

COMPUTER SCIENCE ENGINEERING SOCIETY MAGAZINE



DEPARTMENT OF CSE, NIT MEGHALAYA

**JULY TO
OCTOBER
2024**

1st Edition

CODE ABODE

*The department of Computer
Science and Engineering Brings to
You*



**code
abode**

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Director's Message



Welcome to the inaugural edition of “Code Abode”, your premiere source for insights, innovations and inspiration in Computer Science and Engineering. I am thrilled to introduce this magazine, which aims to empower the next generation of computer engineers to shape the future of technology!

The Code Abode promises to deliver a platform for knowledge sharing, discussion, and connection, fostering growth and progress in this dynamic field and making a meaningful impact in the world. Our goal is to make Code Abode a go-to resource for anyone passionate about Computer Science and Engineering. Through Code Abode, we aim to publish articles on cutting-edge technologies, showcase the department’s activities and achievements, offer in-depth analysis of emerging technologies and provide inspiration with stories from alumni achievers, innovators and entrepreneurs.

I extend my gratitude to our editorial team, contributors and well-wishers for their efforts in bringing this magazine to life. Whether you are a student, researcher, professional, or simply a curious enthusiast, we invite you to join us on this journey of embracing the challenges, embracing the opportunities and embracing the future of Computer Science and Engineering.

Warm regards,
Prof. Pinakeswar Mahanta
Director

National Institute of Technology Meghalaya

HoD's Message



It is with great pleasure that I present the inaugural issue of our department's magazine, a platform created to highlight the exceptional talents, achievements, and ongoing initiatives within the Department of Computer Science and Engineering (CSE) at NIT Meghalaya. This magazine reflects the dedication and passion that our students, faculty, and staff bring to their work each day, and I am proud to be a part of this endeavour.

Since its inception, our department has been committed to fostering a strong academic and research environment that promotes innovation and excellence in CSE department. Through this magazine, we aim to connect academia with industry by showcasing the latest trends, technologies, and research breakthroughs in the field. It will serve as a source of information on the department's accomplishments, student activities, research efforts, and collaborative projects that continue to enhance our reputation within the engineering community.

May this magazine serve as a testament to the strength of our department and grow into a beacon of knowledge and collaboration. I look forward to seeing the progress we make as we continue to shape the next generation of computer engineers.

Dr. Deepak Kumar
Assistant Professor & HOD

Editors' Message

“Our classroom is where ideas are born, our departments are where they grow, and our institute is where they thrive”

Greetings!

From our classrooms to the entire institute, we are thrilled to present to you our first issue of the bi-monthly Department E-Magazine of Computer Science and Engineering, NIT Meghalaya – Code Abode - ahead of the curve one line of code at a time.

Code Abode is a manifestation of our department's ethos that is built on a foundation of Innovation, Excellence, Collaboration, Inclusivity, Integrity, Impact, Learning and Fun.

Through this magazine, we showcase our department's activities, achievements, research and projects, featuring articles on cutting-edge research, alumni success stories and publications that demonstrate our commitment to both academic excellence and societal impact.

This magazine would not have been possible without the sincere efforts and dedication of our entire team, including our editors, digital designer, photographers, students, faculties, and staff, who have all played a huge part in bringing this publication to life.

So, take a glimpse of what's new and exciting in our department with our magazine, Code Abode.



Dr. Ningthoujam Johny Singh
Assistant Professor
Dept. Computer Science and Engineering



Dr. Diangarti Bhalang Tariang
Assistant Professor
Dept. Computer Science and Engineering

ABOUT THE DEPARTMENT

The Department of CSE at NITM has adequate facilities to support each activity needed for a batch of 30 students (per semester). It has a well-qualified and experienced faculty team consisting of 9 faculty members. The Computer Science & Engineering department makes every effort in imparting high-quality education to its motivated students. One of the aims of this department is to play the role of producing Computer Engineers ready to satisfy the needs of the Computer and IT world. The Department is also actively involved in various research activities.

The department also started its Mtech program from 2014 with an initial intake of 20. There is also a PhD programme under which research scholars are admitted twice a year.

Vision

Attaining global recognition in Computer Science & Engineering education, research and training to meet the growing needs of the industry and society.



Mission

- Imparting quality education through well-designed curriculum in tune with the challenging software needs of the industry
- Providing state-of-art research facilities to generate knowledge and develop technologies in the thrust areas of Computer Science and Engineering.
- Developing linkages with world class organizations to strengthen industry-academia relationships for mutual benefit.



ABOUT THE DEPARTMENT

Program Educational Objectives (PEOs):

PEO1 Apply computer science theory blended with mathematics and engineering to model computing system.

PEO2 Design, implement, test and maintain software systems based on requirement specifications

PEO3 Communicate effectively with team members, engage in applying technologies and lead teams in industry.

PEO4 Assess the computing systems from the view point of quality, security, privacy, cost, utility, etiquette and ethics.

PEO5 Engage in lifelong learning, career enhancement and adapt to changing professional and societal needs.

Program Specific Outcomes (PSOs):

PSO1 The ability to understand, analyse and develop solution strategy towards problems in the areas related to algorithms, system software, machine learning, and Artificial Intelligence, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.

PSO2 The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success, real world problems and meet the challenges of the future.

PSO3 The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, lifelong learning and a zest for higher studies and also to act as a good citizen by inculcating in them moral values & ethics.



HODs CSE Department

08/01/2013 - 20/01/2014

**DR. ALOK
CHAKRABARTY**

01/07/2019 - 07/08/2022

DR. YOGITA

21/01/2014 - 19/01/2017

**DR. RAJARSHI
RAY**

08/08/2022 - 03/07/2024

**DR. SURMILA
THOKCHOM**

20/01/2017 - 30/06/2019

**DR. DIPTENDU
SINHA ROY**

04/07/2024

**DR. DEEPAK
KUMAR**



Department Activites

Innovative Insights from Taiwan: Prasan Kumar Sahoo Illuminates AI and ML at NIT Meghalaya

BY SAYANTAN BOSE

T23CS002

In a notable academic exchange, Prof. Prasan Kumar Sahoo, an adjunct faculty member from Taiwan, recently engaged with MTech and PhD students at NIT Meghalaya, offering profound insights into the realms of Artificial Intelligence (AI) and Machine Learning (ML). Known for his pioneering work in these dynamic fields, Prof. Sahoo's visit was marked by a series of interactive sessions and seminars designed to bridge theoretical knowledge with practical applications.

His sessions delved into cutting-edge AI methodologies and their transformative impacts across various industries, providing students with a deepened understanding of current trends and future directions.

