Ansh Khurana

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Interests: Machine Learning, Computer Vision

EDUCATION

Indian Institute of Technology Bombay *2017-2021*
B.Tech with Honors in *Computer Science & Engineering* and Minor in *Applied Statistics and Informatics*
GPA: **9.75**/10
Received the **Research Excellence Award** for outstanding research work during undergraduate

PUBLICATIONS

1. **SITA: Single Image Test-time Adaptation** [preprint]
   Ansh Khurana, Sujoy Paul, Piyush Rai, Soma Biswas, Gaurav Aggarwal.
2. **Semi-Supervised Deep Expectation-Maximization for Low-Dose PET-CT** [paper]
   Vatsala Sharma, **Ansh Khurana**, Sriram Yenamandra, Suyash P. Awate.
   IEEE International Symposium on Biomedical Imaging (ISBI) 2022 **(Oral, Best Paper Award 🏆)**
3. **What can we do with just the source model? A simple knowledge extraction framework** [paper]
   Sujoy Paul, **Ansh Khurana**, Gaurav Aggarwal.
   Principles of Distribution Shift Workshop, International Conference on Machine Learning (ICML) 2022
4. **Symbolic Binding in Neural Networks through Factorized Memory Systems** [paper]
   Ameya Daigavane†, **Ansh Khurana**†, Shweta Bhardwaj, Gaurav Aggarwal.
   International Conference on Learning Representations (ICLR) 2022, Blog Post Track
5. **Selecting Influential Features by a Learnable Content-Aware Linear Threshold Model** [paper]
   Ansh Khurana, Alvis Logins, Panagiotis Karras.
   ACM International Conference on Information and Knowledge Management (CIKM) 2020
6. **Two-in-One Refinement for Interactive Segmentation** [paper]
   Soumajit Majumder, Abhinav Rai, **Ansh Khurana**, Angela Yao.
   British Machine Vision Conference (BMVC) 2020
7. **Learning Image Inpainting from Incomplete Images using Self Supervision** [paper]
   Sriram Yenamandra, **Ansh Khurana**, Rohit Jena, Suyash P. Awate.
   IEEE International Conference on Pattern Recognition (ICPR) 2020
8. **Multi-Stage Fusion for One-Click Segmentation** [paper]
   Soumajit Majumder, **Ansh Khurana**, Abhinav Rai, Angela Yao.
   German Conference on Pattern Recognition (DAGM GCPR) 2020 **(Spotlight Talk)**

RESEARCH EXPERIENCE

SITA: Single Image Test-time Adaptation [paper] July 2021 - Present
Advisor: Dr. Gaurav Aggarwal | Pre-Doctoral Researcher *Google Research India, Bangalore*

- Formalised the pragmatic SITA setting for test-time adaptation in an on-demand, privacy preserving application
- Proposed the fast **AugBN** adaptation algorithm which uses augmented samples for reliable feature normalisation and achieves state-of-the-art performance for both sparse and dense prediction tasks under SITA
- Developed an Optimal Prior Selection model to make the approach hyper-parameter free at test-time

No Source Domain Adaptation [paper] July 2021 - Present
Advisor: Dr. Gaurav Aggarwal | Pre-Doctoral Researcher *Google Research India, Bangalore*

- Proposed a novel self training approach for adapting semantic segmentation models without access to source data
- Formulated a **constrained optimization problem** to extract knowledge from the source model using confidence-filtered pseudo-labelling while enforcing consistency against various spatial transformations

Akshar: Robust OCR for the Next Billion Users May 2020 - Aug 2020
Advisor: Dr. Gaurav Aggarwal | SWE Internship *Google Research India, Bangalore*

- Worked on improving digitization of forms filled by social workers under the **AI for Social Good** initiative
- Identified the failure modes in current state-of-the-art techniques for Form Structure Recognition and OCR
- Proposed a novel **text guidance** based **multi-stage fusion** architecture for Table Structure Recognition

Content-Aware Influence Maximization [paper] [code] Dec 2019 - Jan 2020
Advisor: Prof. Panagiotis Karras | *Research Internship* *Aarhus University, Denmark*

