

# AMRIT SINGHAL

## CONTACT INFORMATION

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Fourth Year B.Tech. Student  
Department of Computer Science and Engineering  
Indian Institute of Technology (IIT) Kanpur

Email: [amrits@iitk.ac.in](mailto:amrits@iitk.ac.in)  
[amritsinghal97@gmail.com](mailto:amritsinghal97@gmail.com)  
Date Of Birth: 15/10/1997

Mobile: (+91) 73762 51454  
Nationality: Indian

Address: Hall-9, IIT Kanpur,  
Kanpur-208016, UP, India.

## EDUCATION

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- **Indian Institute of Technology Kanpur** 2015 - Present  
Third Year Undergraduate Overall CPI: **9.7/10**  
Department of Computer Science and Engineering (After 6<sup>th</sup> semester)
- **Indian School Certificate Examination (Intermediate), CISCE India** 2015  
City Montessori School, Lucknow Overall Percentage: **97.5%**  
- Secured an aggregate of **97.67% in Science** subjects Physics, Chemistry and Mathematics and **100% in Computer Science**.
- **Indian Certificate of Secondary Education (Matriculation), CISCE India** 2013  
La Martiniere College, Lucknow Overall Percentage: **97.0%**  
- Secured **City Rank 2** and **Institute Rank 1** with an aggregate of **98% in Science**, **100% in Mathematics** and **100% in Computer Applications**.

## ACADEMIC ACHIEVEMENTS

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- Awarded the **Academic Excellence Award** with a certificate of merit at IIT Kanpur for 2015-16 and 2016-17.
- Secured **AIR-322 in JEE(ADVANCED)-2015** out of the **150,000** qualified candidates.
- Secured **AIR-1** in the **SCRA (Special Class Railway Apprentice) EXAMINATION 2015** conducted by the **UPSC (Union Public Service Commission), Govt. of India** out of more than **160,000** candidates who appeared for the examination.
- Secured **AIR-5** among **160,000** candidates in **UPSEE-2015 (Uttar Pradesh State Entrance Examination)** conducted by the Uttar Pradesh Technical University for admission into various Engineering colleges of Uttar Pradesh.
- Secured **AIR-426 in JEE(MAINS)-2015** out of **more than 1,300,000** appearing candidates.
- Secured **AIR-389** in the **KVPY (Kishore Vaigyanik Protasahan Yojana) FELLOWSHIP PROGRAM** under the SA-stream (Class XI) in 2012 implemented by **Indian Institute of Science (IISc), Bangalore**.
- Selected among the **NATIONWIDE TOP 35** candidates for the **OCSC (Orientation-cum-Selection Camp) 2015** for **ICHO (International Chemistry Olympiad) 2015**, after having qualified the **INChO (Indian National Chemistry Olympiad) 2015**.
- Qualified the **NSEC (National Standard Examination in Chemistry) - 2015** successfully among the **NATIONWIDE TOP 1%** candidates.
- Qualified the **NSEP (National Standard Examination in Physics) - 2015** conducted by **IAPT (Indian Association of Physics Teachers)** being among the **NATIONWIDE TOP 1%** candidates.
- Selected under the **INSPIRE FELLOWSHIP PROGRAM** by the **Govt. of India** for being among the **NATIONWIDE TOP 1%** candidates in the **ISC Board Examinations-2015**.
- Attended the **VIJYOSHI CAMP (Vigyan Jyoti Shivir)** organised by **Indian Institute of Science (IISc), Bangalore** and **National Institute of Science Education and Research (NISER), Kolkata**, which allowed a enlightening interaction with various renowned scientists from across the world, including the **Nobel Laureate Prof. Georg Bednorz**.

## TECHNICAL STRENGTHS

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- **Programming Languages:** C/C++, Java, Python, C#, HTML, Bash, Verilog, MIPS, SQL.
- **Libraries:** TensorFlow, ARCore, TensorFlow Serving, Word2Vec, Flask, Scikit-learn.
- **Softwares and Tools:** Unity3D,  $\text{\LaTeX}$ , Matlab, MongoDB, GNUPlot, MySQL, Solidworks, Android Studio.

