

Kumar Ayush



Senior Member of Technical Staff
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Education

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| Indian Institute of Technology, Kharagpur, India Bachelor of Technology (Hons.) in Computer Science and Engineering CGPA: 9.49/10.0 Thesis Advisor: Prof. Pabitra Mitra | 2013 - 2017 |
| Rajendra Vidyalaya, Jamshedpur, India Indian School Certificate (ISC) - 12th Grade - English, Science, Maths, and Comp. Sc. Percentage score: 97.6%, ranked 1st in school | 2013 |
| Rajendra Vidyalaya, Jamshedpur, India Indian Certificate of Secondary Education (ICSE) - 10th Grade Percentage score: 96.57% | 2011 |

Publications

- Kumar Ayush***, Abhishek Sinha*. “Towards Mathematical Reasoning: A Multimodal Deep Learning Approach”. *25th IEEE International Conference on Image Processing (ICIP)*. 2018. (Poster, [pdf](#), [slides](#), ) (*equal contrib.)
- Kumar Ayush**, Raja Karamakar, Varun Rawal, Pradyumna K. Bishoyi, Samiran Chattopadhyay, Sandip Chakraborty. “Supporting Throughput Fairness in IEEE 802.11ac Dynamic Bandwidth Channel Access: A Hybrid Approach”. *42nd IEEE Conference on Local Computer Networks (LCN)*. 2017. (Oral, [pdf](#), [slides](#))
- Gaurush Hiranandani, **Kumar Ayush**, Atanu R Sinha, Sai Varun Reddy Maram, Chinnaobireddy Varsha, Pranav Maneriker. “Enhanced Personalized Targeting using Augmented Reality”. *16th IEEE International Symposium on Mixed and Augmented Reality (ISMAR)*. 2017. (Poster, [pdf](#))
- Avishek Lahiri, **Kumar Ayush**, Prabir Kumar Biswas, Pabitra Mitra. “Generative Adversarial Learning for Reducing Manual Annotation in Semantic Segmentation on Large Scale Microscopy Images: Automated Vessel Segmentation in Retinal Fundus Image as Test Case”. *Computer Vision for Microscopy Image Analysis (CVMI) Workshop - IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*. 2017. (Workshop, [pdf](#), [slides](#), )
- Srinivas S. S. Kruthiventi, **Kumar Ayush**, R. Venkatesh Babu. “DeepFix: A Fully Convolutional Neural Network for predicting Human Eye Fixations”. *IEEE Transactions on Image Processing*. 2017. (Journal, [pdf](#), [slides](#)).
- Mayank Singh, Barnopriya Barua, Priyank Palod, Sidhartha Satapathy, Samuel Bushi, **Kumar Ayush**, Krishna Sai Rohith, Tulasi Gamidi, Pawan Goyal, Animesh Mukherjee. “OCR++: A Robust Framework For Information Extraction from Scholarly Articles”. *26th International Conference on Computational Linguistics (Coling)*. 2016. (Poster, [pdf](#), [framework](#))

Patents

- Kumar Ayush**, Gaurush Hiranandani, Atanu R Sinha. “Compatibility Energy based Identification of Incompatible Products in Augmented Reality Viewpoint”. (In filing process)
- Kumar Ayush**, Harsh Vardhan Chopra. “Context Aware Background Scene and 3D Object Compatibility for Creation of Photorealistic 3D Images”. (In filing process)
- Kumar Ayush**, Gaurush Hiranandani. “Augmented Reality Based Style Aware Recommendations Based on Perceptual Shape Style Compatibility with Objects in the Viewpoint”. *US 15/972,815*. (Filed)
- Kumar Ayush**, Gaurush Hiranandani. “Generating and Providing Augmented Reality Representations of Recommended Products Based on Style Similarity in Relation to Real-World Surroundings”. *US 16/004,787*. (Filed)
- Gaurush Hiranandani, **Kumar Ayush**, Sai Varun Maram Reddy, Chinnaobireddy Varsha, Siddhant Jain. “Creating Personalized Catalogues with Recommendations Embedded in Augmented Viewpoint to Retarget Consumers”. *US 62/415,332*. (Filed)
- Gaurush Hiranandani, **Kumar Ayush**, Chinnaobireddy Varsha, Sai Varun Maram Reddy. “Creating Targeted Content based on Detected Characteristics of an Augmented Reality Scene”. *US 15/454,750*. ([Published](#))
- Gaurush Hiranandani, Sai Varun Maram Reddy, **Kumar Ayush**, Chinnaobireddy Varsha, Siddhant Jain. “Product Recommendations Based on Augmented Reality Viewpoints”. *US 15/492,971, DE 102017007998.6, AU 2017216603*,

GB 1714133.4, CN 201710780770.6. ([Published](#))

Gaurush Hiranandani, Chinnaobireddy Varsha, Sai Varun Maram Reddy, **Kumar Ayush**, Atanu R Sinha. "Identifying Augmented Reality Visuals Influencing User Behavior in Virtual-Commerce Environments". *US 15/433,834*. ([Published](#))

Patents Under Review (by Adobe Patent Review Committee)

Kumar Ayush, Atanu R Sinha, Gaurush Hiranandani. "Augmented Viewpoint Driven Bundle Recommendation in Virtual Commerce".

