# Swarup Ranjan Behera, Ph.D.

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# **Professional Experience**

| Nov 2024 – Present   | Data Scientist, NLP, ExxonMobil (EMSTPL), Bengaluru, India.           |
|----------------------|-----------------------------------------------------------------------|
| Sept 2021 – Oct 2024 | Research Scientist, NLP-Speech, Reliance Jio AICoE, Hyderabad, India. |

### Skills

| Languages  | Python, R, C, Java, Matlab.                                                                                                                                                                                              |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Frameworks | PyTorch, Tensorflow, Hugging Face Transformers, Databricks, FastAPI, Gradio.                                                                                                                                             |
| Expertise  | Large Language Models (LLMs), Retrieval-Augmented Generation (RAG), Seq-to-Seq<br>Tasks, Cross-Lingual Tasks, NLU, NLG, Conversational AI, Chatbots, Audio Language<br>Models (ALMs), and Vision Language Models (VLMs). |
| Misc.      | CI-CD, Docker, Kubernetes, Azure, MySQL, MongoDB, GitHub, Linux, LATEX.                                                                                                                                                  |

# Products

2023 📕 Call Audit Automation

Engineered a large-scale speech and text analytics system for call centers, automating compliance audits and quality assessments. Designed a robust NLP pipeline for processing multilingual conversational data, leveraging sentiment analysis and domain-specific language models to enhance customer experience. Deployed at Jio and Ajio call centers, achieving over 95% accuracy in automated call evaluations.

### 2022 **Patient Notes Conversion**

Developed an AI-driven clinical documentation system that converts spoken patient interactions into structured medical notes, streamlining physician workflows. Designed a specialized NLP pipeline for processing medical text and fine-tuning domain-specific language models. Currently operational at Reliance Hospital, generating SOAP notes with 94% accuracy, significantly reducing manual documentation effort.

# **Applied Projects**

### 2025

### Fleet Optimization

Designing an advanced LLM-driven pipeline on Databricks to systematically classify maintenance logs from pump and motor repairs, mapping engineer-reported issues to standardized failure categories. Employing zero-shot and few-shot learning with RAG and LangChain to enhance anomaly detection by correlating actual repairs with expected maintenance patterns. Synthesizing high-fidelity training data using LLMs to fine-tune lightweight models for scalable deployment.

### Leak Investigation

Developing a specialized LLM-powered framework on Databricks to extract critical insights from leak descriptions in oil well equipment, accurately identifying failure components, spilled substances, and root causes. Integrating zero-shot and few-shot learning with RAG and LangChain to refine contextual understanding and improve precision. Generating domain-specific synthetic datasets via LLMs to train compact models for real-time fault detection and predictive maintenance.

# **Applied Projects (continued)**

Indic LLM 2024 Worked on developing Indic LLMs by extending the vocabulary of pretrained tokenizers and fine-tuning on multilingual Indic datasets like Sangraha. Focused on adapting open-source models such as Mistral and Llama to improve their effectiveness for Indian languages. Agriculture LLM Contributed to building specialized LLMs for agriculture by fine-tuning open-source models like Mistral and Llama on agricultural datasets. Integrated RAG to enhance retrieval and generate context-aware insights. Art VLM Built an Art VLM by fine-tuning open-source models like LLaVA on art datasets for improved visual art understanding, encompassing captioning, retrieval, and VQA. Agriculture Time Series Analysis 2023 Developed time series models like ARIMA, LSTM, and Transformer to enhance decision-making and resource management in agriculture, advancing towards building Time Series LLMs. **PDF Voicebot** Developed customized PDF voicebots integrating RAG on PDF documents with open-source LLMs for effective answer generation, deployed successfully across various domains. 2022 Hospital Voicebot Implemented a voice bot system using ASR, Rasa NLU, and TTS modules to streamline call center operations for scheduling doctor appointments. Achieved a workload reduction of 20-30%. Aspect-based Sentiment Analysis Developed a model to extract aspects and sentiment from customer-agent interactions by finetuning a transformers-based model with domain-specific data. Integrated vernacular translation, enabling analysis of customer issues and sentiments in Indian languages.

#### 2021 Contract Review AI (CRAI)

Developed a CRAI system that autonomously extracts and identifies key clauses from legal contracts, leveraging a BERT-based model for enhanced contract analysis and clause identification.

