Swarnendu **Moitra**

Data Scientist · Linguist · Neuroscientist · Electronics Engineer

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Professional Experience

Pre Doctoral Research Assistant on the **SaVANT Project**   *London, United Kingdom*

Queen Mary University of London (Department of Linguistics)

New York University, Abu Dhabi (Computational Research Building)   *Aug. 2021 – present*

PI: Linnaea Stockall, Co-Is: Dustin A. Chacón, Alec Marantz

- Spearheaded groundbreaking research in neurolinguistics, driving projects from conception to publication (1 peer-reviewed paper) and extensive dissemination (10 conference presentations)
- Recruited over 200 participants for diverse neuroimaging (MEG) and behavioural experiments conducted across two universities.
- Leveraged machine learning algorithms (in Python & R) to analyze and model complex experimental data, extracting key insights.
- Empowered over 20 students (including undergraduates) from diverse backgrounds with a foundational understanding of linguistics & neuroscience through summer school programs.
- <u>Publications:</u> ① Moitra, S. et al. (2024). `How long is long? Word length effects in reading correspond to minimal graphemic units: An MEG study in Bangla.` **PLOS ONE, 19(4), e0292979** [Link].

Education

M.A in Linguistics – Jadavpur University   *2017 – 2019*

Distinction, Overall GPA: 9.53/10

- <u>Dissertation:</u> Neurocognition and Neurophysiology of Scope Ambiguity in Head Final Languages

B.Tech in Electronics and Communications Engineering – West Bengal University of Technology   *2013 - 2017*

Overall GPA: 7.67/10

- <u>Dissertation:</u> Study and analysis of data encryption techniques and implementation using MATLAB.

Skills

Programming	**python** [Scikit-learn, tensorflow, spaCy, eelbrain, mne-python], **R** [tidyverse, brms, lme4], **JavaScript**
Mark-up	LaTeX, (R)Markdown, quarto, HTML
Experiments	jsPsych, presentation, Linger, OpenSesame, PsychoPy, Ibex Farm
Exp. Hardware	**fMRI** (Siemens), **EEG** (BioSemi), **MEG** (Kanazawa Institute of Technology)

Research Projects

Democratizing AI Project   *Feb 2024 - Ongoing*

Dr. Haim Dubossarsky (Queen Mary University of London & Alan Turing-fellow)   *Collaborator*

1. Developed an innovative Word Sense Disambiguation (WSD) dataset adhering to the contemporary Word-in-Context (WiC) paradigm, addressing critical Natural Language Processing (NLP) challenges in low-resource languages.
2. Investigated the intricacies of polysemy in two Indian Languages, emphasizing the limitations of multilingual models (restructured into a binary classification task to accommodate contextualized embeddings) in direct transfer learning from English to Indian Languages.
3. Conducting an extensive evaluation of various pre-trained contextualized models (e.g., mBERT, XLM-R) under zero-shot and few-shot conditions. Demonstrated significant performance enhancement (from 55% to 90% accuracy) with Indian language-specific fine-tuning.

Stock Market Volatility of the G20 Countries: Effects of the 2007 Financial Crisis and Covid-19

Dec 2023 - March 2024

Ms. Eva Mondal (University of York)

Collaborator

1. Conducted an in-depth investigation of the effects of the 2007-08 Financial Crisis and COVID-19 pandemic on stock market volatility by analyzing 20 years of monthly stock market data from eight G20 countries.
2. Performed a comprehensive descriptive analysis of stock returns and volatility to identify trends. Implemented a fixed-effects panel regression model to isolate the impact of the crises while controlling for country-specific factors.
3. Tested hypotheses on the differential impacts of the crises on stock market volatility, uncovering varied responses between Western and Asian countries. The analysis revealed that during the COVID-19 pandemic, Asian countries experienced smaller increases in volatility compared to Western countries, whereas during the 2007-08 Financial Crisis, Asian countries exhibited significantly larger increases in volatility.

lexiVAULT - A Lexical database for understudied languages

Aug 2021 - Ongoing

Dr. Samantha Wray (New York University, Abu Dhabi & Dartmouth College)

Hind Saddiki (New York University, Abu Dhabi)

Collaborator(s)

1. Developed web scraping tools to enrich datasets by integrating with existing corpora, facilitating comprehensive text analysis.
2. Constructed language-specific stemmers for efficient cross-lingual text analysis.
3. Designed and implemented machine learning models for automated feature extraction and advanced lexical statistics calculation.
4. Developed a user-friendly, open-source interface for the public to access and utilize these tools, promoting collaboration and wider use.

