

# Ajil Jalal

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<b>Education</b>	<b>University of Texas at Austin</b> 2016-Present <i>M.S. and Ph.D., Electrical and Computer Engineering</i> GPA: 3.9/4.0 <i>Advisor:</i> Prof. Alexandros G. Dimakis <i>Interests:</i> Generative Models, Statistical Machine Learning, Information and Coding Theory
	<b>Indian Institute of Technology Madras</b> 2012-2016 <i>Bachelor of Technology (Honours) in Electrical Engineering</i> GPA: 9.06/10 <i>Advisors:</i> Prof. Krishna Jagannathan and Prof. Rahul Vaze <i>Minor:</i> Systems Engineering
<b>Publications</b>	Ashish Bora, <b>Ajil Jalal</b> , Eric Price, Alexandros G. Dimakis. "Compressed Sensing Using Generative Models", <b>ICML 2017</b> , Sydney, Australia.
	Umang Bhaskar, <b>Ajil Jalal</b> , Rahul Vaze. "The Adwords Problem with Strict Capacity Constraints", <b>FSTTCS 2016</b> , Chennai, India.
<b>Preprints</b>	D. Van Veen, <b>A. Jalal</b> , E. Price, S. Vishwanathan, and A.G. Dimakis. "Compressed Sensing Using Deep Image Prior and Learned Regularization." <b>1806.06438</b> (2018).
	A. Ilyas, <b>A. Jalal</b> , E. Asteri, C. Daskalakis, and A.G. Dimakis. "The Robust Manifold Defense: Adversarial Training using Generative Models." <b>arXiv:1712.09196</b> (2017).
<b>Professional Experience</b>	<b>Tata Institute of Fundamental Research</b> Mumbai, India Undergraduate Research Intern Summer 2015 Designed approximation algorithms and showed approximation bounds for an online combinatorial optimization problem.
	<b>Audience Communication Systems</b> Bangalore, India Undergraduate Intern Summer 2014 Worked on a text dependent automatic speaker recognition system.
	<b>Audience Communication Systems</b> Bangalore, India Undergraduate Intern Winter 2013 Worked on reducing power dissipation in MIPS processors by minimising switching activity in the processor.
<b>Projects</b>	<b>The Robust Manifold Defense: Adv. Training Using Gen. Models</b> May 2017- Present <i>UT Austin, with Andrew Ilyas, Eirini Asteri, Prof. A.G. Dimakis, and Prof. C. Daskalakis</i> <ul style="list-style-type: none"><li>• 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.</li><li>• 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.</li></ul>

## 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  $\ell_2$  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.
- Honorable Mention in **Quantify**, an analytics competition organised by Goldman-Sachs, 2015.
- Nominated for the **INSPIRE** scholarship, awarded to the top 1% in the CBSE grade XII examinations, 2012.
- Ranked **63** in the **Kerala Common Entrance Examination(CEE)**, 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  
Error Control Coding  
Probability and Stochastic Processes  
Randomized Algorithms  
Pseudorandomness  
Digital Communication Systems  
Analog and Digital Signal Processing  
Network Analysis  
Real Analysis  
Process Optimization

Information Theory  
Convex Optimization Theory and Algorithms  
Approximation Algorithms  
Adaptive Signal Processing  
Theory of Computation  
Computational Methods in EE  
Modern Control Theory  
Multivariate Data Analysis  
Complex Analysis  
Reinforcement Learning