

# INDRANEIL PAUL

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I am a doctoral researcher interested in optimising **code generation** LM pre-training and post-training, with an emphasis on **tool usage** and **multilingual performance**. My long-term mission is to enhance model tool use, unlocking the application of LMs beyond text-only settings to areas such as **robot navigation** and **agentic workflows** by improving their capabilities to **reason**, **offload computation**, and learn from **environmental feedback**. I also work on **preference learning** methods to enhance LMs' code generation capabilities along non-functional axes, such as **security** and **efficiency**. My interests span all facets of improving LM training efficacy, including **data curation**, **context length extension**, **modularity**, and **reinforcement learning**. I am also a long-standing open-source contributor to multiple public repositories and have worked on numerous **open-source** LM releases.

## III EDUCATION

- 09/22 – Pres. ELLIS PhD Candidate in Informatics, TU Darmstadt, Germany  
07/17 – 07/19 Masters by Research in Computer Science, IIIT Hyderabad, India  
08/13 – 05/17 Bachelors of Technology in Computer Science, IIIT Hyderabad, India

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## SUMMER SCHOOLS

- 07/23 Lisbon Machine Learning Summer School (LxMLS)  
07/21 European Summer School in Logic, Language and Information (ESSLLI)

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## IV INDUSTRY EXPERIENCE

- 10/25 – 03/26 Applied Scientist PhD Intern, Amazon Inc. (Web Services), Berlin  
➢ Researched RL methods to reduce the cloud tool-calling error-rate in **Amazon Q Developer** agent  
➢ Explored asynchronous RL approaches for improved distributed training efficiency  
➢ Automated RL environment creation for agents using infrastructure-as-code emulators  
**HuggingFace Transformers** **VeRL** **Megatron-LM** **LocalStack** **AWS Fargate** **AWS AgentCore** **AWS SageMaker**
- 04/20 – 08/22 Applied Scientist, Amazon Inc. (Advertising), Bangalore  
➢ Created text, image and multi-modal models for improving EU ad moderation automation by 28%  
➢ Researched multi-modal, multi-lingual and multi-task pre-training objectives for ad catalog tagging  
➢ Devised sample-efficient training methods for ViT models using self-labelling and sub-task distillation  
**HuggingFace Transformers** **PyTorch** **CUDA C++** **TensorRT** **AWS SageMaker**
- 07/19 – 03/20 Software Development Engineer, Amazon Inc. (Logistics), Hyderabad  
➢ Implemented a planner enabling merchants to rank options and schedule last-mile package drop-offs  
➢ Oversaw database tuning, JVM optimizations and message queue setup for event ingestion service  
**Spring** **METIS** **Java** **AWS SNS** **AWS SQS** **AWS DynamoDB**

## V RESEARCH EXPERIENCE

- 09/22 – 12/26 Doctoral Researcher, TU Darmstadt Ubiquitous Knowledge Processing Lab, Darmstadt  
➢ Researched comparative benefits of various PEFT and MoE methods  
➢ Implemented LLVM IR grounding for improving the multilingual performance of code LMs  
➢ Demonstrated the benefits of pre-training code LMs with obfuscation grounding  
➢ Investigating code LM improvement along non-functional axes like runtime  
➢ Created and solely maintained **VLLM-Code-Harness**, a library for efficient code LM evaluation  
**GPT-NeoX** **HuggingFace Transformers** **Axolotl** **TRL** **DistilLabel** **Docker** **LLVM**
- 06/17 – 08/19 Research Assistant, IIIT-H Language Technologies Research Center, Hyderabad  
➢ Employed temporal activity, network and Tweet-based features to characterize verified users on Twitter  
➢ Curated a **dataset** of 235K+ verified Twitter users, containing 79M+ edges and 494M+ Tweets  
**Graph-Tool** **FastAI** **Neo4j** **AllenNLP** **Twitter API** **PoweRLaw** **R**
- 06/18 – 07/19 Research Assistant, IIIT-H Machine Learning Lab, Hyderabad  
➢ Researched constraint-aware two-sided matching algorithms on dynamic bipartite graphs  
➢ Benchmarked non-manipulable preference elicitation mechanisms for ride-sharing drivers  
**ParamILS** **CVXOpt** **MATLAB** **C++**

