

Nandan Banerjee

iRobot Corporation, 8 Crosby Drive, Bedford, MA 01730, USA
E-mail: nbanerjee [at] irobot [dot] com
Phone: +1 774 420 8142
<http://www.nandanbanerjee.com>

SHORT BIO

My main objective is that I want to work on Robotic systems, devise new algorithms using superior AI techniques and become a reputed roboticist. My areas of interest are in robotics manipulation (motion planning, visual servoing, etc.), computer vision, mapping and navigation (SLAM, occupancy grid mapping, etc.), AI, and general software development. I have worked with robots of all sizes, from the iRobot Roomba, the Kinova Jaco, Rethink's Baxter to the Boston Dynamics' Atlas. I am also very interested in deep learning but I haven't done any work in that field yet - still learning.

I have substantial experience in various languages which include C, C++, and Python. I have also done work in Java and Delphi (Object Pascal) in the past. Apart from this, I also have substantial experience in working with ROS and software APIs like OpenCV, PCL, OpenRAVE and other Robotics libraries.

EDUCATION

Master of Science, Robotics Engineering
Worcester Polytechnic Institute
2013 - 2015 (GPA - 3.83/4)

Bachelor of Technology, Computer Science and Engineering
National Institute of Technology, Durgapur
2008 - 2012 (GPA - 7.97/10)

EXPERIENCE

Robotics Software Engineer June, 2015 - Present
iRobot Corporation

- Research and development of algorithms for robotic manipulation related to motion planning using novel trajectory optimization techniques, and kinematic calibration of a low cost dual arm robot.
- Mapping and navigation research (algorithms for occupancy grid mapping, landmark management, SLAM - graph optimization) in heavily constrained computational platforms for next generation Roombas and other consumer robots.

Graduate student August, 2013 - June, 2015
Worcester Polytechnic Institute

- **ARC Lab** under Professor Dmitry Berenson - Worked on Visual Servoing techniques to counter the inaccuracies in getting to a desired pose on the Baxter robot. Used simulated annealing to arrive at a better solution for the visibility planning problem in the Baxter robot at the ARC lab.
- **ATLAS Lab** under Professor Taşkın Padiç - Was a part of the WPI-CMU DARPA Robotics Challenge team where I worked on the Boston Dynamics' ATLAS robot in the perception and the manipulation area. I was the team lead for the door task, where I developed algorithms for door detection and motion planning for walking to the door, opening it, and walking through it. We successfully completed the door task both times at the DRC Finals.

Teaching Assistant August, 2014 - May, 2015
Worcester Polytechnic Institute

- Teaching and grading freshman Physics laboratory experiments.

Robotics Research Intern June, 2014 - August, 2014
Vecna Robotics (Cambridge Research Lab)

- Porting of a significant part of the Vecna robotics suite to Hydro from Fuerte.
- Implementation of a model based tracking algorithm to track the hand of the Jaco arm.
- Implementation of a Calibration Helper tool to automate partially the process of generating the transform between the camera and the robot base using model based detection techniques.

Software Engineer July, 2012 - July, 2013
Samsung Research India, Bangalore, India

- Interfaced a part of the Tracfone prepaid engine for a Samsung Feature Phone (Erica) released in May, 2013.
- Implemented carrier specific AT commands for AT&T feature phones (Remington and Pocket3G).
- Debugged File System, SD card, USB as well as other System Layer RTOS issues related to the ST Ericsson's ARM9 processor in the feature phones.

Freelance Programmer
Application Programming and Embedded Systems

- Built **Quiz buzzer systems** for two companies - QuizWorks and Quizcraft.
- Developed Quiz software for Quizcraft.

Undergraduate Student July, 2008 - May, 2012
Computer Science and Engineering Department, NIT Durgapur

- Completed a project entitled "A Simple Autonomous Robotic Manipulator for playing Chess against any opponent in Real Time" (**Buttercup Chess Robot**) under Prof. Gautam Sanyal (Computer Science Dept., NIT Durgapur) where I designed the robot, the entire control system and the image processing algorithm to determine the Chess moves made by an opponent.
- Completed a project entitled "A study of parallel computing techniques using NVIDIA CUDA and OpenMPI" under the guidance of Dr. Subhasis Chattopadhyay, Scientific Officer and Incharge of the LHC Grid Computing Laboratory at the Variable Energy Cyclotron Centre, Calcutta, India.
- Completed an autonomous perpendicular **Parking Robot** using an AVR microcontroller under Prof. Gautam Sanyal (Computer Science Dept., NIT Durgapur).
- Made a media system (**HMedia System**) capable of being controlled using as many as 100 Android smartphones which also features a customized LED Matrix capable of displaying the frequency spectrum of the media being played.

