Kapil Agrawal

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EDUCATION

Delhi Technological University   *2013 - 2017*
Bachelor of Technology in Mathematics and Computing

WORK EXPERIENCE

Research Fellow - Microsoft Research India   *Jul, 2019 - Present*
Networking and Systems Group
Advisors: Dr. Sreangsu Acharyya & Dr. Venkat Padmanabhan

Research Intern - Microsoft Research India   *Jul, 2018 - Jul, 2019*
Applied Sciences Group
Advisors: Dr. Arun Iyer

Project Associate - Indian Institute of Technology Mandi   *Jun, 2017 - Feb, 2018*
Applied Cognitive Science Lab
Advisors: Dr. Varun Dutt

PUBLICATIONS

1. **Modeling Decisions in Collective Risk Social Dilemma Games for Climate Change using Reinforcement Learning**.
   Medha Kumar, **Kapil Agrawal** and Varun Dutt.
   IEEE Conference on Cognitive and Computational Aspects of Situation Management (CogSIMA) 2019.

2. **Minute-scale prediction of soil movement using machine-learning techniques**.
   Kapil Agrawal, Shubham Agrawal, Pratik Chaturvedi, Naresh Mali, Venkata Uday Kala and Varun Dutt.
   Indian Landslide Congress (ILC), IIT Bombay, 2018.

3. **A Comparison of Class Imbalance Techniques for Real-World Landslide Predictions**.
   Kapil Agrawal, Yashasvi Baweja, Deepti Dwivedi, Ritwik Saha, Prabhakar Prasad, Shubham Agrawal, S. Kapoor, Pratik Chaturvedi, Naresh Mali, Venkata Uday Kala and Varun Dutt.
   IEEE Conference on Machine Learning and Data Science (MLDS), 2017.

PATENTS

1. **Low cost sensor-based system for landslide monitoring and alerts**.
   Varun Dutt, **Kapil Agrawal**, Shubham Agrawal, Pratik Chaturvedi, Naresh Mali, Venkata Uday Kala.
   Patent Application PCT/IN2018/050217. Geneva, Switzerland, 16/04/2018

DEVELOPMENT EXPERIENCE

1. **NodeViz: A Visualization Tool for Debugging Node Embeddings**.
   Microsoft Research India
   - Built an interactive tool to ensure the correctness of learnt node embeddings in fully connected graphs.

2. **Prayaas: Crowdsourcing App for Disaster Recovery**.
   Self-motivated project
   - After the disastrous earthquake in Nepal, disaster recovery 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 crowd-source volunteers. We were able to cater two organizations by sending them 20 volunteers weekly for two months.

3. **AI4Work: Simulator for Activity Recommendations in Enterprises**.
   Microsoft Research India
   - Typically, in RL problems agent-environment interactions are first performed on a simulated setting to evaluate agent's performance in realistic as well as counterfactual scenarios. Hence, we built an easy to use human-in-the-loop interactive simulator. The design encourages code-reuse, reproduciblility, modularity and error-logging.

Selected Research Projects

Data-Driven Cloud Networking
Jul 2019 - Present

Advisors: Dr. Sreangsu Acharyya & Dr. Venkat Padmanabhan, *Microsoft Research India*

- Proposed a framework to monitor unreachability of cloud services using a Kalman filtering based approach.
- Deployed an end-to-end monitoring tool for detecting network outages for outlook, skype all across the globe.
- Results showed a hit-rate of 88% and a recall of 63% outperforming prior detection mechanisms.

Personalized Recommendation in Enterprise
Jan 2018 - Present

Advisors: Dr. Arun Iyer & Shwetabh Khanduja, *Microsoft Research India*

- Explored personalized recommendations domain to understand challenges of partial observability, explore-exploit and click models.
- Designed a simulator to address the issues of cold-start situation, counterfactual evaluation and noisy users.
- Proposed a semi-supervised learning algorithm that uses label-switching technique to explore.

Information Extraction from Web-data
July 2018 - Dec 2018

Advisor: Dr. Arun Iyer, *Microsoft Research India*

- Proposed and implemented a vision based segmentation technique to remove noise from heterogeneous data.
- Results showed a lift in recall of LSTM-CRFs model by 40% and is now shipped as a feature in outlook mail.

IoT and Machine Learning for Landslide Predictions
Jun 2017 - Feb 2018

Advisor: Dr. Varun Dutt, *Indian Institue of Technology Mandi*

- Developed and scaled a low cost IoT device to monitor landslide prone areas from lab setting to real world.
- Engineered an end-to-end mechanism for sending alerts using Decision Trees for early evacuation of local people.
- Studied and implemented preprocessing techniques like SMOTE, SMOTE-IPF etc in mitigating class-imbalance problems.

Selected Awards and Featured News

- **BBC News, 2019:** Monitoring and early detection of landslides. **[Link]**
- **Kalam Innovation Award 2017:** Placed among top 20 innovations in India for proposing a low-cost Landslide Monitoring and Early Warning System. **[Link]**
- **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. **[Link]**

Key Courses and Skills

- **Key Courses:** Probability and Statistics, Stochastic Processes, Optimization Techniques, Pattern Recognition, Linear Algebra, Data Structures, Algorithms Design and Analysis, Computer Networks, Database Management Systems, Applied Graph Theory, Theory of Computation, Discrete Mathematics
- **Languages:** Python, C/C++, LaTeX, Bash, HTML, CSS, PHP
- **Operating Systems:** Proficient in Windows, Mac and Linux environments; Comfortable working with 8-bit AVR micro-controllers