

RESEARCH INTERESTS      Approximation Algorithms, Randomized Algorithms, Spectral Algorithms, Beyond Worst-Case Analysis, High-Dimensional Probability and Statistics, Numerical Linear Algebra, Optimization, Theoretical Machine Learning, Matrix Analysis.

EDUCATION      **International Institute of Information Technology Bangalore (IIITB)**  
*Integrated Masters of Technology in Information Technology*  
Specialization: Theoretical Computer Science  
CGPA: 3.36/4, Major GPA (Stream- CC,CS,IT): 3.6/4  
Thesis: Clustering Perturbation Resilient Instances  
Advisor: Prof G. Srinivasaraghavan

EMPLOYMENT      **Project Associate**      2018 - Current  
Department of Computer Science and Automation, Indian Institute of Science (IISc)  
Advisor(s): Prof Anand Louis (IISc), Dr Amit Deshpande (Microsoft Research)

**Narendra Summer Intern**      Summer 2017  
Department of Computer Science and Automation, Indian Institute of Science  
Advisor: Prof Anand Louis (IISc)

**Summer Intern**      Summer 2016  
Teaching assistant intern at UpGrad  
Advisor: Prof Dinesh Babu Jayagopi (IIITB)

PUBLICATIONS      ♦ **On Euclidean  $k$ -Means Clustering with  $\alpha$ -Center Proximity**  
(with Amit Deshpande and Anand Louis)  
*Accepted at AISTATS 2019, ([Link](#))*  
♦ **Approximation Algorithms for Min-Max  $k$ -Means Clustering**  
(with Amit Deshpande and Anand Louis)  
*Submitted*

RESEARCH PROJECTS      **Clustering Stable Instances of Data**      2017-Current  
This work is in collaboration with Anand Louis and Amit Deshpande. We are investigating various clustering objectives (spectral, min-max, k-means, etc.) and trying to come up with efficient algorithms for them, under assumptions that the input is “nice” (or stable). This mainly requires looking at the geometry of the instances and exploiting that information. We are also attempting to explain the immense success of the Lloyd’s heuristic, which is commonly used for  $k$ -means clustering.

**Solving Linear Equations in High-Dimensional Space**      Summer 2017  
This work was done as part of the summer internship under Prof Anand Louis. We were trying to solve the system of linear equations faster when the ambient dimension of the space is very high, such that taking inner products proves to be an expensive task. We also explored various topics like gradient descent, compressed sensing, and phase transitions in convex optimization problems.

**Vehicle Routing Problem**      Spring 2017  
This work was done as part of a reading elective under Prof V N Muralidhara at IIITB. We were looking at the vehicle routing problem on various topologies like line, ring,

tree, etc. and were trying to come up with approximation algorithms for it. We were able to show a quasi-polynomial time algorithm on a ring with splittable demands.

### Tensor Decomposition

Fall 2016

This work was done as part of Machine Learning course project under Prof G. Srinivasaraghavan at IITB. This was my first introduction to a theoretical research topic. The aim of the project was to come up with an efficient algorithm for tensor decomposition up to the uniqueness threshold. Most of the time was spent in reading and understanding the various literature on the topic.

### Indian Railways Time-Tabling

Spring & Fall 2016

This work was done as part of a project elective under Prof GNS Prasanna at IITB. We worked on devising various algorithms for time-tabling a set of new trains into an already existing time-table, taking care of numerous constraints like the direction of the track, stoppage time at a station, etc. The project was coding intensive, and we used various heuristics to schedule the trains.

ACHIEVEMENTS	<ul style="list-style-type: none"> <li>◇ Was one of the 18 students selected by the Department of Computer Science and Automation, IISc for their summer internship program, called the <b>Narendra Summer Internship</b>, 2017.</li> <li>◇ Our work on Indian Railways Time-Tabling titled <i>Indian Railways: A heuristic based approach to solve problems in complex networks</i> was selected for <b>poster presentation at Analytics 2017</b> (The INFORMS Conference on Business Analytics and Operations Research), held in Las Vegas, Apr 2-4, 2017.</li> <li>◇ Got selected for the <b>Machine Learning Summer School, 2015</b> co-organised by Microsoft Research and IISc.</li> </ul>
PRESENTATIONS	<ul style="list-style-type: none"> <li>◇ <b>Microsoft Research</b> <span style="float: right;">Sept. 2017</span> Gave a talk in the Microsoft Research (MSR) - IISc theory reading group on the COLT 2016 paper by Lee et al., “Gradient Descent Converges to Minimizers”.</li> <li>◇ <b>IIIT Bangalore</b> <span style="float: right;">Dec. 2018</span> Gave a talk at the IIIT Bangalore Theory Club on our work on clustering with center proximity and min-max k-means problem.</li> <li>◇ <b>AISTATS 2019</b> <span style="float: right;">Apr. 2019</span> Presented our poster on our work on <i>Euclidean k-Means Clustering with <math>\alpha</math>-Center Proximity</i>.</li> </ul>
MISCELLANEOUS	<ul style="list-style-type: none"> <li>◇ Co-founded the <b>IIIT-Bangalore Theory Club</b>, with an objective to hold talks and reading groups, and solve questions.</li> <li>◇ I was the teaching assistant for the <b>E0203: Spectral Algorithms</b> course at IISc in spring 2018 and <b>E0306: Deep Learning, Theory and Practice</b> in spring 2019. My duties were mainly checking papers and clearing doubts of students outside of the class hours.</li> </ul>
RELEVANT COURSES	<p>Topics in Information Theory and Statistical Learning, Matrix Analysis and Positivity, Concentration Inequalities, Probability and Statistics in High-Dimensions, Spectral Algorithms, Real Analysis, Foundations of Big Data and Algorithms, Machine Learning 1 &amp; 2, Approximation Algorithms, Advanced Algorithms.</p>