Effects of scope interactions : An experimental study on Scrambling | **Project Website**

Feb 2020 - Ongoing

Dr. Paul Marty (L-Università ta' Malta)

Dr. Ishani Guha (Indian Institute of Technology - Delhi)

Collaborator(s)

1. **Co-designed and executed** behavioural psycholinguistic experiments to investigate the influence of *syntactic ambiguity* in sentence processing on speakers of Bangla from India and English from the UK.
2. Presented findings at **three** international conferences (2 proceedings published). The research is currently under peer-review in a high-impact journal.
3. **Responsibilities** : Developed and designed 100+ experimental stimuli, utilizing the jsPsych framework to build the online experiment. Managed experiment deployment on a local Linux server with recruitment platforms (Amazon Mechanical Turk/ Prolific) and implemented Node.js backend for real-time data collection and storage.

Decoding Visual Stimulus from Visual Cortex Data | **Neuromatch Project**

July 2020

Fatemeh Abdollahi (University of Alberta), Rekha Crawford (Swarthmore College)

Sreekar Reddy (University of Cincinnati), Pranjal Gupta (Indian Institute of Technology, Bombay)

Collaborator(s)

1. Leveraged Neuropixel data from the mouse visual cortex (Steinmetz dataset) to decode visual stimuli using various machine learning classifiers (LDA, Random Forest) during a Neuromatch Academy group project.
2. Successfully classified stimulus vs. no stimulus conditions and left vs. right visual contrasts with high accuracy using firing rate data. Random Forest achieved the best performance among the employed classifiers.

Manifestation of Agrammatism in Bengali - English Bilingual Aphasia

Sept 2019 - Oct 2019

Dr. Arpita Bose (University of Reading)

Prof. Niladri Sekhar Dash (Indian Statistical Institute - Kolkata)

Collaborator(s)

1. As an intern, I transcribed audio data from aphasic patients verbatim, completing a narration task and contributing to research on language production in aphasia.
2. Analyzed aphasic sentence production using Quantitative Production Analysis (QPA) and compared the results to those of healthy adult controls to identify patterns in language impairment.

Publications & Presentations

Invited Talks

Tracing word length in non-alphabetic orthographies

London, UK

Language and Mind, 30th November 2023

UK Research and Innovation (UKRI)

Understudied languages in neuroscience: from Slovenian to Arabic and more

UNIVERSITY OF LJUBLJANA, 18TH MAY 2023

Ljubljana, Slovenia

`V nevroznanosti šibkeje zastopani jeziki: od slovenščine do arabščine in še naprej`

Manuscripts

Beyond the Left Hemisphere: MEG Evidence for Right Temporal Lobe recruitment in Processing Morphosyntax

osf.io/3bc69

WITH DUSTIN A. CHACÓN AND LINNAEA STOCKALL

in prep

Impossible Numbers: Experimental Investigations into the Marked Values of Phi Features

osf.io/b7yex

WITH JANE MIDDLETON AND DANIEL HARBOUR

in prep

Interaction between Word Order, Quantifier Scope and Lexical Information.

osf.io/bkz72

WITH ISHANI GUHA AND PAUL MARTY

in prep

Publications

How long is long? Word length effects in reading correspond to minimal graphemic units: An MEG study in Bangla.

[Preprint] [doi]

MOITRA, SWARNENDU, DUSTIN A. CHACÓN, & LINNAEA STOCKALL.

2024

`PLOS ONE` 19(4), e0292979.

Study and analysis of data encryption techniques and implementation using MATLAB programming

[link]

ANANYA BANERJEE, SWARNENDU MOITRA, URMEE KARMAKAR, SAYAN GHOSH, SAHELI DATTA AND SANDIPAN DEBNATH

2017

`International Journal of Advanced Research in Computer Engineering and Technology (IJARCET)`

Volume 06, Issue 05, May 2017, ISSN : 2278 - 1323

Proceedings

Interaction between Word Order, Quantifier Scope and Lexical Information: Experimental Evidence from Bangla.

