Yashoteja Prabhu

Postdoctoral Researcher
Microsoft Research India

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EDUCATION

Ph.D. 2013-2021

Advisor	Manik Varma
Thesis	Hierarchical Approaches to Extreme Multi-Label Learning
Dept.	Computer Science and Engineering
College	Indian Institute of Technology Delhi

B.Tech. (Hons) 2007-2011

CGPA	9.1/10
Dept.	Computer Science and Engineering
College	Indian Institute of Technology Bombay

PUBLICATIONS

- N. Gupta, S. Bohra, Y. Prabhu and M. Varma. ZestXML: Zero-Shot Extreme Multi-label Learning for Tagging, Recommendation and Advertising. *Under review* at the Proceedings of the International World Wide Web Conference (**WWW**), Ljubljana, Slovenia, April 2021.

- Y. Prabhu, A. Kusupati, N. Gupta and M. Varma. Extreme Regression for Dynamic Search Advertising. In Proceedings of the ACM International Conference on Web Search and Data Mining (**WSDM**), Houston, Texas, USA, February 2020.

- Y. Prabhu, A. Kag, S. Harsola, R. Agrawal and M. Varma. Parabel: Partitioned label trees for extreme classification with application to dynamic search advertising. In Proceedings of the International World Wide Web Conference (**WWW**), Lyon, France, April 2018.

- Y. Prabhu, A. Kag, S. Gopinath, K. Dahia, S. Harsola, R. Agrawal and M. Varma. Extreme multi-label learning with label features for warm-start tagging, ranking and recommendation. In Proceedings of the ACM International Conference on Web Search and Data Mining (**WSDM**), Los Angeles, California, February 2018.

- H. Jain, Y. Prabhu and M. Varma. Extreme multi-label loss functions for recommendation, tagging, ranking and other missing label applications. In Proceedings of the ACM SIGKDD Conference on Knowledge Discovery and Data Mining (**KDD**), San Francisco, California, August 2016.

- Y. Prabhu and M. Varma. FastXML: A fast, accurate and stable tree-classifier for extreme multi-label learning. In Proceedings of the ACM SIGKDD Conference on Knowledge Discovery and Data Mining (**KDD**), New York, New York, August 2014.

- R. Agrawal, A. Gupta, Y. Prabhu and M. Varma. Multi-label learning with millions of labels: Recommending advertiser bid phrases for web pages. In Proceedings of the International World Wide Web Conference (**WWW**), Rio de Janeiro, Brazil, May 2013.

- A. Shaji, A. Varol, P. Fua, Y. Prabhu, A. Jain and S. Chandran. Resolving Occlusion in Multiframe Reconstruction of Deformable Surfaces. In IEEE Conference on Computer Vision and Pattern Recognition Workshops (**CVPRW**), Colorado Springs, Colorado, June 2011.

WORK EXPERIENCE

Postdoctoral Researcher, Microsoft Research India 2018-2020

- Proposed a new learning paradigm called Extreme Regression for large-scale recommendation and advertising scenarios comprising millions of items (*e.g.* products, ads). This paradigm generalized the conventional Extreme Classification for binary-valued outcomes to learn more accurate models from real-valued feedbacks such as click-through rates or revenue. These techniques have been deployed in several Microsoft products with significant improvements in key metrics.
- Extended the conventional Extreme Classification over a few million labels to Extreme Zero-shot Learning with infinite number of labels where many labels are previously unseen. Some salient applications of this extension are accurate modeling of new queries in Bing advertising and recommending latest products to a user in Walmart.
- Developed extreme classification based approaches for news article recommendation in MSN which signficantly outperformed the competitive baselines for news recommendation in terms of offline metrics. The online evaluation is currently going on.

Teaching Assistant, Indian Institute of Technology Delhi 2013-2017

Assisted with course material preparation, evaluation and grading for the following courses: Artificial Intelligence, Natural Language Processing, Machine Learning, Data Structures and Algorithms, and Introduction to Engineering.

Research Assistant, Microsoft Research Bangalore 2011-2013

Devised solutions to problems such as automatically tagging webpages and recommending bid phrases for advertisements by reformulating them as multi-label classification with millions of labels - the paradigm which later evolved into the field of extreme classification. Developed multi-label random forest technique for extreme classification. Worked with Bing Ads engineers to apply it to bid phrase recommendation task on Bing.

Intern, Microsoft Development Center, Hyderabad 2010 Summer

Worked with the SQL Server team to develop algorithms to efficiently search and filter database objects based on their properties. Devised novel methods for visualizing the search results. Identified the salient personas appearing in SQL Server and implemented a persona-specific layout configuration module. Implemented a Start Page with dynamic feeds and a customizable layout.

RESEARCH IMPACT

- My research presented a novel approach to large scale recommendation and ranking tasks with more than a million choices, called Extreme Classification.
- Developed Multi-Label Random Forest algorithm which scaled to multi-label problems with > 1 million labels for the first time, thus originating the field of extreme classification.

- Proposed and implemented Parabel algorithm which is respectively 1,000x and 10,000x faster at training and prediction, with no significant loss in accuracy, as compared to 1-vs-All classifiers which are state-of-the-art extreme classifiers.
- Proposed and implemented XReg algorithm for learning from real-valued feedback with millions of items. This improved the query coverage by 27% on the Dynamic Search Advertising task in Bing.
- Prepared and publically released several large-scale datasets, code and benchmarks results on the Extreme Classification repository, to aid research in extreme classification.
- Several of my algorithms have found use at Microsoft and other tech companies.

AWARDS/ACHIEVEMENTS

- Tata Consultancy Services Ph.D. fellowship, 2013.
- Outstanding Teaching Assistant Award in COL774 (Machine Learning), 2016.
- First prize in Microsoft Azure ML hacking contest at Machine Learning Summer School, IISC, 2015.
- All India Rank 31 in IIT-JEE amongst 250K students, 2007.
- Rank 5 in Regional Mathematics Olympiad, 2006.

PROFESSIONAL SERVICE

- Organizer for the Extreme Classification Workshop at International Conference on Machine Learning (**ICML**) 2020.
- Reviewer for the following Journals: **JMLR** (2020), **TPAMI** (2018) and **TKDE** (2019).
- Reviewer for the following Conferences: **NeurIPS** (2020), **ICML**, **ICCV** (2013) and **AAAI** (2019,2021).

SKILLS

- Efficient and highly scalable coding in C++ (Code for FastXML, SwiftXML, Parabel).
- Proficient in C++, Matlab, Python, Perl, Bash, HTML.
- Knowledgeable in linear algebra, probability, convex optimization, machine learning etc.

GRADUATE COURSEWORK

- Artificial Intelligence (as Teaching Assistant)
- Advanced Natural Language Processing (as Teaching Assistant)
- Machine Learning
- Computer Vision
- Mathematical Programming

- Algorithmic Graph Theory
- Compiler Design
- Randomized Geometric and Streaming Algorithms

OTHER ACTIVITIES

- Organizer at TechFest 2008, IIT Bombay's technological festival.
- Trained Carnatic singer and guitar enthusiast.