

Somshubra Majumdar

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Education

University of Illinois at Chicago

Chicago, Illinois

Masters in Computer Science (GPA 3.77 / 4.0) (OPT)

2017 - 2018

University of Mumbai

Mumbai, Maharashtra

Bachelor of Engineering in Computer Science (CGPA 8.0 / 10.0)

2012 - 2016

Technical Skills

Programming: Proficient : Python, Java, Android, **Intermediate:** C#, C, C++

Deep Learning Frameworks: Tensorflow, PyTorch, Keras, Theano

Relevant Experience

Sr. Deep Learning Software Engineer

Santa Clara,

California

NVIDIA Corporation

01/21/2020 - Present

2788 San Tomas Expy, Santa Clara, CA 95051

- I. Development of machine and deep learning models in the domain of Automatic Speech Recognition.
- II. Development of the NVIDIA Neural Module (NeMo) package for conversational AI research and development of state of the art ASR, NLP, TTS and Large Language Models.
- III. Published research articles in the domains of speech recognition, speech classification, self-supervised learning for ASR and other speech tasks.
- IV. Development of various CTC/RNNT architectures for high throughput low latency streaming ASR with NVIDIA Riva.

Data Scientist

Chicago, Illinois

Anthem, Inc

04/08/2019 - 01/07/2020

233 S Wacker St, Chicago, IL, 60606

- I. Analysis and modelling of EMR/ERH/Claims data and research on synthetic data generation processes for safe, public distribution of synthetic PHI data to research organizations.
- II. Processing of claims and clinical data of de-identified patients to develop machine learning models.
- III. Research on natural language processing techniques to extract information from free text in EMR data sources.
- IV. Development of visualization software to monitor provider network expansion.
- V. Development of generative adversarial networks to synthesize statistically similar data that can safely be used for downstream processes without risk of PHI/PII data leakage.

Research Assistant at Prominent Group (UIC)

Chicago, Illinois

Professor Houshang Darabi - Time Series Classification with Deep Learning

05/01/2017 - 04/07/2019

1200 W Harrison St, Chicago, IL, 60607

- I. Published several papers on hybrid LSTM Fully Convolutional Neural Networks which obtain state of the art scores on UCR univariate and multivariate time series classification datasets.
- II. Published a paper in the domain of pathological voice detection.
- III. Published a paper in the domain of adversarial attacks on time series, and plausible attack vectors.

Research Assistant (UIC)

Chicago, Illinois

Professor Bing Liu - Lifelong Deep Learning

08/01/2017 - 12/15/2017

1200 W Harrison St, Chicago, IL, 60607

- I. Performed research on how to avoid the catastrophic forgetting issue when training neural networks on new tasks or when finetuning models on vastly different domains.

Relevant Projects

- I. Implemented **Neural Style Transfer** from the paper “A Neural Algorithm of Artistic Style” in Keras. Includes several improvements from various other papers such as **Color transfer, Multi style transfer and Masked style transfer**. (2000+*) <https://github.com/titu1994/Neural-Style-Transfer>
- II. Implemented **Image Super Resolution** neural network models such as SRCNN, Denoise SRCNN, SRResNet and ESPCNN **which can upscale an image** with reduced loss of details. (550+*) <https://github.com/titu1994/ImageSuperResolution>
- III. Implemented **Neural Image Assessment**, trained on the AVA dataset to evaluate how visually impressive an image is. (400+*) <https://github.com/titu1994/neural-image-assessment>
- IV. Implemented **deep convolutional neural network classifiers** in Keras, such as Wide Residual Networks, DenseNets, Inception Res-Net v2, ResNeXt, MobileNets, Squeeze-and-Excitation Networks, NASNet. (270+*) <https://github.com/titu1994/Keras-Classification-Models>
- V. Created a hybrid **Long Short Term Memory RNN - Fully Convolutional Network (LSTM-FCN)** which outperforms all other state of the art models on 85 UCR univariate time series datasets. (270+*) <https://github.com/titu1994/LSTM-FCN>
- VI. Improved **LSTM-FCN model to be used with Multivariate Time Series datasets**, called Multivariate LSTM-FCNs which obtain state of the art performance on 28 out of 35 multivariate datasets. (150+*) <https://github.com/titu1994/MLSTM-FCN>
- VII. Implemented **Neural Architecture Search used by Google for their AutoML project**, which uses a Controller RNN to train and optimize the structure of children models to obtain high performance architectures automatically. (250+*) <https://github.com/titu1994/neural-architecture-search>. A recent update to this was **Progressive NAS**, which uses Sequential Model-Based Optimization to quickly obtain the best model for a search space using fewer number of models trained. (35+*) <https://github.com/titu1994/progressive-neural-architecture-search>.
- VIII. Wrote a **python library, TFDiffEq**, which is a full fledged Ordinary Differential Equation solver built for Tensorflow 2.0 with Eager Execution. Allows building of Neural Ordinary Differential Equations in Tensorflow in a differentiable manner. <https://github.com/titu1994/tfdiffeq>

