Prakhar Kulshreshtha

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Education

- **Indian Institute of Technology Kanpur** — Kanpur, India
  *B.Tech. in Electrical Engineering; GPA: **9.0**/10.0* — *Jul. 2013 – May. 2017*
  minor in Artificial Intelligence and Linguistic Theory
- **Maa Bharati Sr. Sec. School** — Kota, India
  Class XII (CBSE Board); Percentage: 93.0% — *May. 2012 – Apr. 2013*

Publications

- **Prakhar Kulshreshtha** and Tanaya Guha, "An Online Algorithm for Constrained Face Clustering in Videos" In IEEE International Conference on Image Processing (ICIP) 2018, Athens, Oct 2018. [paper][poster][code]
- **Prakhar Kulshreshtha** and Tanaya Guha, "Building Character Interaction Graph via Online Face Clustering for Movie Analysis", ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM) [submitted]

Experience

- **Samsung Research Institute Bangalore** — Researcher
  Advanced Technology Lab — *Jul'17 - present*
  - **Creative-Lab**:
    - Winner of 'SRI-B C-Lab Entrepreneurial Ideation Contest' for 'Computer Vision for quality estimation of food grains'
    - leading a team of three 'entrepreneurs', to develop an app that can run On-Device.
    - The product is to be presented at **Samsung C-Lab Fair** [link], Seoul, South Korea, and a part of the work done is to be submitted in **ICME** 2019.
  - **Samsung Keyboard team, MM Depth Technology Division**:
    - Implemented Minimum Jerk Theory(MJT) based swipe generation algorithm for training Keyboard Swipe engine.
    - Designed and implemented an optimized N-gram based language-model for Indian languages, which resuled in reduction in loading time by **90%**, suggestion generation time by **89%**, and model size by **70%**, while maintaining the same prediction accuracy, when compared to then existing solution.
    - Solution commercialized into SamsungKeyboard in flagship devices.
- **Signal and Multimedia Processing Lab (SiMPL), IIT-Kanpur** — Undergraduate Researcher
  Dr. Tanaya Guha, Dept. of EE, IIT Kanpur — *Dec'16 - Apr'17*
  - **Character Interaction Graphs via Online Face Clustering for Movie Ananlysis**:
    - We build Character Interaction Graph (CIG) from a video using the temporal dynamics of the clusters formed via Online Face Clustering, and demonstrate its usefulness for two movie analysis tasks: (i) segmentation of a movie into its high level semantic structures (acts), and (ii) retrieval of major characters in a movie.
    - The work is to be submitted in Multimedia Tools and Applications journal.
  - **Online Face Clustering**:
    - Designed an online face clustering algorithm that processes a video sequentially in short segments of variable length, and uses several spatio-temporal constraints, along with FACENET features, to obtain a robust representation of the facetracks, achiving high clustering accuracy on two benchmark video databases (82.1% and 93.8%)
    - **published in ICIP 2018**.

Selected Projects

- **MRI Image Reconstruction From Undersampled K-Space Data** — Course project [link]
  Dr. Tanaya Guha,Dept. of EE, IIT Kanpur — *Jan'17 - Apr17*
  - Explored and reviewed Compressed Sensing based reconstruction methods for undersampled MR data like Projection onto Convex Sets (POCS), SparseMRI and Adaptive Dictionary Learning (DictMRI).
  - '**Best Projects Award**' (given to 3 out of 15 projects.
- **Online Single Index Model Learning** — CS773A project [link]
  Dr. Purushottam Kar,Dept. of CSE, IIT Kanpur — *Jan'17 - Apr17*
  - Came up with an interesting problem of Online SIM Learning, and utilised SLISOTRON to make a Follow The Leader (FTL) based online algorithm SLISOTRON-FTL
  - Proposed a proof for the realizable, noiseless setting. Also showed how the problem of Online Isotonic Regression for 1-Lipschitz function extends into our problem of Online SIM Learning

