TAWSIF AHMED

Al researcher



Cambridge, Massachusetts, USA tawsif.ahmed@science.ru.nl sleeping4cat@gmail.com Cell: +880 (198) 785-8562 LinkedIn: https://www.linkedin.com/in/sleepingcat4/ GitHub: https://github.com/sleepingcat4 Website: https://sleeping4cat.github.io/little-dream/ LeetCode: https://leetcode.com/sleeping4cat/

I have five years of research experience in the Artificial Intelligence field. Where I had led numerous teams with successful outcomes. With a strong grasp of TensorFlow and Pytorch frameworks and NumPy, scikit-learn library. Research experience include: Advanced Algorithms, Algorithm, Optimization, Natural Language Processing, Computer Vision and Physics inspired architectures. Although experience largely pertains to Architecture development, I have equally good experience in training models on large scales in the Medicine and Linguistics domain. Lastly, a concrete understanding of activation functions and Bayesian school of thought and deploying neural network models with scalability and Microsoft Azure.

PROFESSIONAL EXPERIENCE

LEAD AI RESEARCHER HARVARD GAMI, HAVRARD UNIVERSITY, Cambridge, MA

September 2022–Present (Full-time)

- Currently, developing state of the art artificial intelligence solutions to detect cancer in its early stages via medical scans.
- Combined grid search and second derivative optimizers to achieve high accuracy
- Developed two fully automated and semi-automated masking solutions, through FAIR's SAM and QuPath models to annotated the datasets
- Benchmarked models between first derivative and second derivative optimizer trained models
- Collaborating with Dr. Anna Yaraslovsky (University of Massachusetts Lowell) and Dr. Victor Neel (Massachusetts General Hospital) to deploy it for clinical trials in Massachusetts General Hospital by the fall.

PORJECT TEAM LEAD

HARVARD GAMI, HARVARD UNIVERSITY, Cambridge, MA

November 2023-Present (Full-time)

- Leading a team of 5 Harvard students composed of undergrad and predominantly graduate students. Graduate students are awardees of the prestigious Bertarelli Fellowship.
- Responsible for both the overall leadership wing of the team and Artificial Intelligence wing as • well.
- Currently, leading "ML Fracture Optimisation" project under the supervision of Prof. Shriya Srinivasan and advisor Kiran Agarwal-Harding.
- We're developing a multimodal solution and a proprietary dataset through collaboration with Harvard Medical School and Massachusetts General Hospital.
- With a deadline of March 2024 and either having a research paper at NeurIPS Or receive funding (investment) from Venture Capitalists and develop an Intellectual Property (IP).

GUEST RESEARCHER

GENZEL LAB, DONDERS INSTITUTE OF BRAIN, COGNITION AND BEHAVIOUR, RADBOUD UNIVERSITY, Netherlands

February 2024 - Present (Part-time)

- Research internship and commitments with Prof. Lisa Genzel & Prof. Paul Tsienga
- Working on Prof. Paul's brain imagery and Neuroscience project
- Unfortunately, can't provide further information. (Non-disclosure)

LEAD AI RESEARCHER

THE PLASTIC PROJECT, Kirkland, Washington

April 2023-Present (Part-time)

- Helped high schoolers to develop a DIY powerful image classifier using Lobe.ai
- (Reverse Engineered + re-wrote WasteNet) (UK Government's waste management DL model) to classify garbage adhering to Kirkland laws.
- Working alongside the local government for the deployment of our solutions in the community and through governmental recycling applications.
- Packaged the website in PWA.
- Currently deployed and accessible online

UI/UX DESIGNER & DEVOPS

OCTOML, Seattle, Washington

October 2022-November 2022 (Contractor)

- Provided feedback & advise to improve the platform for fast deployment by AI researchers and people will little knowledge in DevOps
- Pointed out flaws and unrequired complexities of both the UI and the DevOps portion of the platform.

