# Hritam Basak

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## Research Interests

**Broad interest:** Computer Vision, Deep Learning, Medical Image analysis
**Specific interest:** Annotation-efficient Learning, Image Segmentation, Domain Adaptation, Optimization

## Education

**Stony Brook University** — New York, USA
*Doctor of Philosophy (Ph.D.) in Computer Science* | *Grade* : 3.89/4 — *Aug. 2022 – Dec. 2026 (expected)*

**Jadavpur University** — Kolkata, India
*Bachelor of Engineering in Electrical Engineering* | *Grade* : 8.9/10 — *Jul. 2017 – May 2021*

## Industrial Experience

**Data Scientist** — Jun. 2021 – Jul. 2022
*Tata Digital Limited* — *Mumbai, India*

- Worked on a visual search engine for similar fashion recommendations for the super app TataNeu. Steps involved foreground extraction using Mask RCNN, feature extraction using deep CNN, and similarity-dissimilarity learning using Siamese Network and Contrastive Learning
- Developed an automated human-in-the-loop system to annotate Tata group's native 20M+ fashion image dataset
- Designed a promotion recommendation algorithm for different customer groups employing customer churning behavior, CLTV and collaborative filtering

## Research Experience

**Graduate Research Assistant** — Jan 2023 – Present
*Stony Brook University – Advisor: Dr. Zhaozheng Yin* — *New York, USA*

- Engaging in practical computer vision applications encompassing semi-supervised and self-supervised learning, as well as domain adaptation, with a specific emphasis on medical image analysis
- Proposed novel semi-supervised learning algorithm by utilizing pseudo-labels in contrastive learning, which outperformed state-of-the-art methods significantly
- Collaborating with Dept. of Radiology, Stony Brook Hospital, and St. Francis Hospital & Heart Center, solving real-world clinical problems using computer vision
- Manuscripts from research outcome accepted at prestigious venues (CVPR, MICCAI, etc.)

**Research Internship** — May 2020 – Aug 2020
*ETH Zurich – Advisor: Dr. Luc Van Gool* — *Zurich, Switzerland*

- Focused on cross-image context mining for semi-supervised semantic segmentation employing neural co-attention
- Contributed to cross-image pixel contrast project codebase to enforce pixel embeddings belonging to the same semantic class to be more similar than embeddings from different classes
- Contributed 1000+ lines in their GitHub codebase

**Research Internship** — Nov 2019 – Mar 2020
*Sorbonne University – Advisor: Dr. Daniel Racoceanu* — *Paris, France*

- Used deep learning for clustering and segmentation of densely packed cells
- Designed a toolbox for tracking movement and mitosis of NPC cells in culture medium
- Worked with Paris Brain Institute to analyze the brain activity of human vs. non-human primates
- Analyzed movement of brain microglial cells in protein solution to calculate acquisition time of those cells

**Undergraduate Research Assistant** — Aug 2019 - Aug 2022
*Jadavpur University – Advisor: Dr. Ram Sarkar* — *Kolkata, India*

- Worked on metaheuristic optimization algorithm for efficient deep learning
- Multidisciplinary research includes COVID CT analysis, cervical cytology classification, HCI, image super-resolution, brain MR segmentation, etc.

## Technical Skills

**Languages**: Python, MATLAB, Java, C/C++, SQL, JavaScript, HTML/CSS
**Developer Tools**: Git, Docker, Google Cloud Platform, VS Code, Visual Studio, PyCharm, IntelliJ, Eclipse
**Libraries**: Pytorch, TensorFlow, OpenCV, pandas, NumPy, Matplotlib

## Selected Publications

- *H Basak*, Z Yin. Pseudo-label Guided Contrastive Learning for Semi-supervised Medical Image Segmentation, **CVPR 2023**
- *H Basak*, Z Yin. Semi-supervised Domain Adaptive Medical Image Segmentation through Consistency Regularized Disentangled Contrastive Learning, **MICCAI 2023** [Early Accept: top 13%]
- *H Basak*, S Chattopadhyay, R Kundu, S Nag, R Mallipeddi. Ideal: Improved Dense Local Contrastive Learning For Semi-Supervised Medical Image Segmentation, **IEEE ICASSP 2023**
- *H Basak*, S Ghosal, R Sarkar. Addressing Class Imbalance in Semi-supervised Image Segmentation: A Study on Cardiac MRI, **MICCAI 2022**
- *H Basak*, R Bhattacharya, R Hussain, A Chatterjee. An Exceedingly Simple Consistency Regularization Method For Semi-Supervised Medical Image Segmentation, **IEEE ISBI 2022**
- *H Basak*, R Kundu, R Sarkar. MFSNet: A Multi Focus Segmentation Network for Skin Lesion Segmentation, **Pattern Recognition, Elsevier** [IF: 8.518]
- Kundu R, *Basak H*, Singh PK, Ahmadian A, Ferrara M, Sarkar R. Fuzzy rank-based fusion of CNN models using Gompertz function for screening COVID-19 CT-scans. **Scientific reports, Nature** [IF: 5.516]
- *H Basak*, R Kundu, PK Singh, MF Ijaz, M Woźniak, R Sarkar. A union of deep learning and swarm-based optimization for 3D human action recognition, **Scientific Reports, Nature** [IF: 5.516]
- *Basak H*, Kundu R, Chakraborty S, Das N. Cervical cytology classification using PCA and GWO enhanced deep features selection. **SN Computer Science, Springer** [IF: 1.55]

## Ongoing Projects

**Domain Adaptation using Generative Latent Search**

- Developing robust and adaptive semi-supervised domain adaptation algorithm for object detection and segmentation
- Using Gaussian priors for latent space feature alignment followed by latent search

**Robust AI system for Multi-modal Medical Image Analysis**

- Utilizing gaze data to analyze visual attention patterns of expert clinicians on medical images
- Working on CLIP-inspired vision-language models for accurate medical image segmentation

## Achievements/Awards

- **IEEE SPS Travel Grant:** for presenting work at IEEE ICASSP 2022
- **MICCAI Travel Award:** for presenting work in MICCAI 2022
- **Professional Development Grant:** by SUNY Research Foundation for excellent research contribution
- **Gandhi Fellowship, 2021:** by Primal Foundation, India for solving real-world problems using AI
- **Charpak Fellowship, 2020:** for summer research internship in France

## Miscellaneous

- **Teaching**: CSE377 Medical Imaging, CSE214: Intro. to Data Structure
- **Reviewer**: CVPR, MICCAI, ICASSP, ISBI, TNNLS, TCSVT, Pattern Recognition