## INDUSTRIAL EXPERIENCE

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1. **Augmented Reality Authoring: Visualizing natural language descriptions in AR** *May '18 - Jul '18*  
*Internship at BEL Research Lab, Adobe Systems India Private Limited, Bangalore*
  - Developed a **novel end-to-end interface** that allows **easy authoring of Augmented Reality experiences from natural language input**, allowing visualization of any text in AR.
  - Introduced novel methods for **scene graph augmentation**, and extended a MLP prediction model to 3D.
  - Utilized multiple NLP techniques such as scene graph parsing, co-reference resolution, clause splitting, and many others, and implemented multiple MLP networks for the multiple learning tasks involved in the pipeline.
  - Designed a **Unity3D** application, using the **ARCore** library from Google, to present the AR output.
2. **Language independent Text-to-Emotion Neural Network Classification** *May '17 - Jul '17*  
*Internship at Hike Private Ltd., National Headquarters, New Delhi*
  - Developed a **neural network model** using **Tensorflow** backend to assign an emotion to any input message.
  - Implemented multiple type of neural networks including Convolutional Neural Networks(CNNs), Recursive Neural Networks(RNNs) and Long-Short Term Memory(LSTM) networks, to get the best accuracy.
  - Developed a **Language-Classifer**, which segregated a given collection of chats into the top 5 chat languages in the application, but can easily be extended to any number of languages as required.
  - Implemented server support for **model deployment** into production through `tensorflow.serving` library.

## KEY PROJECTS AND RESEARCH EXPERIENCE

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1. **Cross Modal Media Retrieval** *[Project Report]* *Jan '18 - May '18*  
*Project Supervisor: Prof. Medha Atre, Department of Computer Science and Engineering, IIT Kanpur*
  - Used the **emotional information** present in images and audios to perform cross modal-media retrieval.
  - Proposed a hypothesis to allow **establishment of ground truth** mapping across the different mediums.
  - Proposed two different models to **bring the emotion vectors from different modalities into the same space**, a learning based approach and a statistical analysis approach.
  - Implemented and trained a neural network model to extract the emotional information present in an image.
  - Used **Procrustes analysis** technique to check for linear transformations between the various emotion spaces.
  - Performed **experiments** to validate our proposals, and came up with inferences to explain the results.
2. **Query Dependant Multi-Document Summarization** *[Project Report]* *Jan '18 - present*  
*Project Supervisor: Prof. Arnab Bhattacharya, Department of Computer Science and Engineering, IIT Kanpur*
  - Introduced a **novel pipeline** to implement a query-biased multi-document summarization using abstractive summarization, without having to process all documents in a network simultaneously at any time.
  - Utilized and improved upon techniques like text-tiling, Tf-Idf Scoring, Luhn's Clustering, and LSA based scoring, to perform efficient **passage retrieval incorporating the query bias**.
  - Used existing frameworks for abstractive summarization process. Improving this further is work in progress.
3. **Reviewer Recommendation for Conference Paper Submissions** *[Project Report]* *Aug '17 - Nov '17*  
**(Advanced Project for CS771 - Introduction to Machine Learning)**  
*Project Supervisor: Prof. Purushottam kar, Department of Computer Science and Engineering, IIT Kanpur*
  - Understood the currently most prevalent techniques for automated paper-reviewer assignment like the **Toronto Paper Matching System**, and the **Robust Paper-Reviewer Assignment Model**.
  - Implemented multiple modifications and techniques for **improving the TPMS** system by improvising on the Latent Dirichlet Allocation technique used in the generative model, and adding some intuitive biases.
  - Implemented an **alternating optimization approach** for completing the matrix of relevance scores between paper vectors and author vectors.
4. **Machine Learning for Large-Scale Logistics Platform** *May '17 - Jul '17*  
*Project Under: New York Office, IIT Kanpur*
  - Implemented **document similarity** problem using trained word vectors and Word-Mover's Distance algorithms to remove the semantically similar documents.
  - Implemented the **reverse k-nearest neighbour** problem to return all those users for which the query facility is among the k-nearest facilities, by using the **SLICE** algorithm for RkNN.
5. **Quantum Machine Learning (CS682 - Quantum Computing)** *[Project Report]* *Aug '17 - Nov '17*  
*Project Supervisor: Prof. Rajat Mittal, Department of Computer Science and Engineering, IIT Kanpur*
  - Understood the quantum methods and their complexity speed-ups in the quantum implementations of the **Perceptron Model** and the **nearest neighbour methods**, provided by Wiebe, Kapoor and Svore.
  - Understood various variants of the kNN method, using various distinct and non-equivalent metrics like **inner product** and **Hamming distance**, and the relations between them.

