Abhay Shukla

abhay.shukla1999@gmail.com +91 9022631758 Website

RESEARCH INTEREST

Natural Language Processing, Information Retrieval, Reinforcement Learning, Machine Learning

ACADEMICS

Indian Institute of Technology (IIT), Kharagpur (Gold Medallist) **2018 - 2022**
Bachelor of Technology (Hons.) in Industrial Engineering *GPA - 9.17/10*
Minor in Computer Science and Engineering *GPA - 9.35/10*

PUBLICATIONS

- ***Legal Case Document Summarization: Extractive and Abstractive Methods and their Evaluation***
  A. Shukla, P. Bhattacharya, S. Poddar, R. Mukherjee, K. Ghosh, P. Goyal and S. Ghosh
  In 2nd Conference of the Asia-Pacific Chapter of the Association for Computational Linguistics and the 12th International Joint Conference on Natural Language Processing ***AACL-IJCNLP (2022)***
- ***Design of an All-Purpose Terrace Farming Robot***
  A. Patnaik, V. Mohta, S. K. Panda, S. V. Krishnan, A. Gupta, **A. Shukla**, G. Wadhwa, S. Verma and A. Bandopadhyay
  In ***IEEE/ASME MESA 2022*** *– 18th Int. Conference on Mechatronic, Embedded Systems and Applications*

RESEARCH EXPERIENCE

Legal Role Identification *February 2022 – May 2022*
Adviser: Prof. Pawan Goyal & Prof. Saptarshi Ghosh
Research Areas: Named Entity Recognition - Natural Language Processing

- Developed an approach to extract and classify roles like counsel and witness from legal documents using transformer models
- Implemented a 2-step classification model (F1 - 45.35) which outperformed standard NER models (F1 - 15.52)
- Modelled long-range dependencies, multiple contexts (occurrences) and references for a named entity in the court case document

Abstractive Long Legal Document Summarization *August 2021 – April 2022*
B.Tech Project, Adviser: Prof. Saptarshi Ghosh & Co-Adviser - Prof. Pawan Goyal
Research Areas: Summarization - Natural language processing

- Developed abstractive and hybrid summarization methods for long legal documents sometimes containing $>$ 20 thousand words
- Merged tree-based structures with classification based chunking to create summarization algorithms for long documents.
- Increased Rouge-L scores by incorporating legal expertise through a rhetorical role classifier within the summarization process.

Detection of Language Bias in Wikipedia *January 2021 – April 2021*
Course Term Project - Adviser: Prof. Animesh Mukherjee
Research Areas: Classification - Natural language processing

- Developed a novel approach to detect lingual bias in sentences for maintaining Neutral Point of View policy in Wikipedia articles
- Implemented five transformer based classification models (eg. BERT, RoBERTa, and XLNet) with F1 scores between 65% - 75%
- Increased F1 score to 83 % by devising a novel weighted ensemble approach on our baselines using differential evolution algorithm

Evolutionary Neural Networks for Sequential Problem Optimization *December 2020 – December 2021*
Adviser - Prof. Nirupam Chakraborti
Research Areas: Genetic Algorithms, Optimization, Neural Networks

- Developed self-evolving Neural Networks along with genetic operators to heuristically solve Travelling Salesman Problem
- Formulated a bi-objective cost function aimed at concurrently minimizing tour expenses and simplifying model complexity
- Implemented island-based genetic model combining Predator-Prey with ACO for concurrent use of multiple evolutionary algorithms

Optimizing Bank Lending Decisions using Metaheuristics *January 2021 - April 2021*
Adviser - Prof. Akhilesh Kumar
Research Areas: Optimizations and Heuristics Methods

- Developed a meta-heuristic optimization approach to maximize bank's profits through its lending decisions in a credit crunch
- Developed a novel hybrid optimization algorithm based upon Genetic Algorithm, Simulated Annealing, and Tabu Search
- Achieved faster convergence and better near-optimum solutions when compared to traditional algorithms

WORK EXPERIENCE

Walmart Global Tech *June 2022 – Present*
Software Development Engineer II
Walmart's technology division focused on driving innovation and enhancing its retail operations through advanced technological solutions
Domain: Software Engineering - Supply Chain

