Shailja | Curriculum Vitae

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Research Interests — Design and Analysis of Algorithms, Graph Theory, Combinatorial Algorithms, Machine Learning

Education

- **University of California, Santa Barbara (UCSB)** **2018 - Present**
  Ph.D.in Electrical and Computer Engineering, GPA: 4.0/4.0
- **Indian Institute of Technology (IIT), Kharagpur** **2012-2016**
  Bachelor of Technology (Hons), Electrical Engineering Department, GPA: 8.15/10

Research Experience

- **Carnegie Mellon University (CMU)** **Aug 2017 - Jan 2018**
  Visiting Research Scholar, Mentor : Prof. George Stetten, The Robotics Institute

  → **Project:** Automated Segmentation Analysis Using High Resolution Ultrasound Imaging
  - Developed the model of Descending Variance Graphs (DVG) for segmenting neurological structure of ultrasound images in both 2D and 3D spaces.
  - Tested the algorithm for detecting tumors from various brain magnetic resonance images. Performed computational cost analysis for the algorithm.
  - Developed a clustering algorithm to detect anatomical shapes using medialness of the segmented patches. Combined with the mean and variance of each patch, we built an optimization algorithm which could try various combinations of inclusion/exclusion of patches to find the best combination in terms of yielding a segmented cluster with the desired medial parameters. Lab Webpage - Visual Image Analysis Lab
- **University of Pittsburgh Medical College (UPMC)**
  Visiting Research Scholar, Mentors : Prof. Howard Aizenstein, Prof. Minjie Wu, Department of Psychiatry

  → **Project:** Descending Variance Graphs (DVG) post-filter for hippocampus subfield segmentation from brain MRI
  - Developed the multi-modal DVG algorithm for segmenting hippocampus area of brain MRI in 3D space. Results were verified using coregistered 3D images data from 7-Tesla fMRI. Compared algorithms available in the literature on different metrics.
- **University of Washington (UW)** **Sept 2016 - Nov 2016**
  Research Assistant, Mentor : Prof. Tyler Folsom, Computing and Software Systems Division

  → **Project:** Localization and Navigation of a Self Driving Tricycle, Elcano
  - Successfully developed a fuzzy algorithm to estimate the position of a trike using GPS and dead reckoning. I also developed a lane detection algorithm to update the position from the edge to complement the GPS based positioning.
  - Developed an optical odometer for 2-D displacement measurement using 30×30 pixel image to track the trike's motion. In addition to the dead reckoning and lane detection algorithms that I implemented for the autonomous navigation, the use of this odometer led to a better position estimation of the trike, covering most corner cases as well.
  - In the media : UW Bothell News | The Woodinville Weekly | The Komo News TV Report
- **Indian Institute of Technology (IIT), Kharagpur** **Jul 2015 - April 2016**
  Bachelor's Thesis, Mentor : Prof. Jayanta Mukhopadhyaya, Computer Science Department

  → **Project:** Visual Navigation of Mobile Robots Using Monocular Vision
  - Developed an algorithm to generate a complete map of the traversable region for a robot using monocular vision.
  - Multiple images taken by a simple webcam were used for obstacle detection and avoidance using graph algorithms.

Industrial Experience

- **Flipkart Internet Pvt Ltd., Bangalore, India** **Dec 2016 - Aug 2018**
  Software Development Engineer
  - Worked at Flipkart, India's largest e-commerce company. Developed the code to automate the return flow of orders and implemented the business logic for product exchange offers. Played a lead role in the order management system's migration to an improved version, handling a large amount of data.
- **GreyOrange Robotics, Gurgaon, India** **Jun 2016 - Sept 2016**
  Software Development Intern
  - Developed an algorithm to reduce the processing time of orders by implementing an idea of classifying each order as multiple or single item order. The algorithm was developed on the functional programming language - Erlang. Single-item orders were stacked together in a bin to be processed as multi-items orders, thus increasing the throughput.

Technical Reports

- Shailja and George Stetten "Descending Variance Graphs for Segmenting Neurological Structures" - PDF
- Shailja and Tyler Folsom "Navigation and Localization of an Autonomous Tricycle". *Technical Report - University of Washington.* Presented at Computing and Software Systems Division, UW. PDF
- Shailja, Soumabh Bhowmick, and Jayanta Mukhopadhyay "Visual Navigation of Mobile Robots". *Undergraduate Thesis, IIT Kharagpur.* Presented at Electrical Engineering Department, Indian Institute of Technology, Kharagpur. PDF

Honors and Awards

- **Research fellowship:** Received a fellowship of $\$7000$ from the Amazon Catalyst in partnership with the University of Washington for my research at UW.
- **Undergraduate scholarship** for consecutive four years (2012-16) offered by Indian Institute of Technology, Kharagpur.

Relevant Courses

- **Computer Science & Engineering and Mathematics**
  - Topics in Combinatorial Algorithm, Introduction to Data Sciences and Special Topics in Machine Learning, Design & Analysis of Algorithms, Advance Digital Image Processing & Computer Vision, Object Oriented Programming, Software Engineering, Computer Architecture & Operating System, Probability & Stochastic Processes.
    Independent study: Biomedical Imaging, Complexity theory, Machine Learning
- **Humanities & Social Science**
  - Positive Psychology, Visual Communication, Introduction to Ethics

Computer Skills

Programming Languages C, Python, C++, Java, OpenCV (Advanced Proficiency)
Assembly Language, Erlang, MATLAB (Intermediate Proficiency)

Selected Projects

- **Chromatic Shortest Path**
  Term project, Topics in Combinatorial Algorithms, UCSB, 2018
  - Studied the hardness of the problem and implemented dynamic programming, and two greedy algorithms.
  - Developed the approximation algorithm with the performance bound of $O(\sqrt{|V|})$. Implemented the algorithms to analyze the performance and accuracy.
- **Plots to Table Converter**
  OpenSoft Inter-Hostel Competition, IIT Kharagpur, 2016
  - Developed a software for extracting information from plots in PDFs to create data tables. Set of scanned pages were used as input, with each page having one or more plots embedded in text.
  - Algorithms were developed to recognize plots, curves, captions, axis ranges etc. and a data set of two dimensional tables was created.
- **Gesture Controlled Robot**
  Minefield Event in Kshitij, Technical Fest, IIT Kharagpur, 2015
  - Designed an accelerometer based hand gesture controlled robot. Hand gestures could be used as input signals to drive the robot in different direction and detect mines using a metal detector circuit. Application: Rescue robotics.

Positions of Responsibility

- **Teaching Assistant, Programming & Data Structure**
  - I was one of the TAs for a class of first year undergraduate students taking Programming and Data Structure course.
  - I gave a total of 20 recitation lectures.
- **Team Leader, OpenSoft Team**
  - I initiated and formed a team with 6 other undergraduate women and led the team to participate in the Inter-Hostel OpenSoft competition to win the Silver award for our software.
- **Team Leader, Gopali Youth Welfare Society (GYWS)**
  - Led the team of GYWS, an NGO run by students and faculty of IIT Kharagpur. I was responsible for planning different activities, managing the overall action plan and coordinating between different teams of the society.
- **Mentor, Student Welfare Group (SWG)**
  - I was responsible for ensuring the academic and personal well being of three allotted men-tees.