

# Parth Natekar

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IIT MADRAS | UNIVERSITY OF CALIFORNIA, SAN DIEGO

| EDUCATION | INSTITUTION & DEGREE                                                                                                                                      | CGPA              | YEAR    |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------|
|           | <b>University of California, San Diego</b><br><i>MS, Electrical and Computer Engineering</i><br>(Specializations: Machine Learning, Medical Devices)      | <b>3.9/4.0</b>    | 2021-23 |
|           | <b>Indian Institute of Technology, Madras</b><br><i>Bachelor of Technology in Engineering Design,</i><br><i>Master of Technology in Biomedical Design</i> | <b>8.89/10.00</b> | 2020    |
|           | <b>Fergusson College</b><br><i>Higher Secondary School (Major: Electronics)</i>                                                                           | 92.4 %            | 2015    |

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| PUBLICATIONS | <p><b>Parth Natekar</b>, Zichen Wang et al. "Self-supervised deep learning uncovers the semantic landscape of drug-induced latent mitochondrial phenotypes." <i>Under review</i> (<a href="#">Link</a>).</p> <p>Zichen Wang, <b>Parth Natekar</b>, et al. "MitoTNT: Mitochondrial Temporal Network Tracking for 4D live-cell fluorescence microscopy data." <i>PLOS Comp. Bio.</i>, 19(4), p.e1011060 (<a href="#">Link</a>).</p> <p>Yiding Jiang, <b>Parth Natekar</b>, et al. "Methods and Analysis of The First Competition in Predicting Generalization of Deep Learning." <i>Proceedings of the NeurIPS 2020 Competition and Demonstration Track</i>, PMLR 133:170-190 (<a href="#">Link</a>).</p> <p><b>Parth Natekar</b>, Manik Sharma. "Representation Based Complexity Measured for Predicting Generalization in Deep Learning." <i>Winning Solution of the NeurIPS 2020 competition on Predicting Generalization in Deep Learning</i>, arXiv:2012.02775 (2020) (<a href="#">Link</a>).</p> <p>Avinash Kori, <b>Parth Natekar</b>, Balaji Srinivasan, and Ganapathy Krishnamurthi. "Abstracting Deep Neural Networks into Concept Graphs for Concept Level Interpretability." <i>Best Paper Award, AAAI 2021 Health Intelligence Workshop</i> (<a href="#">Link</a>).</p> <p><b>Parth Natekar</b>, Avinash Kori, and Ganapathy Krishnamurthi. "Demystifying Brain Tumour Segmentation Networks: Interpretability and Uncertainty Analysis." <i>Frontiers in Computational Neuroscience</i> 14 (2020): 6 (<a href="#">Link</a>).</p> |
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| EXPERIENCE | <p><b>Etiome, Flagship Pioneering, Cambridge</b><br/><b>Senior Data Scientist II   Computational Platform Lead</b><br/>(Manager: <a href="#">Artem Sokolov</a>, VP of Computational Biology) April '23 - Present</p> <ul style="list-style-type: none"><li>- Played a <b>key role in building Etiome's Temporal Biodynamics Platform</b>, which leverages deep learning models to understand disease progression using transcriptomic and clinical data.</li><li>- Lead platform development, focused on improving computational approaches and integrating single-cell foundation models to generate a robust gene-target identification pipeline for chronic diseases.</li><li>- Work with wet-lab scientists to translate biological hypotheses identified by the platform into pre-clinical experiments, as well as to integrate experimental in-vitro/vivo data back into the platform.</li></ul> <p><b>Intuitive Surgical, Sunnyvale</b><br/><b>AI/Computer Vision Research Intern   DeepSight Team, Future Forward Research</b><br/>(Manager: <a href="#">Omid Mohareri</a>, Manager, Applied Research, CV/AI) June '22 - September '22</p> <ul style="list-style-type: none"><li>- Built, from scratch, a <b>deep learning based, kinematics informed, 3D hand-tracking and pose estimation pipeline</b> for supporting tele-operated surgery on the Da Vinci surgical robot.</li><li>- Ideated on and implemented the entire pipeline, from sensor setup and data collection, to deep learning model training and fine-tuning, to 3D prediction, to kinematic correction and sensor fusion.</li><li>- Demonstrated working use cases of the pipeline during surgical activities on the Da Vinci robot.</li></ul> |
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## University of California, San Diego

### Research Associate | 4DCELL Lab

(Guide: *Dr. Johannes Schoeneberg, UC San Diego*)

September '21 - April '23

- Worked on **Deep Learning for 4D Cellular Imaging and Cell-Organelle Tracking** to better understand neuro-degenerative diseases.
- Devised 4D (x, y, z, t) graph-based tracking algorithms for mitochondria from microscopic videos to understand mitochondrial network dynamics and behaviour (refer [this paper](#)).
- Created MitoSpace, a novel mitochondrial phenotypic atlas that leverages self-supervised deep learning to create a semantically meaningful latent space from microscopic images (refer [this paper](#)).

### Researcher | ARCLab and Human-Centered Extended Intelligence Lab

(Guide: *Dr. Michael Yip, UC San Diego*)

June '21 - April '23

- Worked on a tele-robotics platform which enables remote, mobile, augmented-reality robotic surgery.
- Built a **Computer Vision based 3D Human-Pose Estimation pipeline using RGB-D data** for dynamic 6-degree-of-freedom annotation tracking in Mixed Reality Telementoring scenarios.

## Anheuser-Busch InBev, Bangalore

### Data Scientist | Machine Learning for Compliance Analytics

Aug '20 - May '21

- Worked on building machine learning models and developing hypotheses to flag anomalous and risky transactions for legal and financial compliance.

