# Kshitij Goyal

PhD Researcher in Machine Learning

GitHub | Personal webpage | Linkedin

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## Education

**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.

**MSc (Integrated) in Mathematics, IIT Kanpur, India** *June 2009 - May 2014*
*Master thesis:* Analysis of middle censored data under a shifted exponential distribution

## Professional Experience

**PhD Researcher @ DTAI lab, KU Leuven, Belgium** *Oct'2018- present*
*Topic:* Machine Learning with Constraints: Towards Trustworthy AI; *Advisor*: Prof. Hendrik Blockeel

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|---|---|
| **Learning Models that Provably Satisfy Domain Constraint** *(primary goal of the thesis)* | • Developed a new framework and an optimisation algorithm to learn models that can **guarantee domain constraint satisfaction** (e.g., safety constraints, fairness constraints) for all possible predictions.<br>• Evaluation on various regression, classification and structured prediction tasks demonstrated that our approach, in contrast to existing approaches like regularization, is able to guarantee domain constraint satisfaction. |
| **Music Playlist Generation** *(awarded the best paper at BNAIC'22)* | • Working with music streaming company **Tunify**, developed and implemented an approach that combines rule based classification with **PU learning** to automatically **identify music playlists.**<br>• Proposed a **clustering** based approach to identify new playlists from customer data, leading to an identification of more than **50 new playlists** previously unidentified by Tunify. |
| **Iteratively Improving Tree Performance by Optimising Subtrees** | • Proposed and implemented an approach to improve the performance of an already learned tree by **optimising sub-trees** iteratively.<br>• Demonstrated that the proposed approach improves the performance of CART and lookahead trees to close to optimal levels, while being **tractable for deep trees**. |

**Business Analyst - Zynga Games, Bangalore, India** *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.

**Business Analyst - Accenture Management Consulting, Bangalore, India** *June 2014 - Mar'2017*
Collaborated with multiple teams across the globe to provide business consulting services to clients in the fields of inventory optimisation, reliability management systems, social media analytics.

**Data Analyst Internship - Media iQ Digital, Bangalore, India** *May - July 2013*
Developed forecasting models to predict digital impressions won by an airline carrier for a given bid.

## Technical and Language Skills

| General Skills | Programming | Python Data Science Stack | Languages |
|---|---|---|---|
| Machine Learning,<br>Data Mining,<br>Logic and Satisfiability,<br>Combinatorial Optimisation,<br>Computer Vision | Python, R, Java,<br>SQL | **ML:** Scikit-learn, numpy, pandas, pytorch, XGBoost, opencv<br>**Visualisation:** matplotlib, seaborn, altair<br>**Parallelisation:** scoop, dask | English (full professional proficiency)<br>Hindi (native proficiency) |

## Publications

1. SaDe: Learning Models that Provably Satisfy Domain Constraints. (pdf) *ECML 2022*
   **K. Goyal,** S. Dumancic, H Blockeel
2. Automatic Generation of Product Concepts from Positive Examples. (pdf) *BNAIC 2022*
   **K. Goyal,** W. Meert, H Blockeel, E. V. Wolputte, K. Vanderstraeten, W. Pijpops, K. Jaspers
3. Feature Interactions in XGBoost. (pdf) *AIMLAI-ECML 2019*
   **K. Goyal,** S. Dumancic, H Blockeel
4. DeepSaDe: Learning Neural Networks that Guarantee Domain Constraint Satisfaction (pdf) *(under review)*
   **K. Goyal,** S. Dumancic, H Blockeel

## Leadership & Awards

- Teaching assistant for three courses: taught exercise sessions and prepared assignments *2018 - 2022*
- Thesis advisor to 5 master students: projects in areas of **personalised search**, **music streaming, game theory & constrained learning** *2018 - 2022*
- Department representative for the thesis administration for MSc Computer Science at KU Leuven *2019 - 2022*
- Research paper reviewer for ECML'19 and ECML'22
- Received the **best paper award** at BNAIC'22
- Awarded **2nd prize** at the KU Leuven Datathon *2017 - 2018*
- Awarded the prestigious INSPIRE undergraduate scholarship by the government of India *2009 - 2014*