Rakesh Bal

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Education

Indian Institute of Technology (IIT) Kharagpur, West Bengal, India   2016 – 2020 (Expected)
Computer Science And Engineering   CGPA - **9.04/10**
Bachelor of Technology (Hons.)

BJB Junior College, Odisha, India   2014 – 2016
Council of Higher Secondary Education, Odisha   Aggregate - **89%**
Higher Secondary Examination

St. Joseph's High School, Odisha, India   2011 – 2014
Council for the Indian School Certificate Examinations   Aggregate - **96%**
Indian Certificate of Secondary Education

Interests

Machine Learning | Natural Language Processing | Social Computing | Algorithmic Fairness | Computer Vision

Relevant Papers

- <u>Rakesh Bal</u>*, Swastika Dutta*, Sayan Sinha*, Ritam Dutt, Rishabh Joshi, Sayan Ghosh. *"Analysing the Extent of Misinformation in Cancer Related Tweets"*, arXiv, 2020. (Link)   *(Accepted to ICWSM 2020)*
- Sanskar Agarwal*, <u>Rakesh Bal</u>*, Sayan Sinha*, Arijit Nag. *"Modelling Bahdanau Attention using Election methods aided by Q-Learning"*, arXiv, 2019. (Link)   *(Submitted to ACL 2020 SRW)*
                                                                                                                                              * - equal contribution

Research Experience

Incorporating Prior Domain Knowledge for Stock Prediction using Textual Data   *May'19-Aug'19*
Advisors: K M Annervaz (ATL) and Prof. Ambedkar Dukkipati (IISc, Bangalore)

- Worked on stock price prediction using news articles and incorporation of the knowledge graph as domain knowledge.
- Used Graph Convolutional Networks along with events for better representation of the real-world stock scenario.
- Implemented joint training of Regression Models and Graph Networks for more accurate predictions.
- The project was carried out as a summer internship at IISc, Bangalore (sponsored by Accenture Technology Labs).

Misinformation Detection in Cancer Related Tweets   *Aug'19-Jan'20*
Advisor: Prof. Mainack Mondal

- Worked on determining the extent to which misinformation about cancer is spread across tweets for over a month.
- Used BiLSTM-CRF based seq2seq classifier for detecting the keywords discussing about cancer in tweets.
- Performed experiments on various embeddings and tfidf weighted PubMed gave best results.
- Analysed the spread of misinformation among various domains like prevention, cure and causes of cancer.
- Accepted to *ICWSM 2020*.

Election Optimization in Recommendation Fairness   *Oct'18-Mar'19*
Advisor: Prof. Niloy Ganguly

- Worked on determining fairness in recommender systems using election voting methods.
- Used traditional recommender system algorithms like Matrix factorization on SmartMedia Adressa News Dataset
- Applied the theory of electoral systems like SNTV, k-Borda, Chamberlain Courant and Monroe to measure fairness.

AI Team Member Autonomous Underwater Vehicle, IIT Kharagpur   *Feb'17-Ongoing*
Advisor: Prof. CS Kumar

- Implemented real-time underwater buoy detection using Single Shot MultiBox Detector on the top of MobileNet.
- Made the inference of models lightweight and suitable for use in bot using Movidius NCS.
- Used Actionlib and Smach Packages of ROS to create Mission Planner Stack on Kraken 3.0.
- The team participated in SAVe organised by NIOT, Chennai.

PAST PROJECTS

Performance analysis of attention networks for Search Engine query results
Jan'19-May'19

Advisor: Prof. Jiaul Paik

- Analysed performance of various NMT models based on Attention Networks such as Bahdanau, Transformer etc.
- The translation results were queried into a search engine and top results were compared for analysis.

Overcoming Bias by Dataset Augmentation using GANs
Feb'19-Apr'19

Advisor: Prof. Abir Das

- Worked on overcoming dataset bias towards gender by balancing the images in the dataset.
- Used GANs (Cycle-GAN) for unsupervised domain translation in order to achieve dataset balancing.

Discovery and Mitigation of Algorithmic Bias using Deep Neural Networks
Apr'18-Sep'18

Advisor: Prof. Niloy Ganguly

- Worked on discovering bias in COMPAS dataset using deep neural networks.
- Formulated ideas for its mitigation using Layerwise Relevance Propagation technique.

Interactive Timeline of NASA Space Missions
July'18-Nov'18

Advisor: Prof. Plaban Kumar Bhowmick

- Worked on implementing Faceted Search and Browsing features in the timeline of NASA space missions.
- Used gFacet as new way of browsing RDF data by combining graph visualization and faceted browsing.

SKILLS

- **Languages:** Python | C | C++ | Octave | Java | Verilog | MIPS
- **Libraries and Frameworks:** PyTorch | Keras | TensorFlow | Pandas | Scikit-Learn | OpenCV | ROS | Git

COURSEWORK INFORMATION

- **Departmental Courses:** Algorithms, Discrete Mathematics, Linear Algebra, Symbolic Logic, Formal Language and Automata Theory, Probability and Statistics, Switching Circuits and Logic Design, Computer Organization and Architecture, Compilers, Knowledge Modelling and Semantic Technologies, Operating Systems, Computer Networks, Educational Data Analytics, Machine Learning, Theory of Computation*, Artificial Intelligence*, Image Processing*, Reinforcement Learning*, Social Computing*   * - Ongoing
- **Other Relevant Courses:** Deep Learning Specialization (Coursera), CS231n: CNNs for Visual Recognition (Stanford), CS294-112: Deep RL (UC Berkeley)

ACADEMIC ACHIEVEMENTS

- Secured All India Rank of 265 (amongst 200,000 candidates) in IIT-JEE Advanced 2016.
- Outperformed in Probablity And Statistics and Electrical Technology courses securing an EX grade given only to exceptionally performing students (top 1 percent).
- Qualified KVPY in SX stream (Organized by IISc, Bangalore) with an All India Rank of 191.
- Secured top 1% percentile in National Standard Examination in Physics and Chemistry in the state of Odisha.
- Qualified National Talent Search Examination conducted by NCERT in Xth standard.

RESPONSIBILITIES

- **National Digital Library of India**: Prepared solutions for Previous years JEE Question Papers as a part of the JEE Archive which is one of the key features in the official website of the NDL.
- **Spring Fest, IIT Kharagpur**: Prepared music tracks for the event Shuffle and helped in the management of the same. Also organised the performance of international artists during the fest.

EXTRA CURRICULARS

- Represented LBS Hall, IIT Kharagpur in InterHall Maths Olympiad General Championship.
- Awarded B-Certificate in drill and weapon training, Cadet Welfare Society in National Cadet Corps (NCC).
- Secured 4th position in the Science Quiz held by Institute of Physics, Bhubaneswar.
- Qualified for semifinals of debating tournament conducted by Debating Society, IIT Kharagpur.
- Secured 5th position in Rakesh Memorial Chess Championship at Puri.