Work Experience

Adobe Inc., Noida, India

Sep 2018 - Present

Senior Member of Technical Staff (Media and Data Science Research)

- Augmenting real-world training datasets with realistic renderings of virtual scenes and 3D objects for Adobe Deep Product Search (for fashion and furniture domain). Addressing domain shift issue for the same.
- Working on enhancing digital experience in AR-based retail apps (personal initiative).

Adobe Inc., Noida, India

Jan 2018 - Aug 2018

Senior Member of Technical Staff (Photoshop Elements and Adobe Stock)

- Developed a Neural Network based technology for Modeling the Salability of Adobe Stock Images.
- Worked on Creative Cloud Bot for Slack and Microsoft Teams.
- Implemented a VQA model for solving mathematical equations from images. *Published in ICIP 2018*.
- Proposed and worked on improving product recommendations in AR-based retail apps using state-of-the-art computer vision and machine learning techniques. *Filed 3 international patents*.
- Proposed and developed a method for background scene recommendation for 3D objects in Adobe Dimension CC using scene compatibility, theme compatibility, and automated image matching. *A patent is being filed*.

Adobe Inc., Noida, India

Jun 2017 - Dec 2017

Member of Technical Staff (Photoshop Elements and Adobe Stock)

- Created a service using a Deep Learning Based Object Detection Method to provide Object Proposals for automatic mask selection in Nimbus (Adobe's cloud-based Lightroom-style photo editor).
- Primary developer for Adobe Stock Add-on for Wordpress. Worked on Creative Cloud Bot for Slack.
- Created an Intelligent Stock Plugin for Content Authoring Systems as part of the Adobe Stock Hackathon in November 2017. Used NLP techniques to automatically construct queries from an author's content to be used for retrieving relevant assets from Adobe Stock. Used Google Slides as the Content Authoring System for realization of the idea.

Internship Experience

Big Data Experience Lab, Adobe Research, Bangalore, India

Summer 2016

Enhanced Digital Marketing using Augmented Reality

Advisors: [Gaurush Hiranandani](#) and [Dr. Atanu R Sinha](#)

Proposed and developed a novel consumer targeting system by exploiting the rich data from AR systems. Analyzed consumer interactions on AR-based retail apps to identify the preferred purchase viewpoint. Created personalized catalogues with recommendations, based on style similarity and theme compatibility, embedded in the viewpoint visual. Devised a graph based approach for automatic generation of personalized email content for the catalogue. *Three international patents published. Work published in IEEE ISMAR 2017*.

Video Analytics Lab, Indian Institute of Science, Bangalore, India

Summer 2015

DeepFix: A Fully Convolutional Neural Network for predicting Human Eye Fixations

Advisor: [Prof. R. Venkatesh Babu](#)

Implemented a deep learning model for saliency prediction. Utilized the potential of inception modules and filters with holes. Introduced Location Biased Convolutional filters, a novel technique to learn location dependent patterns such as the centre-bias present in eye fixations. *Work published in IEEE Transactions on Image Processing. Winner of Saliency Prediction task at LSUN 2016, organized by Princeton University*.

Research Projects

Adobe India - Indian Institute of Technology, Kharagpur, India

2018

Neural Network Model Selection using Singular Learning Theory

Advisor: [Prof. Pabitra Mitra](#)

Investigating Watanabe-Akaike Information Criterion (WAIC) as a candidate for evaluating Bayesian Neural Networks. Implemented and inferred Bayesian Neural Networks for MNIST in PyMC3 and tensorflow-probability through techniques sourced from both Markov Chain Monte Carlo and Variational Inference.

Adobe India - Indian Institute of Technology, Kharagpur, India

2018

Improving Classification Performance of SVMs via Guided Custom Kernel Search

Advisor: [Prof. Pabitra Mitra](#)

Working on improving SVM classification via automatic task specific custom kernel function using reinforcement learning and genetic algorithms. Verifying the effectiveness of the searches by conducting an empirical evaluation with the best discovered kernel function on MNIST, FashionMNIST and selected UCI datasets.

