

ROHIT AGARWAL

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Address: 109 Idunnvegen 9, 9019 Tromsø, Norway

Research Interests: Scalable AI Models, Online Learning, Varying Feature Space, Time Series, Large Language Models

EDUCATION

- JUNE (2021-2025) Doctor of Philosophy in Artificial Intelligence
UiT The Arctic University of Tromsø, Norway
Title: Scalable AI architectures for modeling complex dynamic systems
Objective: Develop machine learning architectures and concepts to model varying feature space in online learning.
Supervisor: [Prof. Dilip K. Prasad](#), [Prof. Alexander Horsch](#) & [Prof. Krishna Agarwal](#)
- June(2015-2020) 5-year Integrated M.Tech in Mathematics And Computing
[DEGREE](#) Indian Institute of Technology (ISM) Dhanbad, India
GOLD MEDALIST Passed with distinction
[GPA: 9.49/10](#) Thesis Title: [Deep Learning for Streaming Classification](#) | Grade: A+
Objective: Proposed a deep learning model based on the hedge algorithm and online gradient descent to model dimension-varying inputs in online learning.
Supervisor: [Prof. Garib Nath Singh](#) & [Prof. Dilip K. Prasad](#)

PUBLICATIONS

TOTAL - 13 | JOURNAL - 3 | CONFERENCE - 4 | UNDER REVIEW - 4 | ARXIV - 2

Conference

- MABNet: Master Assistant Buddy Network with Hybrid Learning for Image Retrieval
◇ Authors: [R Agarwal](#), [G Das](#), [S Aggarwal](#), [A Horsch](#), [D Prasad](#) [PAPER](#) | [CODE](#) | ICASSP 2023
Outcome: Introduced a hybrid learning network comprising two blocks, where one operates under supervised learning and the other under self-supervised learning, improving the decision boundary.
→ Keywords: Python, PyTorch, Computer Vision, ViT, ResNet, Supervised Learning, Self-Supervised Learning
- Auxiliary Network: Scalable and Agile Online Learning for Dynamic System with Inconsistently Available Inputs
◇ Authors: [R Agarwal](#), [K Agarwal](#), [A Horsch](#), [D Prasad](#) [PAPER](#) | [CODE](#) | ICONIP 2022
Outcome: Proposed a neural network architecture designed to dynamically scale according to the dimension variations in the input feature space at any given time instance.
→ Keywords: Python, PyTorch, Online Learning, Dimension Varying Inputs, Multilayer Perceptron
- DSC-IIT ISM at WNUT-2020 Task 2: Detection of COVID-19 informative tweets using RoBERTa
◇ Authors: [S Laxmi](#), [R Agarwal](#), [A Sinha](#) [PAPER](#) | [CODE](#) | WNUT, ACL 2020
Outcome: Employed a RoBERTa model to classify tweets related to COVID-19 as informative or un-informative. This model was compared with various conventional and transformer-based models.
→ Keywords: Python, PyTorch, RoBERTa, BERT, Natural Language Processing
- C-Net: Contextual Network for Sarcasm Detection
◇ Authors: [A Jena](#), [A Sinha](#), [R Agarwal](#) [PAPER](#) | [CODE](#) | FIGLANG, ACL 2020

Outcome: Proposed a BERT-based architecture to sequentially model context and response sentences, thereby generating probabilities of sarcasm. These probabilities were subsequently fused using exponential smoothing to produce the final prediction.

→ Keywords: Python, PyTorch, BERT, Exponential Smoothing, Natural Language Processing

Journal

Aux-Drop: Handling Haphazard Inputs in Online Learning Using Auxiliary Dropouts

◇ Authors: R Agarwal, D Gupta, A Horsch, DK Prasad [PAPER](#) | [CODE](#) | TMLR 2023

Outcome: Proposed a novel concept that imparts scalability to any online deep learning architectures, enabling them to handle dimension-varying input streams in an online learning setting.