The discussions also focused on innovative ML techniques, fostering an environment of intellectual curiosity and collaborative learning. Prof. Sahoo's expertise left a significant impression on the students, inspiring them to explore new research avenues and technological advancements. His contribution not only enriched the academic experience at NIT Meghalaya but also highlighted the institution's commitment to fostering global academic collaborations and advancing knowledge in critical technology sectors.



PhD Scholar and MTech students interacting with Prof. PK Sahoo



... jusqu'à deux décennies de
... Pierpaolo Piccioli chez Valentino,
... Maria Grazia Chiuri (page 22,
... John Galliano en devenant en 2016 directrice
... artistique de Dior.

En 1996, le créateur allemand Karl Lagerfeld écrit
à propos de Peter Lindbergh que « sa vision des
femmes est toujours d'actualité et, en même temps,
intemporelle ». Il est aussi un des premiers à aider
le photographe lorsque celui-ci arrive dans la Ville
Lumière, en lui confiant plusieurs prises de vue,
notamment la première campagne publicitaire de
sa propre marque, Lagerfeld, réalisée sur les plages
bretonnes avec le modèle Lynne Koester, muse
de Lindbergh à l'époque. Lagerfeld, qui débute en
1954 après avoir importé l'International Woolmark
Prize tout d'abord pour Fendi, crée des
collections à partir des années Saint Laurent, crée des
séries (1963-1978 et 1992-1997)
pour Fendi, mais aussi sous son
nom, maison alors considérée
et démodée depuis le décès de
Karl Lagerfeld parvient à rajeunir
ses codes classiques
à travers des versions modernisées
de la collection, en couture comme en
dessin, avec humour, par exemple avec
la collection automne 1993
présentée à Linda Evangelista
pour *Vogue's Bazaar* (page 261). Dans
le magazine de Babeth
Haider Ackermann, qui
a travaillé après de John Galliano,
il est possible de le remplacer
par Peter Lindbergh et Patou dont la
collection d'été (2007) qui souhaite
être plus « naïf d'Arles,
à l'inspiration de
la porte en 2009
de la scène ainsi qu'une col-
lection de Schiaparelli à l'automne
2012, plus de
la marque Schiaparelli est
devenue une marque franco-algérienne Farida
et gourou des styles, qui fut aussi
présentée par Paul Gaultier et d'Azzedine Alaïa
et rejoignit l'atelier d'Alaïa en 1995
pour reprendre en 2002 la tête du salon de haute
couture de Gaultier.

gestes. C'est pour cette raison que
lui depuis la campagne automne-
C'est l'époque où mes créations ont
valoriser la féminité en suggérant un
de séduction qui, tout en restant fidèle
de base de ma vision esthétique, fait
certains aspects de mon concept de vêtements
ces images en noir et blanc et en couleurs
extérieur ou en studio, portent encore, après
ces années, la signature de Peter, sa tonalité
sophistication et de spontanéité inattendue
image est un portrait qui apporte une étincelle
vitalité à des hommes et à des femmes et le
encore plus beaux. Le vêtement devient alors
prolongement naturel du corps. »

Depuis leur première rencontre à la fin des années
1970, Lindbergh a également noué des liens étroits
avec des créateurs comme le Tunisien Azzedine Alaïa
connu pour avoir habillé des légendes du cinéma
comme Greta Garbo et Arletty, mais surtout pour
ses robes moulantes et sculpturales portées par
Grace Jones et Tina Turner. Arrivé à Paris en 1957,
Alaïa entre chez Dior au moment où le tout jeune
Yves Saint Laurent en est le directeur de la création,
mais est congédié à peine cinq jours plus tard car
ses papiers d'immigration ne sont pas en règle et
la guerre d'Algérie prend de l'ampleur. Il travaille
avec son ami Thierry Mugler. Connu pour son
indépendance envers le cercle parisien de la mode,
il montre ses collections dans son atelier de la rue
de Moussy dans le Marais en dehors du calendrier
de la semaine de la mode. Présentée à Lindbergh
par Alaïa à la fin des années 1980, Tina Turner voit
dans le photographe allemand « un cauchemar de
styliste (page 35) ! Il aime les vêtements naturels et
simples et quand les stylistes arrivent avec les bras
chargés de portants de haute couture, il leur demande
toujours s'ils ont aussi pensé à prendre une chemise
blanche et un jean⁹ ! » Lindbergh photographiera cette
légende de la scène en de multiples occasions pour
des articles et des pochettes d'albums, et réalisera
son clip *Missing You*¹⁰.

Voici près de cinq décennies que Lindbergh collabore
avec de grands noms de la mode, dont Jean Paul
Gaultier et John Galliano depuis leurs premières
collections jusqu'à aujourd'hui, mais aussi
Japonaise Rei Kawakubo et sa marque Comme
Garçons (page 24, image 21). En 1988,
débarquée de Tokyo avec Yohji Yamamoto,
présente à Paris une première collection
radical. Si, pour beaucoup,
gardistes font alors l'effet
une contre-proposition
rante et dorée en
savoir-faire français
photographe
cinématographique
man...

Articles

Pour façonner l'image des marques, Lindbergh
partage la vision d'une femme forte, à la silhouette
conquérante et la féminité minimaliste, avec des
créatrices comme Jill Sander, l'Américaine Donna
Karan et l'Italienne Miuccia Prada. Franca Sozzani,
rédactrice en chef du *Vogue* Italie, qui travaille avec
Lindbergh depuis l'époque de son magazine *Lei*
en 1980, déclare que « Peter est un photographe qui
marquera l'histoire de la photographie car il n'est
pas prisonnier des tendances. Il a sa propre identité :
ce n'est pas un photographe de mode. Il se sert de
la mode pour parler aux femmes et pour parler des
femmes, ce qui est très différent. »

Giorgio Armani, qui a aussi collaboré avec Lindbergh
sur diverses commandes, explique : « Il y a tout un
monde dans les yeux d'un photographe, une faculté de
comprendre et de rassembler des expériences et
des personnes qui peuvent changer notre regard. Le
visage des femmes, par exemple. Leur corps et leurs

Comparative Study of Pattern Recognition for Biometric Authentication

BY ROUNAK SAHA

What is Finger Vein Recognition ?

Finger vein biometrics, also called vein matching or vascular technology, is a technique for biometric authentication that analyzes the patterns of blood vessels visible from the surface of the skin of fingers. This technique relies on capturing images of the veins inside one's hand by shining near-infrared light on their fingers. This makes it almost impossible to counterfeit. In addition, blood flow in the veins during identification ensures that the individual is alive and real, rather than a fraudster.

How does Finger Vein Technology work ?

