Janvijay Singh

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Education

- **Georgia Institute of Technology** — Atlanta, USA
  M.S. in Computer Science · Specialization: Machine Learning · GPA: 3.85/4.00 — *Aug 2021 - Present*
- **Indian Institute of Technology (BHU) Varanasi** — Varanasi, India
  B.Tech. in Computer Science and Engineering · GPA: 9.62/10.00 · Class Rank: 2/65 — *July 2014 - May 2018*

Research Interests

- Natural Language Processing, Data-efficient Learning, Multimodal Learning, AI for Social Good.

Experience

- **Georgia Institute of Technology** — Atlanta, USA
  Graduate Student Researcher · Advisors: Profs. Alan Ritter, Chao Zhang, and Diyi Yang — *Aug 2021 - Present*
  - **Geographic Citation Gaps in NLP Research**: Created a citation graph of NLP publications. Investigated multiple research questions examining geographic disparities in NLP research. *Accepted at EMNLP 2022.*
  - **Procedural Text Understanding**: Examined the efficacy of generic PLMs and out-of-domain datasets to rival/outperform SOTA approaches (utilise domain-specific architectures and datasets). *Submitted to EACL 2023.*
  - **Pretrained-LM assisted Data Generation for NLU**: Designing a sample-efficient PLMs-based approach to adaptively generate unlabelled training data for Natural Language Understanding tasks.
- **ETH Zürich** — Zürich, Switzerland
  Summer Research Fellow · Advisor: Prof. Mrinmaya Sachan — *July 2022 - Present*
  - **Enriching Textbooks with Images**: Designing a novel task to retrieve and embed relevant images into long-form text. Analysing the effectiveness and shortcomings of SOTA vision-languauge models such as CLIP & DaLLe.
- **Walmart Group** — Bangalore, India
  Applied Scientist II · Advisor: Dr. Sanjeev Kumar. — *Aug 2018 - July 2021*
  - **Speech Recognition for Indic Languages**: Designed and analysed a hierarchical model architecture and decoding scheme based on RNN-T loss to alleviate shortcomings of various text segmentation schemes.
  - **Speech Synthesis for Indic Languages**: Designed a joint multilingual training framework, based on automatic transliteration to a common Devanagari script, to improve the quality of synthesised code-mixed speech.
- **MIDAS Lab, IIIT Delhi** — Delhi, India
  Research Collaborator · Advisor: Prof. Rajiv Ratn Shah — *July 2020 - Jan 2021*
  - **Robust Speech Recognition**: Designed, implemented and analysed an adversarial forgetting based approach to learn accent-invariant speech representations for speech recognition.
- **MICS Lab, CentraleSupélec** — Gif-sur-Yvette, France
  Research Intern · Advisor: Prof. Céline Hudelot — *May 2018 - Oct 2018*
  - **Multimodal Document Image Segmentation**: Designed and studied a fully convolutional neural model to segment the textbook's page's image into semantic regions, such as lesson, exercise and title.
- **Microsoft** — Hyderabad, India
  Sofware Engineer Intern — *May 2017 - Aug 2017*
  - **MS-Excel**: Developed user interface dialogs and back-end's callback routines for multiple features across the pivot-table functionality in Microsoft Excel for MacOS. *Offered a full-time software engineer role for my work.*

Publications & Pre-Prints[1]

- Mukund Rungta*, **Janvijay Singh***, Saif M. Mohammad, Diyi Yang. *"Geographic Citation Gaps in NLP Research"*. To appear in Proceedings of the Conference on Empirical Methods in Natural Language Processing, 2022. https://arxiv.org/abs/2210.14424/
- **Janvijay Singh**, Fan Bai, Zhen Wang. *"Entity Tracking via Effective Use of Multi-Task Learning Model and Mention-guided Decoding"*. arXiv pre-print, 2022. *updated version submitted to EACL 2023. older version*: https://arxiv.org/abs/2210.06444/.

[1] * denotes co-first authorship.

