Brihi Joshi
in | ⊘ | 𝔾 | 🐦

Email : brihijos@usc.edu
Website : brihijoshi.github.io

Research Interests

Machine learning methods for natural language processing: specifically, in developing *label-efficient, explainable* methods for diverse NLP tasks.

Education

- **University of Southern California**   Los Angeles, CA
  Doctor of Philosophy, Computer Science (Annenberg Fellow)   *Aug. 2021 – Present*

- **Indraprastha Institute of Information Technology**   New Delhi, India
  Bachelor of Technology, Computer Science and Engineering; CGPA: 9.30/10   *Aug. 2016 – Dec 2020*
  - Received the Innovative Student Projects Award for **best thesis in Computer Science** from the Indian National Academy of Engineering. One of the highest honors for undergraduates in India.

Skills

- **Relevant Courses ([†]=Graduate Level Courses):**Data-Centric NLP[†], Robustness and Generalization in Natural Language Processing[†], Representation Learning for NLP[†], Deep Learning[†], Machine Learning, Natural Language Processing[†], Speech Recognition and Understanding[†], Affective Computing[†], Statistical Computation[†], Semantic Web[†], Linear Optimization, Linear Algebra, Data Mining[†], Probability and Statistics, Real Analysis

- **Languages**: Python, Java, C, Bash

- **Tools & Technologies**: Git, PyTorch, Keras, MATLAB, scikit-learn, nltk, spaCy, numpy, Spark, SparQL

Publications

- **Brihi Joshi***, Aaron Chan*, Ziyi Liu*, Shaoliang Nie, Maziar Sanjabi, Hamed Firooz, Xiang Ren. ER-Test: Evaluating Explanation Regularization Methods for NLP Models. *Findings of EMNLP 2022 and TrustNLP@NAACL 2022*

- Dong-Ho Lee*, Akshen Kadakia*, **Brihi Joshi**, Aaron Chan, Ziyi Liu, Takashi Shibuya, Ryosuke Mitani, Toshiyuki Sekiya, Jay Pujara, Xiang Ren. XMD: An End-to-End Framework for Interactive Explanation-Based Debugging of NLP Models. *Preprint*

- **Brihi Joshi**, Neil Shah, Francesco Barbieri and Leonardo Neves. The Devil is in the Details: Evaluating Limitations of Transformer-based Methods for Granular Tasks. In *The 28th ACM International Conference on Computational Linguistics (COLING 2020)*.

- **Brihi Joshi***, Aditya Chetan*, Hridoy Sankar Dutta, Tanmoy Chakraborty. CoReRank: Ranking to Detect Users Involved in Blackmarket-based Collusive Retweeting Activities. In *The 12th ACM International Conference on Web Search and Data Mining (WSDM 2019)*. (Acceptance Rate: 16%, CORE2018 A*)

- Udit Arora, Hridoy Sankar Dutta, **Brihi Joshi***, Aditya Chetan*, Tanmoy Chakraborty. Analyzing and Detecting Collusive Users Involved in Blackmarket Retweeting Activities. In *ACM Transactions on Intelligent Systems and Technology (TIST)*. (Impact Factor: **3.971**)

- **Brihi Joshi***, Amogh Gulati*, Chirag Jain*, Jainendra Shukla. It's Not What They Play, It's What You Hear: Understanding Perceived vs. Induced Emotions in Hindustani Classical Music. In *22nd ACM International Conference on Multimodal Interaction, Late Breaking Reports (ICMI 2020)*.

- **Brihi Joshi***, Shravika Mittal, Aditya Chetan. Did You "Read" the Next Episode? Using Textual Cues for Predicting Podcast Popularity. In *First Workshop on NLP for Music and Audio (NLP4MusA) at International Society for Music Information Retrieval Conference (ISMIR 2020)*.