Finger vein recognition biometrics is based on the images of the unique veins beneath the skin of an individual's hands. To capture the pattern, an attester terminal containing a near-infrared LED (light-emitting diode) light and a monochrome CCD (charge-coupled device) camera is utilized. The hemoglobin in the blood absorbs the light, which makes the veins appear as a pattern of lines.

The camera records the image and the raw data is digitized and sent to a database of similar images.



For authentication, the finger is scanned by a special camera in the same way as before, and the data is verified against the database of registered images. The whole process takes less than two seconds. These near-infrared camera systems can also be built into mobile devices, to enable ubiquitous and secure identification.

Since it is based on the vein patterns under the skin surface, it is said to be more accurate than a fingerprint, which have been faked in the past. Also, since it's the veins, this authentication process provides proof that the individual whose identity is being verified is a live person.

How is Finger Vein Biometric Technology being used ?

The technology is currently being used or developed for a wide array of applications including credit card authentication, employee attendance and time tracking, network authentication, end-point security, automobile security, and at ATMs.

Infact, Egypt has already integrated finger-vein recognition in its national ID program. This initiative is the first of its kind by any administration in the world. The country is leading the charge in authentication technology and the results of the program will set the stage for adoption by other countries.

How Finger Vein Recognition will eliminate Biometric Bias?

Facial recognition and AI-based biometrics have increasingly been in the news as a result of their unintentionally coded demographic bias, particularly when used in law enforcement. However, the negative impacts of biometric bias reach far beyond into everyday use cases. For example, false negative authentication might occur during an ATM transaction or a false positive during online banking, which opens the door to fraudulent activities.

Finger vein biometrics avoids the issue of biometric bias completely. This is because biometric bias is caused by an algorithmic misunderstanding when it's tasked with the automated recognition of people based on their behavioral and biological characteristics. However, this problem is eliminated, or at least minimized, if physical characteristics do not come into play at all and, instead,

authentication is dependent on the inner workings of the body. Finger vein biometrics, which depends on a database of vein patterns, circumvents systemic biometric bias.

Limitations of Finger Vein Biometrics ?

Despite all the positive impacts of finger vein biometric authentication, the technology doesn't come without its problems. Some of the limitations and challenges of finger vein biometrics include. For example, finger vein patterns alter as a person grows. Finger vein patterns are only constant between the ages of 20 to 50 years, meaning that younger and older people need to replace their finger vein records every few years.

Additionally, finger recognition efficiency is affected by environmental changes. For example, low temperatures raise blood viscosity, meaning that the finger veins contract and produce poor image patterns. In elevated temperatures, the opposite happens and the finger veins expand. This could lead to a lot of false negatives during identification in extreme climatic conditions. Other challenges include customer adoption (since the technology is new and largely unknown), and scalability.

Overall, finger vein recognition is a promising new technology that has the potential to supplement, or even replace, fingerprint identification biometrics in the future as it is a safer, more secure option. It also has the potential to remove bias from biometric identification techniques, leading to more secure, diverse, and inclusive digital verification systems all over the world.

The Incredible Story of ARM1: Powering Mobile Technology

- BY T VIKRAM RATHOD

Have you ever wondered how we can use mobile phones that are as powerful as early computers, all while fitting in our pockets? This revolution is made possible by highly efficient processors that allow mobile devices to operate at incredible speeds without draining their batteries. At the core of this transformation is the ARM architecture, which began with the development of the very first ARM processor: the ARM1.

The Birth of a Vision



Hermann Hauser - Co-founder of Acorn Computers

It all started with Acorn Computers, a small British company led by co-founders Hermann Hauser and Chris Curry. In the late 1970s, they dreamed of breaking into the booming microprocessor and home computer industry. To realize this dream, Hauser sought out talented engineers at the University of Cambridge, finding Steve Furber, a PhD student, and Sophie Wilson, an undergraduate with a passion for microprocessors.

In 1981, Chris Curry spotted a massive opportunity. The BBC was searching for a single flagship computer to use in its new educational television program, aimed at teaching computer literacy to the masses. Curry realized this could propel Acorn Computers into the spotlight, giving them a chance to be the go-to provider for the UK's educational market. The BBC wanted a robust, versatile machine that could handle programming, word processing, and more. Seeing this as a golden chance to grow Acorn, Curry set his sights on winning the BBC contract.

To spur his team into action, Hauser cleverly tricked Furber and Wilson into competing with each other. He told each of them that the other had made more progress on the project, which pushed them both to work harder. This friendly competition led to the development of the Acorn BBC Micro prototype.

A Triumph of Innovation



The Acorn BBC Micro - A cornerstone of British educational computing

Even though the prototype was incomplete at the time of the BBC's visit, Acorn's presentation still impressed the BBC. The team demonstrated their vision and technical expertise so convincingly that the BBC awarded them a multi-million-pound contract to produce the BBC Micro. This computer became a huge success, selling millions of units and introducing computing to classrooms across the UK.

After the success of the BBC Micro, Acorn had an even bigger ambition: to design their own microprocessor. Furber and Wilson set out to create a chip based on Reduced Instruction Set Computing (RISC) architecture. The goal was to develop a processor that was not only powerful but also incredibly energy-efficient. Despite the odds, they produced the ARM1 processor in 1985.

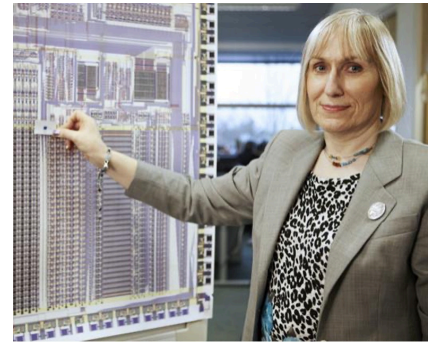
Legacy of the ARM Architecture



Modern devices powered by ARM architecture (RIKEN Fugaku (2020) World's most powerful Supercomputer in 2020)



The Game-Changer: ARM1



Hermann Hauser - Co-founder of Acorn Computers

One of the most remarkable features of the ARM1 chip was its extraordinarily low power consumption. During testing, the chip drew so little power that it was actually running on leaked current. This efficiency was a game-changer and would become a hallmark of ARM processors, making them perfect for mobile devices where battery life is critical.

The ARM1 chip laid the foundation for what would become the ARM architecture, now powering billions of devices worldwide, from smartphones to tablets and beyond. While Acorn Computers eventually faded from the spotlight, the legacy of ARM1 continues to shape the future of technology, allowing us to carry incredibly powerful computing devices in our pockets today.

Acknowledgement

Low Spec Gamer. How Amateurs Created the World's Most Popular Processor. YouTube, 27th January, 2023, <https://youtu.be/nIwdhPOVOuk?feature=shared>.

