Sarath Shekkizhar

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Education

Ph.D. in Electrical and Computer Engineering, **M.S.** in Computer Science — *Aug 2017 - Present*
University of Southern California, Los Angeles, CA — *GPA: 3.93*
Advisor: Antonio Ortega.

M.S. in Electrical Engineering (Computer Vision, Machine Learning) — *Aug 2012 - Dec 2013*
University of Southern California, Los Angeles, CA — *GPA: 3.86*

B.Tech. in Electronics and Communication — *July 2008 - June 2012*
National Institute of Technology, Tiruchirappalli, India — *GPA: 9.12*

Publications

The geometry of self-supervised learning models and its impact on Transfer learning
R. Cosentino, S. Shekkizhar, M. Soltanolkotabi, S. Avestimehr, A. Ortega, *In review.*, 2022

NNK-Means: Data summarization using dictionary learning with non-negative kernel regression
S. Shekkizhar, A. Ortega, *In Press, IEEE 30th European Signal Processing Conference (EUSIPCO)*, 2022

Channel redundancy and overlap in convolutional neural networks with Channel-wise NNK graphs
D. Bonnet, A. Ortega, J.Ruiz-Hidalgo, S.Shekkizhar, *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2022

Channel-Wise Early Stopping without a ValidationSet via NNK Polytope Interpolation
D. Bonnet, A. Ortega, J.Ruiz-Hidalgo, S.Shekkizhar, *Asia Pacific Signal and Information Processing Association (APSIPA)*, 2021

Model selection and explainability in neural networks using a polytope interpolation framework
S. Shekkizhar, A. Ortega, *Asilomar Conference on Signals, Systems, and Computers *, 2021

Revisiting nearest neighbors from a signal approximation perspective
S. Shekkizhar, A. Ortega, *Bay Area Machine Learning Symposium (BayLearn)*, 2021

Revisiting local neighborhood methods in machine learning
S. Shekkizhar, A. Ortega, *IEEE Data Science and Learning Workshop (DSLW)*, 2021

Efficient graph construction for image representation **[Best student paper]**
S. Shekkizhar, A. Ortega, *IEEE International Conference on Image Processing (ICIP)*, 2020

Graph-based Deep Learning Analysis and Instance Selection
K. Nonaka, S. Shekkizhar, A. Ortega, *IEEE International Workshop on Multimedia Signal Processing (MMSP)*, 2020

DeepNNK: Explaining deep models and their generalization using polytope interpolation
S. Shekkizhar, A. Ortega, *arXiv Preprints*, 2020

Graph Construction from Data by Non-Negative Kernel Regression
S. Shekkizhar, A. Ortega, *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2020

Graph construction from data using non negative kernel regression - Journal draft
S. Shekkizhar, A. Ortega, *arXiv Preprints*, 2019

Optimizing training sets used for setting up inspection-related algorithms
M. Plihal, E. Soltanmohammadi, S. Paramasivam, S. Ravu, A. Jain, S. Shekkizhar, P. Uppaluri, *US Patent Office*, 2019

Detection and removal of Salt and Pepper noise in images by improved median filter
S. Deivalakshmi, S. Shekkizhar, P. Palanisamy, *IEEE Recent Advances in Intelligent Computational Systems*, 2011

Work Experience

Software Engineer, KLA Tencor, Milpitas, CA — *Mar 2014 - Oct 2016*
Designed and developed tools to classify and visualize defect modulations for Process Window Qualification in wafer fabrication. Also, implemented and co-owned components for analysis and classification using decision trees and Random forests

Freelance Researcher, Toonchat (Demo: youtu.be/B7LyoWksHHE) — *Jan 2014 - Jun 2014*
Researched and worked with animators and researchers on real time face tracking under the advise of Dr. Eric Petajan for low bandwidth animations and anonymous video chat clients

Software Developer, Laboratory of Neurological Imaging, USC (invizian.loni.usc.edu) — *Aug 2013 - Dec 2013*
Worked under the supervision of Dr. John Van Horn as part of the Information Visualization project, a platform to interact and research on large amounts of brain data

Intern, Bharat Heavy Electrical Ltd, India — *June 2011 - July 2011*
Designed an assembly level microcontroller program to measure the bend angles in pipes of different sizes.

Other Research Works

Manifold embedding using NNK Graphs — *Jan 2020 - May 2020*
Revisited data embedding using graphs in terms of robustness and stability with respect to hyperparameters. NNK graphs are significantly sparser compared to other graph constructions, while being able to capture the structure of noisy manifolds.

Manifold Regularized Variational Autoencoder (VAE) — *Aug 2019 - Dec 2019*
Studied disentanglement in VAEs with explicit regularization using graphs. This work was motivated from the perspective of locality often enforced in autoencoders using noisy sampling of embeddings.

