

# Anirudh Choudhary

RESEARCH INTERESTS	Machine Learning; Image Processing Biomedical Data Analysis	E-mail: <a href="mailto:ac67@illinois.edu">ac67@illinois.edu</a> Website: <a href="https://github.com/anic46">anic46.github.io</a>
EDUCATION	<b>University of Illinois at Urbana-Champaign</b> <i>Ph.D. in Electrical and Computer Engineering (3.83/4.0)</i> <b>Georgia Institute of Technology</b> <i>Masters in Computational Science and Engineering (3.81/4.0)</i> <i>Thesis: Robust Counterfactual Learning for Clinical Decision-Making using EHRs</i> <b>Indian Institute of Management Calcutta, India</b> <i>Masters in Business Administration (Completed all levels of CFA and FRM)</i> <b>Indian Institute of Technology Kharagpur, India</b> <i>B.Tech &amp; M.Tech (Honors), Electrical Engineering</i>	2020 - present 2018 - 2020 2011 - 2013 2005 - 2010
PUBLICATIONS	<ol style="list-style-type: none"><li>1. Pose-aware C-arm Calibration &amp; Distortion Correction for Guidewire Tracking &amp; Image Reconstruction F. Heemeyer*, <b>A. Choudhary*</b>, J. P. Desai (*equal contribution) <i>International Symposium on Medical Robotics, 2020 (Oral)</i> [Paper]</li><li>2. Advancing Medical Imaging Informatics by Deep Learning-Based Domain Adaptation <b>A Choudhary*</b>, L. Tong*, Y. Zhu, M. Wang (*equal contribution) <i>IMIA Yearbook of Medical Informatics, 2020</i> [Article]</li><li>3. Learning to Evaluate Color Similarity for Histopathology Images using Triplet Networks <b>A. Choudhary</b>, H. Wu, L. Tong, M. Wang <i>ACM Conference on Bioinformatics, Computational Biology, and Health Informatics, 2019 (Long Oral)</i> [Paper]</li><li>4. Texture-based Segmentation of Epithelial Layer from Oral Histological Images M. Krishnan, <b>A. Choudhary</b>, C. Chakraborty, A.K. Ray, R. Paul <i>Micron Journal (Elsevier), 2011</i> [Paper]</li><li>5. Textural Characterization of Histopathological Images for Oral Sub-mucous Fibrosis Detection M. Krishnan, P. Shah, <b>A. Choudhary</b>, C. Chakraborty, R. Paul, A.K. Ray <i>Tissue Cell Journal (Elsevier), 2011</i> [Paper]</li><li>6. A New Image Processing Filter for the Automatic Extraction of Organ's Internal Structures F.P. Ferrarese, N. Moretto, D. Botturi, <b>A. Choudhary</b>, G.A. Zamboni <i>European Congress of Radiology, 2009</i> [Poster]</li><li>7. An Entropy-based Multi-thresholding Method for Semi-automatic Segmentation of Liver Tumors <b>A. Choudhary</b>, N. Moretto, F.P. Ferrarese, G.A. Zamboni <i>MICCAI Workshop, 2008</i> [Paper]</li><li>8. Learning Disentangled Histopathology Image Representation via Latent Similarity Subspaces <b>A. Choudhary</b>, H. Wu, L.Tong, M. Wang (in preparation)</li><li>9. Clinical Decision-Making under Uncertainty: A Bootstrapped Counterfactual Inference Approach <b>A. Choudhary</b>, H. Wu, M. Wang (in preparation)</li></ol>	
RESEARCH EXPERIENCE	<b>DEPEND Group</b> , University of Illinois at Urbana-Champaign <i>Mentor: Prof. Ravishankar Iyer</i> <ul style="list-style-type: none"><li>• Modeled long term cognition decline during dementia using ODE-based pathology simulation and policy gradient-based RL; Results competitive with RNN-based supervised learning for prediction upto 6 years.</li><li>• Survival modeling for chronic liver disease (PBC) using fully parametric RNN-based approach. Leveraged time-based decay function for missing data imputation and self-attention for clinical interpretability.</li></ul> <b>Biomedical Informatics Lab</b> , Georgia Tech <i>Mentor: Prof. May Wang</i> <ul style="list-style-type: none"><li>• Developed self-supervised representation learning approach using triplet networks for image retrieval and perceptual similarity evaluation of histopathology images. Studied optimal transport based deep generative models for color transfer in pathology images. (Publications #3, #8)</li><li>• Proposed frameworks to tackle model uncertainty and enable improved generalization for RL-based clinical policy learning on health records. Leveraged bootstrapping and adversarial learning to derive robust oral anticoagulant dosing policy. Incorporated meta learning (REPTILE) with IRL-based imitation learning to develop personalized Sepsis treatment policies using MIMIC-III data. (Publication #9)</li></ul>	Fall '20 - Present Spring '19 - Summer '20

