Kshitij Goyal

Researcher in Machine Learning and Artificial Intelligence

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Experience

KU Leuven
Sep 2018 - Present

PhD in Machine Learning and Artificial Intelligence

Thesis: Verifying Learning Artificial Intelligence Systems.
- Primary focus on learning machine learning models with domain based constraints.
- Submitted a paper which presents a way to learn parametric models that satisfy domain constraints.
- Currently working on an optimal decision tree implementation using SMT solvers which can be used to learn noise robust decision trees.

Other Projects:

1. Feature Interactions in XGBoost.
- Learned interactions between features using mutual information on the data.
- Used the learned interaction with XGBoost to enforce interaction constraints.

2. ITOS: Improving Decision Trees using Optimal Subtrees.
- Utilised optimal subtrees of depth 2 to improve a binary greedy decision tree in a bottom up approach.
- Proposed approach led to an average improvement of more than 10% in the performance of the tree.

3. Industry Collaboration: Tunify (A music streaming service for commercial clients)
- Tunify product is based around the concept of musical environments.
- Designed a novel algorithm that combines unsupervised clustering with decision tree learning to identify musical environments automatically.

4. CeGL: Counter-Example Guided Learning
- A counter example guided approach to learn models that satisfy domain constraints in neural networks.
- The proposed approach significantly outperformed the regularization based baselines in terms of performance.

Student Thesis Projects:
1. Machine learning in Shapley Space: Demonstrated that clustering in the Shapley space leads to better quality clusters.
2. Personalised Search with Deep Learning: Used VAE and LDA as encodings to learn personalised search models that outperform the baselines.

Zynga Games
May 2017 - August 2017

Data Analyst
- Worked as a data analyst for multiple mobile games.
- Analysed key performance metrics to provide insights on the business strategies.

Accenture Services Pvt. Limited
May 2014 - March 2017

Business Analyst
Worked on a number of projects:
- Inventory optimisation for European Telecom Company.
- Reliability Analysis for an automotive manufacturer.
- Social media analytics in demand planning.

Media iQ Digital
May 2013 - July 2013

Business Intern
- Developed an algorithm using simple heuristics to forecast maximum number of impressions won.
- Analysed twitter stream data in python to obtain the sentiments of people for a carrier airline

Education

KU Leuven
Sep 2017 - August 2018

Master of Engineering in Computer Science (Artificial Intelligence)
Graduated Magna Cum Laude.
Thesis: Personalised Search with Deep Learning.

Indian Institute of Technology, Kanpur
June 2009 - May 2014

Integrated Masters in Mathematics and Scientific Computing
Thesis: Analysis of Middle Censored data to estimate the lifetime distribution function.

Technical skills

Data Science

Machine Learning, Constraints in Machine Learning, Satisfiability (SAT), Satisfiability Modulo Theories (SMT), Tree Ensembles, Optimal Decision Trees, Natural Language Processing, Music Streaming Analysis, Neural Networks, Game Theory in Machine Learning.

Software Development

Expert Python Programmer. Proficient with libraries such as Scikit-learn, Pandas, Numpy and Matplotlib, tools such as Jupiter Notebooks. Moderate experience with Java, R, SQL, z3 etc.

Publications

Peer reviewed conference publications

SaDe: Learning Models that Provably Satisfy Domain Constraints
K. Goyal, S. Dumancic, H. Blockeel.
ECML 2022
(Under Review)

Peer reviewed workshop publications

Feature Interactions in XGBoost
K. Goyal, S. Dumancic, H. Blockeel.
AIMLAI-XKDD Workshop @ECML 2019