

Rahul Chatterjee

Education

- Sep 2020 - **Master of Science (Thesis)**, *Neuroscience*, McGill University, Supervisors: Prof. Marie-Hélène Boudrias; Prof. Georgios D. Mitsis
May 2022 GPA – 4.0/4.0.
- Aug 2016 - **Bachelor of Engineering**, Department of Electronics and Telecommunication Engineering,
May 2019 Jadavpur University, GPA – 8.56/10.0.

Links

Portfolio: <https://rahulchatterjee07.github.io/>
LinkedIn: <https://www.linkedin.com/in/rahul-chatterjee-m-sc-878a61145/>

Technical experience

- SiftMed Inc** Ottawa, Canada(remote)
Data Scientist May 2022 - Present
- Developed machine learning models and algorithms to process and understand large volume of unstructured text.
 - Used predictive analytics for tasks such as invoice processing, contract analysis, insurance claims processing using document workflows
 - Worked on Amazon Bedrock and prompt engineering for advanced information extraction using state-of-the-art LLMs.
 - Leveraged techniques like prompt chaining, Chain of Thought reasoning, tool usage with LLMs, and prompt compression to optimize performance and reduce cost.
 - Applied zero-shot and few-shot learning for structural information extraction with LLMs.
 - Experience in preprocessing and cleaning the text data - tokenization, stemming, lemmatization, and removing PII and Feature Engineering - Word2Vec, GloVe, fastText, Topic modelling
 - Transformer-Based Model Fine-Tuning with Hugging Face (e.g., Phi-3.5, Mistral, LLaMA, Qwen)
 - Model Deployment on SageMaker Endpoint (both server and serverless)
- Zummit Infolabs** Toronto, Canada
Machine learning consultant Dec 2021 - Mar 2022
- Fine-tuned CNN and RNN models for multiple tasks including Object Detection, Sentiment Analysis and Time Series Forecasting.
 - Implemented hyperparameter optimization/tuning methods (e.g. grid search, random search, hyperband, bayesian optimization with gaussian processes (BO-GP)) for machine learning (Logistic Regression, Random Forest, LDA, PCA, SVM, KNN) and deep learning (Artificial Neural Networks) models.
- McGill University** Montreal, Canada
Graduate Research Assistant Sept 2020 - May 2022
- Time series analysis for detection of transient event-related spikes from EEG data using Time-Delay Embedded (TDE) Hidden Markov model.
 - Regression analysis (mixed effect model and GLM) to find correlation between EEG data and motor performance.

Relevant Coursework

University	Artificial Intelligence and Pattern Recognition, Computer Programming and Numerical Analysis, Digital Signal Processing, Signals and Systems, Control Engineering, Embedded Systems
Certification	Big Data 101 (IBM), Git for Data Science (DataCamp), Introduction to SQL (DataCamp), ETL in Python (DataCamp)

Technical skills

Languages	C++ and Python (Scikit-learn, Matplotlib, Tensorflow, Pytorch, OpenCV), R (Ggplot2, Dplyr etc. lib), Matlab
Tools	AWS step function, Lambda, ECS Fargate, S3, DyamoDB, RDS, Sagemaker, HuggingFace LLM interface, MySQL, PostgreSQL

Major Projects

Multimodal QnA System for Personal Injury Case Data (AWS Bedrock + Claude Sonnet)

- Developed a domain-specific QnA platform to extract insights from healthcare documents in personal injury cases using image and text inputs and summarize them in client-specific format.
- Utilized Claude Sonnet (via AWS Bedrock) to process and answer questions from complex medical documents.
- Supported multimodal input (scanned images + text) for real-world legal/medical data scenarios
- Extracted context from forms, assessments, and clinical reports for case-relevant answers.
- Integrated with LangChain to orchestrate prompt chains and manage retrieval-augmented generation (RAG)
- Applied dynamic prompt templating to improve context alignment and reduce hallucinations
- Achieved significant improvement in precision and coverage compared to baseline keyword-based extraction

Insurance Claim Auditor: Medical Timeline and Fraud Detection with LLMs

- This project simulates an advanced LLM-based pipeline for insurance claim analysis, specifically targeting Ontario Claim Forms (OCFs), medical invoices, and duplicate billing detection.
- The system combines fast inference with Hugging Face Phi-3.5 and structured JSON generation using fine-tuned LLaMA, and is deployable to Amazon SageMaker.
- Further, it extracts chronological medical events from unstructured documents and parses OCF-21, OCF-18 and OCF-23 forms to extract claimed amounts.
- Finally, it identifies invoices and maps them to treatment categories and detects duplicate or overlapping billings for fraud prevention. Outputs standardized JSON for downstream audit tools.

