

# Ashish Kumar

*Ph.D Applicant in Machine Learning*

CONTACT INFORMATION	Microsoft Research India #9, Lavelle Road Bangalore, India - 560001	<a href="https://ashishkumar1993.github.io">https://ashishkumar1993.github.io</a> ashishkr9311@gmail.com +91 8963033560
RESEARCH INTERESTS	Large Scale Machine Learning Applications	
CURRENT POSITION	<b>Microsoft Research India</b> <i>Research Fellow</i>	(Jul 2015 - Present) Advisors: Dr Manik Varma and Dr Prateek Jain
EDUCATION	<b>Indian Institute of Technology Jodhpur</b> B. Tech. in Computer Science and Engineering CGPA: 9.84/10 ( <i>Among top 3 in CSE department</i> )	(Jul 2011 - May 2015)
PUBLICATIONS	<b>A Novel Image Inpainting Framework using Regression</b> <b>Ashish Kumar</b> , Smriti Jain, Gaurav Bhatnagar, Q.M. Jonathan Wu In Submission to <i>IEEE Transactions on Systems, Man and Cybernetics</i>	
RESEARCH EXPERIENCE	<b>On Device Prediction for IoT Applications</b> <i>Advisors: Dr Manik Varma and Dr Prateek Jain, Microsoft Research</i> <ul style="list-style-type: none"><li>• Several IoT application domains (Agriculture, Walking Cane) require low latency, low battery consumption, and might have limited cloud access; necessitating prediction on device</li><li>• 2KB to 16KB of RAM are typical of low end IoT devices, limiting ML models to this range</li><li>• Proposed Bonsai, a sparse low rank tree based non-linear classifier and implemented a hard thresholding based optimization routine to jointly learn sparse low rank projection and model parameters</li><li>• Experiments on 8 datasets show that Bonsai achieves accuracy of uncompressed SVMs, Neural Nets, kNN in just 16KB; gains upto 15% within 2KB over state-of-art compressed methods</li></ul> Currently, we are extending Bonsai to Anomaly Detection, Multiclass and Extreme Multilabel Classification. <b>This work will be submitted to ICML 2017</b>	
	<b>Speeding up Bing Ranker &amp; Compressing Malware Detector</b> <i>Advisor: Dr Manik Varma, Microsoft Research</i> <ul style="list-style-type: none"><li>• Experiments with Bing Search data and Malware data showed that only a few of the extracted features are relevant in making predictions</li><li>• Proposed a sparse ranker/classifier as an extension to LDKL (non-linear tree classifier) &amp; implemented a thresholding based procedure to learn sparse LDKL while optimizing NDCG@k/Accuracy</li><li>• Achieved 10x speed-up and 10x compression over the currently deployed Bing Ranker; also gained compression over the current Malware Detector (which need to fit in cache memory)</li></ul> We are currently working with Microsoft product groups to ship our algorithm to production pipeline of Bing Ranker and Malware Detector	
	<b>A Novel Image Inpainting Framework using Regression</b> <i>Advisor: Dr Gaurav Bhatnagar, IIT Jodhpur</i> <ul style="list-style-type: none"><li>• Implemented Telea FMM in MATLAB (spatial &amp; wavelet transform domain) and used Navier Stokes from OpenCV, as baselines</li><li>• Applied block-wise regression using SVM where blocks were identified using pixel variance on the input image after applying edge extension to it</li><li>• Evaluated the proposed algorithm with PSNR, UIQ and SSIM metrics on images corrupted with Random Noise, Text Noise and Real Noise</li></ul> <b>Paper in submission to IEEE Transactions on Systems, Man and Cybernetics</b>	

	<b>Parallel Sparse Matrix - Sparse Vector Multiplication</b> (May 2014 - Jul 2014) <i>Advisors: Prof. Dr David Bader and Dr Jason Reidy, Georgia Institute of Technology</i> <ul style="list-style-type: none"> <li>Implemented and compared 5 different techniques of computing sparse matrix - sparse vector product in parallel (subroutine to dynamic Page Rank)</li> <li>Implemented performance portable version of sort &amp; merge technique in OpenMP &amp; observed up to 2x speed-up over other methods (compared on dynamic graphs simulated in Stinger Software)</li> </ul>
SELECTED PROJECTS	<b>Virtual Edge Detection, MIT Media Labs Design Workshop</b> (Jan 2015) <i>Advisor: Dr Rahul Bhargava, MIT Media Labs</i> <ul style="list-style-type: none"> <li>Worked with Blind School to develop a device (Raspberry Pi) to identify printed shapes/images</li> <li>The hand held device vibrated only at the outlines of a shape when hovered over the entire page</li> <li>Used an approximate edge detection method on thresholded image for extremely low response time</li> </ul> <b>Smart Traffic Analyzer, IBM National Technical Challenge (NTC)</b> (Sep 2014) <ul style="list-style-type: none"> <li>Developed an algorithm to locate public buses in real time without requiring any hardware on buses</li> <li>Clustered the GPS data of commuters and marked large clusters moving together as buses and tracked them to identify bus routes; used filtering techniques to avoid false positives</li> <li>Implemented it as a mobile app and tested it on synthetic data modeled on Poissons Distribution</li> </ul> Secured 3rd Position Nationally for our novelty and implementation
SCHOLASTIC ACHIEVEMENTS	Ranked 23 in ACM-ICPC 2014 Onsite Gwalior Regionals Secured 3rd position in IBM NTC 2014 out of 75 participating teams Selected on research merit for CRUISE-14, Georgia Tech, CSE (among 8 students selected worldwide) Attended Microsoft Research Summer School on Machine Learning (2015) and IoT (2016) All India Rank:10 in National Science Olympiad (2006)
TALKS & SEMINARS	ML Algorithms for On-Device Prediction, Microsoft Research Redmond (Nov 2016) <i>Advisor: Dr Manik Varma and Dr Prateek Jain, Microsoft Research</i> Model Compression and Prediction Time speed-ups, Microsoft Research India (Sep 2015) <i>Advisor: Dr Manik Varma, Microsoft Research</i> A Novel Image Inpainting Framework using Regression, IIT Jodhpur (May 2015) <i>Advisor: Dr Gaurav Bhatnagar, IIT Jodhpur</i> Parallel Sparse Matrix - Sparse Vector Multiplication, Georgia Tech. (Jul 2014) <i>Advisor: Prof. Dr David Bader and Dr Jason Reidy, Georgia Institute of Technology</i>
EXTRA CURRICULARS	Working with <i>Make A Difference Foundation</i> in Education Support (Sep 2016 - Ongoing) Innovation and Incubation Center Coordinator at IIT Jodhpur (Jul 2013 - Mar 2014) Literature Club Coordinator at IIT Jodhpur (Jul 2013 - Mar 2014)