Arkadeep Narayan Chaudhury

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Education

Carnegie Mellon University — Pittsburg, PA
PhD in Computer Science (Robotics) — *Aug. 2020 – Dec. 2023 (expected)*

Carnegie Mellon University — Pittsburg, PA
PhD in Mechanical Engineering (Robotics) — *Aug. 2018 – Aug 2020 (moved to SCS)*

Indian Institute of Science — Bangalore, India
Master of Science in Mechanical Engineering — *Aug. 2015 – Dec. 2017*

Indian Institute of Engineering Science and Technology — Shibpur, India
Bachelor of Engineering in Mechanical Engineering — *Jul. 2011 – May 2015*

Experience

Atkeson Lab & Robotouch Lab, CMU RI — Pittsburgh, PA
Graduate Research Assistant — *Nov. 2019 – Present*
Advisor: Prof. Christopher Atkeson
Thesis topic: *Active Sensing for Manipulation*

Moving cameras: Developed an ensemble of collocated vision, depth and touch sensors and a set of algorithms to viually servo robots to workspace goals and localize objects through vision and touch. Link

Moving lights: Designed and implemented a robot workspace scale photometric stereo setup for prior free, object agnostic, surface texture, surface orientation, and surface deformation perception. Work in progress

CI2CV Lab, CMU RI — Pittsburgh, PA
Graduate Research Assistant — *July. 2019 – Nov. 2019*
Advisor: Prof. Simon Lucey

Learning Based Registration: Researched learning based pose estimation algorithms – insights on why it works, what are the open problems.: Short report.

Biorobotics Lab, CMU RI — Pittsburgh, PA
Graduate Research Assistant — *Aug. 2018 - Jul. 2019*
Advisor: Prof. Howie Choset

Medical device prototype: Co-developed and prototyped a hand held soft tissue investigation device for low-cost tumor diagnosis. Link

Non-rigid registration: Surveyed algorithms for human organ registration and proposed and implemented faster algorithms with comparable accuracy to handle larger volumes of data. Link

Robotics and Design Lab, IISc — Bangalore, India
Research Staff — *Jan. 2018 - Jul. 2018*
Advisor: Prof. Ashitava Ghosal

Optimal Motion Planning: Derived optimal, polynomial time motion plans for snake-like robots in confined spaces such as endoscopes, pipe inspection robots and in cluttered search and rescue scenarios. Link

Robotics and Design Lab, IISc — Bangalore, India
Graduate Research Assistant — *Jul. 2015 - Dec. 2017*
Advisor: Prof. Ashitava Ghosal

Design of Parallel Robots: Designed Monte Carlo simulations to model workspaces of parallel robots. Modeled the human 3-fingered grasp and proposed techniques for optimal design of parallel robots. Thesis, paper 1, paper 2.

Solid Mechanics Lab, IIEST — Kolkata, India
Undergraduate Researcher — *Jul. 2014 - Apr. 2015*
Advisor: Prof. Debasis Datta

Computational Design of Springs: Formulated closed form expressions for design of springs of un-conventional shapes to estimate their stresses, natural frequencies, buckling loads etc. Link

Selected Course Projects

Planning on Manifolds: Devised algorithms for path planning of collaborative robot arms to manipulate ultra-sound probes on a human body phantom. This algorithm was lated used to research automatic femoral artery catheterization. [Video]

SLAM for Legged Robots: Used GTSAM and OpenCV to co-develop a framework for visual state estimation in legged robots using their gait information. [Report]

Publications. [Google Scholar Page]

[1] **Chaudhury, A. N.**, Man, T. Yuan, W. & Atkeson, C. (2022) "Using Collocated Vision and Tactile Sensors for Visual Servoing and Localization." *IEEE RA-L 2022* Link

[2] Ashwin K.P., **Chaudhury A.N.**, and Ashitava Ghosal. (2020) "Efficient representation of ducts and cluttered spaces for realistic motion planning of hyper-redundant robots through confined paths."J. Computer-Aided Design, 119, 102777. Link

[3] **Chaudhury, A. N.**, & Ghosal, A. (2017). "Optimum design of multi-degree-of-freedom closed-loop mechanisms and parallel manipulators for a prescribed workspace using Monte Carlo method". Mechanism and Machine Theory, 118, 115-138. Link

[4] **Chaudhury, A. N.**, & Ghosal, A. (2018). "Workspace of Multi-fingered Hands Using Monte Carlo Method". Journal of Mechanisms and Robotics, 10(4), 041003. Link

[5] **Chaudhury, A. N.**, & Datta, D. (2017). "Analysis of prismatic springs of non-circular coil shape and non-prismatic springs of circular coil shape by analytical and finite element methods". Journal of Computational Design and Engineering, 4(3), 178-191. Link

Skills

Programming Languages: Python, C++, CUDA, Cython

Modelling Tools: Matlab, Maple (Symbolic Mathematics)

Computing Environments: Linux [Ubuntu]

Machine Learning Toolboxes: PyTorch, TensorFlow, SciKit-Learn

Software Libraries: ROS, OpenCV, PCL, GTSAM

Languages: English (full proficiency), Bengali (native proficiency) and Hindi (bi-lingual proficiency)

Relevant Courses

At CMU: Computer Vision (16-720), Advanced Nonlinear Control Theory (16-748), Robot Localization (16-833), Geometric Methods in Computer Vision (16-822), Linear Systems (18-771), Statistical Techniques in Robotics (16-831), Deep Reinforcement Learning (10-703), Machine Learning (10-701)

At IISc: Robotics (Kinematics, Dynamics and Control), Numerical Linear Algebra, Geometric Modelling, Linear and Non-Linear Optimization,

Awards

DST-SERB Overseas PhD fellowship [Declined]	08/2018 – 08/2023
Graduate Research Fellowship (CMU)	08/2018 – 08/2019
DST Graduate Scholarship (at IISc)	08/2015 – 12/2017

Research Interests

3D sensing for manipulation, tactile sensing, active perception, computer vision for robot learning and manipulation.

References

Dr. Christopher G. Atkeson Professor, CMU, cga@cmu.edu [advisor]

Dr. Ashitava Ghosal Professor, IISc Bangalore. asitava@iisc.ac.in [ex. advisor]

Dr. Wenzhen Yuan Assistant Professor, CMU RI, yuanwz@cmu.edu [collaborator]