Intelligent Prompt Routing Engine using AWS Textract Layout for LLM Preprocessing

- Developed a rule engine to route documents to appropriate LLM prompt templates based on content and layout.
- Leveraged AWS Textract layout analysis (tables, forms, headers, key-value pairs) to infer document type and structure.
- Created preprocessing rules to differentiate between forms, reports, assessments, and correspondence.
- Enabled the system to trigger custom prompt templates per document class for improved response accuracy.
- Rules included logic on keyword presence, layout patterns, and section hierarchy (e.g., header followed by checklist).
- Significantly improved LLM context alignment, reduced hallucination, and boosted overall response precision.

Medical Chronology Builder with Hugging Face Phi-3.5 and Fine-Tuned LLaMA

- Built a pipeline to extract structured medical events in chronological order from unstructured documents.
- Used Hugging Face Phi-3.5 for fast, lightweight inference on general document understanding tasks.
- Leveraged fine-tuned LLaMA for high-precision, JSON-based output extraction tailored to medical timelines.
- Applied prompt tuning to enforce consistent JSON schema ("event": ..., "date": ..., "details": ...) for downstream usability
- Deployed the hybrid system to a real-time Amazon SageMaker endpoint for secure, scalable access

Scalable Text and Transaction Intelligence System with Statistical Modeling and AWS QuickSight Dashboard

- Designed and deployed a robust pipeline to transform raw enterprise text and transactional data into actionable insights using fundamental NLP, classic machine learning, and statistical modeling.
- Engineered regex-driven parsers and rule-based logic to extract key fields (e.g., dates, prices, vendors, references) from unstructured sources like receipts, support logs, invoices, and contracts.
- Implemented NER pipelines with spaCy and domain-specific keyword lists to detect organization names, transaction types, and location entities and Built document classifiers (e.g., SVM, logistic regression) to auto-categorize uploads into types such as Trip Receipt, Support Ticket, or Refund Claim.
- Delivered a fully interactive AWS QuickSight dashboard, allowing non-technical stakeholders to filter by region, vendor, transaction type, and instantly visualize fraud trends, response times, and operational KPIs.

Award & Scholarships

- Sept. 2021 Elaine Belanger Graduate Studentship in Medical Research (value \$10k CAD)
June 2021 CRIR Graduate Fellowship (value \$8k CAD)
Sept. 2020 MITACS Globalink Graduate Fellowship (value \$15k CAD)
Sept. 2020 IPN Graduate Excellence Fellowship (value \$5k CAD)
May 2019 MITACS Globalink Research Internship Award (value \$8k CAD)
Feb. 2019 Singapore International Pre-graduate Award (SIPGA) by A*STAR Graduate Academy.

Publications (Poster Presentations)

1. Characteristics of Beta Burst in The Motor Cortex During a Unimanual Motor Task. Yan X., **Chatterjee R.**, Lungoci G., Mitsis G., Boudrias M.H. QBIN Scientific Day, March 10th, 2021
2. Characterization of Beta Bursts in the Motor Cortex During Unimanual and Bimanual Movement. **Chatterjee R.**, Lungoci G., Yan X., Mitsis G., Boudrias M.H. OHBM 2022 Annual Meeting. June 19, 2022 - June 23, 2022, Glasgow
3. Transient Event Dynamics in the Motor Cortex during Handgrip Tasks. **Chatterjee R.**, Lungoci G., Yan X., Mitsis G., Boudrias M.H. 4th Quebec Congress in Adaptation-Rehabilitation Research. REPAR. June 2022, Canada.
(*) Published abstract - McGill Journal of Medicine Vol. 20 No. 1 (2022); DOI: <https://doi.org/10.26443/mjm.v20i1.923>
4. Age-related changes in MEG beta bursts during rest and hand movements. Javier M. Antelis, **Chatterjee R.**, Lungoci G., Mitsis G., Boudrias M.H. jneurosci (Journal of Neuroscience)