Part of Bachelor's Thesis, Indian Institute of Technology, Kharagpur, India

Spring 2017

Generative Adversarial Learning for Reducing Manual Annotation in Semantic Segmentation on Large Scale Microscopy Images

Advisor: [Prof. Pabitra Mitra](#)

Leveraged GAN for semi supervised learning on large scale fundus imaging modality for automated blood vessel segmentation. Achieved comparable performance (sometimes even better) with recent CNN based segmentation techniques while using upto 9X less training data. *Work published in Computer Vision for Microscopy Image Analysis (CVMI) Workshop - CVPR 2017.*

Part of Bachelor's Thesis, Indian Institute of Technology, Kharagpur, India

Spring 2017

Video Retrieval using Natural Language Query

Advisor: [Prof. Pabitra Mitra](#)

Implemented an encoder-decoder model using LSTM units to encode the frames of a video and generate a description. Embedded the description using a pre-trained skipthoughts model to facilitate query based search. Used Microsoft Video Description Corpus dataset for training and testing.

Indian Institute of Technology, Kharagpur, India

Autumn 2016

Supporting Throughput Fairness in IEEE 802.11ac Dynamic Bandwidth Channel Access: A Hybrid Approach

Advisor: [Prof. Sandip Chakraborty](#)

Performed a literary survey pertaining to unfairness in IEEE 802.11ac Dynamic Bandwidth Channel Access and proposed a hybrid adaptive resource reservation mechanism for supporting fair channel access in DBCA. A polling based online learning mechanism is designed to avoid starvation of primary channel users. Achieved significantly better performance compared to DBCA. *Work published in IEEE LCN 2017 (Oral Paper).*

Indian Institute of Technology, Kharagpur, India

Spring 2016

Branched Convolutional Neural Network for Salient Object Segmentation and Automatic Custom Shaped Mask Placement in an Image

Advisor: [Prof. Pabitra Mitra](#)

Implemented a branched CNN architecture using inception modules to extract features from intermediate layers. Passed the concatenated output from inception modules to a segmentation block. Used fully connected Conditional Random Field (CRF) to obtain the final pixel-accurate segmentation prediction. Achieved comparable performance on MSRA-1K and CSSD datasets with state-of-the-art models. Implemented a method to automatically find custom non-rectangular regions of interest (ROIs) in a user supplied image using Particle Swarm Optimization.

Indian Institute of Technology, Kharagpur, India

Spring 2016

Search and Recommendation System for Scientific Research Community

Advisors: [Prof. Pawan Goyal](#) and [Prof. Animesh Mukherjee](#)

Parsed Microsoft Academic Scholar to generate the dataset. Used clustering techniques to cluster similar authors based on their co-author graph. Used LDA to model topics from the keyword database of an author and recommended top 100 authors based on their rank (gained a 25% increase in recall). Developed a full-fledged Scientific Search Engine.

Indian Institute of Technology, Kharagpur, India



Autumn 2015

OCR++: A Robust Framework For Information Extraction from Scholarly Articles [[Project](#)]

Advisor: [Prof. Pawan Goyal](#) and [Prof. Animesh Mukherjee](#)

Worked with a team on the development of a framework designed for a variety of information extraction tasks from scholarly articles using CRF models and generic patterns. Conducted extensive evaluations to compare OCR++ and state-of-the-art systems, showing significant improvement in each of the retrieval tasks along with fast implementation speed-ups and batch processing functionality. *Work published in Coling 2016.*

Other Key Projects

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| EthPhoto , OpenSoft (inter-hostel tech competition), IIT Kharagpur | Spring 2017 |
| Co-led the hostel team, developing a decentralized location & tag based photo sharing app using Ethereum blockchain technology and IPFS storage. <i>Received Third Prize.</i> | |
| Course Management System , Database Management Systems Term Project  | Spring 2016 |
| Created a web-based application aimed at self-paced learning featuring online course design, text and video based course content, course calendar publishing, automated tests, chat forums and e-mail communication. | |
| PlotEx , OpenSoft (inter-hostel tech competition), IIT Kharagpur | Spring 2016 |
| Developed an application for detecting graphs from scanned documents and producing the corresponding data tables. | |
| TinyC Compiler , Compilers Term Project  | Autumn 2015 |
| Designed and implemented a compiler for a C-like language (a subset of C language) using flex, yacc and gnu assembler. | |
| Software Component Cataloguing Software , Software Engineering Term Project | Spring 2015 |
| A fully functional system, implemented as a JAVA Applet and GUI realized in JAVA Swing, which maintains a catalogue of various available Software Components to allow their potential code reuse. | |