→ Keywords: Python, PyTorch, Online Learning, Varying Feature Space, Multilayer Perceptron

SegPC-2021: A challenge & dataset on segmentation of Multiple Myeloma plasma cells from microscopic images

◇ Authors: A Gupta, ..., R Agarwal, et. al. [PAPER](#) | [CODE](#) | MIA 2023

Outcome: Proposed a transformer-assisted convolution network for cell instance segmentation on the SegPC dataset challenge and achieved the third-best result.

→ Keywords: Python, PyTorch, Instance Segmentation, Computer Vision

Taxonomy of hybridly polarized Stokes vortex beams

◇ Authors: G Arora, A Butola, R Rajput, R Agarwal, et. al. [PAPER](#) | OPTICS EXPRESS 2024

Outcome: Proposed a generalized diffraction-based Stokes polarimetry approach assisted with deep learning methods for efficient identification of Stokes singular beams.

→ Keywords: Python, PyTorch, Computer Vision, ResNet, DenseNet, SqueezeNet, VGG, AlexNet

Under Review

packetLSTM: Dynamic LSTM Framework for Streaming Data with Varying Feature Space

◇ Authors: R Agarwal, P Naidu, K Agarwal, A Horsch, D Prasad

Outcome: Introduced a scalable recurrent neural network model capable of adapting to a varying feature space in an online learning setting and effectively mitigating catastrophic forgetting.

→ Keywords: Python, PyTorch, RNN, LSTM, GRU, Varying Feature Space, Online Learning

Online Learning under Haphazard Input Conditions: A Comprehensive Review and Analysis

◇ Authors: R Agarwal, A Das, A Horsch, K Agarwal, D Prasad [PAPER](#) | [CODE](#)

Outcome: Comprehensive models and dataset categorization, accompanied by extensive benchmarking and promoting open-source resources.

→ Keywords: Python, PyTorch, Varying Feature Space, Numpy, Sklearn, Classical ML Models, Neural Networks

Modelling Irregularly Sampled Time Series Without Imputation

◇ Authors: R Agarwal, A Sinha, D Prasad, M Clausel, A Horsch, M Constant, X Coubez [PAPER](#) | [CODE](#)

Outcome: Introduced a novel LSTM-based network coupled with a simple switch approach to handle irregularly sampled time series without imputation.

→ Keywords: Python, PyTorch, LSTM, Time Series, Missing Data

An UltraMNIST classification benchmark to train CNNs for very large images

◇ Authors: D Gupta, U Bamba, A Thakur, A Gupta, R Agarwal, et. al.

Outcome: Presented an UltraMNIST dataset, comprising 56,000 large images with a resolution of 4000×4000 resolution for propelling the development of CNNs for large scientific images. Additionally, benchmarked current CNN models on the UltraMNIST dataset.

→ Keywords: Python, PyTorch, Computer Vision, CNN, FasterRCNN, ResNet

Arxiv

Transformer assisted convolutional network for cell instance segmentation

◇ Authors: D Pandey, P Gupta, S Bhattacharya, A Sinha, **R Agarwal** [PAPER](#) | [CODE](#) | 2021

Outcome: Proposed a transformer-based approach to enhance the performance of the conventional convolutional feature extractor in the existing region proposal-based methods.

→ Keywords: Python, PyTorch, Instance Segmentation, Computer Vision

Simulation-supervised deep learning for analysing organelles states and behaviour in living cells

◇ Authors: A Sekh, I Opstad, **R Agarwal**, et. al. [PAPER](#) | 2020

Outcome: Proposed physics-based modeling of microscopy data to generate supervised training datasets, enabling the study of mitochondrial states and behavior in heart muscle cells.