BEAMLINE FOR SCHOOLS COACH

PAKISTAN ATOMIC ENERGY COMMISSION, PAKISTAN

January 2023-Present

- Taught high school students high energy physics and Machine Learning
- Helped them to develop both idea and proposal for Beamline for Schools
- Helped the students to create a Quantum Algorithm to recognise faint sounds produced by particles while they collide and recognise particles based upon that

SOFTWARE/ALGORITHM TESTER

TARTEEL AI, San Francisco, California

August 2020-September 2020 (Part-time)

• Tasked to test app UI and voice recognition Algorithm

VOLUNTEER LECTURER

ARTE, The Open Lab, Yale University, New Haven, Connecticut

October 2021-October 2021 (2 weeks)

• Taught New Haven School Students Electrical Physics (performing Circuits and switch making & experiments)

RESEARCH COLLABORATION IFJ PAN INSTITUTE OF NUCLEAR PHYSICS POLISH ACADEMY OF SCIENCES December 2021-March 2022

Collaborated with Krzysztof Woźniak to create DIY Neutrino Detector for Beamline for Schools competition

EDUCATION

DHAKA CITY COLLEGE, Dhanmondi, Dhaka

September 2020 – February 2023

High School Degree in (Literature + Pure Science + Maths + Computer Science), Grade: A (*Taking a Gap Year*)

Key Points:

- Studied introductory Quantum Mechanics and advanced Mathematics
- ICT aka Computer courses included courses in Circuits, programming in C++ & web development
- Selected to be club president in two different clubs i.e. Debate & English
- Active member in all the clubs most notably being English & Art
- Worked as volunteer & planner in English club's national festival

WOLFRAM SUMMER SCHOOL, Boston, Massachusetts

June 2023-July 2023 (3 weeks)

Key Points:

- Received 100% Financial Aid (3000\$) to participate in the program
- Wolfram Mathematica & Research's Owner Stephen Wolfram advised me to work on, "Analysing rare words in Wikipedia".
- Modified Stephen Wolfram's recommendation, and developed my thesis on "Analysing rare and **NER (Named Entity Recognition)** words in Wikipedia through **Large Language Models**"
- Against traditional methods, Large Language models were extremely successful
- Able to provide a proof of concept, Large Language Models has the potential to replace NER domain specific neural network models which costs from hundreds to thousands to train.
- Discovered a potential extension, where through the analysis of words on different layers of Large Language Models, and forming a complete sentence for high resource language such as English, we can understand how complicated Constructed Language are learnt by the Language models as well and thus breaking the linguistics puzzle of language development in Large Language Models and helping us in both Linguistics research and adding context and meaning and cognitive aspects in conversations between humans and AI
- Further comparing the development of a sentence in Large Language model example of flow of information in state-of-the-art Artificial Intelligence(AI) models and then comparing it against flow of information in human brain
- Proceeding paper for my project will be published in the next few weeks
- Finally, performed a small extension of my thesis by making table of inflection for exotic languages such as Latin, Greek and Hebrew via OpenAl's GPT 3.5 Turbo model

TAKE ACTION LAB, GLOBAL CITIZEN YEAR PROGRAM, Cape Town, South Africa

August 2023-December 2023 (3 months in South Africa)

• Deprecated: Due to health concerns regarding visiting South Africa

SUMMER CAMPS

TECH & JOURNALISM CAMP, THE STANFORD DAILY, STANFORD UNIVERSITY, CA

September 2021-September 2021 (3 weeks)

- Accepted as one of 10 participants
- Studied fundamental knowledge of JavaScript and web development
- Studied responsible journalism and ethics
- Received 100% Scholarship

SYNTHETIC BIOLOGY CAMP, STANFORD UNIVERSITY, CA

September 2022-October 2022 (3/4 weeks)

- Studied Genetic engineering and DNA
- Performed DNA modification and Analysis using Software
- Studied Bioinformatics Algorithms and wrote them.

SUMMER SCHOOL

COMPUTATIONAL NEUROSCIENCE SCHOOL, NEUROMATCH ACADEMY, REMOTE

July 13 2023-July 28 2023 (3 weeks)

- Received 100% Financial Aid to participate in the program
- Studied Introduction-Intermediate level Computational Neuroscience
- Developed Computational Neuroscience Project: Finding the flow of information in brain through Functional Connectivity (used Steinmetz dataset)
- Programmed 50% of the entire final project by myself
- Praised by TAs' for proposing exotic mathematical methods to calculate complex formulas with ease

OXML, UNIVERSITY OF OXFORD, OXFORDSHIRE, HYBRID

July 6th 2024 – July 9th (4 days)

