# SOUMYAJIT GUPTA

smjtgupta@utexas.edu  $\diamond$ Google Scholar  $\diamond$ Website

#### **EDUCATION**

PhD in Computer Science, University of Texas at Austin Thesis: Multi-Task Learning for group-targeted tasks under sparse labels (in Car Research Areas: Machine Learning, Deep Learning, Fairness in Natural Language	Aug 2018 - Summer 2024 (expected) adidacy) ge tasks.		
M.S. in Computer Science, UT University of Texas at Austin	2014 - 2017		
M.Tech. in ECE, Indian Institute of Technology Kharagpur, India Specialization: Computer Vision, Image Processing, Parallel Programming.	2012 - 2014		
B.Tech. in ECE, West Bengal University of Technology, Kolkata, India	2007 - 2011		

#### TECHNICAL SKILLS

Languages:	Python, Matlab, C, C++, Visual Basic. Intermediate experience in Java, C#
Libraries:	Tensorflow, Keras, PyTorch, PySpark, Pandas, Scikit, Scipy, OpenCV, CUDA
Tools/IDEs:	WordPress, Rest API, Docker, Git, PvCharm, VS Code, Visual Studio, Ot

#### PROFESSIONAL EXPERIENCE

#### Teaching Positions, UT Austin

- Instructor: Advanced Python Programming (Fall 19)
- TA Grad Courses: Machine Learning (Spring 19, Spring 18), Graphics (Spring 17, Spring 16)
- TA Undergrad Courses: Programming for Informatics (Spring 21, Fall 21), Operating Systems (Fall 18, Fall 15, Spring 15, Fall 14), Graphics (Fall 16), Computer Architecture (Summer 15), Prog. for Optimization (Fall 14)

#### Real-time Image Quality Assessment, Homeaway, Austin, TX

- · Implemented real-time algorithms and metrics to improve and measure image contrast, brightness and blur.
- · Framework is being currently in their IRIS/ODIS system to tag all past and incoming images.
- · Used Amazons Map Reduce to score and label the company's databases of 30 million images.
- · Designed a survey on Amazon Mech Turk for collection of ground truth labels on 30k images for model checking.

#### SELECTED PUBLICATIONS

- 1. "Same Same, But Different: Conditional MTL for Demographic-Specific Toxicity Detection", WWW 23
- 2. "Learning a Neural Pareto Manifold Extractor with Constraints", UAI 22
- 3. "Range-Net: A High Precision Streaming SVD for Big Data Applications", arxiv 2021 (under review)
- 4. "SCA-Net: A Self-Correcting Two-Layer Auto-encoder for Hyperspectral Unmixing", arxiv 2021 (under review)
- 5. "Correlation, Prediction and Ranking of Evaluation Metrics in IR", ECIR 2019, Best Student Paper

## CURRENT RESEARCH PROJECTS

#### Multi Task Learning for group-targeted Toxicity Detection

- Designing MTL framework to operate under sparse group labels.
- · Joint model to account for multiple stakeholders (author, community, target) in the pipeline.
- · Developing loss functions and evaluation measures to operate under soft and ordinal labels.
- · Developing use-case scenarios for data distribution overlap from different sources or targets.

#### Neural Pareto Optimality for Classification and Search

- · Interpretable PINN-based Pareto hypernetwork (SUHNPF) to benchmark non-convex verifiable solutions.
- Extension to finding Pareto Front for Accuracy v.s. Fairness and Relevance v.s. Diversity tasks.
- · Scalable to high dimensional neural problems to trace out an approximate Pareto trade-off front.
- · Formulating differentiable fairness measure to optimize model training to achieve balanced accuracy across groups.

