Digbalay Bose

Curriculum Vitae

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Research Interests

Multimodal Machine Learning, Computer Vision, Affective computing, Machine learning for Healthcare

Education

2018–Present	**University of Southern California(USC)**.
	○ Ph.D in Electrical and Computer Engineering; **GPA: 3.86/4.00**
	○ **Advisor:** Prof. Shrikanth Narayanan
2014–2016	**Indian Institute of Technology Bombay**.
	○ M.Tech in Electrical Engineering; **CPI: 9.51/10**
	○ **Specialization**: Control and Computing (Rank: 2/16)
	○ **Advisor:** Prof. Subhasis Chaudhuri
2010-2014	**Jadavpur University**.
	○ B.E. in Electronics and Telecommunication Engineering; **CPI: 9.34/10**
	○ **Specialization rank**: 2/46

Selected Publications

Please see Google Scholar for the complete list of publications

○ **Contextually-rich human affect perception using multimodal scene information**
Digbalay Bose, Rajat Hebbar, Krishna Somandepalli, Shrikanth Narayanan | ***Under Review***

○ **A dataset for Audio-Visual Sound Event Detection in Movies**
Rajat Hebbar, Digbalay Bose, Krishna Somandepalli, Veena Vijai, Shrikanth Narayanan | ***Under Review***

○ **Multimodal Estimation of Change Points of Physiological Arousal in Drivers**
Kleanthis Avramidis, Tiantian Feng, Digbalay Bose, Shrikanth Narayanan | ***Under Review***

○ **MovieCLIP: Visual Scene Understanding in Movies**
Digbalay Bose, Rajat Hebbar, Krishna Somandepalli, Haoyang Zhang, Yin Cui, Kree-Cole Mclaughlin, Huisheng Wang, Shrikanth Narayanan | ***Winter Conference on Applications of Computer Vision (WACV) 2023*** [pdf] [project page]

○ **Automated analysis of asymmetry in facial paralysis patients using landmark-based measures**
Digbalay Bose, Krishna Somandepalli, Tymon Tai, Courtney Voelker, Shrikanth Narayanan, Amit Kochhar | ***Facial Plastic Surgery and Aesthetic Medicine***, 2022 [pdf]

○ **Cross Domain Emotion Recognition using few shot knowledge transfer**
Justin Olah, Sabyasachee Baruah*, *Digbalay Bose**, Shrikanth Narayanan | ***arXiv***, 2021 [pdf]

○ **Understanding of Emotion Perception from Art**
Digbalay Bose, Krishna Somandepalli, Souvik Kundu, Rimita Lahiri, Jonathan Gratch, Shrikanth Narayanan | ***4th ICCV Workshop on Closing the Loop Between Language and Vision(CLVL)***, 2021 [pdf]

Patents

○ **Visually Guided Query Processing**
Ashok Pon Kumar Sree Prakash, Ayushi Dalmia, Amith Singhee, *Digbalay Bose*, Sumanta Mukherjee, Raghavendra Singh, Vikas C. Raykar| ***US Patent (US10878291B2)***, 2020 [pdf]

Work Experience

May 2022-August 2022	**NVIDIA Corporation**, *Software Engineering Intern*.
	○ Developed end-to-end visual and audio-visual deep learning models for high-fidelity facial animation of avatars as part of Maxine ARSDK.
July 2016-June 2018	**IBM Research Lab, India**, *Research Software Engineer*.
	○ Developed an end-to-end soil moisture extraction system from satellite images by incorporating image interpolation techniques as a part of IBM Geospatial Analytics suite.
	○ Developed explainable deep learning models in the domains of image classification and visual search as a part of retail and operations effort

May 2013 -	**Indian Statistical Institute, Kolkata**, *Research Intern*.
July 2013	**Advisor:** Prof. Subhamoy Maitra, Applied Statistics Unit
	○ Developed a key recovery scheme based on the properties of Slid Pairs for stream cipher Salsa20.

Summer schools

July 2020 -	**Oxford Machine Learning Summer School**.
August 2020	○ Acceptance rate: 15% [Certificate]

Research Experience

○ *Research Assistant,* **Signal Analysis and Interpretation Laboratory, University of Southern California (2018 - Present)**

- **Advisor:** Prof. Shrikanth Narayanan

- **Context driven human affect perception:** [**Under Review**]:
  · Developed multimodal context fusion module for apparent emotion recognition in EMOTIC and CAER-S datasets.