- **Janvijay Singh**, Anshul Wadhawan. *"Entity Recognition in Wet Lab Protocols using Structured Learning Ensemble and Contextualised Embeddings"*. In Proceedings of the Sixth Workshop on Noisy User-generated Text, EMNLP, 2020. https://www.aclweb.org/anthology/2020.wnut-1.35/
- **Janvijay Singh**. *"Sentence and List Extraction in Noisy PDF Text Using a Hybrid Deep Learning and Rule-Based Approach"*. In Proceedings of the Second Workshop on Financial Technology and Natural Language Processing, IJCAI-PRICAI, 2020. https://www.aclweb.org/anthology/2020.finnlp-1.9/
- **Janvijay Singh**, Raviraj Joshi. *"Background Sound Classification in Speech Audio Segments"*. In Proceedings of the Tenth International Conference on Speech Technology and Human-Computer Dialogue, 2019. https://ieeexplore.ieee.org/document/8906597/

Selected Projects

- **Backpropogration and its Biological Realism**: Studied the plausibility of backpropogration under constraints of biological neural architecture. Explored the challenges and limitations associated with learning algorithms alternative to backpropogration. https://tinyurl.com/backprop-bio
- **RNN-Transducer Loss Function**: Devised a diagonal-based parallelised formulation of transducer loss and gradient computation algorithm to reduce the time complexity from $\mathcal{O}(T * U)$ to $\mathcal{O}(T + U)$. Open-sourced the `TensorFlow` implementation as a `PyPi` python package. https://github.com/iamjanvijay/rnnt
- **RNN-Transducer Prefix Beam Search**: Optimised inherently sequential and slow prefix-beam search algorithm for RNN-T by introducing caching, batching and 2-D beam-search for intermediate computations. Studied the increment in error-rates caused by these approximations. (`>10x speed-up`) https://github.com/iamjanvijay/rnnt_decoder_cuda

Achievements

- **Selected** as one of 19 students to `ETH Zürich's Summer Research Fellowship` program among 2404 applicants.
- **Best Team Award** at Flipkart - outperformed industry leaders at Text-to-Speech in the vernacular domain.
- **Winner** at FinSBD-2 shared task at `FinNLP@IJCAI` 2020 - rewarded a prize of USD$1000.
- **Runner Up** at Walmart's annual Data Science Hackathon 2019 (∼140 participants) - rewarded a prize of INR₹20000.
- **Selected** for `Summer@EPFL Research Fellowship` program - <2% selection rate.
- **Qualified** for `ACM ICPC India Regionals 2016` - stood 67$^{\text{th}}$ among 402 teams (selected from 2609 teams) across India.

Technical Skills

- **Languages**: `Bash`, `C`, `C++`, `Java`, `Objective-C`, `Python`.
- **Technologies**: `CUDA`, `PyTorch`, `JAX`, `MXNet`, `TensorFlow`, `Django`, `Flask`, `Docker`, `MATLAB`, LaTeX.

Teaching Assistantships

- **Georgia Institute of Technology**: CS4641 - Machine Learning [*Undergrad-level · Fall '21*], CS7650 - Natural Language Processing [*Grad-level · Spring '21*], CSE6740 - Computational Data Analysis [*Grad-level · Fall '22*].
- **IIT (BHU) Varanasi**: CSO101 - Computer Programming and Linux [*Undergrad-level · Spring & Fall '17*].

Positions of Responsibility

- **Event Coordinator and Problem Curator** for `Perplexed` and `Mathmania` events at *Codefest 2017*, an annual global programming festival with the participation of over 500 students from around the globe.
- **Mentor** at `Club of Programmers (COPS), IIT (BHU) Varanasi`. Conducted several workshops for freshmen and sophomores focused on competitive programming and machine learning.
- **Student Representative** at Department Undergraduate Committee (DUGC), CSE Department, IIT (BHU) Varanasi.

Relevant Coursework

- **Graduate Courses**: CS7545 - Machine Learning Theory, CS8803 - Machine Learning with Limited Supervision, CS6550 - Advanced Algorithms and Uncertainty, CS6471 - Computational Social Science, CS7643 - Deep Learning, LING8803 - Langauges and Computers.
- **Undergraduate Courses**: CSE202 - Artificial Intelligence, MA526 - Optimisation Techniques, CSE352 - Computer Vision, MA202 - Probability and Statistics, CSE311 - Intelligent Computing, MA203 - Mathematical Methods, CSO322 - Theory of Computation, CSO324 - Operation Research, CSO202 - Discrete Mathematics.
- **Online Courses**: CS231n - Convolutional Neural Networks for Visual Recognition by Stanford University, CS224n - Natural Language Processing with Deep Learning by Stanford University, Deep Learning Specialisation by deeplearning.ai (Link to Certificates: I II III IV).