# Oct 2020 - Oct 2022

Oct 2022 - Present

Fall 2014 - Fall 2021

(June - Aug) 2017, Intern

# Singular Value Decomposition for Big Data Application

- $\cdot\,$  Two layer neural SVD solver which is fully Interpretable with fixed memory requirement.
- $\cdot$  Produces GPU-precision SVD results as opposed to any randomized SOTA method.
- $\cdot\,$  Extracting the top (Range-Net) or bottom (Tail-Net) singular triplets for Big Data scenarios.

### Hyperspectral Unmixing for Linear Mixture Model

- $\cdot\,$  Autoencoder structure (SCA-Net) to perform blind unmixing of linear mixture model.
- $\cdot\,$  Achieves 1000× lower RMSE and SAD scores than reported in SOTA works.
- · Low-weight network with strict interpretability in terms of model.

# PAST RESEARCH PROJECTS

	<b>Streaming Low rank Model for Generalized Rayleigh</b> University of Texas, Austin	(June - Aug) 2019 Summer Project
	Improved model for Generalized Rayleigh using low rank constraint for big data in a streaming setting. Extensions to Minimum Noise Fraction for Denoising and Linear/Kernel Discriminant Analysis for Classification. Achieves around $10 \times$ efficiency in time and space compared to the earlier models.	
•	<ul> <li>Ranking and Prediction of Information Retrieval evaluation metrics</li> <li>University of Texas, Austin, Dept. of CS</li> <li>Finding better rank correlation metrics for topic evaluation.</li> <li>Developed algorithms for ranking strategies of highly informative and non correlated metrics.</li> </ul>	(Apr-Jun) 2018 Research
	Noise Removal, Feature Selection, Classification of Hyperspectral Data University of Texas, Austin, Dept. of CS Fast and accurate, band correlated noise removal for HSI data with blind error metrics. Robust algorithms for both un-/supervised feature selection and ranking. Non-linear classification models with emphasis on Cancer prediction. Joint methods for multi-scale HSI unmixing under unknown rank constraints.	Sep 2014 - Mar 2018 Research
	Camera motion estimation for Cryo-EM images       (Oct - Dec) 2016         University of Texas, Austin, Dept. of CS       Class Project         • Simulated Cryo-EM images with simulated noise from Protein Database structures.       Class Project         • Developed DeepNet for relative pose estimation of cameras and virus class identification.       Achieved > 90% classification and ~ 80% pose test accuracy, using combination of Siamese and VGG type layers.         • Built 3D virus capsid geometry from 2D image stacks using bundle assignment.       Oct - Dec) 2016	
	Geo-location Prediction from Street View Images       (Sep - Oct) 2016         University of Texas, Austin, Dept. of CS       Class Project         • Trained Deep Nets to place labeled (latitude, longitude) images of France on a dynamic location grid       Class Project         • Predicted location of test images, with 50km average regression error and with > 90% classification cluster accuracy.	
•	<ul> <li>Skull Reconstruction and Segmentation of CT data</li> <li>University of Texas, Austin</li> <li>Separated regions of skull bone, skin and soft tissue using Iso-Surfaces.</li> <li>Generated water-tight meshes, that works for sub-volumes with non-overlapping boundary.</li> </ul>	(June - Aug) 2016 Summer Project
	Computational Visual Saliency for Images & Video IIT Kharagpur, Dept. of E&ECE Developed Real-time Saliency model of intensity/color/shape features using OpenCV. Implemented CUDA based algorithms to achieve speedup in terms of execution with optimal r Saliency Based image manipulation: Filtering, Compression, Mosaics, Cropping, Brushstroke.	June 2013 - Apr 2014 Masters Thesis nemory transfer.
•	Global Motion Compensation and Video StabilizationIIT Kharagpur, Dept. of E&ECEImplemented algorithm to remove shakiness in video based on Eigen feature trajectories.Cropped videos and made them steady using maximally stable extremal region features.	Dec 2012 - Jan 2013 Research project

#### **REVIEWER DUTIES**

ACL, UAI, ACM SIGIR, Elsevier Neural Networks, IEEE Transactions on Computational Social Systems

Oct 2020 - Mar 2021