

# Yash Sanghvi

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## Research Interests

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Computational Imaging, Inverse Problems, Signal Processing, Compressive Sensing, Machine Learning

## Education

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- **Indian Institute of Technology Bombay**, Mumbai, India Jul.'13 - Jul.'18  
Dual Degree (B.Tech. + M. Tech.) in Electrical Engineering  
Major CGPA: 9.12  
Thesis Title: "Application of Wavelets in Inverse Scattering"  
Advisor: Prof. Vikram M. Gadre

## Academic Achievements

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- Awarded **Certificate of Appreciation** for commendable performance of T.A. duty in the undergraduate course *Network Theory*, held in Autumn Semester 2017
- Awarded **Undergraduate Research Award [URA-01]** for project titled '*Chirp Signal Parametrization using Particle Swarm Optimization*' 2015
- Secured All-India-Rank **256 out of 1.4 million students** in Joint Entrance Examination 2013
- Received the **Kishore Vaigyanik Protsahan Yojana (KVPY) fellowship**, instituted by the Department of Science and Technology, Government of India 2012

## Publications

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- Yash Sanghvi, Yaswanth Kalepu, Hrishitosh Bisht, Vikram Gadre, and Uday Khankhoje, "**Inverse Scattering via Constrained Optimization**", under review, IEEE Transactions on Computational Imaging
- Yash Sanghvi, Yaswanth Kalepu, and Uday Khankhoje, "**Embedding Deep Learning in Inverse Scattering Problems**", under review, IEEE Transactions on Computational Imaging

## Selected Work and Research Experience

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- **Embedding Deep Learning in Inverse Scattering** | Project Scientist  
Guide: Prof. Uday Khankhoje Sep.'18-Present
  - Developing a deep learning based framework to solve the electromagnetic inverse scattering problem, building up on the existing iterative solutions and aimed at addressing the issue of imaging strong scatterers.
  - Mitigates the issue of solutions converging to false minima due to the global non-linear effects which become more pronounced as strength of scatterer increases.
- **Wavelets in Inverse Scattering** | Master's Thesis

Guide: Prof. V.M. Gadre

May'17 - May'18

- Formulated iteratively reweighted variation of the joint  $\ell_1$ - $\ell_2$  regularization Born iterative method to obtain improved dielectric profile reconstructions.
- Explored wavelet-sparsity based methods to solve the inverse scattering problem under the assumption of Born approximation.
- Developed a non-linear constrained optimization framework to solve inverse scattering problem. The local minima encountered are circumvented by a penalty function based approach to imposing physical constraints.

○ **Real Time Beat Tracker** | IEEE Signal Processing Cup

Guide: Prof. V. Rajbabu

Oct.'16 - Dec.'16

- Formulated a novel real-time beat tracking algorithm with ability to account for time-varying tempo and implemented on a Raspberry Pi; achieved 55.13% accuracy on the test dataset

○ **Texas Instruments, Bangalore** | Summer Intern

Time-of-Flight Camera Team

May'16 – Jul.'16

- Developed novel metrology system to extract dimensions of objects from ToF images using classical computer vision based methods. The metrology system was integrated into *Voxel Viewer*, the in-house software for depth image visualization and camera-to-PC interface.
- Formulated a novel calibration procedure for low resolution depth camera ( $60 \times 80$  and  $240 \times 320$ ) which simultaneously estimated the camera parameters (optical center and focal length) and per-pixel phase offset.

○ **Design Engineer** | IIT Bombay Racing

Battery Management Subsystem

Mar.'15 – Apr.'16

- Designed and assembled 389V battery from lithium ion cells, along with auxiliary management system for voltage & temperature monitoring of cells
- Designed an integrated PCB responsible for interfacing battery and motor controllers which included several smaller components such as pre-charge discharge circuits, energy monitoring

○ **Chirp Signal Parametrization**

Guide: Prof. V.M. Gadre

Feb.'14 - May'14

- Estimated parameters of quadratic chirp signal i.e. start frequency and chirp rate through a Particle Swarm Optimization (PSO) framework; awarded **Undergraduate Research Award [URA-01]** for successful completion of project with exemplary results

## Teaching

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○ **Introduction to Machine Learning** | Teaching Assistant

Instructor: Prof. Amit Sethi

Jan.'18 - Apr.'18

- Evaluated assignments, mid-semester and end-semester answer scripts of 120+ students

○ **Network Theory** | Teaching Assistant

Instructor: Prof. V.M. Gadre

Jun.'17 - Nov.'17

- Regularly reviewed tutorial solutions posted online; evaluated answer scripts and assignments
- Awarded **Certificate of Appreciation** as recognition for commendable work as TA

○ **Fundamentals of Wavelets** | Teaching Assistant

Instructor: Prof. V.M. Gadre

Jan.'17 – Apr.'17

- Actively involved in planning and design of a massive open online course (**MOOC**)

- Formulated questions for problem sets, mid-semester, and end-semester examinations

## Mentorship

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- **Department Mentor** | Academic Mentorship Program *Mar.'15 – Mar.'18*
  - Mentored 2 academically under-performing students in improving their scores, as a part of Department Academic Mentorship program (D-AMP)
  - Served as Department Coordinator of the program (2016-17), leading a team of 25 undergraduate mentors and acting as an interface between the department and student community.

## Technical Skills

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- **Languages:** C, C++, Java, Python, MATLAB,  $\text{\LaTeX}$ , Octave, Lua, Verilog
- **Packages:** Numpy, Scipy, PyTorch, Tensorflow, OpenCV, OpenCL
- **Software / Hardware:** LTSpice, Eagle, Quartus, GNURadio, Arduino, ATmega AVR,

## Standardized Test Scores

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- **GRE:** 333/340 (Reading: 163/170, Quantitative: 170/170, AWA: 4/6 )
- **TOEFL:** 114/120 (Reading: 29/30, Listening: 30/30, Speaking: 26/30, Writing: 29/30)