SERVERLESS PLATFORMS FOR LATENCY SENSITIVE APPLICATIONS

ARTICLE BY - ROUNAK SAHA¹ ● ARKOJYOTI DEY²

¹ DEPT. OF COMPUTER SCIENCE AND ENGINEERING, NIT MEGHALAYA

² DEPT. OF COMPUTER SCIENCE AND ENGINEERING, IEST SHIBPUR

INTRODUCTION-

Cloudnative programming, microservices and serverless architectures provide a novel way of software development and operation. A new generation of applications with never seen before features have been promised, while the burden on developers and application providers are to be reduced or more exactly, shifted towards the cloud operators. On-demand vertical and horizontal resources scaling in an arbitrary scale, dependability, fault tolerant operation, controlled resiliency are just highlighted features provided inherently by cloud platforms. However, latency sensitive applications with strict delay constraints, such as several distributed IoT services, generally do not fit in well with the new concepts and today's platforms and pose additional challenges to the underlying systems.

A crucial first step towards the envisioned future services is to move compute resources closer to customers and end devices. Edge, fog, and mobile edge computing address this extension of traditional cloud computing.

Nevertheless, solely adding cloud resources to the edge is not enough as the cloud platform itself could significantly contribute to the end-to-end delay depending on the internal operations, involved techniques and configurations.

We adapt some relevant aspects of the cloud native approach and related operating techniques for latency sensitive IoT applications operated on public cloud platforms extended with edge resources.

Technological experts [1][2][3] have applied their general design concepts to one of today's most widely used and versatile public cloud platforms, namely Amazon Web Services (AWS), and its serverless services.

Amazon provides an edge extension for IoT services, called 'Greengrass', where the edge infrastructure nodes are owned and maintained by the user (or application provider) managed by AWS.

Obviously, the pricing scheme and the performance characteristics of serverless components in this realm is totally different from the regular billing policy and operation, therefore, our models should be adjusted accordingly

The contribution is threefold.

1.They have proposed a novel system on top of public cloud platforms extended with edge resourceswhich can dynamically optimize and deploy applications, following the microservice software architecture, based on live performance measurements. Two different controlloops and the corresponding mechanisms which are responsible for the online reoptimization of the software layout and constituent modules at different timescales have been added. The first one addressesthe control of the steady-state, long term operation of given applications and it is suitable for following e.g., the daily profiles, while the second one implements a more responsive control loop which can directly reconfigure the runtime environments of deployed functions if the monitoring system triggers that as a response to e.g., SLA violation.

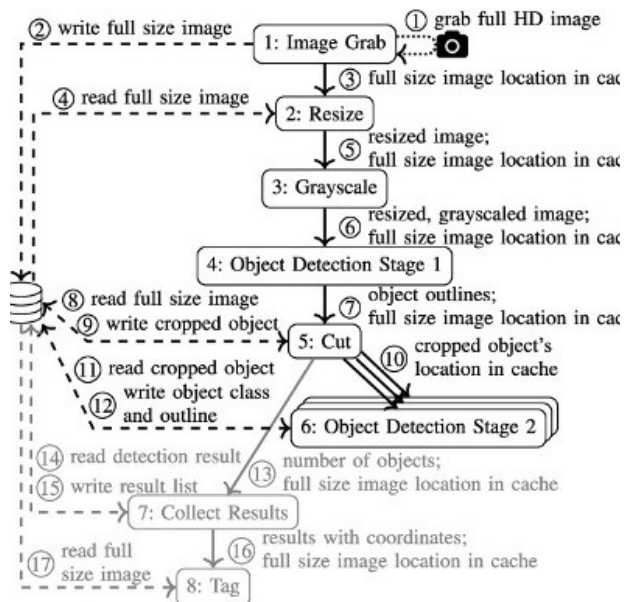
2.A proof-of-concept prototype has been provided, making target AWS and its edge extension for IoT applications, called Greengrass, however, the concept is general and it can be applied to other public cloud environments as well.

Their current solution supports geographically distributed edge cloud infrastructures under the low-level control of AWS. The system encompasses a layout and placement optimizer, a serverless deployment engine and a live monitoring system with dedicated components and operation workflows.

3.Characterizing the main operation phases and conducting several experiments and simulations to evaluate the overall performance of the system. We analyze the performance characteristics of the two control loops as well and investigate different implementation options.

TARGETED USE CASE

The application exploits cloud features and serverless tools in order to provide IoT services at large scale.



The use case, presented in above figure, addresses live object detection on Full HD video streams. As we target cloud native deployment and follow the serverless approach, we have stateless functions requiring all data as input. Therefore, making use of dedicated data stores is the reasonable (or the only feasible) way of data exchange. Here it is strived to decrease bandwidth requirements by preprocessing images before submitting them to elaboration and finally marking them with detailed object classification results.

The preprocessing stage in steps 1 – 10 resizes and grayscales captured video frames and performs preliminary object detection on the modified picture. At the end of the preprocessing stage, the full size image is cut into pieces based on the bounding boxes provided by the preliminary object detection.

As a next step, the Cut function calls the second stage object detection function for each cropped image which performs the object classification task. We observe that the number of calls depends on how many objects we found during the preprocessing stage which we consider as an application specific metric. It depends on the software whether the calls are synchronous and invoked serially or asynchronous and handled in parallel.

Consequently, the implementation of the next function, Collect Results, could be different for the two approaches. In any case, it waits while each second stage detection function finishes and collects their individual results.

Finally, this function calls the Tag function that marks detected objects on the full size image and annotates it with object classification results. For the use case, we interpret the end-to-end (E2E) latency as the average elapsed time between the arrival of a frame and the event when a recognized object's classification is written out into the data store.

In our implementation, Python and leveraged features of the OpenCV library have been used for image processing and object detection steps, relying on its Deep Neural Networks module and the MobileNet-SSD network.

Conclusion -

In this paper, we adapted the cloud native programming and serverless operating techniques for latency sensitive IoT applications. A novel system was proposed on top of public cloud platforms providing serverless solutions for central and edge domains. The general approach was applied to Amazon's AWS leveraging its Function as Service offerings, Lambda and Greengrass.

Acknowledgement –

[1]- Istvan Pelle , BudapestUniversity of Technology and Engineering .

[2]- Janos Czentye,Budapest University of Technology and Engineering.

[3] -Janos D ´ oka, Budapest University of Technology and Engineering.

4 –Amazon Web Services.

5 - I. Pelle, J. Czentye, J. Doka, and B. Sonkoly. Towards Latency Sensitive ´ Cloud Native Applications: A Performance Study on AWS. In 2019 IEEE 12th International Conference on Cloud Computing (CLOUD), pages 272–280, July 2019.