### Education

| 2015 – 2021 | Ph.D., CSE, IIT Guwahati.                                                 |
|-------------|---------------------------------------------------------------------------|
|             | Thesis: Learning Player-specific Strategies using Cricket Text Commentary |
| 2013 - 2015 | M.Tech., CSE, IIT Guwahati.                                               |
|             | Thesis: Spectral Clustering Using Convex and Constrained Settings.        |
| 2008 – 2012 | <b>B.Tech.,</b> CSE, VSSUT Burla.                                         |
|             | Thesis: A Novel Ontology Based Entity Relationship Model.                 |

### **Selected Publications**

- O. C. Phukan, M. M. Akhtar, S. R. Behera, *et al.*, "Strong alone, stronger together: Synergizing modality-binding foundation models with optimal transport for non-verbal emotion recognition," in *ICASSP*, 2025.
  - S. R. Behera, A. Dhiman, K. Gowda, and A. S. Narayani, "Fastast: Accelerating audio spectrogram transformer via token merging and cross-model knowledge distillation," in *INTERSPEECH*, 2024.
  - S. R. Behera, O. C. Phukan, P. Mallick, A. S. Narayani, A. B. Buduru, and S. Rajesh, "Towards multilingual audio-visual question answering," in *INTERSPEECH*, 2024.

S. Jain, O. C. Phukan, S. R. Behera, A. B. Buduru, and R. Sharma, Sequifi: Mitigating catastrophic forgetting in speech emotion recognition with sequential class-finetuning, 2024. arXiv: 2410.12567. O. C. Phukan, S. R. Behera, M. M. Akhtar, A. B. Buduru, and R. Sharma, Beyond speech and more: Investigating the emergent ability of speech foundation models for classifying physiological time-series *signals*, 2024. arXiv: 2410.12645. O. C. Phukan, S. R. Behera, Girish, et al., Representation loss minimization with randomized selection strategy for efficient environmental fake audio detection, 2024. arXiv: 2409.15767. O. C. Phukan, S. R. Behera, S. Singh, et al., Avengers assemble: Amalgamation of non-semantic features for depression detection, 2024. arXiv: 2409.14312. O. C. Phukan, S. Jain, S. R. Behera, A. B. Buduru, R. Sharma, and S. R. M. Prasanna, Are music foundation 8 models better at singing voice deepfake detection? far-better fuse them with speech foundation models, 2024. arXiv: 2409.14131. O. C. Phukan, D. Koshal, S. R. Behera, A. B. Buduru, and R. Sharma, Multi-view multi-task modeling with speech foundation models for speech forensic tasks, 2024. arXiv: 2410.12947. O. C. Phukan, D. Singh, S. R. Behera, A. B. Buduru, and R. Sharma, Investigating prosodic signatures via 10 speech pre-trained models for audio deepfake source attribution, 2024. arXiv: 2412.17796. 11 S. R. Behera, K. M. Injeti, J. S. K. Patibandla, P. K. Pokala, and B. R. Pailla, "Aquallm: Audio question answering data generation using large language models," arXiv preprint arXiv:2312.17343, 2023. S. R. Behera, P. B. Reddy, A. M. Tripathi, B. R. Megavath, and T. Karavadi, "Towards multi-lingual audio 12 question answering," in INTERSPEECH, 2023. S. R. Behera and V. V. Saradhi, "Cricket player profiling: Unraveling strengths and weaknesses using 13 text commentary data," arXiv preprint arXiv:2311.06818, 2023. A. M. Tripathi, S. R. Behera, and K. Paul, "Adv-ifd: Adversarial attack datasets for an intelligent fault diagnosis," in *IJCNN*, 2022. A. M. Tripathi, S. R. Behera, and K. Paul, "Investigation of performance of visual attention mechanisms for environmental sound classification: A comparative study," in *IJCNN*, 2022. A. M. Tripathi, S. R. Behera, and K. Paul, "K-defensive bit planes: Defense against adversarial attacks," in *IJCNN*, 2022. A. M. Tripathi, S. R. Behera, and K. Paul, "Reverse adversarial attack to enhance environmental sound 17 classification," in *IJCNN*, 2022. S. R. Behera and V. V. Saradhi, "Learning strength and weakness rules of cricket players using 18 association rule mining," in MSLA21, ECML/PKDD, 2021. S. R. Behera and V. Saradhi, "Mining temporal changes in strengths and weaknesses of cricket players using tensor decomposition," in ESANN, 2020. 20 S. R. Behera, P. Agrawal, A. Awekar, and V. S. Vedula, "Mining strengths and weaknesses of cricket players using short text commentary," in ICMLA, 2019. Awards and Achievements

| 2020-24 | <b>PCM and Reviewer</b> , ECML-PKDD, IEEE VIS, TASLP, ICASSP, WACV, ICME.               |
|---------|-----------------------------------------------------------------------------------------|
| 2020    | Best Research Award, Ohio State Sports Analytics Association Conference, Columbus, USA. |
| 2013-21 | Grants and Fellowships, MHRD Government of India Fellowship for MTech and PhD.          |
| 2013    | GATE 2013, All India Rank 696.                                                          |

# References

#### **Dr. Vijaya Saradhi Vedula** Associate Professor Department of CSE, IIT Guwahati. saradhi@iitg.ac.in

#### Dr. Amit Awekar

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#### **Prof Ashish Anand** Professor Department of CSE, IIT Guwahati. anand.ashish@iitg.ac.in