→ Keywords: Python, Data Labelling, Mitochondria, Simulation Dataset, Computer Vision, U-Net

WORK EXPERIENCE

- May - August* | **Visiting Researcher at NUS, Singapore** | *Host:* MOHAN KANKANHALLI, NCRIPT-LAB
2023
Performed in-depth analysis of haphazard inputs and related fields. Implemented all the models that are not open-sourced and established dataset and models taxonomy.
→ Keywords: Python, PyTorch, TDigest, Numpy, Sklearn.
- Aug 2020 -* | **Software Engineer at Adobe Inc., Bangalore, India** | *Manager:* LOKENDRA SINGH CHAUHAN
May 2021
Part of the internal cloud operations team of Adobe, dealing with deploying various applications and day-to-day operations.
→ Keywords: Python, GitHub, Kubernetes, AWS, Azure, Puppet, Terraform, Ansible, Chef, CI/CD.
- Feb-June* | **Research Intern at UiT The Arctic University of Norway** | *Guide:* Dr. DILIP K. PRASAD
2020
Developed a scalable architecture for streaming classification tasks. Additionally, developed a pipeline for simulating mitochondria and their motion.
[Certificate](#) → Keywords: Python, Keras, Tensorflow, MLP, Homographic Transformation, Microscopy.
- May-July* | **Intern at Adobe Inc., Bangalore, India** | *Manager:* SUNIL BANNUR
2019
Cloud storage prediction of enterprises and individual customers of Adobe.
[Certificate](#) → Keywords: Python, Keras, Tensorflow, StatsModels, ARIMA, MLP, LSTM, Encoder Decoder.
- May-July* | **Summer Research Fellow at NIBMG Kalyani, India** | *Guide:* Dr. SAMSIDDHI BHATTACHARJEE
2018
Predicting the Single Nucleotide Polymorphisms (SNPs) associated with a disease by analyzing their characteristics using classical machine learning methods. [Report with Code](#)
[Certificate](#) → Keywords: R, Glm, RandomForest, Rpart, Logistic and Lasso Regression, CART, Fisher's Exact Test.

PROJECTS

September 2020	<i>Command Line Utility to crawl web</i> Developed a command line (bash-type) utility tool to report the statistics of website like the number of external links, internal links, broken links, load time, etc. and provide the web-report in user defined format like csv, json, yaml format. It stores the data in a shelve database. GitHub link
Aug 2019 - Jan 2020	<i>An Improved Estimation Procedure for Population Mean in Presence of Non-Response</i> Guide: Prof. GARIB NATH SINGH, Indian Institute of Technology, Dhanbad Hansen and Hurwitz (1946) proposed an estimator by taking a sub-sample from non-respondents. We are developing an improved estimator that considers the auxiliary information in non-response. manuscript
Aug-Dec 2018	<i>Individual Player's Performance Indicators for ODI or T20 International Cricket Matches</i> Mathsport Asia 2018 Guide: Prof. GORDON HUNTER, Kingston University London Individual player's performance was analyzed by evaluating his contribution both over several games, and to the team's performance in a single match using Principal Component Analysis.
Aug-Dec 2018	<i>Competitive Balance in Football Leagues: Domestic vs International</i> Mathsport Asia 2018 Developed a cost function to calculate the competitiveness of a football league. It compares the competitiveness among the leagues and also within a league over seasons. GitHub link
Jan-March 2018	<i>Dow Jones Industrial Average Price Prediction</i> Academic Project at IIT (ISM) Dhanbad, India Guide: Prof. GARIB NATH SINGH Stock Prices of Dow Jones Industrial Average were forecast using time series analysis. Autoregressive Integrated Moving Average model was applied. ARIMA(0,2,1) gave a Standard Error 0.42.
October 2017	<i>Health And Economic Problems Due To Severe Weather Events</i> Implemented a visualization model in R on U.S. National Oceanic and Atmospheric Administration's (NOAA) storm database which addresses events most harmful to the human population health and have greatest economic consequences.

