Aviral Chharia

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Actively Seeking Computer Vision PhD positions starting Fall 2024

RESEARCH INTERESTS

Computer Vision, Deep Learning, Fuzzy/ Neural Systems, Biomedical Signal Processing & Informatics

EDUCATION

Carnegie Mellon University   May 2024
Master of Science, Mechanical Engg. Research, Computer Vision Specialization   GPA: 4.0/4.0
ATK-Nick G. Vlahakis Fellowship 2024 (Awarded to Only 2 CMU College of Engg. Grad students)
Courses: Computer Vision (16-720B), Deep Learning (11-785), Machine Learning & Artificial Intelligence for Engineers (24-787), Trustworthy AI (24-787), Numerical Methods (24-703), Computer Vision for Engineers (24-678)

Thapar Institute of Engineering & Technology, India   May 2022
Bachelor of Engineering, Mechanical with Minor in Computer Science   GPA: 9.34/10
Twice Dean's List Scholarship (50% Tuition) 2020-22
MITACS Globalink Graduate Fellowship (Financial support for MS/ PhD/ Postdoc in Canada) 2021
IIT Kanpur Student's Undergraduate Research Graduate Excellence (SURGE) (<4% acceptance) 2021
MITACS Globalink Research Award, Canada 2021
Winner, University of Queensland Engineering Design Hackathon 2020
Courses: Data Structure & Algorithms, Database Management Systems, Computer Networks, Operating System, Optimization Techniques, Numerical Analysis, Object-Oriented Programming, Sequences, Series, Advanced Calculus

JOURNAL PUBLICATIONS G SCHOLAR ↗

- **A. Chharia** *et al. (2024).* CMU-ConstructNet: Realtime Worker-Object Unsafe Action Recognition for 3D Multi-Camera Construction Environments. *IEEE Robotics & Automation Letters (RA-L)*   [In Prep]
- **A. Chharia** *et al. (2024).* ADHD-Net: Convolutional Time-Frequency domain Neural Network for EEG-aided ADHD diagnosis in children on Continual mental task. *IEEE Transactions on Neural Systems & Rehabilitation Engg.*   [In Prep]
- G. Singh, **A. Chharia**, R. Upadhyay, V. Kumar, L. Longo *(2024).* PyNoetic: a Modular Python Framework for Rapid Prototyping & Development of Brain-Computer Interface. *IEEE Transactions on Neural Systems & Rehabilitation Engineering*   [Under Review]
- **A. Chharia***, G. Jeevan*, R. A. Jha*, M. Liu*, J. Berman, C. Glorioso *(2023).* Accuracy of US CDC COVID-19 Forecasting Models. *Frontiers in Public Health*   [medRXiv][Under Review]
- **A. Chharia**, R. Upadhyay, V. Kumar, C. Cheng, J. Zhang, M. Xu *(2022).* Deep-Precognitive Diagnosis: Preventing Future Pandemics by Novel Disease Detection With Biologically-Inspired Conv-Fuzzy Network *IEEE Access*   [Paper]
- N. Grover, **A. Chharia**, R. Upadhyay, L. Longo *(2023).* Schizo-Net: A novel Schizophrenia Diagnosis framework using late fusion multimodal deep learning on EEG-based Brain connectivity indices. *IEEE Transactions on Neural Systems & Rehabilitation Engg.*   [Paper]
- J. Kalra, P. Mittal, N. Mittal, A. Arora, U. Tewari, **A. Chharia**, R. Upadhyay, V. Kumar, L. Longo *(2023).* How Visual Stimuli evoked P300 is transforming the Brain-Computer Interface Landscape. *IEEE Transactions on Neural Systems & Rehabilitation Engg.*   [Paper]

CONFERENCE/ WORKSHOP PUBLICATIONS

- **A. Chharia**, R. Saran, A. Narayan *(2023).* cAPTured: Neural Reflex Arc-Inspired Fuzzy Continual Learning for Capturing *in silico* Aptamer-Target Protein Interactions *International Joint Conference on Neural Networks (IJCNN)*   [Paper]
- **A. Chharia**, A. Narayan *(2021).* Novel fuzzy approach to B-cell epitope prediction inducing antigen-specific immune response for Vaccine Design. *IEEE Intl. Conference on Bioinformatics & Bioengineering (BIBE)*   [Paper]
- **A. Chharia**, N. Kumar *(2021).* Foreseeing Survival Through 'Fuzzy Intelligence': A Cognitively-Inspired Incremental Learning Based *de novo* model for Breast Cancer Prognosis by Multi-Omics Data Fusion. *MICCAI Predictive Intelligence in Medicine (MICCAI PRIME)*   [Paper]
- **A. Chharia**, N. Kumar *(2021).* Learning after Deployment: A Missed Tale of Supervision *NeurIPS ML for Public Health* [Lightening Talk]
- **A. Chharia***, S. Chauhan*, R. Upadhyay, V Kumar *(2021).* From Convolutions towards Spikes: Environmental Metric that the Community currently misses. *NeurIPS AI for Science: Mind the Gaps/ Human-Centered AI*   [Poster][Paper]
- **A. Chharia**, R. Upadhyay, V. Kumar *(2021).* Novel fuzzy approach to Antimicrobial Peptide Activity Prediction: A tale of limited & imbalanced data that model's won't hear. *NeurIPS AI for Science: Mind the Gaps*   [Poster][Paper]
- **A. Chharia**, R. Upadhyay *(2021).* Deep Recurrent Architecture based Scene Description Generator for Visually Impaired. *IEEE ICUMT*   [Paper]
- **A. Chharia***, S. Chauhan*, S. Basak*, B. Sharma* *(2021).* NeT-vent: Low-cost, rapidly scalable & IoT-enabled ventilator with adaptive control to reduce pulmonary barotrauma in SARS-CoV-2 patients *IEEE GCAT*   [Paper]