- **Visual scene understanding** [WACV 2023]:
  · Proposed a large-scale weakly labeled dataset (**MovieCLIP**) of movie shots with automatic method for visual scene labeling.
  · Developed deep learning models for scene and genre classification from short video clips in HVU and MovieScopes datasets.
  · Work done in collaboration with Google Research.

- **Automated analysis of facial paralysis patients** [Facial Plastic Surgery and Aesthetic Medicine]:
  · Developed a configurable web application for recording and segmenting clinical sessions involving facial paralysis patients.
  · Developed a facial landmark based video pipeline involving novel asymmetry measures for predicting standardized scores in a linear mixed effects modeling setup.
  · Work done in collaboration with Dr. Amit Kochhar and Dr. Courtney Voelker.

- **Understanding emotion perception in art work** [ICCV CLVL Workshop 2021]:
  · Developed multimodal transformer (MMBT) based architectures with configurable image features for 9 class evoked emotion recognition using art images and captions in Artemis dataset.

- **Cross-domain emotion recognition from text**:
  · Co-developed a method for few shot emotion recognition by transferring knowledge from GoEmotions dataset of Reddit comments to SemEval tweet corpus using various label representation methods.

- **Computational analysis of gender portrayal in media**:
  · Collaborated with Geena Davis Institute on the Seejane Project to computationally analyze TV shows and advertisements from 2020-2022.

○ *Research Scholar,* **Vision and Image Processing Laboratory, Indian Institute of Technology, Bombay (2015 - 2016)**

- **Advisor:** Prof. Subhasis Chaudhuri

- **Applications of sparsity and metric learning based methods in classification problems (Master's thesis)**
  · Developed a hierarchical scheme of fine-grained image classification based on a self tuning variant of spectral clustering followed by application of large margin nearest neighbor algorithm.

Skills

○ **Languages:** Python, C, C++, R, Javascript, HTML, Bash

○ **Machine Learning Frameworks:** Pytorch, Tensorflow, Keras, Caffe, Scikit-learn

○ **Computer Vision Frameworks:** OpenCV, Scikit-Image, PIL

○ **Softwares:** Maya, Blender, VTK

○ **NLP Frameworks:** Spacy, StanfordCoreNLP

Selected Academic Projects

○ **StyleIT: Style Guided Image Captioning** (CSCI 699, USC) [Report]

○ **Future sales prediction using ensemble models (CSCI 567, USC)** [Report] [Code]
  - Obtained a world rank of 80 among 8292 teams in the Kaggle future sales competition

○ **Visual Question Answering : Attention and Fusion based approaches (CSCI 599, USC)** [Report] [Code]
  - Awarded the best project by the poster session sponsors, Neudesic.

○ **Multimodal Emotion Recognition from speech utterances (EE 599, USC)** [Slides]

Professional Service

○ **Conference Review:** WACV 2023, EMNLP 2023, COLING 2022, ACM MM 2022, ICME 2021, ICASSP 2020, ICME 2020, HiPC 2017

Invited Talk

- Invited talk on **Understanding context in movies: Taxonomies, Benchmarks and Challenges** at the 3rd Media Understanding Workshop on Context and Environment by Google Research and Center for Computational Media Intelligence, USC.

Selected Awards and Honors:

- **2021:** Phase 1 Finalist in **OpenCV AI Competition** as part of USC SAIL Team (top 200 teams globally).
- **2018:** Awarded **Annenberg Fellowship** by **University of Southern California** .
- **2016: Managers choice award** by **IBM Research, India** for research contributions in data-driven soil moisture modeling.
- **2016: Academic excellence award** by **IIT Bombay** for ranking among top 1% students of Masters in Electrical Engineering.
- **2014:** Secured All India Rank **251** out of 216367 candidates in **Graduate Aptitude Test in Engineering (GATE) 2014**

Selected Coursework

- **USC:** Grounding Natural Language, Machine Learning, Deep Learning and its Applications, Affective Computing, Random Processes.
- **IIT Bombay:** Computer Vision, High Performance Scientific Computing, Matrix Computations.

Teaching Experience

- **Fall 2020:** Teaching Assistant, EE 599: Deep Learning Systems (USC)

Mentoring

- **exploreCSR:** Mentored 3 senior and 1 freshman student for exploreCSR workshop.
- **USC Viterbi:**
    - Eshna Gupta - Freshman (Computer Science)
    - Haoyang Zhang - Sophomore (Computer Science)
    - Selina Martinez - Sophomore (Electrical and Computer Science)
    - Kishan Narashima Murty - 2nd year Masters (Computer Science)