Akshay Goindani

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Education

B.Tech & M.S. by Research, Computer Science and Engineering — Aug 2017 – Present
International Institute of Information Technology - Hyderabad — *Major GPA - 9.21/10, GPA - 9/10*

Research Experience

Research Assistant — Spring 2019 – Present
Advisor: Professor Manish Shrivastava, Language Technologies Research Center — *IIIT Hyderabad, India*

- Developed a dynamic head importance computation mechanism for Neural Machine Translation (NMT).
- Augmented Transformer architecture that outperforms baseline Transformer model by a large margin, especially in low resource conditions, and learns better word alignment. Published in ***RANLP 2021*** (Link to Paper).
- Designed methods for generation and translation of code-mixed data.

Research Assistant — Summer 2020 – Present
Advisor: Professor Vineet Gandhi, Center for Visual Information Technology — *IIIT Hyderabad, India*

- Developed approach for Domain Generalization that achieves state of the art performance on PACS dataset.
- Designed new evaluation method that is closer to human judgement compared to traditional methods, for Domain Generalisation. Research paper currently under review at ***CVPR 2022*** (Link to Paper).
- Built hierarchical architecture to exploit relationship between class labels for robust image classification. Proposed novel loss function to penalize severe miss-classifications, outperforms different baselines. (GitHub Link)

Research Assistant — Fall 2021 - Present
Advisors: Professors Ponnurangam Kumaraguru and Jisun An — *PreCog Research Group, IIIT Hyderabad, India*

- Analyze hate speech on Twitter, and the impact of offline events during COVID-19 on online user activity.
- Designed classifiers to predict if a user will tweet hateful content, and if a tweet contains religious hate speech.

Research Intern — Summer 2021
Advisor: Professor Hadi Hemmati, ***MITACS Globalink Research Internship*** — *University of Calgary, Canada*

- Developed model to generate interpretations for the predictions of complex deep learning models, on sequence to sequence tasks, e.g., method name prediction, code documentation generation, with Explainable AI techniques.

AI-ML Research & Engineering Intern — Summer 2021
ExaWizards AI Platform — *ExaWizards Inc., Tokyo, Japan*

- Designed Deep Learning method to retrieve body poses from images and videos in real time. Evaluated on cross view pose retrieval task in both controlled environment and in the wild, using Hit@K metric.
- Utilized probabilistic view invariant pose embeddings for each pose to compute K-Nearest Neighbors of a query image, to obtain most similar poses.
- Received Pre-Placement Offer to work as Full-Time Employee, based on performance during internship.

Research Intern — Winter 2020 – Spring 2021
Advisor: Professor Hogun Park, LearnData Lab — *Sungkyunkwan University, Seoul, South Korea*

- Analysed performance of different state-of-the-art models like QA-GNN (Graph Neural Networks), and their ability to incorporate commonsense knowledge for Question-Answering (QA) task.
- Enhanced performance of QA-GNN by improving knowledge graph grounding method to make schema graphs more dense that contain information not explicitly mentioned in the Question or Answer.

Software Engineering Intern — Fall 2018
Fit AI Virtual Trainer Product — *Variance AI, Hyderabad, India*

- Designed a multi-class classification system to predict different yoga poses using Deep Learning techniques.
- Developed a Mobile App to capture and classify images, along with Active Learning on new captured images.

Selected Publications

Akshay Goindani, and Manish Shrivastava. 2021. A Dynamic Head Importance Computation Mechanism for Neural Machine Translation. ***In Proceedings of the International Conference on Recent Advances in Natural Language Processing***.

Key Projects

Hateful Meme Classification
- Built a Multi Modal Deep Learning Classifier to classify memes as hateful vs non-hateful (Link to GitHub), using ensemble of models like VisualBert, ERNIE-VIL, DeVLBERT, OSCAR, UNITER and LXMERT.
- Ranked 12^{th} on the leader-board of the competition hosted by Facebook AI.

Learning Bilingual Word Embeddings with Minimal Bilingual Data
- Implemented unsupervised method to learn bilingual word embeddings for English and Italian.
- Transformed word embeddings of both languages to a common embedding space using parameterized linear transformation. Optimised parameters using self training and a seed dictionary.
- Incorporated supervised learning with a few known translation pairs to the bilingual dictionary after every iteration. The code for the project is at GitHub.

Hybrid Machine Translation
- Proposed a Machine Translation approach that utilizes a combination of phrase tables extracted with Statistical Machine Translation methods, and the Sequence-to-Sequence architecture for Neural Machine Translation.
- Used phrase tables to lookup for translation of relevant source words, to replace the unknown tokens generated during translation.
- The proposed approach performs well and outperforms a Bi-LSTM model with attention mechanism, by 1 - 1.3 BLEU points, for low resource languages. The code for the project is available at GitHub.

DeepCrypt
- Developed Bayesian and Hyperplane Classifier for encrypted inputs and weights using comparison, argmax and dot product building blocks (Link to GitHub).
- Developed building blocks using DGK, Paillier and Goldwasser Micali Cryptosystem. Compared encrypted numbers using veu11 protocol.

Computer Vision
- Implemented a deep learning model for the Image-Caption retrieval task using pre-trained Resnet model as encoder and LSTM as a decoder.
- Built an Image Classification system using Convolutional Neural Networks and Residual Neural Networks.
- Implemented Object Detection and Localization model using YOLO algorithm in PyTorch.

Technical Skills

Languages: Python, C/C++, Matlab, Bash, HTML/CSS, JavaScript
Libraries: PyTorch, TensorFlow, Pandas, Matplotlib, NumPy, Scikit-Learn, LIME, Fairseq
Deep Learning Techniques: Autoencoders, RNN, CNN, GRU, LSTM, Transformers, BERT, VisualBERT, GNN, MLP

Courses

Artificial Intelligence	Natural Language Processing, Machine Learning, Statistical Methods in AI, Optimization Methods, Deep Learning Specialization, Artificial Intelligence
Computer Systems	Database Systems, Operating Systems, Software Engineering, Digital Signal Analysis and Applications, Computer Graphics
Mathematics	Discrete Maths, Linear Algebra, Probability & Statistics, Complex Analysis, Multivariate Analysis, Formal Methods
Security & Networks	Advanced Computer Networks, Principles of Information Security
Algorithm & Programming	Data Structures and Algorithms, Computer Programming

Teaching

Mentored students, provided multiple tutorials, designed and evaluated assignments, for courses:
Statistical Methods in AI (Fall'20), Computer Graphics (Spring'21), Automata Theory (Fall'19)

Achievements

- Dean's List Award for academic excellence (Top 5% of all students), 2018 - 2021
- ACM ICPC 2019 - Successfully cleared Online Round and secured rank 90 out of 300 candidates at Regional Level
- Recipient of MITACS Globalink Graduate Fellowship
- Qualified for pre-final round of Microsoft Codefundo++ 2018 and Flipkart GRID 2.0 Robotics Challenge.
- Secured an **All India Rank 1658** in the IIT-JEE Mains, across 1.4 million candidates, at National Level.
- Secured an **All India Rank 4218** in the IIT-JEE Advanced, across 0.2 million candidates, at National Level.