

# Shubham Agrawal

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Applying for C.S. M.S. at Stanford University

## Interests

Machine Learning, Recommender Systems, eCommerce and Tourism, Adaptive and Conversational Systems

## Education

- 2013–2017 B.Tech in Computer Science & Engineering, IIT Kanpur, CGPA: 8.7/10.0
- 2013 AISSCE, St. Joseph's Senior Secondary School, Performance: 94.0%
- 2011 AISSE, St. Joseph's Senior Secondary School, CGPA: 10.0/10.0

## Publication

- Nov. 2017 Ankur Garg, Sunav Choudhary, Payal Bajaj, Sweta Agrawal, Abhishek Kedia, and Shubham Agrawal. Smart Geo-fencing with Location Sensitive Product Affinity. ACM SIGSPATIAL 2017

## Patent

- Feb. 2017 Ankur Garg, Payal Bajaj, Sweta Agrawal, Abhishek Kedia, and Shubham Agrawal. Smart Geo-fencing with Location Sensitive Product Affinity. Patent Application Number - 15/434,886. (Filed)

## Experience

- Jul. 2017 **Adobe Systems India Pvt. Ltd., Member of Technical Staff (Software Engineer).**
- Ongoing
  - Developed POC of a **unified annotation tool** which automatically detects the annotation user is trying to make. Trained CNN for detecting tool (highlight/underline/strikethrough/polygons) given user drawings and pdf context. Idea got selected to be shipped with the March release of Adobe Acrobat
  - Engineered an efficient algorithm for the synchronization of sticky comments between PDFNext (HTML based PDF format) and Classic PDF inside Adobe Acrobat.
  - Fixed more than ten critical security vulnerabilities (including buffer overflow vulnerabilities and javascript parameter tempering) inside Adobe Acrobat.
- May 2016 **Adobe Systems India Pvt. Ltd., Research Intern.**
- Jul. 2016
  - The aim was to assist marketers in creating **smart geo-fences**. The project was focused on segmenting users based on their geo-distributions of mobile app activity, identifying points-of-interest and then suggesting geo-fences customized to each user segment.
  - To unsheathe interest from sparse location tagged browsing data, algorithm captures intrinsic interest of user, trends at semantically similar locations and similarity between products and users
  - Achieved f1 score (24.89%) was significantly higher than geofence designed using Matrix Factorization (18.16%). (ACM SIGSPATIAL '17 paper [↗](#), paper presentation [↗](#), project page [↗](#), Adobe Tech Summit talk video [↗](#))
- May 2015 **Pariksha.co, (Startup for digizing education) Research & Development Intern.**
- Jul. 2015
  - Engineered an algorithm that adaptively recommends questions depending upon students performance and question ratings. The algorithm uses modified version of model-based collaborative filtering
  - Modeled and programmed scalable **adaptive recommender system** as a microservice using the GO language and MongoDB database
  - Implemented Pariksha Practice Section for adaptive content and a Gamification engine with impact on more than 50K students

## Key Projects

- Aug. 2016 **Densecap with NMS Convenet, Course project under Dr. Gaurav Sharma.**
- Nov. 2016
  - Analyzed the work “DenseCap” by Andrej Karpathy et. al. by experimenting with the parameters and design choices of Fully Convolutional Localization Network on Visual Genome dataset.
  - To discard the original test-time non-maximum suppression, we used trainable spatial suppression layer from the work “A convnet for non-maximum suppression” by Jan Hosang et. al. This enhanced the **mAP** of densecap from **5.698 to 5.76**. (report [↗](#), pres [↗](#))