- **Stochastic Variational Inference for Heirarchical Poisson Matrix Factorisation** CS698S project [link]
  Dr. Piyush Rai,Dept. of CSE, IIT Kanpur *Jan'17 - Apr17*
  - Formulated and implemented SVI version of Hierarchical Poisson Matrix Factorization [Gopalan et al., 2015], while the paper only had batch VB updates, resulting in an SVI-HPMF model which is scalable to large datasets.
- **Modifying Stacked Attention Networks Architecture For VQA** CS698N project [here]
  Dr. Gaurav Sharma ,Dept. of CSE, IIT Kanpur *Aug'16 - Dec16*
  - We modified the architecture of Stacked Attention Network (SANs), which originally utilized image features to project attention on query-vector, for the problem of Image QA, by trying different attention mechanisms. The modified models performed on par with the original model proposed in paper.
- **Automatic Wheat Grain Quality Estimation** EE604A project [link]
  Dr. Tanaya Guha,Dept. of EE, IIT Kanpur *Aug'16 - Dec16*
  - The project was a collaboration with Govt. of India, aimed to introduce automatic grain quality assessment from an image of spread out sample of grain to assist farmers in getting fair price of their produce. Using binary thresholding for segmentation, followed by an SVM classifier model, we were able to distinguish between grain and impurities with an accuracy of 88%.
  - **Best Project Award** (given to 3 out of around 25 projects).

Industrial Internships

- **Samsung Research Institute-Bangalore** Summer 2016 Internship
  Mentor: Mr. Vasu Kakkirala, Senior-Engineer, SRI-Bangalore *May'16 - Jul'16*
  - Worked on Tizen OS based VR Engine Core, intended to be embedded in Web Browser for various Samsung Devices like GearVR. My contribution was in profiling of VR pipeline, analysis of Rendering, bug fixes and in refining the VR-Engine interface layer. I received a **Pre-Placement Offer** as a *Researcher*, based on my performance.
- **Khitchdee Technologies-Allahabad** Summer 2015 Internship
  Mentor: Mr. Rohit Agrawal, CEO, Khitchdee Technologies *May'15 - Jun'15*
  - Developed a Windows-app that detects percussive beats in the music and displays synchronized 3D graphics

Achievements

- Won **SRI-B C-Lab Entrepreneurial Ideation Contest** (2 winners out of 244 pitches)
- Cleared "**Professional**" level of Samsung Electronics Global Software Competency (SWC) test, (**passing rate: 5%**)
- Recipient of Merit-Cum-Means (MCM) scholarship for Academic Excellence for 6 semesters
- A* grade (Outstanding Performance) in *Digital Image Processing* course and *Fundamentals of Computing* course, IIT Kanpur
- All India Rank 465 in JEE-Advanced 2013 out of 1.4m candidates (top 0.03%)

Relevant Courses

- **Computer Vision**: Recent Advances in Computer Vision, Digital Image Processing, Image Modeling Tools and Techniques
- **Machine Learning**: Bayesian Machine Learning, Online Learning and Optimisation, Introduction to Artificial Intelligence
- **Programming**: Data Structures and Algorithms, Fundamentals of Computing
- **Mathematics**: Linear Algebra, Probability and Statistics, Complex Analysis, Differential Equations, Partial Differential Equations, Single and Multi-Variate Calculus
- **Signal Processing**: Signals, Systems & Networks, Principles of Communication, Digital Signal Processing, Statistical Signal Processing

Technical Skills

- **Programming Languages**: C, C++, Python, Java, MATLAB
- **Libraries**: TensorFlow, OpenCV, NLTK, Scikit-Learn
- **Development Tools**: Android-Studio, Visual Studio, Arduino IDE
- **Hardware**: Raspberry-Pi, Atmel Micro-Controllers, Arduino

Volunteer Work

- Gave Maths and Science tuitions to four Class-5 students from underprivileged families from a nearby village as a Volunteer at PRAYAS, IITK
- Designed and organised Circuit-Design challenges as Event Coordinator in Techkriti, the annual Technical Fest at
- Assisted 1st-year students academically by conducting lectures and doubt-clearing sessions as academic-mentor for Electrodynamics course