Jasivan Alex SIVAKUMAR

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QUALIFICATIONS

Sep 21 - Sep 25 **PhD in Computer Science** (Supervised by Dr. Nafise Sadat Moosavi)
Natural Language Processing Group, University of Sheffield, United Kingdom
Research title: *Numerical Reasoning for General-Purpose Language Models*
Focus: AI, ML, NLP, NLG, LLMs, Reasoning, Number Representation Learning, Tokenisation

Sep 20 - Sep 21 **MA Computational Linguistics - Distinction**
University of Wolverhampton, United Kingdom

Sep 16 - Sep 17 **PGCE (Mathematics)**
University of Cambridge, United Kingdom

Oct 12 - Jul 16 **MMath Mathematics – First Class**
University of Warwick, United Kingdom

PUBLICATIONS

1. FERMAT: An Alternative to Accuracy for Numerical Reasoning (**Sivakumar** & Moosavi, ACL 2023)
   ▹ Created more mathematical informative multi-view test sets for numerical reasoning in NLP to judge specific mathematical capabilities of models both in terms of numbers and operations, performed zero-shot evaluation of existing mathematics models, provided method for automatic data-augmentation of worded arithmetics problems to fine-tune models, demonstrated that diversity in language and mathematics representation significantly improve performance of FLAN, BART and T5 type LLMs, explored data-leakage to support improvement

2. A GRU-based Pipeline Approach for Word-Sentence Segmentation and Punctuation Restoration in English (**Sivakumar**, Muga, Spadavecchia, White & Can, IALP 2021)
   ▹ Train separate GRU architectures using PyTorch to retrieve spaces, period, comma and capital letter for unformatted text, create binary classification models on bigrams to identify insertion of aspect of interest, generate synthetic data for training the recovery of each aspect, investigate different evaluation metrics considering which align with improved human perception

RESEARCH ACTIVITIES

Sep 21 - Present **NLP for Endangered Language Revitalisation**
▹ Collect and digitise text data using OCR for Palenquero, an endangered language of Colombia. Deploy low-resource language NLP research to develop pedagogical resource

Nov 21 - Jun 22 **Speech Technology and NLP to improve Oral History Search functionality**
▹ Worked with Legasee, an oral history video archive, trained latest ASR systems on elderly speech and explore NER systems to identify domain specific terms to produce annotated transcripts to better search and retrieve video based on timestamps

Sep 20 - Sep 21 **Dissertation in Computational Linguistics** (Supervised by Dr. Burcu Can)
▹ "Improved Sentence Embeddings Using GAT with Siamese Neural Networks on UCCA Semantic Parse Trees", trained BERT embeddings with contrastive loss using Graph Neural Networks over parse trees to learn improve semantic representation of sentence embeddings for a downstream NLU task

Sep 15 - May 16 **Dissertation in Mathematics** (Supervised by Dr. Hugo Van den Berg)
▹ "A Mathematical Approach at Analysing the Influence of English in the French Language", collected news articles to generate a diachronic dataset and mathematically modelled the adoption of English lexica in French using stochastic and differential equations, analysed and explained trends using historical context

SKILLS

Programming

- Python (PyTorch, Huggingface, scikit-learn, NLTK)
- MATLAB
- Bash (HPC)
- Latex
- Version control (git/github)

Languages

- French (Native)
- Tamil (Native)
- English (Near Native)
- Spanish (Fluent)
- German (Conversational)

ACADEMIC ACTIVITIES

Nov 23 - Present **Transformers Workshop for Undergraduates**
▹ Teaching the latest deep learning techniques both theoretically and practically

Jun 23 **Invited Talk** - 3rd Speech and Language Technology CDT Conference
▹ Presented FERMAT research in main talk event

Mar 23 - May 23 **Supervisor for final year research project in NLP and representation learning**
▹ "How much does the number representation matter in downstream applications?"

Nov 22 - Feb 23 **Examiner for Text Processing and Professional Issues**
▹ Assessed student code and marked reports, provided feedback on assignments

Jul 22 **12th Lisbon Machine Learning Summer School**
▹ Attended lectures on linear classifiers, seq2seq models, neural networks and talks from industry and academia on novel research, networked with other attendees

Jan 22 - Jun 22 **Teaching Assistant for Foundations of Computer Science**
▹ Taught mathematical foundations such as probability, linear algebra and number theory

Jan 21 - May 21 **Machine Learning Tutorial for Postgraduate Computational Linguists**
▹ Explained mathematics using linguistics examples for kNN, decision trees, Naive Bayes, linear regressions, regularisation, beam search, EM algorithm, gradient descent, entropy