- Hridoy Sankar Dutta, **Brihi Joshi***, Aditya Chetan*, Tanmoy Chakraborty. Retweet Us, We Will Retweet You: Spotting Collusive Retweeters Involved in Blackmarket Services. In *The 2018 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM 2018).* (Acceptance Rate: 15%)

- Nishtha Madaan, Gautam Singh, Sameep Mehta, Aditya Chetan*, **Brihi Joshi***. Generating Clues for Gender based Occupation De-biasing in Text `arXiv:1804.03839 [cs.CL]`

* Equal Contribution

RESEARCH EXPERIENCE

- **Information Sciences Institute, USC** Los Angeles, CA, USA
  Graduate Research Assistant *Aug 2021 - Present*
  - **Measuring the Utility of Free-text Machine Rationales**:
    Advised by - Dr. Xiang Ren

    * Understanding the utility that machine generated free-text rationales provide users, while answering the following research questions: 1) How can we design a framework to assess utility of a machine generated free-text rationale for users? 2) Can such a framework be used to automatically evaluate free-text rationale methods without human-in-the-loop?

  - **Evaluating Explanation Regularization (ER) methods**:
    Advised by - Dr. Xiang Ren

    * Evaluated different ER strategies in different task settings and across In-distribution, Out-of-distribution, as well as Stress Test cases.
    * Also conducted thorough analysis of ER methods under resource constraints like - time and sample constraints.
    * Project accepted at TrustNLP@NAACL 2022 Workshop, and EMNLP 2022.

- **Snap Research** Los Angeles, CA, USA
  Research Intern *Sep 2019 - Dec 2019*
  - **Understanding Granular-level Similarity of documents**:
    Advised by - Leonardo Neves, Neil Shah and Francesco Barbieri

    * Curated a dataset of news articles, with ground truth annotations of article pairs that report the same event.
    * Benchmarked contextual embeddings generated from Transformer-based methods against simpler methods like TF-IDF for granular-level textual similarity. Formed the basis of the Happening Now feature in Snapchat.
    * Currently working on understanding task granularity in cross-lingual news data.

    Keywords: *Machine Learning, NLP, Representation Learning, Low-Resource Languages*

- **Laboratory for Computational Social Systems** New Delhi, India
  Undergraduate Researcher *Jan 2018 - Jan 2021*
  - **Understanding adversarial collusive activities in OSNs [Bachelor's Thesis]**:
    Advised by - Dr. Tanmoy Chakraborty

    * Worked on detecting detecting collusive retweeters via freemium blackmarket services.
    * Curated an open dataset of manually annotated users from various freemium services.
    * Proposed a novel set of features which beat the state-of-the-art supervised models for fake users and spam bot detection on the task of collusive user detection.
    * Extended the approach by developing an unsupervised and semi-supervised approach that takes into account - network features, behavioral features and topical features.

    Keywords: *Unsupervised Learning, OSNs*

- **IBM India Research Laboratory** New Delhi, India
  Undergraduate Researcher *Nov 2017 - Sept 2018*
  - **Occupational Debiasing [code][preprint]**:
    Advised by - Dr. Sameep Mehta

    * Developed a system for detecting occupational gender bias in text, by demography and time period.
    * Developed and curated a dataset comprising of various occupation names and occupational evidences.
    * Proposed a pipeline that detects potential gender bias in occupations

    Keywords: *NLP, Machine Learning*

- **Interdisciplinary Lab for Interactive AV Development (ILIAD)** New Delhi, India
  Undergraduate Researcher *Jan 2019 - May 2019*
  - **Generating Audio Samples from Images**:
    Advised by - Dr. Timothy Scott Moyers Jr
    - ∗ Developed a pipeline for bridging Audio and Visual Engines with real-time modifications.
    - ∗ Developed a model to learn non-linear mappings between projected images and audio pieces.
    - ∗ Developed linear and non-linear envelopes on data filters along with other common features present in DAWs.

    Keywords: *Computer Music, Machine Learning, Creative AI, MIDI*

Work Experience

- **Goldman Sachs** Remote
  Analyst (Full-time) *Dec 2020 - July 2021*
  - **Regulatory Operations Engineering Team:**:
    - ∗ Worked on the Analytics platform for Regulatory Core Engineering, which included developing clustering scripts for downstream anomalous ticket grouping.