काव्य की कलम से...

-शिवेश कुमार

नया आभास

कागज़ी फूल नहीं हूँ मैं,
जो किसी कृत्रिम गंध का मोहताज है।
जीवंत है मेरा रौआ -रौआ,
कण -कण में अपना सुवास है।
मत सिखलाओ संवारने का तरीका,
और कुछ क्षण वाला झुठा अंदाज,
खिलने दो हर कली और अंकुर को,
फैलने दो स्वाभाविक प्रकाश।
झुमने दो मीरा जैसी धुन में,
उभरने दो कबीर जैसा मस्त अंदाज।
जगने दो बाबा फरीद की दुआओं वाला प्रेम,
और बुद्धों वाला लयबद्ध तान।
मत बनाओ खूबसूरती को तारीफ का मोहताज,
जो जैसा है उम्दा है,
उसे वैसे ही रहने दो।
सबकी अपनी -अपनी धुन है,
अपने राग में जीने दो।
तलाश अगर खूबसूरत है,
तो फिर हर मंजर रौशन है।
कोई उधार रौशनी नहीं हूँ मैं,
जिसका सीमित अंत और आगाज़ है,



समय की माँग: बदलाव

जब खुद के लिए खुद से डर लगे,
तो बदलना जरूरी है।
जब हार हकीकत बनने लगे,
जब भरोसे पर अंकुश लगने लगे,
तो नई जागृति जगाना जरूरी है।
भ्रम खुद को दे सकते हैं,
टाल अपनों को सकते हैं,
वक्त कि आंधी से बच के ,
सिर्फ कुछ क्षण भटक सकते हैं।
जब दुनिया सताने लगे,
जब सच जगाने लगे,
तो निपटना जरूरी है।
जब जज्बे ढलती शाम सा लगे,
जब वजूद में थकान सा लगे,
तो नई स्फूर्ति लाना जरूरी है।

Research & Development

Notes:

Journals

- A. Dahal, S. Moulik, "The Multi-Model Stacking and Ensemble Framework for Human Activity Recognition", IEEE Sensors Letter, August 2024.
- K. Das, N. N. Devi, S. Moulik, "EADA: Energy-aware Adaptive Duty-cycle Adjustment in superframe for IEEE 802.15. 6-based Wireless Body Area Networks", IEEE Sensors Letter, July 2024.
- Parida, A.K., Kumar, D., Sahoo, R.R. and Balabantaray, B.K., 2024. Solar power prediction approach using data augmented deep learning technique. Scientia Iranica.
- D. Rana, S. Pratik, B. K. Balabantaray, P. Rangababu, R. B. Pachori, "GCAPSeg-Net: An efficient global context-aware network for colorectal polyp segmentation". Biomedical Signal Processing and Control, Elsevier Science, 2024. (Accepted)

Conferences

- A. Verma, S. Thokchom, "An Optimized SIMON Lightweight Image Encryption Algorithm for Internet of Things: Balancing Performance and Security". 1st IC2SDT, NIT Delhi, 2nd -4th August 2024.
- P. Shreerudra, P. Sharma, D. Rana, and B. K. Balabantaray. "EU-Net: Efficient U-shaped Deep Convolutional Neural Network for Colon Polyps Segmentation". In 2024 6th International Conference on Energy, Power and Environment (ICEPE), pp. 1-5. IEEE, 2024.

Running Projects

- Design and Development of Intelligent Cyber Physical System for Prediction, Early Detection and Remote Monitoring of Alzheimer's Disease in Real-Time using Bio-Multifunctional Smart Wearable Sensors. Funded by Science and Engineering Research Board (SERB) at a total cost of ₹6111867/-

PI: Dr. Soumen Moulik, Computer Science & Engineering, NIT Meghalaya

Co-PI: Dr. Debasis Das, Computer Science & Engineering, IIT Jodhpur

Dr. Badal Soni, Computer Science & Engineering, NIT Silchar

- A Deep Learning Approach for Preservation of Cultural Heritage. Funded by SERB at a total cost of ₹23,91345/-

PI: Dr. Bunil Kumar Balabantaray, NIT Meghalaya

- Use of Artificial Intelligence and Deep Learning Methods to predict Pain outcomes after transforaminal nerve block (TENB) in patients of lumbar spondylosis. MRU-AIIMS Raebareli ₹50000/-

PI: Dr. Bunil Kumar Balabantaray, NIT Meghalaya



Student
Achievements

Student Achievements

Ph. D Student win Best Paper Award

A Research scholar, Mr. Moirangthem Rabindra Singh, has won the best paper award for the paper titled "Cryptanalysis of a secure and efficient aggregate signcryption scheme" in the 13th International Conference on Computing, Communication and Sensor Networks.

Mr. Moirangthem Rabindra Singh is working under the supervision of Dr. Surmila Thokchom and Dr. Soumen Moulik



Placement

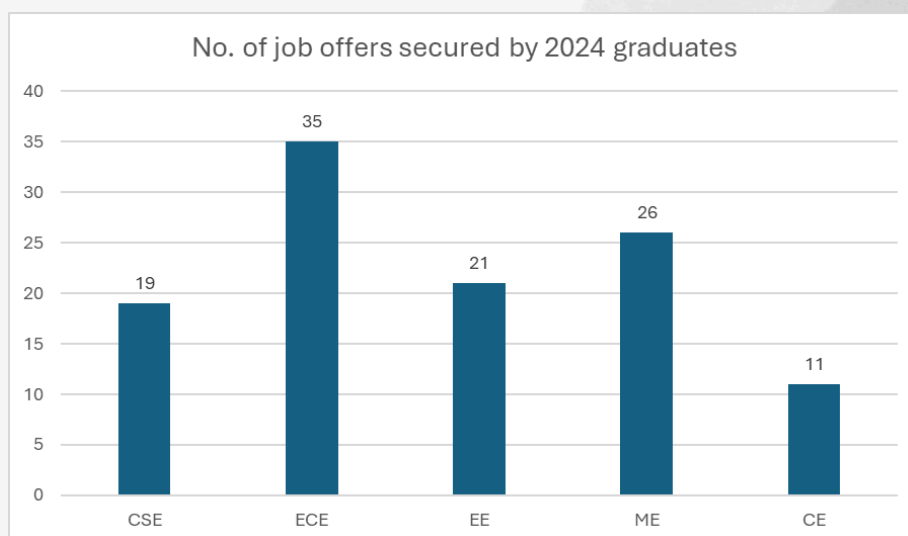
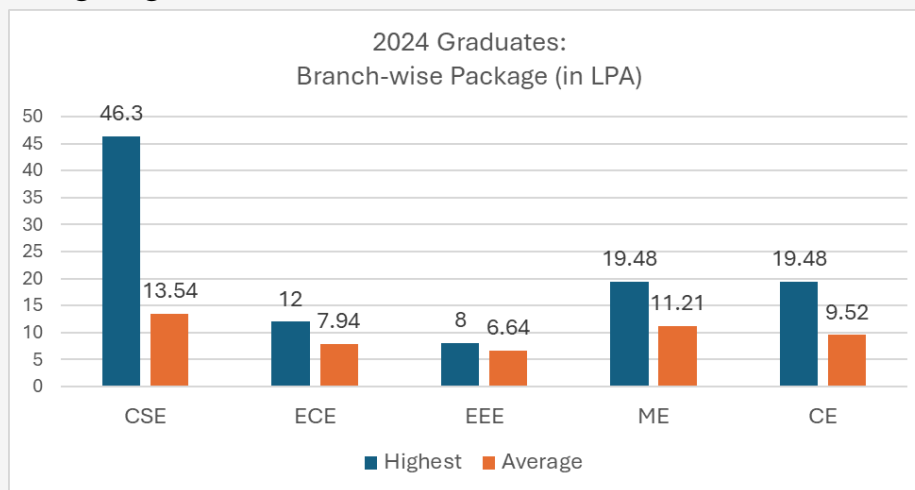


