Ajil Jalal

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Education

University of Texas at Austin 2016-Present
M.S. and Ph.D., Electrical and Computer Engineering GPA: 3.9/4.0
Advisor: Prof. Alexandros G. Dimakis
Interests: Generative Models, Compressed Sensing, Information and Coding Theory

Indian Institute of Technology Madras 2012-2016
Bachelor of Technology (Honours) in Electrical Engineering GPA: 9.06/10
Advisors: Prof. Krishna Jagannathan and Prof. Rahul Vaze
Minor: Systems Engineering

Publications

Ashish Bora, **Ajil Jalal**, Eric Price, Alexandros G. Dimakis. "Compressed Sensing Using Generative Models", ICML 2017 , Sydney, Australia.

Umang Bhaskar, **Ajil Jalal**, Rahul Vaze. "The Adwords Problem with Strict Capacity Constraints", FSTTCS 2016 , Chennai, India.

Preprints

D. Van Veen, **A. Jalal**, E. Price, S. Vishwanathan, and A.G. Dimakis. "Compressed Sensing Using Deep Image Prior and Learned Regularization." 1806.06438 (2018).

A. Ilyas, **A. Jalal**, E. Asteri, C. Daskalakis, and A.G. Dimakis. "The Robust Manifold Defense: Adversarial Training using Generative Models." arXiv:1712.09196 (2017).

Professional Experience

Tata Institute of Fundamental Research Mumbai, India
Undergraduate Research Intern Summer 2015
Designed approximation algorithms and showed approximation bounds for an online combinatorial optimization problem.

Audience Communication Systems Bangalore, India
Undergraduate Intern Summer 2014
Worked on a text dependent automatic speaker recognition system.

Audience Communication Systems Bangalore, India
Undergraduate Intern Winter 2013
Worked on reducing power dissipation in MIPS processors by minimising switching activity in the processor.

Projects

Compressed Sensing Using Deep Image Prior and Learned Regularization January 2018-
UT Austin, with D. Van Veen, Prof. Eric Price, Prof. Sriram Viswanathan, Prof. A.G. Dimakis

- We show that deep convolutional networks are good priors for solving differentiable compressed sensing problems.
- We propose a new form of regularization that improves performance.

The Robust Manifold Defense: Adv. Training Using Gen. Models May 2017- Present
UT Austin, with Andrew Ilyas, Eirini Asteri, Prof. A.G. Dimakis, and Prof. C. Daskalakis

- By adding imperceptible noise to a clean image, an adversary can arbitrarily influence the prediction of a neural network on the image. We show that generative models can defend against adversarial attacks.
- We search for an image in the span of a generative model that is close to an input image- this helps filter out adversarial perturbations. We also demonstrate how this idea can be used to robustify a classifier during its training.

Compressed Sensing Using Generative Models August 2016- Present
UT Austin, with Ashish Bora, Prof. Alexandros G. Dimakis, and Prof. Eric Price

- Introduced a new approach to compressed sensing. Traditional compressed sensing tries to find a sparse solution to an under-determined system of linear equations.
- Our approach is to search for an approximate solution in the span of a generative model.
- Proved upper bounds on number of measurements required for recovering a solution with low ℓ_2 error. Empirical results show that we require 10x less measurements than the traditional LASSO algorithm.

The Adwords Problem with Strict Capacity Constraints May 2015- May 2016
TIFR, with Prof. Rahul Vaze and Prof. Umang Bhaskar

- An adversary produces weighted jobs to a set of servers with finite capacities at discrete time steps, and a matching must be found at each time step. Objective is to maximize the aggregate sum of jobs matched.
- Designed and proved approximation guarantees for randomised and deterministic online algorithms. Also showed that a load balancing algorithm is near-optimal for a special case.
- Proved lower bounds which show our algorithms are almost tight.

Text Dependent Automatic Speaker Recognition Summer 2014
Audience Communication Systems, with Murali Deshpande and Vinay N Krishnan

- Implemented an adaptive Gaussian Mixture Model which can be trained to recognise a particular keyphrase by a user. Can be used as part of a voice activated wake up feature for cellphones.
- Model uses approximately 10 seconds of training data per user and achieves 80%+ accuracy.

Honors

- Ranked **535** nationally in the **2012 IITJEE**, among 700,000 competitors.
- **Karnataka Regional Mathematical Olympiad** scholar. Attended the **Indian National Mathematical Olympiad (INMO)** camp and represented Karnataka in the INMO, 2011.
- **Kishore Vaigyanik Protsahan Yojana (KVPY)** fellow, 2012. 2015.
- Nominated for the **INSPIRE** scholarship, awarded to the top 1% in the CBSE grade XII examinations, 2012.

Teaching Experience

University of Texas at Austin:
Teaching Assistant, EE351K: Introduction to Probability and Statistics Spring 2017
Teaching Assistant, EE360C: Algorithms Fall 2016

Skills

Programming languages: Python, C, C++.
Libraries and Toolkits: Tensorflow, PyTorch, Matlab, LaTeX, Numpy, Scipy.

Relevant Courses

Machine Learning	Information Theory
Unsupervised Learning	Learning Theory
Error Control Coding	Convex Optimization: Theory and Algorithms
Probability and Stochastic Processes	Approximation Algorithms
Randomized Algorithms	Advanced Concentration Inequalities
Pseudorandomness	Theory of Probability
Adaptive Signal Processing	Theory of Computation