Are combined Fuzzy Cognitve Maps (FCM) always better than individual maps? — *Aug 2018 - Dec 2018*
Analysed the performance of decisions taken by individuals in a simple game against that of the additive. Combined FCM reduces the effect of error associated with each individual.

Impact of lp-norm choice on K-nearest neighbor graph construction — *Jan 2018 - May 2018*
Explored the impact of distance norms for k-nearest neighbor graph construction in high dimensional spaces using eigen analysis. Lower norms produce data clusters better than euclidean and higher norms.

Graph based Image Segmentation, Prof. Antonio Ortega — *Aug 2013 - Dec 2013*
Performed experiments and analysis on graph based approach to image Segmentation. Leveraged methodologies for finding approximate Fiedler vector on a graph laplacian as an alternative to doing normalized cuts.

3D Face Recognition System, Dr. Jongmoo Choi, Prof. Gerard Medioni — *May 2013 - Aug 2013*
Developed on the core recognition library and created an evaluation framework and data set for benchmarking. Made integration efforts on incorporating 3D modelling module for recognition.

Dynamic Face Warping, Prof. Antonio Ortega — *Jan 2013 - June 2013*
Implemented a real time facial tracking and warping module in DaVinci DSP board. The project emphasized working under constrained resources and was targeted towards applications in mobile.

Optical Character Recognition, Prof. S. Deivalakshmi — *Jan 2012 - June 2012*
A neural network based character recognition system for use with motor vehicle license plate recognition was developed. The system was evaluated with different fonts and lighting confitions.

Classification of Mammograms, Prof. S. Deivalakshmi — *Aug 2011 - Dec 2011*
A method to differentiate and identify the nature of tumor in mammograms using discriminant analysis on extracted features was developed and evaluated on the MIAS database.

Side Projects

Deeplearning Projects using Tensorflow (github.com/shekkizh/TensorflowProjects)
Highlights: DCGAN for generating flowers/ faces, Face completion using context, Deep dream, VGG visualization, Image Inversion, Style Transfer

Neural Networks Experiments (github.com/shekkizh/neuralnetworks.thought-experiments)
Experiments on Activation functions, Model Pruning (Optimal Brain Damage), Unsupervised Learning using AutoEncoders, VAEs, GANs

Fully Convolutional Networks for Semantic Segmentation (github.com/shekkizh/FCN.tensorflow)
Tensorflow implementation of FCNs for segmentation as in CVPR paper applied on MIT scene parsing challenge dataset

Energy Based Generative Adversarial Networks (github.com/shekkizh/EBGAN.tensorflow)
Model implementation of Junbo et. al's paper of training GAN with energy based objective in tensorflow

Image Colorization (github.com/shekkizh/Colorization.tensorflow)
Experiments on leveraging CNNs for colorizing grayscale images by statistical knowledge gained about objects and colors from a dataset.

Image Processing Projects (github.com/shekkizh/ImageProcessingProjects)
Highlights: Eye Tracking, Facial Tracking and Localization, Seam carving, Image Stitching, Image calibration, Image filters, Object detection and processing

Co-Mentoring

Carlos Hurtado Comín, Universitat Politècnica de Catalunya (Visiting Researcher, USC) — *Mar 2022 - Present*

Aryan Gulati, University of Southern California (CURVE program, USC) — *Aug 2021 - April 2021*

David Bonet Solé, Universitat Politècnica de Catalunya (Visiting Researcher, USC) — *Dec 2020 - Aug 2021*

Keisuke Nonaka, KDDI Research (Visiting Researcher, USC) — *Aug 2019 - July 2020*

Teaching Experience

Course Producer, CS 561 Foundations of Artificial Intelligence, Dr. Sheila Tejada — *Fall 2013*

Course Grader, EE 483 Introduction to DSP, Prof. Edgar Satorius — *Summer 2013*

Course Grader, EE 483 Introduction to DSP, Prof. Edgar Satorius — *Spring 2013*

Academic and Co Curricular Activities

- Reviewer, ICLR 2022
- Mentor, Viterbi Graduate Mentorship Program, Fall 2021
- Discussant, UAI 2021
- Volunteer, NeurIPS, ICLR, ICML
- Viterbi Graduate Student Association (VGSA) Senator, Fall 2017, Spring 2020
- Volunteer, USC Vision and Voices, 2018
- *Coordinator*, ECE Campus Placement Committee 2012, NIT-Tiruchirappalli
- *Organizer*, Guest Lecturs, Texas Instruments workshop, ECE Probe 2010 & 2011, NIT-Tiruchirappalli
- *Event Manager*, Robotic Event, Pragyan 2009 & 2010, NIT-Tiruchirapalli
- Ranked among the top 1%, All India Engineering Entrance Exam, 2008
- Ranked among the top 10%, Talent Exam 2007, National Assoc. of Physics and Chemistry Teachers