    Keywords: *Apache Spark, Clustering*

- **Goldman Sachs** Bangalore, India
  Summer Analyst *May 2019 - July 2019*
  - **Regulatory Operations Engineering Team:**:
    - ∗ Working on the Data Intelligence and Analytics (DIA) module
    - ∗ Responsible for intelligent join of large amount of data from multiple sources, to be used for downstream clustering tasks

    Keywords: *Apache Spark, Hadoop, MLLib*

- **dunnhumby** New Delhi, India
  Associate Analyst Intern *May 2017 - July 2017*
  - **North America Data Team:**:
    - ∗ Studied the various aspects and applications of Data Science in the Business Dimension.
    - ∗ Worked on creating a large-scale implementation demo of `MLLib` in `Apache Spark` to predict user purchase patterns for various clients of dunnhumby focusing on those based in North America
    - ∗ Studied the Automation of ETL processes using `Apache Airflow` on `Google Cloud Platform` and worked in transferring data from SAS Archives to Hadoop Datalake.

    Keywords: *Data Analytics, Apache Spark, Hadoop*

- **Rails Girls Summer of Code** New Delhi, India
  Student Scholar *May 2017 - July 2017*
  - **Worked on Tessel - an IoT and Robotics development platform**:
    - ∗ Part of one of the selected 16 sponsored teams out of 190 teams worldwide.
    - ∗ Developed tutorials - Prepared Documentation, code snippets, Fritzing diagrams and a working demonstration.
    - ∗ Developed a model for a Humanoid Arm Project - Understood the idea behind product design and development.
    - ∗ Studied and worked on Reach - an ESP32 (low power BLE module), that is supposed to be Tessel's new launch in the domain of Low power boards.

    Keywords: *Open Source, IoT, Project Design*

Teaching Experience

- **CSE343: Machine Learning** IIIT, Delhi
  Teaching Assistant for a class of 150 senior undergraduate students *Aug 2020 - Dec 2020*
- **CSE632: Semantic Web** IIIT, Delhi
  Teaching Assistant for a class of 170 senior undergraduate and graduate students *Jan 2020 - May 2020*
- **MTH201: Probability and Statistics** IIIT, Delhi
  Teaching Assistant for a freshman class of 300 students *Jan 2019 - May 2019*

Awards

- **Indian National Academy of Engineering Undergraduate Thesis Award 2021**: Awarded for research done as a part of undergraduate thesis in the Computer and Information Sciences Domain.
- **Annenberg Fellowship**: Awarded for admission to the PhD program at the University of Southern California.
- **Snap Research Scholarship 2019**: Awarded for research done in the field of Data Mining and Machine Learning. Award includes 10,000 USD and an offer to intern at Snap Research, USA. Only scholar from India!
- **AAAI 2020 Undergraduate Consortium**: Accepted to present my thesis at the AAAI 2020 Undergraduate consortium. Includes scholarship to attend to attend AAAI 2020
- **Microsoft Research India Travel Grant**: Awarded travel support of 50000 INR for visiting WSDM 2019
- **ACM-W Scholarship**: Awarded travel support of 1200 USD for visiting WSDM 2019
- **Google Women Techmakers Scholarship, 2018**: Awarded to students who work for diversity and inclusion in the field of Computer Science.
- **Best Technical Poster Runner-up at GHCI 2018**: Received for the project, "Generating Clues for Gender based Occupation De-biasing in Text"
- **Dean's Award for Innovation R&D**: Awarded to students who work on Research projects beyond coursework. Awarded for the academic years 2016-17 and 2017-18.
- **Dean's List of Academic Affairs**: Awarded to students who demonstrate excellence in an academic year. Awarded for the academic year 2016-17 and 2018-19.
- **Grace Hoppers Celebration India (GHCI) Scholarship, 2018**: Awarded travel grant and scholarship to attend the GHCI conference.

