Kshitij Goyal

PhD Researcher in Machine Learning

GitHub | Personal webpage

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Experience

PhD Researcher @ DTAI Machine Learning group, KU Leuven Oct' 2018- present

Thesis Topic: Machine Learning for Verifiable Artificial Intelligence

Publications/Projects:

- SaDe: Learning Models that Provably Satisfy Domain Constraints (ECMLPKDD - 2022)
  Developed and implemented a new framework and optimisation algorithm for enforcing domain constraints (i.e., safety constraints) in machine learning models. In contrast to existing approaches, our method is able to certify that a constraint is satisfied by the predictions of the model on all possible inputs. (PDF)(Code)

- DeepSaDe: Towards Satisfying Domain Constraints in Neural Networks (Ongoing)
  Developing a solution to enforce domain constraints with satisfaction guarantees on neural networks. The parameters of the last layer are learned in a satisfiability framework in conjunction with the standard gradient descent. We also propose a bound propagation algorithm to propagate domain constraints across the network.

- Automatic Generation of Product Concepts With Only Positive Examples (under review) (BNAIC - 2022)
  Proposed a novel approach to identify and learn dynamic product concepts (e.g., product categories on e-commerce websites, public playlists on music streaming services) using only positive examples. Evaluated this approach for a music streaming service to effectively identify new dynamic public playlists from a collection of user defined playlists.

- Feature Interactions in XGBoost (AIMLAI workshop @ECMLPKDD - 2019)
  Conceptualised an approach to use the feature interactions from the data, calculated using mutual information, as constraints in the existing XGBoost framework to improve the predictive performance. (PDF)

Zynga Games, Bangalore, India - Business Analyst April - Sep' 2017

Analysed key performance metrics for multiple mobile games to provide insights for business strategies in addition to developing an in-house tool to perform A/B tests on newly rolled updates.

Accenture Management Consulting, Bangalore, India - Business Analyst June 2014 - Mar' 2017

Projects:

- As part of a team, developed fraud detection techniques for a reliability management system for an automotive giant to reduce post-sale expenses. Proposed approach resulted in a projected reduction in warranty spend by $249 over the course of 4 years.
- Optimised stock levels at central warehouses across multiple locations for a European telecom giant. Proposed a rebalancing solution between locations to optimise the value stock that led to an improvement of 9% in the total stock value.

Education

Master (MSc) in Artificial Intelligence, KU Leuven (graduated magna cum laude) Sep' 2017 - Sep' 2018

Master thesis: Proposed and implemented a variant of the classic RankNet approach of ranking documents which personalises the results based on user profiles.

Master (Integrated MSc) in Mathematics and Scientific Computing, IIT Kanpur, India June' 2009 - May' 2014

Master thesis: Analysis of middle censored data under a shifted exponential distribution

Technical Skills

Programming Languages:	Python, SQL, Java, R
General:	Machine Learning, Satisfiability and Logic, Optimisation
Language Skills:	English, Hindi (native speaker)

Leadership & Awards

- Teaching assistant for courses: Informatics (Fall 2019, Fall 2020) and Scripting Languages (Fall 2021), and the master's thesis advisor to 6 students between 2018-2022
- Department representative for the master thesis administration for master in computer science at KU Leuven
- Research paper reviewer for ECMLPKDD 2019 and 2022
- Awarded 2nd prize at the KU Leuven datathon 2018
- Participated in the DeepLearn Summer School, Gran Canaria, 2022