## OTHER ACADEMIC INVOLVEMENTS

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1. **Teaching Assistant** in the course **ESO207: Data Structures and Algorithms** under **Prof. Sumit Ganguly**, CSE, IIT Kanpur, which has more than 300 registered students. *July '18 - present*
2. Implemented a **compiler** from scratch for a simplified variant of the **C#** language, taking it to MIPS, implemented in C++, as part of the course **CS335: Compilers**, under **Prof. Subhajit Roy**, CSE, IITK.
3. **Cops and Robbers Game on Graphs (CS201 - Discrete Mathematics)** *Aug '16 - Oct '16*  
*Supervised by: Prof. Nitin Saxena, Department of Computer Science and Engineering, IIT Kanpur*
  - Studied the **Aigner and Fromme** and **Frankl lower bounds**, and the **Frankl and Lu and Peng upper bounds**, and the **Meyniel's Conjecture** on the tight upper bound on the cop number of the graph.
  - Used the concept of retracts and dismantlable graphs to study a characterisation for cop-win graphs.
  - Studied **No-Backtrack Strategy** for cop to win in finitely many steps on a graph with countable vertices.
4. **Group Theory and Its expansion to Symmetry Analysis (Reading)** *May '16- Jun '16*  
*Guided by: Prof. Santosha Kumar Pattanayak, Department of Mathematics, IIT Kanpur*
  - Read chapters from **Topics in Algebra** by **I. N. Herstein**, and **Algebra** by **Michael Artin**.
5. **Special Theory of Relativity (Reading)** *Dec '15*  
*Guided by: Prof. Manoj Kumar Harbola, Department of Physics, IIT Kanpur*
  - Studied the **Michelson-Morley Experiment** and the concept of simultaneity of events.
  - Read the complete book **Introduction to Special Relativity** by R. Resnick.

## RELEVANT COURSES

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Introduction to Machine Learning	Data Structures and Algorithms	Information Retrieval
Introduction to Natural Language Processing	Discrete Mathematics	Theory of Computation
Linear Algebra and Ordinary Differential Equations	Fundamentals of Computing *	Computer Networks
Game Theory and Mechanism Design	Database Management Systems	Algorithms-II
Computational Number Theory and Algebra	Probability and Statistics *	Operating Systems
Introduction to Psychology	Introduction to Calculus	Compiler Design
Computational Methods in Engineering	Engineering Graphics *	Neurobiology
Introduction to Electronics *	Abstract Algebra	Time Series Analysis

\* Exceptional Performance

## SOCIAL INITIATIVES

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- **Dramatics:** Performed multiple **Street Plays** at institute and hostel level for **generating social awareness** among the students, residents and workers of the college campus on issues such as nationalism, youth awareness and corruption.
- **NCC:** An active member of the **National Cadet Corps** for **4 years**, aimed at development of discipline, unity and leadership qualities among the youth of the the nation.

## POSITIONS OF RESPONSIBILITY

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1. **Academic Mentor, Counselling Service, IIT Kanpur** *Jun '16 - May '17*
  - Worked as one of the 27 mentors of **ESC101**(Fundamentals of Computing) for the term 2016-17 to help **850** freshmen students in difficulties with the course, through multiple **institute level remedial classes**.
2. **Student Guide, Counselling Service, IIT Kanpur** *Jun '16 - May '17*
  - Guided 5 freshmen students of **2016** UG batch with their academic, extra-curricular and personal issues.
  - Associated with the team responsible for supervision of the **orientation and registration of 2016 UG batch of 850 students** and acted as a link between counsellors and students to handle their issues.
3. **Election Council, Students' Gymkhana, IIT Kanpur** *Jan '16 - Nov '17*
  - Worked among the team to manage the overall **conduction of the Students' Gymkhana General Elections** in an ethical and unbiased manner for all posts in the Students' Senate and various Gymkhana Councils.
  - Managed the smooth conduction of the **Students' Gymkhana By-Elections** for the unoccupied posts.