- Accepted into the program as Undergrad freshman in MLx Health & Bio, Generative AI and Fundamentals
- Reason for acceptance: past and present stellar research activities and experience in Artificial Intelligence.
- Opportunity to invite-only research collaboration with University of Oxford

RESEARCH PAPERS & TALKS

UNDER A MINUTE, NEUROMATCH, FEB 2024

- Will be delivering a lecture on my 2023 project, **"Finding Short-term synaptic plasticity in Steinmetz dataset**" on Neuromatch's **Under the minute** presentation program.
- Was selected to be giving a lecture, parallel to MIT, UC Berkeley and John Hopkings students.

COLLEGE CREDITS

4TH ANNUAL CONFERENCE ON DISABILITY IN HEALTHCARE AND MEDICINE, STANFORD MEDICINE, STANFORD UNIVERSITY, CA

• Received 6.00 AMA PRA Category 1 Credit(s)TM for the live activity

ACTIVISM ACTIVITIES

MENTORSHIP FOR PROJECTS ADDRESSING TO SOLVE SOCIAL INJUSTICE IN ASIA/OCENIA, PEACE

FIRST, Boston, MA

May 2023-June 2023

- Received 1:1 mentorship for my project
- Selected as one of the top 10 projects from their application pool in South East Asia/Oceania
- Opportunity to meet impactful changemakers and learn the process of activism and changemaking from them.

CONFERENCE & ACTIVITIES

NATIONAL IQ TEST

December 2020-December 2020 (1 week)

• Secured 3rd position among 250 high school seniors from top schools in Bangladesh

INTERNATIONAL CONFERENCE FOR LEARNING REPRESENTATION (ICLR), Virtual

May 2021-May 2021 (1 week) – 2 times (2021 & 2022)

- Web testing, monitoring the website & looking for bugs and errors.
- Helping Authors and moderators with video infrastructure software & monitoring chat rooms for code of conduct violation
- Conducting Q&A sessions after Orals with moderators, and helping them to select important questions and forward them.
- Answering questions on technical issues in the helpdesk

INTERNATIONAL CONFERENCE FOR MACHINE LEARNING (ICML), Virtual

July 2021-July 2021 (1 week)

- Conducting 3 Orals as the youngest moderator in ICML history (high school junior)
- Web testing, monitoring the website & looking for bugs and errors.
- Helping Authors and moderators with video infrastructure software & monitoring chat rooms for code of conduct violation
- Conducting Q&A sessions after Orals with moderators, and helping them to select important questions and forward them

CONFERENCE ON NEURAL INFORMATION PROCESSING SYSTEMS (NEURIPS), Virtual

December 2021-December 2021 (1 week)

- Web testing, monitoring the website & looking for bugs and errors.
- Helping Authors and moderators with video infrastructure software & monitoring chat rooms for code of conduct violation
- Conducting Q&A sessions after Orals with moderators, and helping them to select important questions and forward them.

OX-WSDC, THE OXFORD UNION, Oxford, England

April 2021-June 2021

- Selected as one of the 10 independent teams among 100 total selected team for highly prestigious debate competition for high school students
- Competed against sixth forms like Eton College.
- Praised by the judges for gifted logical and reasoning skills.
- Received partial 80% scholarship

HARVARD SCIENCE AND RESEARCH CONFERENCE (HSRC), MA, Cambridge

October 2021-October 2021 (3 days)

- Selected among one of the 250 participants from 1000+ applications as one of the advanced high school students
- Received the chance to learn key academic qualities from Harvard Professors
- Received 100% scholarship

INTERNATIONAL ASTRONOMY AND ASTROPHYSICS COMPETITION (IAAC), Virtual

April 2021 (1 month)

• Received a Bronze award in the competition

FEMTECH BERKELEY 2022

April 2022-April 2022 (1 day)

- Had the opportunity to learn scalability and best software practices from industry experts
- Developed a project using lobe.ai to detect nail styles and tell its name

HARVARD COLLEGE VISION PROGRAM, Cambridge, MA

March 2022-March 2022 (1 week)

- One of the 30 students selected from an application pool of 1000s
- Learned Medical Leadership and activities
- Participated in Case Study
- Received 100% scholarship

HARVARD UNICEF CONFERENCE, Cambridge, MA

February 2022-February 2022 (3 days)

- Accepted for the Conference and participated as one of the 30 few individuals
- Participated in Environment and Climate Change Project
- Accepted in both 2022 & 2023 Conferences with 100% scholarship
- In 2023, served as an Ambassador for the Conference

IMMERSIVE ESSAY COMPETITION, UK

January 2022-February 2022

• Accepted into their program with 20% scholarship

HARVARD UNDERGRADUATE INTERNATIONAL RELATIONS SCHOLARS PROGRAM, Cambridge, MA

May 2023-June 2023 (2 months approx.)