ISHANI GUHA, SWARNENDU MOITRA, PAUL MARTY

Forthcoming

in Proceedings of `the 57th Annual Meeting of the Chicago Linguistic Society.`

Inverse Scope in Scrambling Languages: the case of Bangla

ISHANI GUHA, SWARNENDU MOITRA, PAUL MARTY

IN PRESS

in Proceedings of the `39th West Coast Conference on Formal Linguistics.`

Conference Presentations (Talks/Posters)

Syntactic licensing and semantic interpretation processes occur in parallel in complex word recognition in Abugidas

Belgrade, Serbia

SWARNENDU MOITRA, DUSTIN A. CHACÓN AND LINNAEA STOCKALL

To Present

`International Word Processing Conference [WoProc 2024],`
University of Belgrade, Serbia. 2024

Tracing word length in non-alphabetic orthographies

Belgrade, Serbia

SWARNENDU MOITRA, DUSTIN A. CHACÓN AND LINNAEA STOCKALL

To Present

`International Word Processing Conference [WoProc 2024],`
University of Belgrade, Serbia. 2024

Towards developing a functional localiser for letter-specific brain responses for Bangla: An MEG Study

Kanpur, India

Swarnendu Moitra, Dustin A. Chacón and Linnaea Stockall

Presented

Annual Conference of Cognitive Science [ACCS - 10],
Indian Institute of Technology - Kanpur, 9 - 11 December, 2023

Syntactic vs. semantic computation in posterior temporal lobe: an MEG study on Bangla nominal prefixes.

Marseille, France

Swarnendu Moitra, Dustin A. Chacón and Linnaea Stockall

Presented

The Society for the Neurobiology of Language [SNL-2023],
The Palais du Pharo, Marseille, 24 - 26 October, 2023

Morphological decomposition in bilateral fusiform areas in Bangla: An MEG study.

Marseille, France

Swarnendu Moitra, Dustin A. Chacón and Linnaea Stockall

Presented

The Society for the Neurobiology of Language [SNL-2023],
The Palais du Pharo, Marseille, 24 - 26 October, 2023

The Effect of Determiner Type on Quantifier Scope Ambiguity in English and Bengali

Pittsburgh, USA

Ishani Guha, Swarnendu Moitra, and Paul Marty

Presented

Human Sentence Processing [HSP - 36],
University of Pittsburgh, Pittsburgh, 8 - 11 March, 2023

How long is long? An MEG study of M100 response in tracking word length in Bangla/Bengali

New Delhi, INDIA

Swarnendu Moitra, Dustin A. Chacón and Linnaea Stockall

Presented

9th Annual Conference of Cognitive Science [ACCS-9],
Indian Institute of Technology, Delhi, 8 - 10 December, 2022

How long is long? M100 response in Bangla tracks number of phonemes not graphemes of glyphs

Philadelphia, USA

Swarnendu Moitra, Dustin A. Chacón and Linnaea Stockall

Presented

The Society for the Neurobiology of Language [SNL-2022],
Loews Philadelphia Hotel, Philadelphia, 6 - 8 October, 2022

Morphological recomposition and the concrete/abstract distinction in Bangla

York, UK

Swarnendu Moitra, Dustin A. Chacón and Linnaea Stockall

Presented

Architectures and Mechanisms for Language Processing [AMLaP-2022],
The Principal, York, 7 - 9 September, 2022

Complex word de/recomposition across languages: lexical decision and MEG studies

Zurich, Switzerland

Linnaea Stockall, Dave Kenneth Cayado, Dustin Alfonso Chacón, Karin Kavcic, Swarnendu Moitra, Christina Manouilidou, Alec Marantz, Suhail Matar, Bojana Ristić, Samantha Wray and Rok Žaucer

Presented

The Crosslinguistic Perspectives on Processing and Learning [X-PPL 2022],
University of Zurich, 12 - 13 September, 2022

Interaction between Word Order, Quantifier Scope and Lexical Information: Experimental Evidence from Bangla

Illinois, USA

Ishani Guha, Swarnendu Moitra and Paul Marty

Presented

Annual Meeting of the Chicago Linguistic Society 57 [CLS - 57],
University of Chicago, 6 - 8 May, 2021

Inverse Scope in Scrambling Languages: the case of Bangla

Tucson, USA

Ishani Guha, Swarnendu Moitra and Paul Marty

Presented

West Coast Conference on Formal Linguistics 39 [WCCFL - 39],
University of Arizona, 8 - 11 April, 2021.