- Worked on applications handling receiving and inventory to facilitate operations across multiple Distribution Centers
- Developed and deployed productions pipelines to deploy applications across 43 distribution centers situated across USA
- Developed micro-services and libraries with a tech stack comprising of Golang, Java, Python, Axon, Cassandra and Kafka

Akaike Technologies *November 2021 – April 2022*
Machine Learning Engineer Intern
Deep learning (AI) services company helping businesses add intelligence to their existing processes
Domain: Question Answer Generation - Natural Language Processing

- Designed a multi-layered approach to generate question-answer pairs from a large piece of text using transformer models
- Reduced hallucinations made by the abstractive transformer-based sequence generating model using entailment technique

Walmart Global Tech *May 2021 – July 2021*
Software Developer Intern
A program for an 8-week summer internship that offers real stakes, access to industry leaders, and the chance to revolutionize supply chain
Domain: Software Engineering - Optimization

- Worked on the team responsible for optimizing pick walks by solving a multi-layered travelling salesman problem heuristically
- Designed a Golang based automation suite capable of running multiple procedures with different configurations concurrently

Autonomous Ground Vehicle (Autonomy and Intelligence) (AGV.AI) *February 2019 – September 2020*
Undergraduate Researcher, Guide - Prof. Debashish Chakravarty
Multi-disciplinary research group aimed at building a fully operational self-driving car
Domain: Controls - Autonomous Vehicles

- Implemented geometric steering methods such as Stanley and Pure-pursuit along with PID for path tracking for Mahindra E2O
- Implemented the Model Predictive Control algorithm in python using two optimization frameworks: Gurobi and Casadi
- Modelled residual dynamics of the vehicle using Gaussian processes by generating training data from simulations

AWARDS AND ACHIEVEMENTS

Dr. B. C. Roy Memorial Gold Medal *IIT Kharagpur*

- Awarded the distinction of 'Best All-Rounder' among all graduating students of all B.Tech (Hons.) and B.Arch (Hons.) courses

Institute Order of Merit *IIT Kharagpur*

- Acknowledged for exceptional performance in the field of technology during my bachelor's degree program

Medury Bhanumurthy Memorial Prize *IIT Kharagpur*

- Awarded as the top performer in extra-curricular activities among all Bachelor of Technology (Honors) students

National Winner | Smart India Hackathon 2020 *Government of India*

- Secured First Position at All India Level in Smart India Hackathon by making an AI enabled robotic trash boat

National Winner | DIC Terrace Farming Robot | 8th Inter-IIT Tech Meet *IIT - Roorkee*

- Among the top 50 students to represent IIT Kharagpur. Secured 1st position in my event and stood 2nd among 20 other IITs

27th Intelligent Ground Vehicle Competition *Oakland University, USA*

- Part of the team (support) which secured 2nd position in the AutoNav challenge among a total of 43 teams worldwide

RELEVANT COURSEWORK

- **Industrial Courses**: Information Systems, Operations Research, Logistics and Supply Chain Management, Optimisation and Heuristic Methods, Simulation, Financial Engineering, Quality Engineering
- **Computer Science Courses**: Switching Circuits and Logic Design, Computer Architecture and Operating Systems, Data Analytics, AI and Ethics, Programming and Data Structures, Design and Analysis of Algorithms, Genetic Algorithms, Image Processing, Linear Algebra, Probability and Statistics, Big Data Processing

MENTORSHIP AND OUTREACH

Head, Technology Robotix Society, IIT Kharagpur

- Lead a 3-tier team to execute the annual Robotix fest & to conduct nationwide workshops, hackathons and competitions
- In charge of Makerspace lab - an open source lab for robotics enthusiasts seeking guidance, resources and components

IEEE Mentor and Organizer, Winter School of AI & Robotics, IIT Kharagpur

- Organized the Winter School of AI & Robotics in collaboration with Centre for Excellence in AI for 500+ students
- Mentored 112 students on autonomous robotics tools/concepts like robot operating system, electronics, controls, etc