- Accepted to Harvard's Prestigious International Relations program as a gap year student
- Considered as one of the best applicants they received in 2023 application pool
- Full scholarship was awarded

TEACHING AND MENTORSHIP/ACADEMIC ADVISOR

HARVARD GAMI, HARVARD UNIVERSITY, Massachusetts, Cambridge

(Performing this role every year)

- Performing the role of (academic advisor + mentor) for first year undergraduate students at Harvard University
- Teaching them about Artificial Intelligence & Neuroscience
- Being their academic and research advisor for entire four years of their undergraduate program for the selected students by Harvard GAMI

INTERNSHIPS

DONDERS INSTITUTE FOR BRAIN, COGNITION, AND BEHAVIOUR, GENZEL LAB, Netherlands

Research Assistant Intern

- August 2023 Undefined
 - Previously was assigned to the "Path Analysis" project under the supervision of Prof. Federico Stella.
 - Change of circumstances, reassigned me to Genzel lab from past involvement with Donder's Institute of Brain, Cognition and Behaviour. Now, I've a new project, supervisor and work directly under Prof. Lisa Genzel.
 - Responsibilities include both Artificial Intelligence, Computational portion and Neuroscience. Though Computation accounts for the larger portion of my involvement.
 - Currently, I'm in the transition point from an intern to becoming a part-time researcher in Computational Neuroscience in Genzel lab. Its conclusion will happen after the next 6 months.

Note: this internship is handled as direct research activity in the Institute. Completion of it Or Change of terms are bound to happen. With possibility to become a permanent staff/individual.

PROGRAMMING LANGUAGES

Python

- Primary programming language
- Advanced level expertise
- Six years of experience developing advanced software, data analysis and artificial intelligence

С

- Secondary programming language
- Intermediate level expertise
- 2 years of experience writing algorithms

Wolfram Language

- Favourite functional programming language
- Intermediate level expertise
- 10 months of experience writing algorithms, data analysis and artificial intelligence

Julia

- Hobbyist programming language
- Intermediate experience and can use Julia notebooks
- 1.5 years of experience performing data analysis

LaTeX

• 2 years of experience in LaTeX by using TeXMaker and Overleaf

Scilab

- Preferred Matrix Programming Language
- Intermediate level expertise
- 11 months of experience writing algorithms and computational mathematics

Fields of Expertise:

- Artificial Narrow Intelligence (ANI) (e.g. RHLF, CNN, NLP and vice versa) (Advanced level)
- Cognitive Artificial Intelligence/Neuromorphic Artificial Intelligence (Intermediate level)
- Statistical Machine Learning (Advanced level)
- Computational Neuroscience (Intermediate level)
- Computational Mathematics (Intermediate level)
- Particle Physics (Advanced level + mainly in Neutrino/high-energy beams/particle interaction)
- Synthetic Biology (Beginner level)
- Quantum Computing (Intermediate level)
- Quantum Artificial Intelligence (Intermediate level)

FRAMEWORKS

DEEP LEARNING FRAMEWORKS

- TensorFlow (Advanced level)
- Pytorch (Intermediate level)

MATHEMATICS & DATA ANALYSIS

- NumPy (Advanced level)
- Pandas (Advanced level)
- SciPy (Advanced level)
- Scikit-learn (Advanced level)
- Matplotlib (Advanced level)

SOFTWARE ENGINEERING/WEB-DEVELOPMENT & DATABASE

• Flask (Advanced level)

QUANTUM COMPUTING & QUANTUM ARTIFICIAL INTELLIGENCE

- Qiskit (Advanced level)
- PennyLane (Advanced level)
- lambeq (Advanced level)
- DisCoPy (Advanced level)

COMPUTATIONAL NEUROSCIENCE

- Nengo (Intermediate level)
- NetworkX (Advanced level)
- Statsmodel (Advanced level)
- Brainrender (Beginner level)
- Navis (Intermediate level)
- CellMap (Intermediate level)

GITHUB PROJECTS

A set of best projects are highlighted here. I request to check-out my entire GitHub account to receive a proper glimpse of the breadth and encompassing nature of the projects.