# OPEN SOURCE EXPERIENCE

- 04/24 – 09/24 MaLA-LM, UTTER Project
- Conducted SOTA multilingual continual pre-training evaluations on frontier LMs
  - Investigated the code completion performance of multilingual LMs in non-English language prompts
  - Worked on the **EMMA-500** model and **MaLA-2** massively multilingual corpus releases
- HuggingFace Transformers Megatron-DeepSpeed DeepSpeed Docker
- 06/23 – 09/24 BigCode Project, ServiceNow and HuggingFace
- Contributed to **StarCoder-2** pre-training data collection and training ablations
  - Worked on containerization, evaluation framework and annotation for **BigCodeBench**
- LLVM HuggingFace Transformers Megatron-LM Docker
- 05/17 – 07/17 Google Summer of Code, Green Navigation
- Implemented an LSTM forecaster for the **EV-Charge-Prediction** project to alleviate range anxiety
  - Implemented an ensemble solution that reduced absolute forecasting error by 39%
  - Productionized the Bayesian Optimization service for optimal hyper-param selection in training jobs
- TensorFlow Pandas BayesOpt

## INVITED TALKS

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|-------|--|--|
| 10/24 | Challenges in Code LMs, IIIT Hyderabad                 |  Slides |
| 09/24 | Code Generation : Challenges and Solutions, BHT Berlin |  Slides |
| 04/23 | Parameter-Efficient Fine-Tuning for NLP, MBZUAI        |  Slides |
| 01/23 | Multilingual Adapters, TU Darmstadt                    |  Slides |

## SELECTED PUBLICATIONS

### DROID : A RESOURCE SUITE FOR AI-GENERATED CODE DETECTION

EMNLP 2025, Suzhou

Daniil Orel et al. (incl. Indraneil Paul)

 ABSTRACT

 PDF

### MASSIVELY MULTILINGUAL ADAPTATION OF LARGE LANGUAGE MODELS USING BILINGUAL TRANSLATION DATA

DMLR 2025 (Under Review)

Shaoxiong Ji et al. (incl. Indraneil Paul)

 ABSTRACT

 PDF

### OBSCURACODER : POWERING EFFICIENT CODE LM PRE-TRAINING VIA OBFUSCATION GROUNDING

ICLR 2025 Poster, Singapore

Indraneil Paul et al.

 ABSTRACT

 PDF

### BIGCODEBENCH : BENCHMARKING CODE GENERATION WITH DIVERSE FUNCTION CALLS AND COMPLEX INSTRUCTIONS

ICLR 2025 Oral, Singapore

Terry Yue Zhuo et al. (incl. Indraneil Paul)

 SLIDES

 ABSTRACT

 PDF

### IRCODER : INTERMEDIATE REPRESENTATIONS MAKE LANGUAGE MODELS ROBUST MULTILINGUAL CODE GENERATORS

ACL 2024 Oral, Bangkok ( Outstanding Paper)

Indraneil Paul et al.

 SLIDES

 ABSTRACT

 PDF

### STARCODER 2 AND THE STACK V2 : THE NEXT GENERATION

TMLR 2024

Anton Lozhkov et al. (incl. Indraneil Paul)

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 ABSTRACT

 PDF

### ADAPTERS : A UNIFIED LIBRARY FOR PARAMETER-EFFICIENT AND MODULAR TRANSFER LEARNING

EMNLP 2023 System Demonstrations, Singapore

Clifton Poth et al. (incl. Indraneil Paul)

 DEMO

 ABSTRACT

 PDF

### SUB-TASK IMPUTATION VIA SELF-LABELLING TO TRAIN IMAGE MODERATION MODELS ON SPARSE NOISY DATA

CIKM 2022 Oral, Atlanta

Indraneil Paul et al.

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 ABSTRACT

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