In Search of Inverse Scope in Bangla

Ishani Guha, Swarnendu Moitra and Paul Marty

Minneapolis, USA

Presented

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11th (Formal) Approaches to South Asian Languages, [(F)ASAL - 11]
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University of Minnesota 26th - 28th March 2021

Internships & Summer Schools

INTERNSHIPS

2018-19	**UGC-UPE II project - Intercultural Communication in Multilingual Urban Spaces**, part time field assistant for data collection and transcription (**Dept. of Linguistics, University of Calcutta - July 2018 - August 2019**)	*Kolkata*
2019	**Neuro Cognition Lab - Sir C V RAMAN Centre for Physics and Music**, Running Psycho/Neurolinguistic Experiments (**Jadavpur University, January 2019 - August 2019**)	*Kolkata*
2019	**Linguistic Research Unit (L.R.U)**, transcribe Audio data of Aphasic Patients (Verbatim) of a Narration task (**Indian Statistical Institute, Kolkata - Sept'2019**)	*Kolkata*

SUMMER SCHOOLS

2022	**SMLP 2022**, Sixth Summer School on Statistical Methods for Linguistics and Psychology, (Org. by : **University of Potsdam, Potsdam**)	*Germany*
2021	**CuttingEEG**, 5th symposium for cutting edge methods on EEG research. (Org. by : **Le Cube Université Aix-Marseille, Aix-en-Provence**)	*France*
2020	**Neuromatch Academy**, Online summer school for Computational Neuroscience (Org. by : **IEEE brain, Facebook Reality labs, UPenn, DeepMind and others**)	*Online*
2019	**ESSLLI - 31**, European Summer School in Logic, Language and Information (Org. by : **University of Latvia**)	*Riga, Latvia*

Grants and Achievements

United Kingdom Research and Innovation (UKRI) - Global Talent — *2021*

Endorsed by **UKRI**, sponsored by the Department for Science, Innovation and Technology (DSIT) in support of the Global Talent Migrant Visa for conducting Neuroscience research in the UK.

Rashtriya Uchchatar Shiksha Abhiyan (RUSA) - Travel Grant for Overseas Conference — *Jun 2019*

Awarded **1125 USD** Travel Grant in support for paper presentation at **25th Himalayan Languages Symposium**

Neuromatch Academy Summer School — *2019-20*

Awarded Full scholarship to attend the Summer School

Swami Vivekananda Merit-cum-Means Scholarship — *2019-20*

Awarded **850 USD** scholarship per-annum for MPhil.

University Grants Commission (UGC) - (NET) National Eligibility Test in Linguistics — *Dec 2018*

Qualified for Assistant Professor in India

Services

TEACHING

2024	**Course Instructor**, Experimental Linguistics Taster Day - 12th June (Org. by : **Queen Mary University of London**)	*London, UK*
2023	**Course Instructor**, Winter Workshop on Neurolinguistics (Org. by : **Queen Mary University of London**)	*London, UK*

| 2023 | **Teaching Assistant,** London Summer School on Neurolinguistics
(Org. by : **Queen Mary University of London)** | *London, UK* |
| 2022 | **Teaching Assistant,** London Summer School on Neurolinguistics
(Org. by : **Queen Mary University of London)** | *London, UK* |

OTHERS

2020	**Local Organizing Committee,** International Conference on Rhythm in Speech and Music (Org. by : **Jadavpur University)**	*Kolkata, India*
2019	**Organizing Committee,** 7th International Conference on Endangered and Lesser Known Languages (Org. by : **Jadavpur University**)	*Kolkata, India*
2018	**Organizing Committee,** 46th All India Conference of Dravidian Linguists (Org. by : **Jadavpur University**)	*Kolkata, India*

Extracurricular Activity

LingClub, Jadavpur University *Jadavpur University*

CO-FOUNDER AND COORDINATOR *Aug. 2018 - 2021*

- The LingClub of the School of Languages and Linguistics,Jadavpur University, is an initiative by the current students of the school to concert their efforts to organise 1. LINGVISTIKO (Colloquium) 2. ARTICULATE (Reading Group) 3. ASSIMILATION(Outreach Prog)

Hindustani Classical Flautist

TRAINED IN NORTH - INDIAN STYLE CLASSICAL MUSIC

- Completed 2nd Year Diploma in Hindustani Classical Music : Bamboo Flute (Bansuri)

Referees

Dr Dustin A. Chacón (PhD, University of Maryland) *University of Georgia ⇒UC Santa Cruz*

ASSISTANT PROFESSOR IN DEPARTMENT OF LINGUISTICS

`dustin.chacon@uga.edu`

Dr Linnaea Stockall (PhD, Massachusetts Institute of Technology) *Queen Mary University of London*

PROFESSOR IN DEPARTMENT OF LINGUISTICS

`l.stockall@qmul.ac.uk`