Research Papers

Time Series Classification

- I. Author of the paper “*LSTM Fully Convolutional Network for Time Series Classification*”, which is a hybrid model of LSTM and FCN. Accepted at IEEE Access and published in IEEE Transactions : <http://ieeexplore.ieee.org/document/8141873/>
- II. Co-author of the paper “*Multivariate LSTM-FCNs for Time Series Classification*”, which extends the above model to multivariate time series datasets. Can be viewed at: <https://arxiv.org/abs/1801.04503>
- III. Co-author of “*Microaneurysm Detection using Fully Convolutional Neural Networks*”, which obtains state of the art results on semantic segmentation of microaneurysms in fundus photography. Accepted in

the *Journal of Computer Methods and Programs in Biomedicine* :
<https://www.sciencedirect.com/science/article/pii/S0169260717308544>

- IV. Author of “***Insights into LSTM Fully Convolutional Networks for Time Series Classification***”, a paper studying the effectiveness of LSTM FCN for various time series classification tasks, and setting new state-of-the-art benchmarks on new UCR datasets published recently. It can be viewed at :
<https://ieeexplore.ieee.org/abstract/document/8713870>
- V. Author of “***Adversarial Attacks on Time Series***”, a paper which describes a variety of possible attack vectors on Classical Models and Deep Neural Networks for Time Series Classification using a simple Gradient Adversarial Transformation Network to construct both white and black box attacks.
<https://arxiv.org/abs/1902.10755>

Speech

- I. Author of the paper “***Citrinet: Closing the gap between non-autoregressive and autoregressive end-to-end models for automatic speech recognition***”, a memory and compute efficient ASR model that obtains strong WER and can do one-shot inference on 2+ hours of speech. <https://arxiv.org/abs/2104.01721>
- II. Author of “***MatchboxNet: 1D Time-Channel Separable Convolutional Neural Network Architecture for Speech Commands Recognition***”, published at Interspeech 2020. Obtained state-of-the-art results for speech classification on Google Speech Commands in 2020. It can be viewed at : https://www.isca-speech.org/archive_v0/Interspeech_2020/pdfs/1058.pdf
- III. Co-author of the paper “***NVIDIA NeMo Offline Speech Translation Systems for IWSLT 2022***”, which obtains state-of-the-art results on cascade speech translation system based on Conformer encoder. It can be viewed at : <https://aclanthology.org/2022.iwslt-1.18/>
- IV. Co-author of the paper “***Multi-blank Transducers for Speech Recognition***”, an extension to the RNN Transducer loss which can skip upto K tokens for every token predicted, thereby reducing the autoregressive decoding time of RNNT significantly. It will be published in ICASSP 2023. Arxiv - <https://arxiv.org/abs/2211.03541>

Extracurricular Activities

- **Won First prize at Emirates Carnegie Mellon CMU Machine Learning & AI Hackathon**