

# HARISH RAJAGOPAL

Fourth Year Undergraduate

Computer Science and Engineering · Indian Institute of Technology Kanpur

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## EDUCATIONAL QUALIFICATIONS

Degree	Year	Institution/Board	CGPA/%
B. Tech	2016 - Present	IIT Kanpur	9.7/10.0
Sr. Secondary	2016	Maharashtra H.S.C	90.46%
Secondary	2014	Maharashtra S.S.C	93.6%

## ACADEMIC ACHIEVEMENTS

- Secured 7 **A★** grades for exceptional performance across 6 semesters.
- Awarded **Academic Achievement Awards** for outstanding performance in 1st and 2nd years.
- Secured All India Rank of **185** in **JEE (Advanced) 2016** given by about 200 thousand students.
- Secured All India Rank of **205** in **JEE (Mains) 2016** given by about 1.4 million students.

## INTERNSHIPS

- **Research Intern, NYU Tandon** May '19 - July '19  
*Prof. Pawel Korus, Prof. Nasir Memon*
  - Researched robust image hashes that are immune to typical image transformations, while being sensitive to malicious image edits such as face swaps, deep fakes, object addition/deletion.
  - Constructed models that take an image and output a binary hash that would give lower *Hamming distances* for hashes of similar images while giving more considerable distances for dissimilar images.
  - Developed a *framework* for testing against transformations like compression, contrast changes, blurring, warping.
  - Trained various novel network architectures on the *triplet loss* along with *mining* of examples for improved training.
  - Tested the networks against *adversarial attacks* such as *FGSM*, *Projected Gradient Descent*, *Boundary Attack*.
- **Research Intern (Remote), NYU Tandon** May '18 - July '18  
*Prof. Yao Wang* <https://github.com/rharish101/Plasticity-Networks>
  - Researched *differentiable plasticity* for *domain transfer* in images using Convolutional Neural Networks.
  - Improved *efficiency* in the temporal update rule for the *Hebbian weights* by using *transpose convolution*.
  - Achieved notable improvement in classification accuracy for the 20 layer models using full plasticity, when adapting models trained on the SVHN dataset for the MNIST dataset.
- **Intern, Machine Learning Team, New York Office of IIT Kanpur** May '17 - July '18  
*Prof. Manindra Agrawal*
  - Developed an *online* text clustering model using a fully-online modification of the *DBSCAN* algorithm.
  - Implemented an *online* document vectorisation model based on the *Distributed Memory paragraph vectors* model.
  - Deployed above models using Docker and integrated with existing infrastructure using Apache Kafka.
  - Developed a *Word2Vec* model to identify duplicate documents using *Word Mover's Distance* on word vectors.
  - Trained a Convolutional Neural Network with sliding windows for English Optical Character Recognition (OCR).

## PROJECTS

- **Compiler for Golang in Python** Jan '19 - Apr '19  
*Prof. Amey Karkare, CS335A Course Project* <https://github.com/rharish101/CS335A>
  - Developed a compiler for translating Golang to MIPS written in Python as part of a course.
  - Implemented basic C-like features like data types, variables, expressions, control statements (if-else, switch, loops), arrays, functions, pointers, structs, library imports, and I/O.

- Implemented advanced features like composite literals, struct embeddings, typedefs/aliases, operator overloading, multiple value returns, multiple parallel assignments, short declarations, and short-circuit evaluation.
- **GemOS - Operating Systems Development** Aug '18 - Nov '18  
*Prof. Debadatta Mishra, CS330A* <https://github.com/rharish101/CS330-Assignments>
  - Developed an object-store FUSE filesystem for storing files inside a single directory.
  - Implemented process scheduling and swapping, context creation, sleeping, and signal handling for GemOS.
  - Implemented syscalls for writing & expanding/shrinking memory, and handlers for page faults & divide-by-zero.
  - Implemented virtual memory and paging using a 4-depth radix tree page table.
- **No-Frills Cab Locator - Android App** Sept '18 - Nov '18  
*Prof. Nisheeth Srivastava, CS252A Course Project* <https://nfcl.pythonanywhere.com>
  - A one-button-touch cab service with apps created using the *Ionic framework* for Android as part of a course.
  - Developed separate customer and driver apps using *Angular2* in Typescript and *Sass* for styling.
  - Setup a slim *Django* server to find nearest drivers, with an SQL database to store available drivers.
- **Improving GANs through Test-Time Constraints** Jan '19 - Present  
*Prof. Vinay Namboodiri and Prof. Chetan Arora* <https://cse.iitk.ac.in/users/rharish/ugp2>
  - Pre-trained *Generative Adversarial Networks* (GANs) are fine-tuned using *interactive user input*, inspired by the iGAN paper and the paper Exploiting Test Time Evidence to Improve Predictions of Deep Neural Networks.
  - The user provides sketches of edges on a single output of the generator, and a *difference-of-Gaussians* based loss is backpropagated through the generator to fine-tune the generator's weights.
  - A regularisation term in the loss prevents the weights from deviating away from the weights learned initially.
- **Multi-Agent GANs for Image Super-Resolution** Aug '18 - Dec '18  
*Prof. Vinay Namboodiri* <https://cse.iitk.ac.in/users/rharish/ugp1>
- **Higher-Order Optimisation in Deep Learning** Sept '18 - Nov '18  
*Prof. Piyush Rai, CS771A Course Project* <https://github.com/rharish101/CS771-Project>
- **7th Inter-IIT Tech Meet (Silver Medal)** Dec '18  
*IIT Kanpur Contingent* <https://github.com/rharish101/eye-in-the-sky>
- **6th Inter-IIT Tech Meet** Dec '17 - Jan '18  
*IIT Kanpur Contingent* <https://cse.iitk.ac.in/users/rharish/sixth-tech-meet>
- **Reinforcement Learning in Atari Games** Jan '17 - July '17  
*Association of Computing Activities, IIT Kanpur* <https://github.com/rharish101/ACA-Project>
- **Depression Therapy Chatbot** May '17 - July '17  
*Programming Club, IIT Kanpur* <https://github.com/rharish101/PClub-Project>
- **Visual Attention in Image Captioning (Mentored)** May '18 - July '18  
*Programming Club, IIT Kanpur* [https://github.com/DEVANSH99/Image\\_cptning2018](https://github.com/DEVANSH99/Image_cptning2018)

## TECHNICAL SKILLS

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- **Programming Languages:** Python, Bash, C, C++,  $\LaTeX$ , PHP, HTML+CSS, MySQL, Typescript
- **Software and Utilities:** TensorFlow, PyTorch, Keras, Numpy, Git, OpenCV, Hyperopt, Gensim, Ionic, AutoCAD

## RELEVANT COURSES

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Compiler Design (A★)	Algorithms II	Operating Systems
Visual Recognition	Introduction to Machine Learning	Data Structures and Algorithms
Probability and Statistics	Introduction to Linear Algebra (A★)	Fundamentals of Computing (A★)

## POSITIONS OF RESPONSIBILITY

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- **Secretary**, Programming Club, IIT Kanpur Aug '17 - Apr '18
- **Academic Mentor**, Counselling Service, IIT Kanpur Mar '17 - Feb '18