- Jan. 2015 **Multiple Kernel Learning**, *Undergraduate project under Dr. Harish Karnick.*
- Apr. 2015
- Studied Relative Reproducing Kernel Hilbert space, Multiple Kernel Learning, and Hierarchical Kernel Learning.
  - Implemented **Simple MKL** to study the effects of the linear combination of distinct kernels on SVM classifier. Classification task was done on Caltech multiclass object classification dataset using SURF and convolutional deep-net features(pre-trained BVLC GoogleNet model). (report ↗)
- Jan. 2017 **Poisson Matrix Factorization**, *Course project under Dr. Piyush Rai.*
- May 2017
- Studied various models for Bayesian Recommender Systems including Poisson Matrix Factorization, Hierarchical Poisson Matrix Factorization, Bayesian Non-parametric Poisson Matrix Factorization
  - Implemented and compared the performance of the three models on MovieLens 1M dataset.
  - Also analyzed the effect of latent dimension on the models. Learnt the use of auxiliary variables in variational inference to make the models locally conjugate and facilitate inference (report ↗)
- Aug. 2016 **Automatic Abstract Generation for Research Papers**, *Course project under Dr. Harish Karnick.*
- Nov. 2016
- The important sentences are extracted from the paper and fed to an abstractive model which outputs the final summary of the paper. For extractive summarization, we experimented with Word frequency based scores, text rank, and latent semantic analysis using ROGUE as an evaluation metric.
  - To generate the final abstract, we implemented RNN encoder-decoder network using Keras library. (report ↗)
- Aug. 2016 **Low-rank model for neural networks**, *Course project under Dr. Purushottam Kar.*
- Nov. 2016
- Implemented a module for decomposing the input weight matrix into a low rank and a sparse matrix.
  - The module is based on the work - “Robust PCA problem via outlier pursuit” which finds the low-dimensional subspace approximation to high dimensional points after eliminating corruptions. (report ↗)
- Jan. 2016 **Object(Pedestrian/Two-Wheeler/Three-Wheeler) Identification in Surveillance Videos**, *Course project under Dr. Harish Karnick.*
- Aug. 2016
- Experimented with object proposal methods (Morphological, Selective Search) and feature extractors (SURF, ConvNets) for detection and classification.
  - Used decision tree, random forest and SVM (OVR and OVO) classifiers to predict labels (code ↗ , report ↗)

## Achievements and Awards

- 2014 **Academic Excellence Award**, *IIT Kanpur (awarded to top 7% students in the institute) .*
- 2013 **All India Rank 191**, *IIT-JEE Advanced (among 150,000 candidates).*
- 2015 **Best Rookie Team, and Design Finalists**, *BAJA Student India (an inter-collegiate all-terrain vehicle design competition).*
- 2013 **All India Rank 1234**, *JEE Mains (among 1,400,000 candidates).*
- 2015 **Awarded A\* grade**, *(awarded to top 1-2% students) in the course “Operating Systems”.*

## Teaching

- Jul. 2014 **Counselling Service, IIT Kanpur**, *Academic Mentor, Introduction to Electrodynamics (PHY103).*
- Apr. 2015
- Conducted regular **tutorial classes** at the institute and hall level
  - Guided 2 students out of the Academic Probation (AP) by constant academic and emotional support

## Relevant Coursework

- Machine Learning Bayesian Machine Learning, Natural Language Processing, Recent Advances in Computer Vision, Optimization Techniques, Machine Learning Tools
- Systems Computer Architecture, Operating Systems, Compiler Design, Computer Networks, Computer Security, Computer Organization, Principles of Database Systems
- Theory Advanced Algorithms, Data Structures and Algorithms, Theory of Computation, Linear Algebra, Probability and Statistics

## Extracurriculars

- Oct. 2013 **IITK Motorsports, BAJA Student India**, *Chassis Head.*
- Jan. 2015
- Built the 3<sup>rd</sup> lightest All-Terrain vehicle with a team of 17 members to compete against 44 national teams.
  - Researched and analyzed various materials and design possibilities using ANSYS and Solidworks. Did FE Analysis and weight optimization on ANSYS WorkBench. Supervised the whole manufacturing process of the chassis.
  - Bagged 4<sup>th</sup> position in the acceleration event, **“Best Rookie Team”** trophy and awarded as Design Finalists in BAJA Student India 2015