

# Kapil Agrawal

No. 11, D-Block, Austin Town, Bengaluru. +91-9999-3781-69

[kapil.agrawal1995@gmail.com](mailto:kapil.agrawal1995@gmail.com)

<https://kapilagrawal95.github.io>

## Education

- **Delhi Technological University** New Delhi, India  
BTech. in Mathematics and Computing Engineering Aug. 2013 – 2017
  - Major: **Mathematics and Computing**, CGPA: **7.8/10**
  - Key Courses: Pattern Recognition, Stochastic Processes, Optimization Techniques, Scientific Computing, Linear Algebra, Data Structures, Algorithms Design and Analysis, Applied Graph Theory, Fuzzy Systems and Fuzzy Logic, Matrix Computations, Theory of Computation, Discrete Mathematics

## Roles and Positions

- **Research Intern** Bengaluru, India  
Microsoft Research India Jul 2018 – Present
  - Extracting information from web-data using sequential tagging models like 1-D CRFs, 2-D CRFs etc.
  - Presently, implementing a hierarchical variant of CRF model to improve the accuracy further.
- **Data Scientist** Hyderabad, India  
Hats.AI Jan 2018 – Jun 2018
  - Tagging people's interests using Topic Models for targeted marketing.
- **Project Associate** HP, India  
IIT Mandi Jun 2017 – Dec 2017
  - **Internet of Things and Machine-Learning:** *Responsible for developing a landslide monitoring and early warning system.* Implemented several machine-learning algorithms to build predictive models for landslides.
  - **Cognitive Science:** Building RL models based on expectancy valence and prospect theories to understand human-decision making in Disasters and Climate Change.

## Research Experience

- **Learning Robust Features for Hierarchical CRFs** Bengaluru  
Microsoft Research India Sept 2018 – Present
  - To extend the previous work on hierarchical CRFs for web data extraction by creating robust automated features instead of handcrafted features. We plan to use unsupervised methods for learning embedding in a tree-structured graph and comparing them with existing approaches.
- **Utilizing RL Models to Understand Human Decision Making in ILS** <sup>1</sup> HP, India  
IIT Mandi Oct 2017 – Jan 2017
  - Objective was to differentiate how humans think in different conditions: mild conditions (fewer landslides per season) and severe conditions (more landslides per season). Answering questions like: Are humans more reward-seeking or loss-averse, Do they tend to forget more rapidly in more-damage condition etc.?
- **Minute-scale Prediction of Landslides using ML Techniques** HP, India  
IIT Mandi Sept 2017 – Oct 2017
  - Released a report on how we built an IoT device for capturing soil and whether data for landslide early warning system and made the data open for contribution to all. We converted a time-series forecasting problem into a supervised learning problem and applied machine learning techniques like C4.5, Neural Nets, Logistic Regression, Random Forests, and SVM. Results reveal that C4.5 produced an accuracy of 92% in predicting landslides and the true-positive rate of 60%.
- **Class-Imbalance Problems in Landslide Predictions** HP, India  
IIT Mandi June 2017 – Aug 2017
  - We addressed the problem of class-imbalance inherent in the domain of predicting landslides. We use techniques like SMOTE, SMOTE-IPF, and Random oversampling on a landslide dataset. Results revealed that SMOTE-IPF significantly outperforms the other variants because of its ability to reduce the class-overlap. **Accepted in the IEEE Proceedings of International Conference on ML and Data Science, Bennett University (ICMLDS) 2017.**

## Development Experience

- **GraphViz: A Debug Tool for Visualizing Walks** Bengaluru, India  
Microsoft Research India July 2018 – Sept 2018
  - Built an interactive tool to visualize web data as network where nodes represent text blocks and weights on edges represent the distance between the nodes. The tool acted as a helper to understand how to embed neighborhood information into nodes for learning better representations.
- **Sentiment Summarizer for Local Service Reviews** Bengaluru, India  
Self-Motivated Project July 2018 – Sept 2018
  - Built an tool that can automatically summarize opinions from a set of reviews and display them in an easy to process manner. More specifically, built an aspect based summarizer , where a summary is built by extracting relevant aspects of a service, such as service or value, aggregating the sentiment per aspect, and selecting aspect-relevant text.
- **Exploration Behaviors of Uber Drivers** New Delhi, India  
Delhi Technological University Aug 2016 – Nov 2016
  - Simulated the logistics networks of Uber to optimise the ETA at the customer's end and maximise earnings at the driver's end in Python. We try to model how drivers' make decisions while looking out for customers and their effects on both at the driver's end and customer's end.
- **Prayaas: Crowdsourcing App for Volunteers** Kathmandu, Nepal  
Engineers' Organization June 2015 – Aug 2015
  - After the disastrous earthquake in Nepal, much of the work like rubble-cleaning, 2-D mapping of demands and food supplies was handled synchronously between government and private organizations. However; their demands for manpower were usually unmet. In these conditions, we came up with an app called Prayaas (meaning to try) to crowdsource volunteers. We were able to cater two organizations by sending them 20 volunteers weekly for two months.

## Patents

- Varun Dutt, Kapil Agrawal, Shubham Agrawal, Pratik Chaturvedi, Naresh Mali, V.U. Kala. A low-cost sensor-based system for monitoring landslides and issuing alerts, filed at the Indian Patent Office: **20171104533**

## Achievements & Awards

- **Kalam Innovation Award 2017:** Placed among top 20 innovations in India for proposing a low-cost Landslide Monitoring and Early Warning System.
- **HackTheQuake 2015:** Placed among top 15 ideas for inventing a crowd-sourcing app, Prayaas to gather volunteers on a daily-scale in HackTheQuake, an initiative launched to drive innovation in the technology sector in rebuilding Nepal post the disastrous earthquake of 25th April 2015.

## Skills

- **Languages:** C/C++, Python, WebPPL,  $\text{\LaTeX}$ , Bash, HTML, CSS, PHP, Matlab, Javascript
- **Operating Systems:** Proficient in Windows and Linux environments; Comfortable working with 8-bit AVR micro-controllers

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<sup>1</sup>Interactive Landslide Simulator is an interactive-decision making game developed by a colleague