## Medical Imaging and Reconstruction Lab, IIT Madras

### Research Associate | Interpretable Deep Learning for Medical Image Analysis

(Guide: *Dr. Ganapathy Krishnamurthi, Engineering Design, IIT Madras*) June '19 - June '20

- Conceptualized a pipeline for Interpretability and Uncertainty Estimation of Deep Learning Models which perform various image processing tasks in the medical domain, such as tumor segmentation.
- This involved developing a new method for concept-level interpretability as well as implementing techniques like Network Dissection and Bayesian Dropout on segmentation and classification models.
- Implemented the pipeline on benchmark brain tumor segmentation datasets to understand information flow and representation in internal layers and to quantify uncertainty of model predictions.
- Developed a python package for direct implementation of the proposed interpretability pipeline on deep neural networks for any relevant biomedical dataset.

## Honeywell Technology Solutions, Bangalore

### Research Intern | Graphical Modelling of Neural Networks for Causal Inference

(Mentor: *Satyanarayan Kar, Honeywell Aerospace, India*)

January '19 - June '19

- Devised a probabilistic graphical model based algorithm for Causal Inference on a deep neural network, to provide human-understandable explanations of what the network actually learns.
- Implemented the algorithm on benchmark datasets and successfully delineated variables in the model which were causal for a particular prediction compared to those with spurious correlations.
- Developed a deep learning pipeline for time-series analysis of flight data in order to predict anomalous flight landings. Achieved 86% accuracy in predicting instability 2 minutes prior to landing.
- Implemented an algorithm for object detection and text extraction from aircraft documents.

## Convergence Design Lab, Purdue University, USA

### Research Intern | Wearables for Human-Computer Interaction

(Guide: *Dr. Karthik Ramani, Mechanical Engineering, Purdue University*) May '18-July '18

- Completed the entire design cycle – ideation, detail design, fabrication and prototyping, of IOT based flexible, wearable electronic devices for interaction with Mixed Reality environments.
- Devised a novel method to design flexible electronic circuits on various fabric substrates. Conducted material and sensor tests to integrate tactile sensing using carbon based piezoresistive sensors.
- Developed multiple ergonomic, working prototypes. Set up networking capabilities via UDP/TCP protocols and tested the wearables in Mixed Reality and IoT environments.
- Created applications in Unity and C# to validate the efficiency of using the prototyped wearables.
- Reduced task time by 44% and error rate by 74% vis-à-vis traditional interaction methods.

## CERN (European Organization for Nuclear Research), Geneva

### Engineering Intern | Testing Apparatus for CMS cooling system

(Mentor: Antti Onnela, [EP-DT](#), CERN, Geneva)

May '17 - July '17

- Selected to be part of a 3-member team from IIT Madras to work on the Large Hadron Collider.
- Designed an adiabatic testing apparatus for the evaporative CO<sub>2</sub> based cooling system of the CMS Detector using concepts from thermal, mechanical and electrical design.
- Created a software interface in LabView to enable easy user interaction.

#### AWARDS & ACHIEVEMENTS

- **Winner, NeurIPS competition on Predicting Generalization in Deep Learning**, 2020
- **PURE fellow**: Awarded PURE Scholarship for a two-month Research Internship at Purdue University, Indiana, having been selected in the top 14 among 800 students from IIT Madras.
- **CBSE Class X School Topper**: Came first in school with percentage of 97.00%. Awards for highest marks in Math (100/100) and Science (99/100).
- One of 15 students selected from 5000 by Infosys for their 'Spark Program'.

#### SKILLS

**Programming**: Python, Machine Learning (Keras, Tensorflow, Pytorch), ROS, C, C++, C#, JavaScript, Unity, Arduino, Raspberry Pi, L<sup>A</sup>T<sub>E</sub>X, SQL  
**Languages**: Competent French, Limited Working German.

#### RELATED COURSE WORK

##### Computation & Machine Learning

- Machine Learning for Engineering Applications
- Probabilistic Graphical Modelling
- Statistical Learning
- Unsupervised Learning
- Advanced Computer Vision
- Computational Systems Biology
- Computational Evolutionary Biology

##### Biomedical Design

- Medical Image Analysis
- Design of Diagnostic and Monitoring Systems
- Design of Implantable and Surgical Devices
- Medical Equipment Dissection Lab
- Human Anatomy, Physiology & Biomechanics
- Biomaterials Engineering

##### Mechanical/Electrical Engineering

- Design of Mechanical Systems (I & II)
- Design of Electronic Systems (I & II)
- Digital Signal Processing
- Engineering Mechanics
- Design of Thermal and Fluid Systems
- Electromagnetic Compatibility for Design
- Bio-Micro-Electrical-Mechanical Systems

##### Design Methodology

- Functional and Conceptual Design
- Human Factors in Design
- Geometric Modelling and CAD
- Computational Methods in Design
- Design for Form and Aesthetics
- Creative Design

#### TEACHING AND VOLUNTARY EXPERIENCE

##### Teaching Assistant - Design of Electronic Systems Lab, IIT Madras

Professor :[Dr. Tuhin Subhra Santra](#)

Aug '19 - Dec '19

- Selected as Graduate Teaching Assistant for the Design of Electronic Systems Lab (Fall 2019).
- Managed and guided a group of 60+ students in electronic circuit design principles.

##### Teaching Assistant - Medical Image Analysis, IIT Madras

Professor :[Dr. Ganapathy Krishnamurthi](#)

Aug '19 - Dec '19

- Conducted tutorial sessions to teach students the programming aspects of Medical Image Analysis.

##### Volunteering

- Worked with an organization called *Lata Mahajan Foundation* on their project *EducationLinked*, which is aimed at overall development of tribal and underprivileged children.
- Worked with *iVolunteer*, Bangalore to help organize health camps in orphanages.