ACTIVITIES

Academic

CO-SUPERVISOR	Aaron Celeste, Master at Department of Computer Science, UiT Tromso 2022-2023 Title: Presenting CODS (Cell Organelle Dynamic Simulation) Link
TEACHING ASSISTANT	Cloud and Big Data Technology (<i>INF-2220-1 21H</i>) at UiT Tromso Fall 2021, 2022, 2023 Artificial Intelligence, AI - Methods and Applications (<i>INF-2600-1 23V</i>) Spring 2023, 2024
REVIEWER	Conference: 2 papers at ICASSP 2024; 2 papers at ICDEC 2023 Journal: 1 paper at Nordic Machine Intelligence (NMI) 2023
PROGRAM COMMITTEE	International Conference on Neural Information Processing (ICONIP2023)
MENTOR	Mentor at Data Science Club (DSC), IIT (ISM) Dhanbad, 2019-20.

Dissemination

- TALK Gave a 30-minute talk on “*In-context Learning, Fine-tuning and RLHF in LLMs*” at the [LLM Workshop](#) organized by Bio-AI Lab in collaboration with NORA and DLN.
Date: 28th Oct, 2023 | Place: Tromso, Norway | [Presentation Link](#)
- BLOGS Challenges of early career researchers. [Link](#)
Why PhD: Self-contemplation. [Link](#)
- VIDEOS Explanation of Mabnet Article. [Link](#)
Explanation of Auxiliary Network Article. [Link](#)

Management: Office Bearer

- BOARD MEMBER Member of Digital Life Norway - [Junior Research Group](#) for 2023-Present.
- BOARD MEMBER Member of Tromsøstudentenes Idrettslag Volleyball for 2022-23.
- NOMINATED MEMBER Dean Students Welfare, IIT (ISM) Dhanbad 2019-20.
- MEMBER I look after the students’ school affairs at Kartavya (Student Run NGO) 2016-20.
- G.SEC., SPORTS General Sports Secretary of IIT (ISM) Dhanbad for the session 2018-19.
- CAPTAIN Led IIT (ISM) Volleyball Team at Inter IIT Sports Meet 2017 & 2018.
- SECRETARY Coordinator of IIT (ISM) Volleyball Club for the session 2016-18.

Management: Organizer

- ORGANIZER Organized Large Language Model Workshop at UiT, Tromso. [Link](#) | 27-28th Oct, 2023
- ORGANIZER Coordinated Inter Hostel General Championship 2017 and 2018.
- EVENT HEAD Coordinated Annual Sports Meet 2018.
- COORDINATOR Coordinated CONCEPTO (University Technical Fest) 2018.

Member

- Digital Life Norway, 2022-Present.
- Norwegian Artificial Intelligence Research Consortium, 2021-Present.
- Institute of Electrical and Electronics Engineers (IEEE), 2023.
- Society of Industrial and Applied Mathematics - IIT (ISM), 2015-20.
- Society for Applied Mathematics - IIT (ISM), 2015-20 .

Others

- PLAYER Division 2 Volleyball Player at Tromsøstudentenes Idrettslag, 2021-Present.
- MODERATOR Moderated Large Language Model workshop at UiT, Tromso. [Link](#) | 27th Oct, 2023
- CHAMPION Won Volleyball Tournament at Parakaram (Inter-University Sports Fest), IIT (ISM), 2015-16.

COMPUTER SKILLS

- LANGUAGE: Python, R, C++, C, Java, HTML, LaTeX, JavaScript
- CONCEPTS: Linux, Kubernetes, Docker, AWS, Azure, Infrastructure as Code, CI/CD
- LIBRARIES: PyTorch, Keras, Tensorflow, Sklearn, Pandas, Numpy, Matplotlib
- TOOLS: Visual Code, Git, Terraform, Puppet, Chef, Ansible, Jira, MySQL, Jenkins

AWARDS

- 2023 Visiting researcher grant for 3 months stay at NUS, Singapore awarded by UiT.
- 2017, 2018 & 2019 MERIT CUM MEANS (MCM) Scholarship offered by the institute.
- 2017 & 2018 Director Scholarship for excellence in academics.
- 2018 Science Academies' Summer Research Fellowship.