A new type of AlexNet

AlexNet is widely considered as one of the best large Neural Network models ever created. Especially in Computer Vision. Recently, researchers working for the United Kingdom Government, made a new Image Classification Model known as WasteNet.

That allows faster and better image Classification results by leveraging fine-tuning and a new method called Hybrid Tuning. Preventing destruction of information in the fine-tuning stage and getting better performance in downstream tasks that are widely different from the training dataset of the initial model.

In this project, I have recreated the original model's architecture WasteNet closely to the original in TensorFlow.

Link: https://github.com/sleepingcat4/WasteNet

GUI for Object Detection (YOLO v5)

A personalised GUI is long a demand in Object Detection tasks, that can run locally on a user's computer. Another demand was having Flask as backend to deploy a inference GUI to create a lightweight inference interface for Object Detection tasks.

There were solutions available yet none were complete as either all were broken Or outdated. Understanding those project's code was another challenge since they didn't have best coding style practices.

That prompted me to develop a GUI for Object Detection task while having Flask as the backend to light all the technical intricacies with outstandingly simple and well-documented code.

Link: https://github.com/sleepingcat4/wasteclassification

Competitive Programming

I had been well fascinated by Competitive Programming, though I am interested in Computer Science, I perceive it being a cornerstone in understanding Computer Algorithms and one of the prerequisites in becoming a good Artificial Intelligence researcher.

I started practising this year, from practising Competitive Programming Questions from Wolfram Mathematica and solving them. From 2024, I am starting to practise LeetCode.

Link: https://github.com/sleepingcat4/Wolfram-Challenge

Presence Monitor

Quite lately, I had been feeling bored, and I came-up with a project that allows anyone on the internet to see when I was "LAST SEEN ONLINE" on my computer.

It's done through clever, tracking system design that runs a script on my computer locally and another Flask backend website fetches metadata from a GitHub repository and tracks the last commit done by me.

It's updated every hour and 24 times a single day.

Link: <u>https://github.com/sleepingcat4/p-monitor</u> Tracker: <u>https://track-ammar.onrender.com/</u>

GitHub Search Engine

Don't get me wrong, GitHub by default provides a very powerful search-engine. One of the best I've ever seen even more than Google search functionalities. Yet, it is plagued by complexities for the beginner.

Which is why, I streamlined it and created a new search engine for GitHub, that searches for all the usernames and repositories with the query terms an individual provides and returns the results.

Link: https://hub-search.onrender.com/

One-step PDF extractor

I have created a Python wrapper around Meta AI (FAIR)'s state-of-art OCR (Optical Character Recognition) Deep Learning Model: Nougat. To provide one-step PDF extraction and Latex extraction at ease.

PyPI: pip install nougatop Link: <u>https://github.com/sleepingcat4/nougat-op</u>

<u>Bash Blog</u>

Having a personal Blog in Computer Science and specifically in Artificial Intelligence can always be valuable to illustrate an individual's experience and expertise. Now, an obvious choice nowadays will be Medium.

I personally resent it because it has the worst fonts and too much pressure on me to monetise it. Which is a complete unnecessity for me and hinders me from writing quality content.

That's why, I created a new Blog template, basing Chad Baldwin's blog template and modifying to my needs.

Link: <u>https://github.com/sleepingcat4/bash-blog</u> Blog-site: <u>https://sleeping4cat.github.io/Milkshake/</u>

RESEARCH PROJECTS

• **Ox-Debate:** A high-quality dataset compiled of Oxford Union's debate sessions, public events and interviews that were uploaded in their official YouTube Channel. **(SIZE: 13GB)**

Link: https://github.com/sleepingcat4/datasets

• **8chan-kun:** A high-quality dataset compiled of all 8chan boards' image embeddings and raw images itself.

