# Chahat Deep Singh

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**Research Interests**: Computer Vision, Artificial Intelligence and Aerial Robotics.

## Current Research

**- FlyNet:** Deep Learning driven Structure-less Gap Detection for Quadrotor Flight through Unknown Window. (arXiv print coming soon); *Advisor: Prof. Yiannis Aloimonos and Cornelia Fermuller*

**- Transfer of Motion Primitives:** A Technique to Transfer the Human Motion Model to a Kinematic Chain Cooperatively Manipulated by a Swarm of Quadrotors. *Advisor: Prof. Yiannis Aloimonos*

## Education

- **University of Maryland** — College Park, MD
  *Master of Engineering in Robotics* — *2016–Present*
- **Guru Gobind Singh Indraprastha University** — New Delhi, India
  *Bachelor in Electronics and Communication Engineering* — *2011–2015*

## Research Experience

- **Research Assistant** — with Prof. Yiannis Aloimonos
  *Computer Vision Lab, University of Maryland* — *Jan 2017 – Present*
  - **Extrinsic Calibration of multiple cameras**: Worked on Spatial Calibration for Multi-Sensor Systems for Rolling Shutter Camera. with Dr. Cornelia Fermüller
  - **Gap Detection using Optical Flow**: Worked on deep learning networks to obtain optical flow between two consecutive frames from RGB images followed by Gap Detection in the Presence of a Strong Parallax.
- **Research Assistant** — with Dr. Sudipto Mukherjee
  *Indian Institute of Technology, Delhi* — *August 2015 – October 2015*
  *Inductive Motion Capture:* Human Gait analysis using sensitive inductive sensors by changing the permeance of the space occupied by the flux between the two human body limbs.
- **Project Assistant** — with Scientist Vijayant Bhardwaj
  *Defence Research & Development Orgranization* — *May 2014 – July 2014*
  *Computer Vision driven Laser Wander Correction:* Developed an adaptive optic system at *Laser Science and Technology Centre* that uses a very high frame rate monochrome camera and automatically corrects for light distortions in the medium of transmission.
- **Research Assistant** — with Prof. Arvind Rehalia
  *Senior Year Project* — *October 2014 – May 2015*
  *REDIPS, a Quadruped Robot:* Developed a Quadruped Robot, codenamed *REDIPS* having both autonomous and manual capabilities trained on standard Trot gait algorithm capable of object tracking and following.
- **Project Assistant** — with Squadron Leader R Vasanth
  *Indian Air Force* — *Feb 2014 – May 2014*
  *Gillham Encoding:* Developed a calibration tester for encoding Altimeter using special binary coding scheme.

## Publications

- **FlyNet: Deep Learning driven Structure-less Gap Detection for Quadrotor Flight through Unknown Window**: Chahat Deep Singh*, Nitin J Sanket*, Yuxin Ma, Cornelia Fermuller, Yiannis Aloimonos. (*equal contribution. arXiv Prepint coming soon.)
- **Mobile Surveillance Spheroid Robot with Static Equilibrium Camera, Leaping Mechanism and KLT algorithm based Detection with Tracking**: Shamsheer Verma, Chahat Deep Singh, Sarthak Mittal, Prateek Arora and Arvind Rehalia. International Journal of Control Theory and Applications, 09(41) 2016, 473-488. ISSN: 0974-5572.
- **Fully Autonomous and Manually Controlled Quadraped with Object Detection and Tracking**: Shamsheer Verma, Chahat Deep Singh, Arvind Rehalia. International Journal of Engineering and Technical Research (IJETR). Volume-2, Issue-9, 09-2014. ISSN: 2321-0869.
- **A Novel Method to Increase Transmission Power Efficiency in Portable Systems**: International Journal of Innovative Research in Science, Engineering and Technology. Vol. 4, Issue 11, 11-2015. ISSN: 2319-8753.

## Course Projects

- **Segmenting Objects in a 3D Point Cloud**: Segmented a concave reconstructed point cloud into $n$–convex clouds.
- **Structure from Motion**: Created a sparse structure of the scene from a sequence of RGB images.
- **Collision-free Optimal Trajectory Planning in a Mult-Robot System**: Solved the problem of cooperative planning in order to simulate the algorithm for concurrent assignment and planning of trajectories (CAPT).
- **3D pose estimation**: Localization using Perspective-n-Point and optimizing it using GTSAM factor graphs.

## Relevant Courses

- **CMSC 733 - Computer Processing of Pictorial Information**: Spring 2017 *by Prof. Yiannis Aloimonos*
- **CMSC 828G - Image Understanding**: Fall 2016 *by Prof. Rama Chellappa*
- **CMSC 726 - Machine Learning**: Fall 2017 *by Prof. Jordan Boyd-Graber*
- **CMSC 828T - Vision, Planning and Control in Aerial Robotics** : Fall 2017 *by Prof. Yiannis Aloimonos*
- **ENPM661 - Planning for Autonomous Robots**: Spring 2017 *by Dr. Michael Otte*

## SKILLS

**Computer Languages:** C, C++, Python, Matlab, HTML5, Bash, LaTeX
**Operating System:** Arch Linux, Debian-based Linux (ARM and x86-64), Windows XP/7/8/10
**Tools:** Tensorflow, PyTorch, Git, Autodesk Inventor, Arduino