ACHIEVEMENTS

- 15-19 APR 2024 Runner-up of DLN mini-MBA organized by the Digital Life Norway ([certificate](#))
- 2015-2020 Gold Medalist in the Applied Mathematics Department, IIT(ISM) Dhanbad
- 2015 Secured All India Rank 5017 in IIT JEE Advance among 1,50,000+ candidates.
- 2015 Secured General Merit Rank 51 in WBJEE among 3,00,000+ candidates.
- 2014 Secured International Rank 23 in Level 1 and International Rank 19 in Level 2 of INTERNATIONAL OLYMPIAD OF MATHEMATICS.

INTERESTS

- SPORTS: Volleyball, Football, Basketball, Cricket, Badminton, Running, Cycling, Hiking
- OTHERS: Leadership, Management, Finance, Programming, Rubik's Cube, Cooking
- LANGUAGES: Hindi (Native), English, Nepali, Bengali(Intermediate), Norwegian (Beginner)

ACADEMIC COURSES

Doctor of Philosophy

- STATISTICS Computer-Intensive Statistics
- MACHINE LEARNING Pattern Recognition; MLx Fundamentals 2024 ([Certificate](#))
- ETHICS Theory of Science, Research Ethics and Research Design ([Essay](#))
- OTHERS AFINO & DLN Summer School 2022 – Engaging with Critical Research Within Institutions ([Essay](#))

Integrated Masters

- STATISTICS Probability and Statistics; Statistical Inference; Sampling Theory
- MATHEMATICS Discrete Mathematics; Project Management; Operation Research; Topology; Graph Theory; Linear Algebra; Modern Algebra; Theory of Computation; Numerical Methods; Real Analysis; Complex Analysis; Ordinary and Partial Differential Equation; Number Theory
- COMPUTER SCIENCE Object Oriented Programming; Data Structures; Computer Graphics; Design and Analysis of Algorithm; Data Base Management Systems; GPU Computing with CUDA; Operating System; Computer Networks; Computer Organization; Software Engineering; Information and Coding Theory; Software Computing

MOOC COURSES

- WORK HOURS: 391 University courses
2017-2019
- [Machine Learning](#) - Stanford University | 98% | 60 hrs
 - [Introduction to Mathematical Thinking](#) - Stanford University | 94% | 39 hrs
 - [Reproducible Research](#) - Johns Hopkins University | 97% | 8 hrs
 - [Statistical Inference](#) - Johns Hopkins University | 100% | 54 hrs
 - [Exploratory Data Analysis](#) - Johns Hopkins University | 97% | 55 hrs
 - [Getting and Cleaning Data](#) - Johns Hopkins University | 97% | 20 hrs
 - [Regression Models](#) - Johns Hopkins University | 100% | 54 hrs
 - [The Data Scientist's Toolbox](#) - Johns Hopkins University | 95% | 18 hrs
 - [R Programming](#) - Johns Hopkins University | 99% | 57 hrs
 - [Practical Time Series Analysis](#) - State University of New York | 98% | 26 hrs
- WORK HOURS: 43 Coursera courses
2019
- [Neural Networks and Deep Learning](#) - DeepLearning.AI | 95% | 20 hrs
 - [Improving Deep Neural Networks](#) - DeepLearning.AI | 98% | 18 hrs
 - [Structuring Machine Learning Projects](#) - DeepLearning.AI | 87% | 5 hrs
- WORK HOURS: 20 DataCamp courses
2017
- [Introduction to R](#) - 4 hrs
 - [Intermediate R](#) - 6 hrs
 - [Intermediate R: Practice](#) - 4 hrs
 - [Introduction to Importing Data in R](#) - 3 hrs
 - [Intermediate Importing Data in R](#) - 3 hrs
- WORK HOURS: 7 LinkedIn courses
2020
- [Learning Puppet](#) - 2 hrs
 - [DevOps Foundations: Infrastructure as Code](#) - 2 hrs
 - [Learning Ansible](#) - 3 hrs

REFERENCES AVAILABLE ON REQUEST

- dilip.prasad@uit.no [Dilip K. Prasad](#), Professor, Department of Computer Science
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