

# Arkadeep Narayan Chaudhury

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Carnegie Mellon University, Pittsburgh, PA, ZIP: 15232

## EDUCATION

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### Carnegie Mellon University, Robotics Institute

*MS + PhD in Robotics*

Pittsburgh, PA

*Aug. 2020 – May 2024 (expected)*

### Carnegie Mellon University, CIT

*PhD in Mechanical Engineering*

Pittsburgh, PA

*Aug. 2018 – Aug 2020 (transferred to the RI)*

### Indian Institute of Science

*Master of Science in Mechanical Engineering*

Bangalore, India

*Aug. 2015 – Dec. 2017*

### Indian Institute of Engineering Science and Technology

*Bachelor of Engineering in Mechanical Engineering*

Shibpur, India

*Jul. 2011 – May 2015*

## RESEARCH EXPERIENCE

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Neural 3D representations, 3D reconstruction for small scenes, sensor fusion, photometric stereo, active perception, prototyping low-level computer vision systems and CV accelerators, tactile sensing.

## EXPERIENCE

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### Toyota Research Institute

*Research Scientist Intern*

Los Altos, CA

*May. 2023 – Aug. 2023*

#### Team:

ML @ TRI

**Physically based 3D representations:** Researched algorithms on physically based capture of 3D assets for robotics. Developed a robot mounted multi-flash stereo camera rig to capture multi-modal data from small objects in bounded scenes. [Patent filed]

### Atkeson Lab, CMU RI

*Graduate Research Assistant*

Pittsburgh, PA

*Nov. 2019 – Present*

#### Advisor:

[Prof. Christopher Atkeson](#)

#### Thesis topic:

*Moving lights and cameras for better 3D vision*

**Moving cameras:** Developed an ensemble of collocated vision, depth and touch sensors and a set of algorithms to visually servo robots to workspace goals and localize objects through vision and touch. [ICRA & RA-L'22](#)

**Moving lights:** Designed and implemented a robot workspace scale photometric stereo setup for object agnostic, surface texture, surface orientation, and surface deformation perception. [WACV'24](#)

**Moving lights and cameras:** Designed and implemented a portable multi-flash stereo camera for appearance and geometry perception of small scenes. [Project](#)

### Biorobotics Lab, CMU RI

*Graduate Research Assistant*

Pittsburgh, PA

*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. [Hamlyn '19](#)

**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

*Research Staff*

Bangalore, India

*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 in GI tract, pipe inspection robots and in cluttered search and rescue scenarios. [CAD](#)

### Robotics and Design Lab, IISc

*Graduate Research Assistant*

Bangalore, India

*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](#), [MMT](#), [JMR](#).

## SELECTED COURSE PROJECTS

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**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 later 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. [\[GOOGLE SCHOLAR PAGE\]](#)

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- [.] **Chaudhury, A. N.**, Vasiljevic I., Zakharov S., Guizilini V., Ambrus R., Narasimhan S., Atkeson C. (2024) “Incorporating dense depth into neural 3D representations for view synthesis and relighting” *Under Review, SGP Asia '24* [Link](#)
- [1] **Chaudhury, A. N.**, Keselman, L. & Atkeson, C. (2024) “Controlled illumination for perception and manipulation of Lambertian objects” *Proc. of the WACV '24* [Link](#)
- [2] **Chaudhury, A. N.**, Man, T. Yuan, W. & Atkeson, C. (2022) “Using Collocated Vision and Tactile Sensors for Visual Servoing and Localization.” *IEEE RA-L & ICRA 2022* [Link](#)
- [3] 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](#)
- [4] **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](#)
- [5] **Chaudhury, A. N.**, & Ghosal, A. (2018). “Workspace of Multi-fingered Hands Using Monte Carlo Method”. *Journal of Mechanisms and Robotics*, 10(4), 041003. [Link](#)
- [6] **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

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

**Robot platforms:** Universal Robots UR5, Franka Emika FR3, XArm-7

**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

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**At CMU:** Computer Vision, Geometric Methods in Computer Vision, Advanced Nonlinear Control Theory, Robot Mapping and Localization, Linear Systems, Statistical Techniques in Robotics, Deep Reinforcement Learning, Machine Learning

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

## AWARDS

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

## REFERENCES

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**Prof. Christopher G. Atkeson** Professor, CMU, [cga@cmu.edu](mailto:cga@cmu.edu) [advisor]

**Prof. Ashitava Ghosal** Professor, IISc Bangalore. [asitava@iisc.ac.in](mailto:asitava@iisc.ac.in) [ex. advisor]

**Dr. Igor Vasiljevic** Research Scientist, Toyota Research Inst., [igor.vasiljevic@tri.global](mailto:igor.vasiljevic@tri.global) [Internship Mentor]