Shreya Poddar (CSE) has secured job offer from Microsoft with Rs. 51.03 LPA.



Shubhavi Kukreja has secured job offer of Rs 19.75 LPA form JPMorgan Chase & Co.

Many more students have also secured jobs in many reputed companies and placement is still going on.



Centre Developed



Computer Training Center For Visually Impaired Person



The computer training center for visually impaired individuals is dedicated to providing the skills and knowledge needed to thrive in today's workforce. By empowering visually impaired learners, the center aims to open doors to employment opportunities across various sectors, ensuring that individuals with visual impairments can contribute meaningfully to society. Equipped with advanced Braille-enabled computer systems, the facility allows students to develop critical computer literacy, which is essential in today's digital world. These systems, combined with tailored instruction, enable learners to acquire both foundational and advanced computer skills

The training center was officially inaugurated in June, with Shri Sunil Alagh (Board of Governors), his wife Maya Alagh, Prof. Pinakeswar Mahanta (Director of the institute), and other distinguished dignitaries and professors in attendance. This event marked a significant milestone in the institute's commitment to inclusivity and accessibility, representing a major step toward providing equal educational opportunities for people with visual impairments.

Dr. Bunil Kumar Balabantaray (Assistant Professor, Computer Science and Engineering Department) and members of his research team are actively involved in guiding and supporting the visually impaired learners as they navigate the training systems.



CODE ABODE

Their involvement not only enhances the learning experience for the enrolled students but also provides NIT students with an opportunity to develop valuable teaching and communication skills while engaging in meaningful community service.

The program currently enrolls eight students, some of whom are completely blind while others are partially sighted. These students represent a diverse range of abilities and experiences, but they share a common goal: mastering the skills necessary for personal and professional growth. Spanning three months, the course aims to teach participants how to effectively use a variety of computer applications essential to their future endeavors. The curriculum includes both basic and advanced lessons, ensuring that each student progresses at a comfortable pace while being adequately challenged.



To facilitate learning, the center employs NVDA (NonVisual Desktop Access), a powerful open-source screen reader. NVDA enables visually impaired users to access and interact with the Windows operating system through auditory feedback, allowing them to complete tasks independently. This software bridges the gap between traditional visual computer interfaces and the needs of visually impaired individuals, ensuring students can operate standard office software like Microsoft Word and Excel without relying on sight.



The training program began by introducing essential computer skills, starting with keyboard orientation and auditory visualization of the desktop layout. By learning common keyboard commands and shortcuts, students gained the ability to navigate and interact with their computers efficiently without using a mouse.

CODE ABODE

Once these foundational skills were established, the curriculum shifted to practical software training in Microsoft Word and Excel, focusing on document creation, formatting, data entry, and basic spreadsheet operations

Teaching visually impaired individuals presents unique challenges, particularly in conveying concepts that are traditionally explained through visual aids. However, this process has revealed the remarkable capacity of the learners. Their heightened memory and concentration skills allow them to retain information more effectively. This experience serves as a powerful reminder that knowledge and learning are not confined to those with the ability to see. Visually impaired individuals have just as much potential to learn, adapt, and succeed. This training center stands as a testament to the fact that, with the right tools and support, visually impaired individuals can overcome societal barriers and become active, skilled members of the workforce.

Faculty Details





**Prof. Diptendu Sinha Roy Ph.D, BIT Mesra
Professor & Dean (Research & Consultancy)**

Research Interest

Grid, Cloud and Distributed Systems, Data Analytics in Smart Grid Domain, Application of Soft and Evolutionary Computing, Software Reliability

**Dr. Deepak Kumar Ph.D , NIT Meghalaya
Assistant Professor & HOD**

Research Interest

Computational Mathematics, Digital Signal Processing, Machine Learning



**Dr. Akhilendra Pratap Singh, Ph.D, IIIT
Allahabad**

Assistant Professor

Research areas:

Blockchain Technology, Service Computing, Service Oriented Network Architecture, Localization and Routing in Wireless Sensor Networks, Semantic Web and Linked Open Data.





Dr. Bunil Kumar Balabantaray, Ph.D. (NIT Rourkela)

Assistant Professor

Research Interest

Robotics , Image Processing, Biomedical Image Analysis and Cyber Security

Dr. Diangarti Bhalang Tariang Ph. D,
IIT Kharagpur

Assistant Professor

Research Interest

Machine Learning, Deep Learning,
Generative AI, Multimedia Forensics,
Synthetic Media Forensics.



