ray Tomography:** [pub]  
(Graduate Research Assistantship – Robot Vision Lab, Purdue University)
  - This project involves the design of improved classifier frameworks for X-ray based object detection using Dual Energy CT.
  - It encompasses decomposition algorithms for Dual Energy CT data as well as 3D object segmentation/classification.
- **Adaptive Automatic Target Recognition (AATR) for CT-Based Object Detection Systems:** [pub]  
(Graduate Research Assistantship – Robot Vision Lab, Purdue University)
  - This project (a part of the TO-7 DHS ALERT Initiative) dealt with the design of an Automatic Target Recognition System for adaptively segmenting and identifying target objects of varying specifications.

- Its implementation involves a dynamically hierarchical supervoxel segmenter coalesced with an AdaBoost classifier.
- **Indoor Place Categorization for Visual SLAM:** [\[video\]](#) [\[GitHub\]](#)  
(Course Project: BME595 (Deep Learning), Fall 2017 – Purdue University)
- Developed a Place Recognition Classifier using ResNet CNNs to learn indoor visual landmarks during mobile robot navigation.
- **SLAM-Assisted Coverage Path Planning for Lidar Mapping Systems:** [\[pub1\]](#) [\[pub2\]](#)  
(Graduate Research Project - Digital Photogrammetry Research Group, Purdue University)
- Developed a SLAM-based Pseudo-GNSS/INS system for a Lidar Mapping Vehicle in a ROS environment.
- Implemented Lidar Mapping Systems for Roomba iCreate and DJI Phantom M3 for terrestrial/aerial mapping.
- **Optimal Constrained Coverage Path Planning for Mobile Robot Navigation:** [\[pub\]](#) [\[GitHub\]](#)  
(Course Project: AAE568 (Applied Optimal Control & Estimation), Spring 2016 – Purdue University)
- Developed a Pseudospectral Optimal Control Algorithm for Coverage Path Planning for complex obstacles and boundaries.
- **Position Control Using Ultrasonic Levitation Assembly:**  
(Final Year Project (B.E.), University of Mumbai.)
- Designed a Contactless Precision Position Control system harnessing sound waves to suspend particles in mid-air.
- **A Portable Soil Health Monitoring System for Dynamic Soil Mapping:** [\[video\]](#)  
(Presented at Texas Instruments IADC, 2014)
- Implemented a portable UV-VIS spectrophotometry system allowing on-field spectral analysis of soil.

## ❖ PUBLICATIONS / PAPERS:

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- Manerikar, Ankit, Tanmay Prakash, and Avinash C. Kak. "Adaptive target recognition: A case study involving airport baggage screening." *Anomaly Detection and Imaging with X-Rays (ADIX) V*. Vol. 11404. International Society for Optics and Photonics, 2020. [\[pdf\]](#)
- Manerikar, Ankit, Fangda Li, and Avinash Kak. "A Spectrum-Adaptive Decomposition Method for Effective Atomic Number Estimation using Dual Energy CT." IS&T Electronic Imaging: *Computational Imaging VIII, IS&T International Symposium on Electronic Imaging*, 2020. [\[pdf\]](#)
- Li, Fangda, Ankit Manerikar, Tanmay Prakash, and Avinash Kak. "A Splitting-Based Iterative Algorithm for GPU-Accelerated Statistical Dual-Energy X-Ray CT Reconstruction." IS&T Electronic Imaging: *Computational Imaging VIII, IS&T International Symposium on Electronic Imaging*, 2020. [\[pdf\]](#)
- Li, Fangda, Ankit V. Manerikar, and Avinash C. Kak. "RMPD—A Recursive Mid-Point Displacement Algorithm for Path Planning." In *Twenty-Eighth International Conference on Automated Planning and Scheduling*. 2018. [\[pdf\]](#).
- Shamseldin, Tamer, Ankit Manerikar, Magdy Elbahnasawy, and Ayman Habib. "SLAM-based Pseudo-GNSS/INS localization system for indoor LiDAR mobile mapping systems." In *2018 IEEE/ION Position, Location and Navigation Symposium (PLANS)*, pp. 197-208. IEEE, 2018. [\[pdf\]](#)
- Manerikar, Ankit, Tamer Shamseldin, and Ayman Habib. "SLAM-Assisted Coverage Path Planning for Indoor LiDAR Mapping Systems." *arXiv preprint arXiv:1811.04825* (2018). [\[pdf\]](#)
- Manerikar, Ankit, and Anandpara, Tanvi. "Design of a Practical Cat-righting Reflex (CRR) Model." *Procedia Computer Science* 45 (2015): 514-523. [\[pdf\]](#)[\[GitHub\]](#)

## ❖ SKILLS:

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| • <b>Core Programming:</b>             | Python, C++, C, Matlab.  |
| • <b>Computer Vision Tools:</b>        | OpenCV, Torch, PCL.  |
| • <b>Machine Learning Tools:</b>       | PyTorch, TensorFlow, scikit-learn.   |
| • <b>Computer Graphics/Simulation:</b> | Qt, MayaVi, ASTRA, Simulink.   |
| • <b>Robot Experience:</b>             | Roomba iCreate, Pioneer PowerBot, DJI Phantom M3   |
| • <b>Robotics Tools:</b>               | ROS (Indigo - Lunar), Gazebo, ARIA   |
| • <b>Sensor Experience:</b>            | Design and Operational Experience with Velodyne, SICK LMS-XXX, Monocular/Stereo/RGBD Camera Systems, Kinect SDK. |
| • <b>Developer Tools:</b>              | PyCharm IDE, Eclipse IDE, AVR-gcc.   |
| • <b>Embedded Platforms:</b>           | ARM Cortex (TI TivaC, Stellaris), ARM7 (NXP), AVR Family.  |

## ❖ HONORS / AWARDS:

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| • <b>J.R.D. Tata Trust Scholarship Award</b> | Scholarship for Undergraduate Engineering for the academic years: 2012-13, 2013-14.                       |
| • <b>Best Student Paper Award</b>            | "Particle Swarm Optimization in Control Systems Design", <i>IEEE Technomania</i> 2013,                    |
| • <b>Student Award for Academic Merit</b>    | 1 <sup>st</sup> Rank in B.E. (Electronics, DJSCoE), 6 <sup>th</sup> Rank in University of Mumbai.         |
| • <b>Juhu Lions Club Scholarship Award</b>   | 1 <sup>st</sup> Rank in Industrial Electronics for the academic years 2008-09, 2009-10, 2010-11, 2011-12. |