Anirudh Choudhary

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Research Interests

Machine Learning
Image Processing
Biomedical Data Analysis

Education

University of Illinois at Urbana-Champaign, USA — *2020 - present*
Ph.D. in Electrical and Computer Engineering
Advisor: Prof. Ravishankar K. Iyer

Georgia Institute of Technology, USA — *2018 - 2020*
Masters in Computational Science and Engineering
Advisor: Prof. May Wang
Thesis: Robust Counterfactual Learning for Clinical Decision-Making using EHRs

Indian Institute of Management Calcutta, India — *2011 - 2013*
Masters in Business Administration (Completed all levels of CFA and FRM)

Indian Institute of Technology Kharagpur, India — *2005 - 2010*
B.Tech & M.Tech (Honors), Electrical Engineering

Publications (*equal contribution)

A. Choudhary, H. Wu, L.Tong, M. Wang,"Learning disentangled histopathology image representation via latent similarity subspaces", *in preparation*

A. Choudhary, H. Wu, M. Wang,"Clinical Decision-Making under Uncertainty: A Bootstrapped Counterfactual Inference Approach", *in preparation*

F. Heemeyer*, **A. Choudhary***, J. P. Desai,"Pose-aware C-Arm Calibration & Image Distortion Correction for Guidewire Tracking & Image Reconstruction", IEEE Symposium on Medical Robotics, 2020 [Paper]

A. Choudhary, H. Wu, L. Tong, M. Wang,"Learning to Evaluate Color Similarity for Histopathology Images using Triplet Networks", ACM Conference on Bioinformatics, Computational Biology, and Health Informatics, 2019 (Long Oral) [Paper] [Slides] (Invited for JBHI's Special Issue)

M. Krishnan, **A. Choudhary**, C. Chakraborty, A.K. Ray, R. Paul,"Texture based segmentation of epithelial layer from oral histological images", Micron Journal *(Elsevier)*, 2011 [Paper]

M. Krishnan, P. Shah, **A. Choudhary**, C. Chakraborty, R. Paul, A.K. Ray,"Textural characterization of histopathological images for oral sub-mucous fibrosis detection", Tissue Cell Journal *(Elsevier)*, 2011 [Paper]

F.P. Ferrarese, N. Moretto, D. Botturi, **A. Choudhary**, G.A. Zamboni, "A new image processing filter for the automatic extraction of organs' internal structures: Application to liver tumors", ECR 2009 [Poster]

A. Choudhary, N. Moretto, F.P. Ferrarese, G.A. Zamboni, "An entropy based multi-thresholding method for semi-automatic segmentation of liver tumors", MICCAI Workshop, 2008 (Oral) [Paper] [Slides]

Review Articles

A Choudhary*, L. Tong*, Y. Zhu, M. Wang,"Advancing Medical Imaging Informatics by Deep Learning-Based Domain Adaptation", IMIA Yearbook of Medical Informatics, 2020 [Article]

Research Experience

Biomedical Informatics Lab, Georgia Tech; *Graduate Researcher* — *Spring '19 - Summer '20*
- Evaluated optimal transport based deep generative models for color transfer in pathology images; Developed self-supervised representation learning framework for evaluating color-based perceptual similarity
- Proposed distributionally robust offline policy estimators for treatment policy learning on health records
- Implemented offline meta-inverse reinforcement learning for imitating clinician's sepsis treatment policies

Medical Robotics and Automation Lab, Georgia Tech; *Graduate Researcher* — *Fall '19 - Spring'20*
- Developed camera-based CARM pose-tracking using self-supervised point detection & siamese tracking
- Implemented 2D-segmentation & 3D reconstruction for tracking guidewires in X-ray image guided surgery

Centre for Spatial Planning, Georgia Tech; *Research Assistant* — *Fall '18 - Spring '19*
- Formulated large-scale highway infrastructure optimization using parallel Genetic Algorithm in OpenCL

Biomedical Image Analysis Lab, University of Pennsylvania; *Research Intern* — *Summer '09*
- Cerebellum segmentation in MRI images using 3D Gabor features based Demons registration & level sets

Altair Robotics Laboratory, University of Verona, Italy; *Research Intern* — *Summer '08*

- Developed an automated liver tumor detection algorithm for abdominal CT scans (75% ROI overlap)
- Work incorporated into Mirosurge robotic platform; Stood 4th in MICCAI's tumor segmentation challenge

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 Advisors, India; *Manager, Advanced Analytics* *Sep'17 – Jul'18*

- Developed customer segmentation models and performed spend & shopping behaviour analysis for leading multinational retailers
- Frameworks Implemented: Latent mixture model; Shopping trip visualization (graph networks); Campaign uplift model. Worked on PySpark, Hadoop and Hive for analyzing 1TB+ card transaction data.

Loyalty Partner (AmEx subsidiary), India; *Manager, Customer Insights* *Jun'16 — Aug'17*

- Led a team of 3 for spend analytics & customer acquisition modelling for India's leading grocery retailer
- Frameworks Implemented: Propensity scoring (logistic regression); Behavioural segmentation (CHAID, K-Means, LCA); Wallet potential estimation (XGBoost); Revenue-growth simulation
- Business Excellence Award (2017) and Quarter Performance Award (Q4 2016)

EXL Analytics, India; *Manager, Decision Analytics* *Jun'13 - Jun'16*

- Pricing & supply chain analytics for leading US insurer operating T-Mobile's phone trade-in program
- Led a team of 10 consultants; Formulated pricing and bidding allocation models for primary/secondary markets achieving 30% incremental profits; Developed generalized linear models for mobile price forecasting
- Worked as Chief of Staff to Head of Insurance Operations Management (2013-15) - Supported CXOs in financial analysis, capacity optimization, merger planning & strategy formulation ($250M portfolio)

Sabre Corporation, India; *Associate Software Developer* *Jul'10 – May'11*

- Full-stack developer responsible for optimization & enhancement of Travelocity's flight checkout module
- High performance award (top 5 performers in Q1'11); Best technology award at Sabre Hack Day

Academic Achievements

NSF Travel Grant & Graduate Student Travel Award(Georgia Tech) - ACM BCB Conference, 2019
Runners-up: Procter & Gamble's marketing strategy case-study competition, IIM Calcutta, 2013
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) & 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 & 507 in All India Engineering Entrance Examination
State Rank 5 in Regional Mathematical Olympiad, 2002
Mamraj Agarwal Scholarship in Std 10^{th}; CBSE Merit Certificate in Mathematics in Std 12^{th}
Qualified for final round of KVPY & cleared state level of National Talent Search Examination, 2001

Programming

C, Python, R, MATLAB; PySpark, PyTorch, Tensorflow

Academic Projects

Guidewire detection and 3D reconstruction for image-guided surgery [Report] — *BME-8803* *Spring 2020*

Simulation of HIV infection using mean-field ODE and antiretroviral drug-dosing using reinforcement learning [Report] — *Modeling & Simulation* *Spring 2020*

Adversarial domain adaptation using spatio-temporal features for activity recognition in videos [Video, Slides] — *Machine Learning with Limited Supervision* *Fall 2019*

Empirical analysis of ordered neurons-based LSTM on toxic comment classification [Report] — *ICLR Reproducibility Challenge* *Spring 2019*

Solving TSP using heuristic and local search algorithms [Report, Code] — *CSE Algorithms* *Fall 2018*