

# Nirbhay Modhe

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**EDUCATION** **IIT Kanpur**, Bachelor of Technology. CPI - **9.8/10.0** 2013-Present  
**R. N. Podar School, Mumbai.** CBSE (AISSCE) - 95.6% 2013  
**Maneckji Cooper School, Mumbai.** ICSE - 93.4% 2011

**RESEARCH EXPERIENCE** **University of Texas at Dallas**, *Prof. Vincent Ng* May'16 - Ongoing  
Event Coreference Resolution  

- Working on applying deep learning for automatic event extraction and event embedding learning for coreference resolution.

**IIT Kanpur**, *Prof. Amitabha Mukerjee* May '15 – August '15  
Reconstructing Unique Inversions for Deep Model of Motion (**report** ☞)  

- Extended the Convolutional Chair Generation model by Dosovitsky et. al. for reconstructing poses of a 3 DOF robotic arm.
- Obtained a labelled dataset of the CRS Robot Arm using 6 cameras and used the proposed CNN to learn the robot image representations. This aids the subsequent probabilistic roadmap for path planning.

**IIT Kanpur**, *Prof. Raghunath Tewari* Dec '15 - April '16  
Probabilistic Polynomial Method in Circuit Complexity (**pres** ☞ , **report** ☞)  

- Studied the application of the probabilistic polynomial method by Ryan Williams in the All Pairs Shortest Path and Boolean Orthogonal Detection problem.
- Proposed the application of this method to solve min-plus matrix multiplication faster by using the tensor product decomposition of the two matrices.

**COURSE PROJECTS** **Generative Image Modelling using DRAW** July '16 - November '16  
*Recent Advances in CV, Prof. Gaurav Sharma* (**code** ☞ , **report** ☞)  

- Analysed the generative RNN model "DRAW" by Gregor et. al. by experimenting with the parameters and design choices of the encoder-decoder framework on the MNIST and Street View House Numbers (SVHN) cropped dataset.
- Implemented and evaluated three new modifications to DRAW which incorporate convolutional features, supervised learning and fully convolutional networks on the MNIST dataset.

**Sentence Level Grammatical Error Identification** July '16 - November '16  
*Intro to Natural Language Processing, Prof. Harish Karnick* (**report** ☞)  

- Worked on identifying sentence level grammatical errors (those arising from missing or incorrectly placed words) using a RNN model on the NUCLE corpus of the CoNLL-2013 shared task. Error identification was also performed on the NIPS 2015 dataset.
- Evaluated a RNN model which uses lexical features to either identify regions in a sentence where a grammatical error might be present, or identify exactly which error (insertion, deletion or replacement) exists in a particular region of a sentence.

**Image Colorization by Patch Inference** Jan '16 - April '16  
*Computer Vision, Prof. Vinay Namboodiri* (**code** ☞ , **poster** ☞ , **report** ☞)  

- Implemented and evaluate a novel image colorization model inspired by the idea of "Fast Direct Super-resolution by Simple Functions" by Yang et. al. The model learns to color images by training on the luminance and chrominance values of the patch locality of pixels.
- Evaluated the model on a set of scene images from the Sun Database.

**Object Tracking in Surveillance Videos**  
*Machine Learning Tools, Prof. Harish Karnick*

Jan '16 - April '16  
(pres ☑ , report ☑ )

- Adapted the tracking model by Sam Hare in his paper "Structured Output and Tracking with Kernels" for use in the IIT Kanpur Surveillance Video Dataset, 2016.
- Use basic localization algorithms from OpenCV for identifying objects, and combined it with the above tracking step.
- Performed classification of the localized objects using various classification algorithms such as Random Forest, AdaBoost with stumped decision trees and linear SVM.

**Word Sense Disambiguation in Hindi**

March '15 - April '15  
*Artificial Intelligence, Prof. Amitabha Mukerjee (code ☑ , poster ☑ , report ☑ )*

- Designed a word sense disambiguation model for Hindi by training on the HindMonoCorp consisting of 787 million tokens
- Disambiguated a manually generated test set with an accuracy slightly better than that obtained by Lesk's algorithm using the Hindi Wordnet.

**Perl Compiler**

Jan '16 - April '16  
*Compiler Design, Prof. Subhajit Roy (code ☑ )*

- Designed an end-to-end compiler from Perl to x86. Implementation was done using Python Lex-Yacc.

**NachOS**

July '15 - Nov '15  
*Operating Systems, Prof. Mainak Chaudhuri*

- Implemented basic operating system functions, scheduling algorithms, shared memory, semaphores, condition variables and a basic page replacement algorithm in NachOS.

**TEACHING  
EXPERIENCE**

**Fundamentals of Computing, Tutor**

*August '16 - Present*

- Taught in weekly tutorial classes, devised and graded lab exams, supervised weekly lab sessions.

**Fundamentals of Computing, Academic Mentor, Counselling Service 2014-15**

- Mentored academically deficient students in the course ESC101 (Fundamentals of Computing) through personal tutoring and doubt clearing sessions.

**ACADEMIC  
ACCOLADES**

- Received **Academic Excellence Award** twice for outstanding academic performance (awarded to top 7% students in the institute) for the terms 2013-14 and 2014-15.
- Received an **A\* grade** in 8 courses (awarded to top 1-2% students in a course)
- Secured **All India Rank 414** (among 150,000 students) in JEE Advanced 2013
- Secured **All India Rank 313** (among 5,000,000 students) in JEE Mains 2013

**RELEVANT  
COURSES**

- |   |  |
|---|--|
| • Recent Advances in Computer Vision*       | • Natural Language Processing*           |
| • Computer Vision & Image Processing        | • Algorithms - II <sup>†</sup>           |
| • Machine Learning Tools & Techniques       | • Probability and Statistics             |
| • Artificial Intelligence Programming       | • Operating Systems <sup>†</sup>         |
| • Theory of Computation                     | • Logic in Computer Science              |
| • Data Structures & Algorithms <sup>†</sup> | • Abstract Algebra                       |
| • Principles of Programming Languages*      | • Fundamentals of Computing <sup>†</sup> |
| • Compiler Design                           | • Discrete Mathematics                   |

\*To be completed by November 2016

<sup>†</sup>Received an A\* grade for outstanding performance

**TECHNICAL  
SKILLS**

Languages : Python, C, C++, R, BASH, Perl

Software & Tools : TensorFlow, Theano, Caffe, Matlab/GNU Octave, L<sup>A</sup>T<sub>E</sub>X, Git

**OTHER  
RECORDS**

- **Nationally Ranked 276** for fastest single solve of the Rubik's Cube 3x3x3 puzzle with a time of **15.33 seconds** (*March '15*)
- **Nationally Ranked 163** for fastest average of 5 solves of the Rubik's Cube **one-handed**, with a time of **35.07 seconds** (*March '15*)

**OFFICIAL  
POSITIONS**

**Group Leader**, Rubik's Cube Hobby Group, IIT Kanpur *2015-16*

- Held workshops for various puzzles such as the Rubik's Cube, 4x4x4 cube, 5x5x5 cube, 2x2x2, Pyraminx and Megaminx
- Coordinated all Blindfolded Rubik's Cube Solving projects done by first year students in the summer of 2015

**Event Coordinator**, IORC (Indian Open Rubik's Cube) *March '15*

- Appointed judges for all events as well as invigilated over all of them
- Acted as a judge for timing individual solves and provided official scrambles for puzzles

**Student Guide** at Counselling Service, IIT Kanpur *2014-15*

- Helped 7 freshmen adjust to campus life on their arrival to campus, provided emotional support and academic guidance to them during their first year