- Devised a novel Content-Aware Linear Threshold (**CALT**) model that governs a contagion based on both content features and network structure, and studied the properties of the spread function under this model
- Proposed an algorithm to learn the influence parameters of the model using the **credit allocation** technique
- Developed an algorithm for efficient influence maximization by feature selection based on the model's properties

Deep-EM Learning for Medical Image Enhancement [paper] Dec 2020 - May 2021
Guide: Prof. Suyash P. Awate | *Bachelor Thesis* *IIT Bombay*

- Developed a novel *variational* DNN framework for image quality enhancement, relying on **Monte-Carlo EM** optimization, including Metropolis-Hastings Markov-Chain Monte-Carlo (**MCMC**) sampling in the latent space
- Proposed a robust and uncertainty-aware loss through datum-adaptive modelling on the DNN output residuals

Unsupervised and Semi Supervised Image Inpainting [paper] Jan 2020 - Nov 2021
Guide: Prof. Suyash P. Awate | *Bachelor Thesis* *IIT Bombay*

- Devised a **self-supervised** learning framework for inpainting images without using uncorrupted ground truth data
- Experimented with various fully convolutional architectures and weighted loss functions to improve inpainting quality

Multi-Step Fusion for Interactive Instance Segmentation [paper] May 2019 - July 2019
Advisor: Prof. Angela Yao | *Research Internship* *National University of Singapore*

- Worked on improving the Fully Convolutional Networks **(FCN)** approach towards interactive image segmentation
- Developed a generic framework using **PyTorch** to train and evaluate the model using multiple click sampling strategies to simulate human interaction and methods to encode the clicks into guidance maps
- Experimented with fusion of guidance maps into early and late stages of the **VGG-16** architecture

HONORS AND AWARDS

- Received the **Research Excellence Award** for outstanding research work during undergraduate *(2021)*
- Received the **Institute Academic Prize** at IIT Bombay for exceptional academic performance *(2020)*
- Awarded the **JN Tata Fellowship** for pursuing higher education in computer science *(2022)*
- Secured **All India Rank 39** in **JEE Advanced** among **220,000** aspirants *(2017)*
- Secured **All India Rank 168** in **JEE Main** among **1.2 million** aspirants *(2017)*
- Recipient of the prestigious **Kishore Vaigyanik Protsahan Yojana** (KVPY) Fellowship *(2016)*
- Recipient of annual scholarship under **National Talent Search Examination** scheme (NTSE) *(2015)*

POSITIONS OF RESPONSIBILITY

Teaching Assistant IIT Bombay

- DS 303 Introduction to Machine Learning [code] | Instructor: Prof. Biplab Banerjee Jan 2021 - May 2021
- CS 213x Data Structures and Algorithms (edX) | Instructor: Prof. Deepak B. Phatak Sep 2019 - Dec 2019
- MA 105 Calculus | Instructor: Prof. Shripad M. Garge July 2018 - Nov 2018

Academic Service 2021-Present

- Served as a reviewer for CVPR 2022, ECCV 2022, ISBI 2022, ICPR 2022, ISBI 2023 and AAAI 2023

Department Academic Mentor July 2020 - May 2021
Department Academic Mentorship Program (DAMP) *IIT Bombay*

- Mentored 6 sophomore students of the CSE department to assist them in navigating department-specific curriculum

TECHNICAL SKILLS

Languages	Python, C++, C, Java, Bash, HTML/CSS, JavaScript, SQL, Prolog, LISP
Tools and Libraries	PyTorch, TensorFlow, scikit-learn, Kaldi, OpenCV, Git, LaTeX

EXTRACURRICULAR ACTIVITIES

- Represented IIT Bombay in the Student's Academic Conference at the 9^{th} **Inter-IIT** Tech Meet *(2021)*
- Secured 2^{nd} position in **Ubisoft GameJam** hackathon amongst **200+** participants *(2020)*
- Completed a year long course in **Weightlifting** under the National Sports Organization (**NSO**) *(2018)*