

# RITWIK UMMALANENI

1420 Chicago Avenue, Apt 4C ◊ Evanston, Illinois 60201  
(630)-460-0642 ◊ ritwik@u.northwestern.edu

## RESEARCH INTERESTS

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**Robotics** *esp.* planning in uncertainty, motion planning, optimal control, probabilistic robotics, polynomial trajectory planning, navigation, robotic manipulation, computer vision

## EDUCATION

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### Northwestern University, Evanston

*August 2015*

M.S. in Robotics  
Cumulative GPA: 3.65/4.0

### VIT University, Vellore

*May 2014*

B.Tech. in Electronics & Communication Engineering  
Cumulative GPA: 8.57/10.00  
Special Achiever - *Class of 2014*  
Final Year project: UAV - System Development

## EXPERIENCE

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### Auris Surgical Robotics, Inc.

June 2015 - September 2015

*Navigation Systems Intern*

*San Francisco Bay Area, CA*

- Engineered software modules for testing and analysis of real-time control and navigation systems
- Researching novel solutions for interventional navigation to reduce positional uncertainty and tissue damage through probabilistic sensor fusion, state estimation and computer vision.

### MSR - Northwestern University

September 2014 - Current

*Graduate Student*

*Evanston, IL*

- Undertook a variety of projects, working on different platforms primarily using ROS, PCL and Gazebo
- Platforms: KUKA youBot, Rethink Robotics - Baxter, Oculus Rift
- Practical experience in various meta-packages in ROS (perception, navigation, MoveIt! etc.) and in other open source frameworks like OpenCV, PCL, Gazebo etc.

### UAV Development Centre - VIT

January 2014 - May 2014

*Founder & Research Associate*

*Vellore, India*

- Founded and led the robotics research laboratory at VIT University
- Initiated and completed several projects, leading multidisciplinary teams successfully
- Assisted the PI in drafting research proposals and obtaining grants from various institutions

### Scientific and Industrial Research Centre - GVP

October 2013 - January 2014

*Project Intern*

*Visakhapatnam, India*

- Awarded fellowship for research at this institution
- Worked on a Defence R&D project aiming to replace conventional air data systems on 4th generation fighter aircraft
- Developed modules for automated wind-tunnel data analysis. Designed and implemented a back-propagation algorithm for handling erroneous sensor data

### Aeronautical Development Establishment - DRDO

May 2012 - June 2012

*Intern*

*Bangalore, India*

- Worked at the Unmanned Air Vehicles division, Flight Control and Simulation laboratory

## RELATED PROJECTS

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### Robotics

- *KUKA youBot - 5 DOF Mobile Manipulator with a Mecanum Base*  
Motion planning, Constrained manipulation, PID feedback control, , SAC segmentaion, 3-D Reconstruction, ICP
- *Baxter - 14 DOF Industrial Robotic Manipulator*  
Motion planning, Constrained manipulation, Torque control, Obstacle modelling, SAC segmentaion, Volumetric estimation
- *UTIAS Multi-Robot Cooperative Localisation and Mapping Dataset*  
Probablistic modelling, Kalman filter, Extended Kalman filter, Particle filter, Monte- Carlo localisation, Dynamic A-star, Trajectory planning and execution, Cooperative localisation, Support vector machine, Locally weighted regression
- *VOLO 2.0 Quadrotor Research Test-Bed*  
Control system design, Adaptive controller design, GPS denied navigation, Trajectory planning and execution, Aggressive manoeuvring, Decentralised swarm control, Attitude estimation
- *AR DRONE 2.0 based Research and Development*  
Vision based localisation, Recursive state estimation, Parallel tracking and mapping, Object tracking, Automated landing on moving target, Tactical vehicle formations
- *Autonomous Ground Rover - VIT-VAHAN2*  
Controller design, Object tracking, Vision based localisation and mapping, Tactical vehicle formations
- *Design and Simulation of a Robotic Manipulator*  
Kinematic design and simulation of a 3DOF robotic manipulator, Trajectory execution
- *Tilt Rotor RC Aircraft with VTOL and STOL*  
Controller design for altitude hold and hover, PID Controller for attitude error correction
- *VOLO 1.0 RC Micro Air Vehicle*  
Control system design, Electrical subsystem development, Attitude estimation, Scripted mission deployment

### Computer Vision

- *Real-time Human Detection and Tracking for Surveillance*  
Histogram of oriented gradients, Support vector machine, Binary classifiers
- *Real-time Face Detection for Surveillance*  
Eigen face, Haar classifiers, Random trees

## TECHNICAL STRENGTHS

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<b>Computer Languages</b>	C, C++, Python
<b>Packages &amp; Libraries</b>	ROS, OpenCV, PCL, Ecto, Gazebo, Oculus SDK, V-Rep
<b>Software</b>	Matlab, Mathematica, LabView, Eagle, Solidworks
<b>Tools</b>	Git, Emacs, L <sup>A</sup> T <sub>E</sub> X

## SELECT AWARDS & ACHIEVEMENTS

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Special Achiever	Exemplary performance in int'l events and academics	2014
Outstanding Project	School-wide award for the best final project	2014
Research Fellowship	GVP Fellowship for outstanding research 2013-14	2013
Finalist	EADS/Airbus Group: Join the spirit contest	2013
Finalist	Texas Instruments analog design contest	2012

## MEMBERSHIPS & AFFILIATIONS

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*Student Member*    **IEEE (Robotics and Automation Society)**

*Executive Member*    **SEDS (Students for the Development and Exploration of Space)**

## ONLINE PRESENCE

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Project Portfolio: <http://ritwiku.com>

Github: <https://github.com/ritwik1993>

LinkedIn: [www.linkedin.com/in/ritwiku](http://www.linkedin.com/in/ritwiku)