Embeddings: <u>https://www.kaggle.com/datasets/sleepingcat4/8chan-image-embeddings</u> **Raw Images:** <u>https://huggingface.co/datasets/sleeping4cat/8chan</u>

CURRENTLY WORKING

- Developing a startup with friends for Microsoft Imagine Cup 2024
- Studying Bioinformatics and Chemical NLP
- Doing an in-depth study on Reinforcement learning
- Studying cluster computing through utilising industry standard solutions like TorchX, Microsoft Azure and Google Cloud TPUs (research access)
- Pathological Curvature analysis for maths function in BMI (Brain-Machine Inspired Models)
- Learning Causal inference from group-up to advanced
- Mastering Web-development + designing

(FEATURE) WEB-DEVELOPMENT + DESIGNING

- 3D Photo Gallery (Prague Design Quality) <u>https://github.com/sleeping4cat/yuxin-gallery</u>
- Story Book Theme (Ukrainian Quality) https://github.com/sleeping4cat/little-dream
- Moonlit Night (Immersive Europe) https://github.com/sleeping4cat/twilight-sky
- Timeless Mind Creativity (French Design Quality) https://github.com/sleeping4cat/sleepingcat
- Canvas Approach (Chinese Quality) https://github.com/sleeping4cat/canvas-theme

NOTE: Web Development projects are stored in my second account (@sleeping4cat).

LANGUAGE SKILLS

- English (Native Speaker + First Language) + (Both speak, read + write)
- Bengali (Native Speaker) + (Both speak, read + write)
- Hindi (Native Speaker) + (Only speak)
- Urdu (Native Speaker) (Only Speak)
- German (Intermediate Speaker) (Both speak, read + write)
- Spanish (beginner Speaker) + (Both speak, read + write)

SOFT SKILLS

- Friendly and calm attitude with strong leadership skills. And led about 30 teams in deep learning which consisted of master's and PhD students from Ivy league universities and top universities around the world.
- Expert networking and connecting skills
- Experienced in marketing and promotion. And worked as a salesman for 6 months while in middle school.

TECHNICAL WRITING EXPERIENCE

RESEARCH BLOG

LINK: https://sleeping4cat.github.io/Milkshake/

NOTE: In the past, I have written on Quora platform extensively unfortunately due to poor quality of platform in the recent years shifted to my own blog. I have restarted my hobby of writing from past month and I frequently write about most influential and recent research papers and Algorithms.

ETHICS & INTEGRITY

PROGRAMMING CLAUSE

I hereby declare all code and materials showcased on my resume are work completely, partially, Or fractionally owned, Or co-owned by me. I have the proper rights to distribute, modify, utilise and share the code while maintaining proper code of conduct agreements and licence clauses described by the respective owners and contributors.

Common programming etiquettes and practices such as reading documentation, notes, text-books and tutorials and utilising their respective knowledge and use them as learning resources do not make the authors of those materials entitled to any/all shoutouts, mention, or any form of promotion and credit until they have explicitly required in their copyright note to exercise it for the readers by default.

ARTIFICIAL INTELLIGENCE GENERATED CONTENT

I acknowledge Artificial Intelligence to be an important tool in the learning process and synthetic data production for mundane work. Artificial Intelligence tools of any form (text, video, audio, code) not limited but beyond if and were exercised in any of my work were properly cited.

But exemptions were made if an intelligent agent was used for nominal, mundane and repetitive tasks.

CREATIVITY AND DESIGNING

I have complete ownership of the creative ideas and thoughts, which are responsible for making my projects already that are completed/on-going and beyond. If there were other individuals and entities involved in the ideation phase, they are properly mentioned in the respective work.

In terms of designing, I took inspiration from landscapes, picturesque scenes and artistic examples and other moments, took publicly available, licenced under creative commons Or equivalent licence and permissible media and multimedia (video, textual designs, typography, fonts, canvas, scenes, photographs, creative assets, 3d models) not limited to but beyond and made use in my programming, software and artistic activities.

Proper credits are given to all artists, creative individuals and entities whose creations, assets and materials were/are used in my works. Though, in some extreme circumstances where proper credits individuals' information was not readily available it was left blank. But I completely allow the concerned entity whose work might be used in my project and not properly credited to email for allowing me to update the relevant works of mine where it may be in use.

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