Neeraja Kirtane

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Website ◇ LinkedIn ◇ GitHub ◇ Google Scholar

RESEARCH INTERESTS

Research Interests: Deep Learning, Natural Language Processing, Graph Deep Learning.
Focus Areas: Bias/Ethics in NLP, NLP for low-resource languages, Class imbalance handling in Graph Learning.

EDUCATION

University of Illinois Urbana-Champaign 2023 – 2025
Masters of Science in Computer Science (MSCS)

Manipal Institute of Technology, Manipal, India 2018 – 2022
B.Tech in Computer Science and Engineering (Minor: Computational Intelligence) *CGPA: 9.14/10*

EXPERIENCE

Indian Institute of Technology Madras, Chennai, India Jul 2022- Present
Post Baccalaureate Fellow *Advisors – Prof. Balaraman Ravindran & Dr. Rajashree Baskaran*

- Working the Project Hidden Voices at the **Robert Bosch Centre for Data Science and Artificial Intelligence (RBC-DSAI)**.
- Building intelligent tools to aid in adding 10,000 notable women's biography drafts to Wikipedia.
- This aims to **reduce the gender gap** in wikipedia data.
- Working on building knowledge graphs and doing graph to text generation.

Indian Institute of Technology Madras, Chennai, India Jan 2022- Jun 2022
Research Intern *Advisors – Prof. Balaraman Ravindran & Dr. Ashish Tendulkar*

- Worked on Handling class imbalance in Graph neural networks at **RBC-DSAI.**
- Used **implicit ways** at the algorithmic level to handle this imbalance.
- Used a custom loss function and tuned the attention weights to focus more on minority nodes.
- This led to the work "ReGrAt".
- Additional Links: *Report* | *Slides* | *Github*

Centre for development of advanced computing, CDAC Pune Jun 2020 – Aug 2020
ML Intern *Advisor – Rahul Dangi*

- Extracted keywords and named entities from a document for **better comprehension**.
- Used word embeddings of the GLoVe dataset for the predictions. Major libraries used in Python were NLTK (for text processing), Gensim (to use the LDA algorithm), Flask (to create the front end of the project).
- Created an **application** so that people could use it.
- Additional Links: *Github* | *Report*

PUBLICATIONS

1. Wikiworkshop 2023

Hidden Voices: Reducing gender data gap, one Wikipedia article at a time *Paper* May 2023

- Authors: ***Neeraja Kirtane**, Anuraag Shankar, Chelsi Jain, Ganesh Katrapati, Raji Baskaran, Balaraman Ravindran*
- Proposed an algorithm to automate writing wiki articles for women in STEM.
- Discussed the challenges and limitations of the problem at hand.

2. GCLR workshop at AAAI 2023

ReGrAt: Regularization in graphs using attention mechanism to handle class imbalance *Paper* Sep 2022

- Authors: ***Neeraja Kirtane**, Jeshuren Chelladurai, Balaraman Ravindran, Ashish Tendulkar*
- Devised a **custom loss** function by adding a regularizer that handles imbalance.
- Used attention mechanism by making the attention weights focus more on minority nodes, in node classification.
- Our results outperformed the already existing methods by a margin of **5 %**.

3. Deployable-AI workshop at AAAI 2023

Efficient Gender Debiasing of Pre-trained Indic Language Models *Paper* Aug 2022

- Authors: ***Neeraja Kirtane****, V Manushree, Aditya Kane*
- Created a template-based dataset suitable for Hindi language to measure bias.
- Measured bias in Hindi Language model by predicting mask probability of a noun/pronoun given the occupation in the template created.
- Debiased the model by efficiently finetuning **unfreezing less than 1 %** of the parameters by training on a balanced dataset.

4. Gender bias in NLP workshop at NAACL 2022

Mitigating gender stereotypes in Hindi and Marathi *Paper* May 2022

- Authors: ***Neeraja Kirtane****, Tanvi Anand*
- Created a dataset of **160-plus gendered and neutral occupations** in Hindi and Marathi. Also created a dataset of emotions broadly classified into anger, fear, joy, sadness.
- Proposed methods to quantify the bias in the word embeddings by modifying ECT and RND tests for gendered occupations.
- Defined a gender axis, using Principal Component Analysis (PCA). Neutralized and debiased the embeddings by removing this component from the embeddings.
- Additional Links: *Slides* | *Poster*

5. WASSA workshop at ACL 2022

Transformer based ensemble for emotion detection *GitHub* | *Paper* Mar 2022

- Authors: *Aditya Kane, Shantanu Patankar, Sahil Khose,* ***Neeraja Kirtane***
- Developed ensemble based solution consisting of multiple *ELECTRA* and *BERT* models.
- Proposed methods for **synthetically generating datasets** to mitigate class imbalance.
- Studied the behaviour of our models on various raw and synthetically generated datasets.
- Additional Links: *Experiments* | *Slides* | *Poster* | *Video*

6. Widening NLP workshop at EMNLP 2021

Occupational Gender Stereotypes in Indian Languages *Paper* | *Video* | *Poster* Nov 2021

- Authors: ***Neeraja Kirtane****, Tanvi Anand*
- Devised a metric similar to WEAT to calculate bias in **gendered languages** like Hindi and Marathi.
- Used this metric on ULMFiT language model and quantified the occupational bias present.

PROJECTS

Hidden Voices *GitHub* Ongoing

- Building intelligent tools to aid in **adding 10,000 women's biography drafts to Wikipedia**.
- Working on building knowledge graphs and doing graph to text generation using transformer-based methods.
- Its aim is to make a positive impact on gender representation among digital sources and to reduce the gender data gap.

Smart Document Explorer *GitHub* Summer 2021

- Created a program to make a document more **accessible and understandable.** Used history and geography textbooks as the data to help children benefit from this.
- Extracted named entities, keywords. Summarized the text, found similar sentences given a sentence.
- Used relationship extraction to map dates with events in history textbooks.

RELEVANT COURSEWORK AND MOOCS

- Machine Learning, Deep Learning, Social Network Analysis, Soft Computing Paradigms, Computer Vision
- Discrete Mathematics, Vector Calculus, Data structures, Object Oriented Programming
- Stanford University: CS224W Machine Learning with Graphs, CS224n NLP with Deep Learning, CS229 Machine Learning

TECHNICAL SKILLS

Languages: Python, C++, Java, C, SQL
Tools and Libraries: PyTorch, NumPy, TensorFlow

EXTRACURRICULAR

- Volunteer at **EMNLP 2021**, **NAACL 2022**
- **Regional Mathematics Olympiad (RMO)** Finalist.
- College level Finalist at **Smart India Hackathon** among forty plus teams
- Part of **IEEE Student Branch Manipal** which organised multiple technical events at college level.