Vijay Keswani

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Education

09/2017-present **PhD candidate, Computer Science**, *EPFL*, Lausanne, Switzerland, CGPA: 5.5/6.0.

08/2015-07/2016 **M.Tech., Computer Science and Engineering**, *IIT Kanpur*, India, CGPA: 9.3/10.0.

08/2011-07/2016 **B.Tech., Computer Science and Engineering**, *IIT Kanpur*, India, CGPA: 8.7/10.0 .

Experience

Publications

ACM-FAT* 2019 **Classification with Fairness Constraints: A Meta-Algorithm with Provable Guarantees**, *L. Elisa Celis, Lingxiao Huang, Vijay Keswani and Nisheeth K. Vishnoi*.

- Classification algorithms are increasingly being used in many societal contexts such as determining criminal recidivism, predictive policing, and job screening. As such, it is becoming increasingly important that these algorithms are unbiased with respect to race, gender, etc.
- We developed a meta-algorithm that takes the fairness type and constraint as input and returns a classifier which satisfies the fairness constraint and has good accuracy.

ICML 2018 **Fair and Diverse DPP-based Data Summarization**, *L. Elisa Celis, Vijay Keswani, Damian Straszak, Amit Deshpande, Tarun Kathuria, Nisheeth K. Vishnoi*.

- Diverse sampling algorithms are used in many real-world scenarios such as data summarization to capture a representative summary of a large dataset. However for a biased dataset, simple sampling techniques can lead to similar or even aggravated bias in the sampled subset.
- Working in the framework of Detereminantal Point Processes (DPPs), used for diverse sampling, we introduced fairness constraints on the sampling procedure to ensure that the sampled summary is fair.
- We provide a simple linear-time algorithm approximate algorithm to sample from DPPs with fairness constraints. We also characterize the *price of fairness* due to such constraints.

Demo Papers

IJCAI-ECAI 2018 **Balanced News Using Constrained Bandit-based Personalization**, *Sayash Kapoor, Vijay Keswani, Nisheeth K. Vishnoi, L. Elisa Celis*.

- We created a news-search prototype that de-polarizes the news feed by presenting balanced viewpoints across liberal and conservative articles.
- The prototype uses a novel constrained bandit-sampling algorithm, introduced in the paper *An Algorithmic Framework to Control Bias in Bandit-based Personalization*.

Master's Thesis

01/2015 - 06/2016 **Laplacian Solvers and Graph Sparsification**, *Guide: Dr. Rajat Mittal*, CSE Department, IIT Kanpur.

- Solving a linear system of equations usually takes *cubic time*. However, for linear systems associated with the graph Laplacian matrix, the graph sub-structure of the matrix can be exploited to obtain nearly linear time solvers.
- These solvers use Spectral Sparsification of graphs as a subroutine in the algorithm. However their usage extends beyond Laplacian solvers, and have been employed in various settings since their discovery.
- Through this thesis, we tried to understand the scope of spectral sparsification algorithms used in Laplacian solvers and the relations between current state-of-the-art Laplacian solvers.

Industry Experience

07/2016 - 07/2017 **Product Engineer**, *Sprinklr* , Gurgaon, India.

- Sprinklr aimed to provide a single platform for social media management to enterprise.
- As part of the Advertisements team, we worked to ensure that our platform was compatible with current the Ads APIs of all relevant social networks, such as Facebook, Snapchat, etc.
- We also provided several novel analysis tools to the users for them to judge the performance of their ads and to ensure they maximize their returns from these ads.

Internships

05/2014 - 07/2014 **Validation of a Compiler for Critical Embedded Software**, *Guide: Dr. Francesco Zappa Nardelli and Dr. Mark Pouzet*, INRIA, Paris-Rocquencourt and ENS, Paris.

- *Lustre* is a data synchronous language, designed for description and verification of real-time systems. The compiler for these systems need to fool-proof to prevent any unexpected outcome.
- In this project considered one such compiler for Lustre, *Heptagon*. To verify this compiler, we built a symbolic validation framework in *OCaml*. It generated the symbolic representation for the *Lustre* program and the resulting C program.
- The representations were then compared using *Z3 SMT solvers* to authenticate their equivalence, and it was observed that the compiler indeed generated correct equivalent programs for common constructs in *Lustre*.

05/2013 - 07/2013 **Study of Statistical Learning Algorithms**, *Guide: Dr. Ambedkar Dukkipatti*, CSA Department, Indian Institute of Science, Bangalore.

- Applied concepts of **Information Theory** such as *Entropy* as suggested by *Kamal Nigam* and *Andrew McCallum*, to get a better model for **document classification**.
- The generated model was tested on the WEBKB dataset and found to *better* than the models based on Bayes' method of classification. The accuracy was further increased when prior probability of the classes was introduced.

Teaching Experience

2018 **Machine Learning**, *Teaching Assistant*, EPFL.

2018 **Theory of Computation**, *Teaching Assistant*, EPFL.

2016 **Algorithms and Data Structures**, *Instructor*, ACA Summer School, IIT Kanpur.

2016 **Online Learning and Optimization**, *Teaching Assistant*, IIT Kanpur.

2015 **Theory of Computation**, *Teaching Assistant*, IIT Kanpur.

2015 **Data Structures and Algorithms**, *Teaching Assistant*, IIT Kanpur.

2014 **Fundamentals of Computing**, *Teaching Assistant*, IIT Kanpur.

Skills

Programming *Advanced*:C, Python (Tensorflow, Numpy, Scipy, Sklearn, Flask)

Familiar:C++, Java, Haskell, Bash