Awards and Achievements

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| Early Promotion - Adobe | 2018 |
| Promoted to Senior Member of Technical Staff within 6 months of joining Adobe (Usual promotion period: 1-1.5 years). Only one amongst all fresh graduate hires. | |
| Best Project - Web Technologies Technical Bootcamp - Adobe  | 2017 |
| Awarded amongst fresh graduate hires for an Online Examination System made using AngularJS. Adjudged on parameters like best practices, coding standards, code modularity, MVC architecture, etc. | |
| Best Bachelor's Thesis Award - IIT Kharagpur | 2017 |
| Awarded in a batch of 105 students in the Dept. of Computer Science & Engg., IIT Kharagpur. | |
| OpenSoft Interhostel Event (Captain) - Third Prize - IIT Kharagpur | 2017 |
| Co-led the hostel team, developing a decentralized photo sharing application (EthPhoto) using Ethereum blockchain technology and IPFS storage. | |
| Gandhian Young Technological Innovation (GYTI) Award | 2017 |
| Awarded for OCR++ by SRISTI at Rashtrapati Bhawan (Office of the President of India). | |
| IBM Day @ IIT Kharagpur - System Demonstration Contest - Third Prize | 2016 |
| Awarded for OCR++ by IBM Research India, from a pool of 20 submissions. | |
| Saliency Prediction Winner - Large Scale Scene Understanding Challenge (LSUN) | 2016 |
| Our saliency model, DeepFix, won the 1st prize in LSUN , organized by Princeton University in conjunction with CVPR 2016. | |
| Honda Young Engineer & Scientist's (Y-E-S) Fellowship Finalist | 2016 |
| Amongst 20 finalists from all over India. | |
| Best Term Project - Speech & Natural Language Processing Course | 2015 |
| Awarded for OCR++ from a pool of 30 projects by the course instructor and Flipkart (an Indian e-commerce company). The award also included a grant of 1000\$. | |
| Indian Academy of Sciences - Summer Research Fellowship | 2015 |
| Awarded for research internship at Indian Institute of Science, Bangalore. | |
| Kamalavati Syngal and Goralal Syngal Memorial Scholarship | 2014 |
| Awarded for academic excellence at IIT Kharagpur. | |

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| Jagadish Bose National Science Talent Search (JBNSTS) Scholarship Awarded to 34 candidates from around 1000 applicants in the state of West Bengal for exceptional aptitude in basic sciences and research. | 2013 |
| Kishore Vaigyanik Protsahan Yojana (KVPY) Scholarship Awarded to 1056 students from around 100,000 applicants by Dept. of Science and Technology, Govt. of India for exceptional aptitude in basic sciences. | 2013 |
| All-India-Rank 805 - IIT JEE (Joint Entrance Examination) - Advanced Secured an All-India-Rank of 805 in JEE Advanced 2013 amongst 150,000 candidates. | 2013 |
| All-India-Rank 779 - IIT JEE (Joint Entrance Examination) - Mains Secured an All-India-Rank of 779 in JEE Mains 2013 amongst 20,00,000 candidates. | 2013 |
| Abhay Seva Sansthan Gold Medal Awarded for scoring 100% in Computer Science in ISC (12th grade) board examination. | 2013 |
| S. P. Sinha Scholarship Awarded full scholarship for 11th & 12th grade due to outstanding performance in ICSE (10th grade) board examination. | 2011 |

Talks

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| Context Aware Personalized Product Recommendations in Virtual Commerce [Slides - 1 , 2] Adobe Inc., Noida, India | Feb 2018 |
| Saliency Prediction and its applications in Graphics, Vision and Design Adobe Tech Summit, San Francisco, CA - <i>Upcoming talk</i> | Feb 2019 |

Technical Skills

Languages: Python, C, C++, Javascript, PHP
Libraries: Tensorflow, NumPy, OpenCV, scikit-learn
Others: Unity3D, Unreal Engine, LaTeX

Relevant Coursework

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| Probability & Statistics | Matrix Algebra | Information Retrieval |
| Speech & Natural Language Processing | Algorithms I & II | Discrete Structures |
| Formal Languages & Automata Theory | Machine Learning | Image Processing |
| Performance Modeling of Computer Networks | Artificial Intelligence | Theory of Computation |
| Adv. Image Processing & Comp. Vision | Deep Learning | Principles of Programming Languages |

Extra Curricular Activities and Professional Service

Technovation Mentor for Youth Coding Initiative (2018): Mentoring 5 high school girls to build a business plan and mobile app to address a community problem.

Reviewer (2018) for Robotics and Autonomous Systems (Journal - Elsevier), and Computer Vision and Image Understanding (Journal - Elsevier).

Volunteer Teacher at eVidyaloka (2018): Teaching Maths and Science to underprivileged children in remote areas of Jharkhand via Skype.

Teaching Assistant (2017) for the Machine Learning course for employees at Adobe Inc., Noida.

Student Academic Mentor, Student Welfare Group, IIT Kharagpur (2015-2017): Looked after the orientation and guidance of 5 new students and undertook the initiative to motivate them for performing academically as well as in extra-curricular activities.

Captain (2017) of the OpenSoft (inter-hostel tech competition) team of Meghnad Saha Hall of Residence, IIT Kharagpur.

National Sports Organization (2013 - 2015): Involved in Athletics as a part of NSO, IIT Kharagpur for two years.