Projects

- **Deep Multitask Piano Transcription [report][demo]**:
  - Implemented the Onsets and Frames baseline by Hawthorne et. al for polyohonic piano transcription.
  - Developed a smaller, efficient model, reaching the baseline performance in less time and with lesser parameters.
  - Developed as a course project for Deep Learning (CSE641) at IIIT Delhi in Winter 2020.
  - **Keywords:** *Deep Learning, Music Information Retrieval*
- **Emotional Speech to Text [code]**:
  - Explored HMM and DL based methods to generate Emotional speech from text, along with system demonstrations.
  - Worked on developing fine-tuning strategies for SOTA methods in Speech like Tacotron and DC-TTS, to elicit emotional speech, using a low-resource dataset (EmovDB).
  - Developed as a course project for Speech Recognition and Understanding (CSE5SRU) at IIIT Delhi in Winter 2020.
  - **Keywords:** *Deep Learning, Speech Generation*
- **img2LATEX[demo]**:
  - Developed an end-to-end model for converting handwritten mathematical expressions to compilable LATEXcode.
  - Constructed a pipeline consisting of image segmentation, supervised classifiers such as CNNs, SVM, etc. and heuristics for code formation.
  - Developed as a course project for Machine Learning (CSE343) at IIIT Delhi in Monsoon 2018.
  - **Keywords:** *Machine Learning, Deep Learning, Image Processing*
- **SemEval19 Task 3: EmoContext**:
  - Worked on the task of emotion detection in dialogue. This was a shared task for a workshop at ACL 2019.
  - Designied architechtures based on LSTMs and ConvNets, and explored contextual embeddings like ELMo.
  - Used techniques like Data augmentation, emoji context evaluation using DeepMoji.
  - **Keywords:** *NLP, Deep Learning, Word Embeddings*
- **iDabba [code][poster]**:
  - Built a prototype aimed at improving food storage and large scale handling of food silos in granaries.

- Uses Computer Vision techniques with SIFT, Haar classifier and Microsoft Vision API in Python and checks the environmental conditions around it using Humidity, Temperature and Weight Sensors.
- Was amongst the top 10 projects in the first-year batch and received a mention in the Director's blog. [link].
- **Keywords:** *Computer Vision, IoT, Flask*

- **AirBnb Chatbot**:

  - A flask chatbot developed from a curated Ontology of the AirBnb dataset
  - Developed the Ontology from scratch - incorporated validation, SparQL querying, and N-Triple formation
  - Incorporated human language queries using Rasa NLU API. Developed as a course project for Semantic Web (CSE632) at IIIT Delhi in Winter 2019.
  - **Keywords:** *Flask, Ontology, Semantic Web, NLP, Chatbot*

LEADERSHIP

- **Women Who Code**   New Delhi, India
  Director   *Aug 2017 - Present*
  - **Working towards inclusion and diversity in tech**:
    * Establishing relations with corporates to collaborate with WWCode Delhi.
    * Responsible for mentoring new volunteers, their on-boardings, and allotting responsibilities. [testimonial1][testimonial2]
    * Attending meet-ups, conferences and events to expand the WWCode Delhi network and collaborating with network members for organising events and speaking opportunities.
    * Managing the social media activities like managing the Facebook, Twitter and Meetup pages of the chapter.

- **Student Senate**   New Delhi, India
  Batch Representative   *August 2016 - May 2017*
  - **Academic representative for the Batch of 2020**:
    * Established communication between batch students and the academic body. This includes conveying academic policies like plagiarism policies and course selection criteria with the students.
    * Handled student grievances related to academics and building their solutions.
    * Attended Undergraduate board meetings with other student representatives, Undergraduate Council Chair and Dean of Academic Affairs to discuss problems and their solutions.

CO-CURRICULAR ACTIVITIES

- **Talks**

  - *Practically Machine Learning*: Taught 100 students and industry professionals basics of machine learning [link]
  - *Intro to Computer Vision:* Introductory talk on the self-taught topic, demonstrating basics of Images, colour, processing and basic CV algorithms. Delivered at WWCode Delhi. [slides]
  - *Intro to Mathematics of ML:* Introductory talk on the self-taught topic, demonstrating basic ML algorithms from a mathematical point of view. Delivered at WWCode Delhi. [GitHub]
  - *Intro to Web connectivity with Tessel:* An introductory talk about Tessel development board and its features. Delivered at LinuxChix India. [coverage]

- **Volunteering**

  - *Summer School, IIITD:* Took sessions on Personality Development and Communication Skills for middle-school children from government schools. [coverage]