SKILLS

Programming Languages: C, C++ (Qt and Visual C++), Python, Java (mostly Android), and Object Pascal (Delphi and Lazarus).

APIs: ROS, OpenRAVE, OpenCV, PCL, MoveIt, FCL, OpenGL, Android SDK, and CUDA.

Operating Systems: Windows and LINUX (Ubuntu and Scientific Linux CERN).

Software: Matlab, Visual Studio, Qt Creator, Delphi XE2, Source Insight, Lazarus, L^AT_EX, GDB, Git, Perforce, Lauterbach Trace32.

Embedded Systems: AVR Microcontrollers, Robot design, Various ICs, Designing Embedded Circuits, CircuitLab (Circuit Simulation)

JOURNAL/ CONFERENCE PUBS.

Heuristically initialized motion planning in a low cost consumer robot
IEEE RAS Humanoids Conference, November 2017
Birmingham, UK

Human Supervised Control of the ATLAS Humanoid Robot for Traversing Doors
IEEE RAS Humanoids Conference, November 2015
Seoul, South Korea

NO FALLS, NO RESETS: Reliable Humanoid Behavior in the DARPA Robotics Challenge
IEEE RAS Humanoids Conference, November 2015
Seoul, South Korea

Team WPI-CMU: Achieving Reliable Humanoid Behavior in the DARPA Robotics Challenge
Journal of Field Robotics (DRC Finals Special Issue), January, 2017

A Simple Autonomous Robotic Manipulator for playing Chess against any opponent in Real Time (Best paper award)
International Conference on Computational Vision and Robotics, 2012
Bhubaneswar, India

Learning OpenCV 3 Computer Vision with Python - Second Edition
Book Reviewer (2015)

AWARDS

IRNet Young Investigator Award
Presented at the ICCVR - 2012 for my undergraduate thesis and subsequent paper on it.

MEMBERSHIP

IEEE

IEEE RAS (Robotics and Automation Society)

STEM

Job shadow

- Talked about the various engineering disciplines that come together while building robots, piqued interest in mathematics and science by showing some simulations of the exciting things in robotics that mathematics helps enable, and answered questions about working in the robotics industry to high school juniors/seniors from Massachusetts.

Robotics / STEM Talk

- Seven Hills Charter School, Worcester, MA (Talk about robotics and STEM to primary and middle schoolers).
- Touch Tomorrow 2016 at the Worcester Polytechnic Institute, Worcester, MA (Talk about robotics and STEM to kids of all ages.)
- Yale Hackathon at Yale University (Organized a hackathon based on the iRobot Create 2 platforms)

EXTRA-CURRICULAR ACTIVITIES

While a part of the ROBOCON team at NIT Durgapur, I led our team in developing the software and control systems for our robots.

Have participated in many Robotics and Embedded Systems competitions.

- I was a member of the college robotics team. As such I represented my Institution in the India leg of ABU-ROBOCON 2011 and 2012 held in Pune.
- Won 1st prize in the Pacman event organized by the Society of Automotive Engineers collegiate club, NIT Durgapur during their annual auto fest.
- Won 2nd prize in the Dig the Change sensor design competition held by the IEEE students society of NIT Durgapur during the universitys techno management fest AAROHAN.

Been an ardent quizzier throughout.

- Came 1st in the General Quiz at REBOOT 2012 (Bangalore) where I represented Samsung.
- Came 1st in the BizQuiz held at IIT Kharagpur's tech-fest KSHITIJ 2011.
- Came 1st in the TechKnow quiz organized by the Maths and Tech club of NIT Durgapur in 2010.
- Came 1st in the MusicQ quiz organized by QuizInc club of NIT Durgapur 2011.
- Came 1st in the Biz Quiz organized by the Literary Circle of NIT Durgapur in 2011.