- S. Prajapati, Y. Upadhyay, **A. Chharia**, B. Sharma *(2021)*. A novel hybrid Fuzzy AHP-TOPSIS approach for multi-criteria feature-based EV Recommender System. ***IEEE GCAT*** [Paper]
- S. Prajapati, N. Mehta, **A. Chharia**, Y. Upadhyay *(2021)*. Computational fluid dynamics-based disease transmission modeling of SARS-CoV-2 ICU. ***ICCAME*** [Paper]
- S. Prajapati, **A. Chharia**, N. Mehta, S. Yadav *(2021)*. Computational modeling & conjugate heat transfer study for *in situ* design of artificial porous media. ***ICCAME*** [Paper]

RESEARCH EXPERIENCE/ SELECTED PROJECTS

Occlusion-Agnostic Real time Multi-person 3D Human Pose Estimation using Multi-View cameras
CMU Computational Engineering & Robotics Lab, Research Assistant | Pittsburgh, USA | Video Result ↗ Aug 22 - Present
- Developed Occlusion Agnostic Real time Multi-person 3D Human Pose Estimation using Multi-View cameras at Construction Sites. Tested the model on benchmark CMU Panoptic, EPFL Campus, Shelf & UMPM datasets.
- Implemented Triangulation & Regression-based methods for estimating 3D Human poses.
- Performed Camera Calibration using Checkerboard & OpenCV on 03 LUCID Industrial Grade Cameras & collected custom construction site data at CMU's Mill-19 facility.

Deep Precognitive Diagnosis: Novel Disease Detection With Biologically-Inspired Conv-Fuzzy Network
CMU School of Computer Science, Computer Vision Intern | Pittsburgh, USA | Paper ↗ Oct 20 - July 22
- Proposed "Deep Precognition" as a novel category of Computer-aided X-ray diagnosis models (based on Zero-Shot Learning) that can itself discover a novel disease unseen by model earlier. Framed the task as a class-membership lookup problem allowing real-time novel class addition.
- Proved fuzzy classifiers can achieve high performance on imaging tasks. Accomplished SOTA ACC = 82.50% on COVID-19. Tested model on SARS-CoV-1 & MERS-CoV. Project in collaboration with Multiple labs.

Multimodal Incremental learning for Breast Cancer Prognosis
Thapar Institute of Engineering & Technology, Research Assistant | Patiala, India | Paper ↗ Jul 21 - Sep 21
- Proposed a novel multimodal model for breast cancer prognosis on METABRICS multi-omics data. Implemented 3 stacked CNNs for multimodal feature extraction from clinical, gene expression & CNA data. Utilized Binary-cross entropy loss with $\mathcal{L}2$ regularization. Registered 5.74% ACC & 9.53% PREC improvement. Performed parametric study to analyse effect of number of Hyperboxes with increase in expansion coefficient ("exponential decay").
- Demonstrated model's ability on imbalanced $(25-75\%)$ & reduced data ($n = 200$) preserving PREC (variation 1.86%).

Convolutional Neural Network based Automatic Visual Inspection System for quality control
TATA Motors- Heavy Commercial Vehicle Assembly Line, AI Intern | Lucknow, India Jan 21 - May 21
- Designed an automatic Visual Inspection System for quality control by classifying 06 steel strip surface defects using Convolutional Neural Networks. Achieved 91.67% validation accuracy score on the NEU surface defect dataset.

SKILLS

Programming Languages: Python, C/ C++, MATLAB, JAVA, Bash Scripting
Tools/ Libraries: PyTorch, Keras, OpenCV, Scikit-learn, Matplotlib, Pandas, NumPy, SQL, LaTeX, Git, HTML, CSS, Linux

TEACHING

Teaching Assistant, 24-788/ 799: Intro to Deep Learning/ Intermediate Deep Learning (Spring 2024)
Teaching Assistant, 24-787: Machine Learning & Artificial Intelligence for Engineers (Spring 2023, Fall 2023)
Teaching Assistant, 24-675: Humanoid Robotics & Cognition (Fall 2022)

SCHOLASTIC ACHIEVEMENTS

2021 ICCAME Best Research Paper Award
2016 World Rank 98, International Olympiad of English Language, Special achievement award
2015 All India Rank 1, ICSE Computer Science of 0.16 Million applicants
2015 World Rank 264, International Olympiad of Mathematics, Special achievement award
2015 Uttar Pradesh State-level National Talent Search Examination (NTSE)
2015 2 Bronze Medals, 06th International Young Mathematicians' Convention (IYMC)

PRESS COVERAGE & INVITED TALKS

2024 *Frankfurt School of Finance & Management, Germany*. Forecasting Heuristics in Infectious-disease Surveillance. [Link]
2023 *CMU Engineering News*. Activity Tracker for Worker Safety [Link]
2022 News-Medical.net (Media Publication: 100M+ Annual Readership). Accuracy of US-CDC COVID-19 models. [Link]
2022 *Climate Policy Radar*. Hacking AI for climate policy: OpenAI Hackathon for Climate Change. [Link]
2021 *NeurIPS ML for Public Health*. Learning after Deployment: Missed Tale of Supervision? [Lightening Talk]

ACADEMIC REVIEWING

Technical Program Committee: IJCNN 2024; *Reviewer:* IEEE Access