# Sanchayan Sarkar

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**Summary:** 4+ years experienced in Machine Learning and data analysis with expertise in multimodal deep learning in analyzing emotion and turn-taking behavior in multimodal dialogue. Working at the intersection of Computer Vision and Natural Language Processing. Passionate and adept in developing and applying statistical and ML algorithms in solving industry standard problems.

## Education

**Master of Science (MS), University of Pittsburgh,** PA, USA *Aug 2017- Aug 2021 (Expected)*
- Computer Science with 3+ years research experience in Machine Learning. | *CGPA: 3.55 / 4.0*
- *Courses:* Machine Learning, Deep Learning, Natural Language Processing, Computer Vision, Artificial Intelligence.

**Master of Science, (MSc) University of Calcutta,** India *Jul 2013- Jun2015*
- Computer and Information Science. | *First Class, 75 % (in top 5)*
- *Thesis*: Image Enhancement using Cuckoo-Search Optimization.

**Bachelor of Science**, **(BSc)**, **St. Xavier's College, Kolkata**, India *Jul 2010- Jun 2013*
- Computer Science (Honors). | *First Class, 76% (in top 10)*

## Skills

**Programming Languages:** Python, MATLAB, Java, C/C++, SQL.
**Tools** **:** PyTorch, Keras, TensorFlow, scikit-learn, openCV, pandas, Caffe, git, AWS, Android SDK, Unity 3D
**Research Skills** **:** Deep Learning/Machine Learning, Natural Language Processing, Computer Vision, Data Analysis.

## Experience

***Graduate Student Researcher,* University of Pittsburgh,** Pittsburgh, PA, USA. *Aug 2018-Present*
Research assistant in developing multimodal machine learning models for turn-taking and emotion analysis in dyadic conversations.

***Project: Multimodal Turn Taking in Dyadic Conversations (****Current Research****)*** *July 2020- Present*
- Developed multimodal machine learning models (in Python, PyTorch) for learning turn-taking strategies (end-of-turns, speaker pause) from multimodal (audio + video + text) sequences in dyadic interactions.
- **Achieved** statistically significant multimodal cues and **proposed** multimodal transformers to obtain higher performance.

***Project: Automatic Emotion Recognition in Dyadic Conversations (****Current Research****)*** *May 2020- Present*
- Developed context aware multimodal sequential and non-sequential neural models (LSTM, Conv-LSTM, Transformers) for predicting composite emotion constructs from audio-video-text sequences in dyads (using Python, PyTorch).

***Project: Automatic Depression Detection in Mother-Child Dyads*** *Aug 2018- Apr 2020*
- **Created** jointly learned Siamese neural networks for predicting PHQ-9 scores of depressed mothers in from mother-child face to face conversations (using Python, PyTorch).
- **Increased** the performance of the prediction system by **3% (F1-Score)** over non-siamese models.

***Graduate Teaching Assistant,* University of Pittsburgh,** Pittsburgh, PA, USA. *May 2018- Present*
- **Led classes** and **evaluated courses**: Algorithm Implementation (CS1501), Artificial Intelligence (CS 2710, CS 1571), Machine Learning (CS 1675), Human Computer Interaction (CS 1637).

***Project Researcher*, Indian Statistical Institute,** Kolkata, West Bengal, India. *Nov 2015- Dec 2016*
Research Intern working on developing mathematical and statistical models for human face recognition.

***Project: Illumination Variation Problem on Human Face Recognition***. [Paper]
- **Created a novel** local illumination-invariant descriptor for face recognition **increasing accuracy** over state-of-the-art methods by 6.7% on CMU-PIE, 5% on Yale B and 2% AR, CUHK dataset (using MATLAB).

***Project: Dimension Reduction and Noise Reduction for Face Recognition*** [Details]
- Applied linear regression to stabilize lower entropy space for dimension reduction in face recognition (using MATLAB).
- **Increased accuracy by 3%** on FRAV-2D, FERET dataset over state-of-the art methods and **established** proof of correctness.

## Selected Academic Projects

**Image Captioning Using attention-based image context (3730 Advanced NLP)** *Oct 2020- Nov 2020*
- Designed a caption generator (in PyTorch) from images using a Resnet-101 encoder with an attention-based LSTM decoder.

**Mortality Prediction Using Heterogenous Data Sources (3750 Advanced ML)** [Details] *Mar 2020- Apr 2020*
- Investigated contribution of multiple data sources (medications, vital signs) and built a Transformer architecture to predict mortality from continuous time-series data (using PyTorch).
- **Identified** Microbiology events as indicative of morality and **achieved a 3% improvement** with Transformers over LSTM.

**Detecting Deep Fakes (11785 Deep Learning)** [Details] *Nov 2019- Dec 2019*
- Created a Siamese Statistical Recurrent Neural Network to detect deep-fake video sequence (using Python, PyTorch)
- **Achieved 10% increase** in AUC-ROC over Statistical Recurrent Networks in FaceForensics++ dataset.

**Detecting Pneumonia in Chest X-Ray Images: ML approaches (2750 ML)** [Details] *Mar 2019 – Apr 2019*
- Implemented Resnet-50, InceptionNet, CNN, Resnet-50 on Chest X-ray images (using Keras, Tensorflow).
- **Increased recall by 3%** using Resnet-50 over InceptionNet.

**Tiny Google - A Parallel Word Search Engine (2510 OS)** [Details] *Nov 2018- Dec 2018*

- Developed a distributed search engine, using multithreading, that searches and retrieves documents based on search words from multiple worker nodes. Project done using Python and Threading.

**Direct Manipulation in Virtual Reality (2610 HCI)** [Details] *Nov 2017- Dec 2017*

- Extracted tracked movements from smartwatch to move objects in Virtual Reality (using Android SDK, Unity 3D).
- **Created a user study** gauging the difficulty of moving a box to a sphere of varying length in the virtual environment.

## Publications

- *"Leaning Turn-Taking Strategies in Multimodal Dialogue", 2021***.** (under preparation).
- *"Local Centre of Mass Face for Face Recognition under varying Illumination", 2017***.** *[Link]*
- *"Challenges and Effects of Plastic Surgery on Face Recognition Performance: A review", 2016. [Link]*