**Medical Robotics and Automation Lab**, Georgia Tech

Fall '19 - Spring'20

Mentor: Prof. Jaydev Desai

- Designed camera-based pose-tracking setup for X-Ray image intensifier using self-supervised point detection (Superpoint) & Siamese object tracking (SiamMask). Combined ridge detection-based segmentation with 3D image reconstruction (FISTA) for tracking guidewire during image-guided surgery. (Publication #1)

**Biomedical Image Analysis Lab**, University of Pennsylvania; *Research Intern*

Summer '09

Mentor: Prof. Christos Davatzikos

- Developed cerebellum segmentation approach for brain MRI data using 3D Gabor features based Demons Registration & level set techniques (FAST).

**Altair Robotics Laboratory**, University of Verona, Italy; *Research Intern*

Summer '08

Mentor: Prof. Paolo Fiorini

- Developed liver tumor segmentation algorithm for low-quality CT scans with 75% IOU score (4th in MICCAI's tumor segmentation challenge & incorporated into Mirosurge platform). (Publications #6, #7)

## COURSES

Advanced Computer Vision, Deep Learning, Machine Learning, Graphical Models, Random Processes, Computational Inference, Dependable AI, Reinforcement Learning, Linear Algebra, CSE Algorithms

PROFESSIONAL  
EXPERIENCE**Mastercard**, India; *Manager, Advanced Analytics*

Sep'17 – Jul'18

- Developed customer segmentation models and performed card spend analysis for leading multinational retailers. Identified customer segments for a grocery retailer and amusement park using hierarchical clustering and latent mixture model. Performed campaign uplift analysis and shopping trip intent analysis using graph networks.

**Loyalty Partner** (AmEx subsidiary), India; *Manager, Customer Insights*

Jun'16 — Aug'17

- Led a team of 3 to develop predictive marketing models for 50M+ customers of India's leading grocery retailer. Developed models for campaign targeting (logistic regression), behavioural segmentation (CHAID, K-Means), wallet potential estimation (XGBoost) and revenue-growth projection. Awarded "Business Excellence" and "Best Quarterly Performance" awards.

**EXL Analytics**, India; *Manager, Decision Analytics*

Jun'13 - Jun'16

- Pricing & supply chain analytics for cellphone trade-in program of a Fortune-500 US insurer. Led a team of 10 consultants; Formulated pricing and bid-allocation models for primary & secondary markets achieving 30% incremental profits; Developed logistic regression & Poisson regression models for price forecasting.

**Sabre Corporation**, India; *Associate Software Developer*

Jul'10 – May'11

- Full-stack developer responsible for optimization & enhancement of Travelocity's flight checkout module. Awarded "High Five" (top 5 performers in Q1'11) & "Best Technology Hack" awards.

ACADEMIC  
ACHIEVEMENTS

NSF Travel Grant &amp; Graduate Student Travel Award(Georgia Tech) - ACM BCB Conference, 2019

Finalist: Modulus, financial markets trading competition at IIM Calcutta's business summit, 2012

Masters Research Scholarship and Indian Oil Scholarship at IIT Kharagpur, 2009

Research Assistantships during internships at Univ. of Verona (2008) &amp; Univ. of Pennsylvania (2009)

Best Outgoing Technology Award, IIT Kharagpur, 2010

Winner - National level product design competition at Entrepreneurship Summit, IIT Kharagpur, 2010

All India Rank 68 in IIT Prelims Examination &amp; 507 in All India Engineering Entrance Examination

State Rank 5 in Regional Mathematical Olympiad, 2002

Mamraj Agarwal Scholarship in Std 10<sup>th</sup>; CBSE Merit Certificate in Mathematics in Std 12<sup>th</sup>

Qualified for final round of KVPY &amp; cleared state level of National Talent Search Examination, 2001

COURSE  
PROJECTS

Analyzing the implicit adversarial robustness of networks trained using SGD [Report]

Fall 2021

Guidewire detection and 3D reconstruction for image-guided surgery [Report]

Spring 2020

HIV infection simulation using mean-field ODE and antiretroviral drug-dosing using RL [Report]

Spring 2020

Domain adaptation using spatio-temporal features for video activity recognition [Video, Slides]

Fall 2019

Toxic comment classification using ordered neurons-based LSTM [Report]

Spring 2019

Solving TSP using heuristic and local search algorithms [Report, Code]

Fall 2018

TECHNICAL  
SKILLS

Programming

C/C++, Python, PyTorch (library)

Softwares &amp; Tools

R, MATLAB, LATEX, Hadoop, Apache Spark, Hive