Dr. Ngangbam Herojit Singh PhD, NIT Manipur

Assistant Professor

Research Interest

Mobile Robot Navigation, Artificial Intelligence, Healthcare Applications, Hybrid Intelligent System





Dr. Ningthoujam Johny Singh PhD,
IIT Manipur

Assistant professor

Research Interest

Computer Vision, Machine Learning,
Deep Learning, Machine Translation
for low resource languages

Dr. Soumen Moulik Ph.D, IIT Kharagpur,
India

Assistant Professor

Research Interest

Wireless Personal/Body Area Networks
(MAC of IEEE 802.15.4, IEEE 802.15.6),
Wireless Sensor Networks, Internet of
Things, Machine Learning



Dr. Surmila Thokchom Ph.D, NIT
Meghalaya

Assistant Professor

Research Interest

Security in Cloud computing, IoT, Smart
grid, Cryptography and Machine Learning





Student
Details

BTECH 2021-2025

Faculty Advisor

DR. AKHILENDRA PRATAP



Anshu Das
B21CS001



Parthiv Das
B21CS002



Ananya Manohar
B21CS003



Freddy John Dkhar
B21CS004



Avinash Renukunta
B21CS011



Kishan Ranjan
B21CS005



Jayden Blah
B21CS013



Ankit Singh
B21CS006



Chebolu Sai Teja
B21CS014



Panga Sai Teja
B21CS008



Ankit Saini
B21CS015



Aidan Ehbok Wankhar
B21CS016



Aditya Kumar
B21CS024



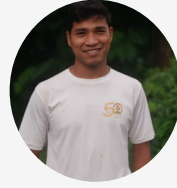
Bengi Warsaw R Sangma
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Nitesh Singh
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Shubhavi Kukreja
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Naphisabet Kharnaor
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Supriya Neogi
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Nitish Modi
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Abhishek Anand
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Achintya Chaudhary
B21CS035



Shreya Poddar
B21CS036



Manish Kumar Dubey
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Koruprolu Bhagya Raju
B21CS038

BTECH 2022-2026
Faculty Advisor
DR. DEEPAK KUMAR



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Amartya Ghosh
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ROUNAK SAHA
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MOHD ASHAD ANSARI
B22CS003



POTHULA APARNA
B22CS009



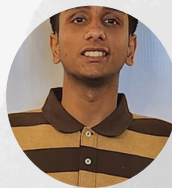
BADURGARI RASOOL
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MANADAPBIANG MAWLIEH
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ADITEYA SIVAKUMAR
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KAMPA RAMAKRISHNA
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AVINASH KUMAR SINGH
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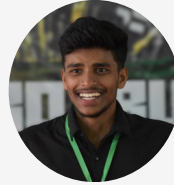
MANISH PRASAD GUPTA
B22CS007



RITABRATA PAL
B22CS013



ALVIN GARNET LANGSTIEH
B22CS014



KARIPIREDDY SURYA TEJA GOPAL REDDY
B22CS022



WAMESAMBIANG LALOO
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BINRAJ SINGH
B22CS023



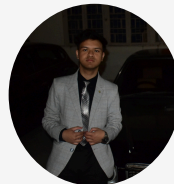
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T VIKRAM RATHOD
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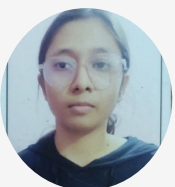
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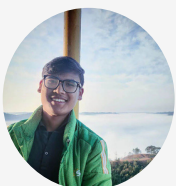
Kavindu Dilshan Amarasingha
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Gabriel I Jongte
B23CS004



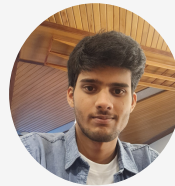
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Nancy Tinglalnei
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Deijuhhi Dkhar
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Priyanshu Singh
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Koyel Kalita
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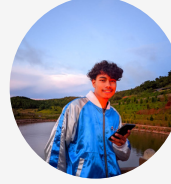
Purushottam Thakur
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Kerborlang Khyriem
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Subrata Das
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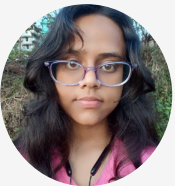
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BTECH 2024-2028

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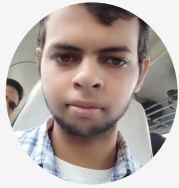
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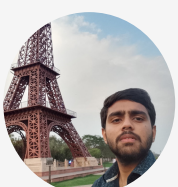
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MTECH 2023-2025

Faculty Advisor

DR. BUNIL KUMAR BALABANTARAY



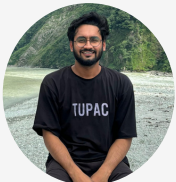
SUBHASISH DUTTA
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Sayantan Bose
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Marissa Nova Khyriem
T23CS003



Dhananjay Bhargava
T23CS004



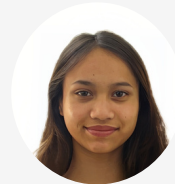
Shrikant Sharma
T23CS005



Ankita
T23CS006



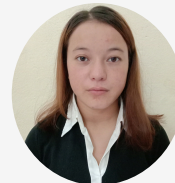
Sweta Jha
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Abygail Nora Lyngdoh
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Sainphyrnai Marbaniang
T23CS009



Deibyntalang Myllemngap
T23CS010



Badahun Konjir
T23CS011

MTECH 2024-2026

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DR. BUNIL KUMAR BALABANTARAY



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Tanishq Sasmal
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Utsav Balar
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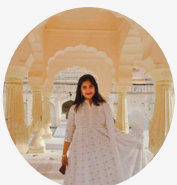
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Mriganka Shekhar Das
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Anushka Sarkar
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Sohonsagar Singha
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Rahil Agarwal
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Siddhant Siwach
T24CS010



Rahul Maity
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Skhembor Suchen
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Divyodeep Chowdhury
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Abhijit Kachary
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Saucy Mukhim
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Shining Massar
T24CS023



Wallambok Rani
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Ashutosh Kumar
T24CS024



Philarihun Khongshah
T24CS017



Agatha Zara Swett
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Plabana Saud
T24CS020

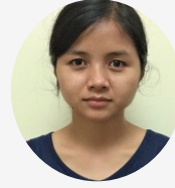


Phidaiaibha Syiemlieh
T24CS021

The
**RESEARCH
SCHOLARS**



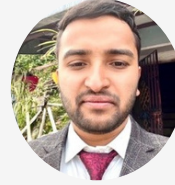
Moirangthem Rabindra Singh
P19CS012



Lumlang Sawkmie
P22CS010



Prasant Kumar Mohanty
P21CS001



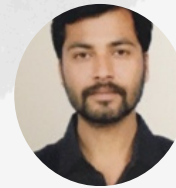
Abisek Dahal
P23CS001



Madhusudan Naik
P21CS003



Shaphiiakyrmen Skhembill
P23CS005



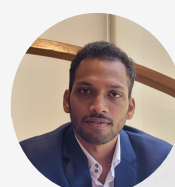
Pushpak Das
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Audrey Liza Nongrum
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Anushka Chaurasia
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Arindam Baidya
P24CS002



Dillip Kumar Mishra
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Ayush Shukla
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Namrata Govind Ambekar
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Edawanbiang Dhar
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Shreerudra Pratik
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Russell Cooper Banks
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The
**RESEARCH
SCHOLARS**



Samrat Sarkar
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Mhasivilie Sekhose
P24CS008



Mughalu
P24CS009



Subhrajeet Ganguly
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Shemphang Ryntathiang
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Ericson Rani
P24CS012

Alumni Insights



“ JOURNEY FROM A STUDENT AT NITM TO IIT GUWAHATI ”



*Dr. Phrangboklang Lyngton
Thangkhiew,
Assistant Professor,
Department of CSE,
IIT Guwahati*

Greetings NIT Meghalaya!

