Gurpreet Singh

B. Tech · Department of Computer Science and Engineering

(+91) 9005528086 | guggu@iitk.ac.in | fat-fighter.github.io | github.com/fat-fighter | fat-fighter

Job Application for Job Title

Dear Sir / Ma'am,

I have been researching openings at Company Name with great interest and came across the advertisement for Job Title on your website careers page. I believe my skills and experience could be a great match with your organization's initiatives and culture and, therefore, have decided to apply for the said position.

I have always been fascinated by the intricate machine, that is the personal computer. I started programming when I was 14 years old, and have been hooked since. During my high school, I learned to code in the Visual Basic environment and dabbled in web development. I had decided at that time to get a degree in computer science and started preparing for the Joint Entrance Examination (JEE), an admit to the top technological institutes in India, the IITs. After two years of arduous preparation and competing with more than a million aspirants, I qualified in the top 0.12% of those who took the JEE Advanced test. Presently, I am a senior in the Department of Computer Science and Engineering at Indian Institute of Technology Kanpur.

It wasn't until the sophomore year that I discovered Machine Learning, through Prof. Andrew Ng's Course on Coursera. Fascinated by the concepts discussed in the course and in order to probe deeper into machine learning, I decided to go for an internship in a leading unicorn startup in the field of mobile advertising, Inmobi. During this internship, I looked at ways of feature extraction for ad creative images and built interpretable regression models to predict the click rate of an ad based on actionable features. The internship allowed me to look into some theoretical aspects of machine learning, particularly regression, and gain practical knowledge on building simple interpretable models.

Summer of 2018 saw me working at Goldman Sachs (GS) where I worked in the Corporate Treasury Strats team on augmenting features to existing models for Asset Liability Gap management. In another project at GS, I developed a greedy strategy for customer margin allocation to maximize internalization in the firm, taking various parameters into consideration. Through these internships, I was exposed to the working of the industrial world, and they helped me connect with many people. These experiences helped me build my development skills and afforded me chances to solve real-world problems in different sectors. Attributed to these internships, I have substantial experience in the industry.

During my junior and senior years, I have undertaken multiple courses in machine learning, including "Introduction to Machine Learning", "Natural Language Processing" and "Data Mining". I have also completed a course on "Probabilistic Modelling and Inference" under Prof. Piyush Rai, which particularly piqued my interest. It was this course that introduced me to formal methods in probabilistic machine learning and laid the foundations of my interest in Approximate Inference and Bayesian Optimization. Another riveting course I have done at IITK is "Statistical and Algorithmic Learning Theory" under Prof. Purushottam Kar, which introduced me to concepts in learning theory, particularly statistical convergence analysis of algorithms.

Apart from the coursework, I have done a number of projects during my undergraduate study up till now. I worked on a reading comprehension task on the SQuAD dataset under the supervision of Prof. Harish Karnick, in the "Natural Language Processing" course. In another course project under Prof. Purushottam Kar, I worked on an incremental method to train two-layer neural networks (single hidden layer) by presenting a (two-layer) network as an ensemble and incrementally training each node in the hidden layer using boosting, particularly Gradient Boosting. Using this incremental training as a pre-training step prior to applying backpropagation afforded interesting results on some simple datasets. In the same course, I did a survey on the convergence of different techniques for convex optimization such as Vanilla Gradient Descent (Vanilla GD), Stochastic GD, NAG, etc., and also studied the non-convergence of Adam.

During my junior year, I did a project as part of the course "Probabilistic Modelling and Inference" under Prof. Piyush Rai on clustering in arbitrary shapes. We surveyed several models based on clustering in the latent space. Moreover, we proposed a novel Mixture of Experts model using the clustering embeddings discovered in Variational Deep Embeddings (VaDE) model as a gating function. I extended this work in another course project during my senior year, under the supervision of Prof. Arnab Bhattacharya. In order to overcome the slowed inference in VaDE, we proposed another model based on approximating the posterior of the cluster assignments using a deep neural network. The model built was shown to work better than VaDE at clustering tasks, with much faster inference. We further extended the model to be used as a gating function for ME models, and it was shown to be superior to some baseline gating functions.

Presently, I am working with Prof. Piyush Rai on models for link prediction in graphs. So far in the project, I have extended an unpublished work to build a model combining the predictive properties of Graph Variational Autoencoders with the interpretability of variants of Stochastic Block Models (SBMs), more particularly Mixed Membership SBMs. In addition, I surveyed some of the state of the art smoothing and reparametrization tricks in Black Box Variational Inference for Discrete Latent Variable Models, particularly VAE styled models with RBM priors. Using the GumBolt trick, I was able to build a model which afforded superior results to most existing baselines on some graph datasets.

The various projects I have pursued in my undergraduate study are evidence of my interest in research. Through each and every course and project, I have learned ways of understanding and implementing different machine learning algorithms and inference strategies. Through my internships and other projects, I have substantial development experience as well. Details of all my projects are given on my webpage. Other than my cognition in Machine Learning, my technical expertise includes cross-platform proficiency (Windows, Linux and MacOS); fluency in scripting/programming languages such as C/C++, Python, JS and SQL. I am comfortable with Tensorflow and other tools for Machine Learning such as Scikit-Learn, Pandas, Weka, etc.

With my technical skills, determination and interest in your firm, I believe I can make a valuable contribution to furthering your company's success and goals. The resume attached with this application provides more information about my background. I thank you for your time and consideration. Looking forward to a positive reply.

Sincerely,

Gurpreet Singh