"Technology is best when it brings people together"-Matt Mullenweg

As I reflect on my journey from NIT Meghalaya, where I pursued my PhD, to my current role as an Assistant Professor at IIT Guwahati, I am filled with immense gratitude and pride. NIT Meghalaya played a crucial role in shaping not only my academic path but also my perspective on research and innovation. The institute's supportive faculty, vibrant academic environment, and commitment to fostering curiosity created a foundation for my growth as a researcher and educator.

NIT Meghalaya is where I developed the skills, resilience, and knowledge that continue to guide me in my professional endeavors. I will always cherish the memories and the sense of community I experienced during my time there. It is heartening to see the institute continue its upward trajectory, nurturing the next generation of scholars and professionals.

I am proud to be an alumnus of NIT Meghalaya and look forward to its continued success and contributions to the world of education and research.

Thesis Title: Synthesis and Mapping of Boolean Function to Memristive Crossbar Array

Supervisor: Dr Kamalika Datta

Joining Date: July 29, 2015

Defended on : July 2, 2019

Convocation: September 28, 2019



As a child, I had a dream to build software that people use. I enrolled at NIT Meghalaya with the same dream. Now, 4 years later, the institute helped me fulfill it. The calm environment, engaging peer groups, supportive faculty, and vast opportunities that the institute provided us with were my foundation. I am thankful for the time I had at the institute.

Samuel Khongthaw
B20CS004



UPCOMING
EVENTS

COMING
SOON
Stay Tuned

Upcoming Events

Workshop on Viksit Bharat 2047 15th-16th November 2024



विकसित भारत अभियान पर दो दिवसीय राष्ट्रीय कार्यशाला -आत्मनिर्भर पूर्वोत्तर (Viksit Bharat 2047 through Atmanirbhar Bharat-North East-Agriculture, Healthcare & IKS/ Viksit Bharat 2047 through North Eastern Tech Innovation: Agriculture, Healthcare, and IKS)

Organised by
National Institute of Technology Meghalaya
and
North Eastern Hill University Shillong

STP on Cultural heritage preservation using AI Tools, sponsored by SERB 25th - 29th November



SHORT TERM TRAINING PROGRAM
on
Cultural Heritage Preservation using Machine Learning
organized by
NATIONAL INSTITUTE OF TECHNOLOGY MEGHALAYA
(An Institute of National Importance)

EVENT ORGANISER
Dr. B. K. Balabantaray, Dept of CSE, NIT Meghalaya
Email: bunil@nitm.ac.in

ABOUT NIT MEGHALAYA
National Institute of Technology (NIT) Meghalaya is one among the 31 NITs established under the NIT Act 2007 (Amended 2012) of the Parliament of India as Institutes of National Importance with full funding support from the Ministry of Education, Government of India. It has been established in 2007 and started functioning from its temporary campus in Shillong in 2012. It is presently campus is currently under development at Charaighat. Presently the institute has one (01) Department and eight (08) Centres with a combined strength of 452 regular faculty members all the well equipped and modern facilities. It has advanced and experimental setup.

PROGRAM OBJECTIVE
The program is aimed to provide hands-on experience to the students through the use of various experimental facilities and ready available facilities for the preservation of Cultural Heritage. The program is designed to provide the students with the following objectives:
* Develop an AI model for the preservation of Cultural Heritage.
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HOW TO REGISTER
* Register online at: <https://nitm.ac.in>
* Participants are notified during the all the semester semesters.
* Last date for registration: 20th November 2024, 5 PM.

MODE OF WORKSHOP
* This is a 5-day online workshop.
* Participants are to be physically present for the duration from 25th to 29th November 2024.

HOW TO REACH
The nearest railway station is Shillong. The online mode can be used for the duration of the workshop. It takes about 3 hours to reach Shillong from Guwahati. One can use the local bus to reach the nearest bus station, Jalandhar.

PROGRAM OUTCOME
The program is aimed to support the students in their research work, which will be published in the form of articles, papers, and books.

CONTENTS
* Image Segmentation
* Image Classification
* Image Compression
* Image Restoration
* Computer Vision
* Deep Learning
* Generative AI
* Generative AI for Cultural Heritage
* Generative AI for Cultural Heritage

KEY SPEAKERS
1. Prof. Sankar Nath, IIT Bombay
2. Prof. Sanjay Kumar, IIT Bombay
3. Dr. Deepak Kumar, IIT Bombay
4. Dr. Sankar Nath, IIT Bombay
5. Dr. Sankar Nath, IIT Bombay
6. Dr. Sankar Nath, IIT Bombay
7. Dr. Sankar Nath, IIT Bombay
8. Dr. Sankar Nath, IIT Bombay
9. Dr. Sankar Nath, IIT Bombay
10. Dr. Sankar Nath, IIT Bombay
11. Dr. Sankar Nath, IIT Bombay
12. Dr. Sankar Nath, IIT Bombay
13. Dr. Sankar Nath, IIT Bombay
14. Dr. Sankar Nath, IIT Bombay
15. Dr. Sankar Nath, IIT Bombay

STUDENT COORDINATORS
1. Learning Institute, IIT Bombay
2. Learning Institute, IIT Bombay
3. Learning Institute, IIT Bombay
4. Learning Institute, IIT Bombay
5. Learning Institute, IIT Bombay
6. Learning Institute, IIT Bombay
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15. Learning Institute, IIT Bombay

5th International Conference on Intelligent Systems and Machine Learning is scheduled to organize by the Computer Science and Engineering Department during 09-10 May, 2025 at NIT Meghalaya

ICISML-2025
The 5th International Conference on Intelligent Systems and Machine Learning (ICISML-2025) is a leading event focused on the latest advancements in intelligent systems and machine learning. These technologies play a vital role in analysing vast amounts of data, aiding decision-making, and driving progress across various domains. By enabling machines to learn from data and perform human-like tasks, they facilitate the discovery of valuable insights and patterns. The conference provides a platform for researchers, practitioners, and industry experts to exchange knowledge, discuss challenges, and explore emerging trends in this dynamic field.

ABOUT NIT MEGHALAYA
The National Institute of Technology Meghalaya is one among the 31 NITs in India established under the NIT Act 2007 (Amended 2012) of the Parliament of India as Institutes of National Importance with full funding support from the Ministry of Education, Government of India. The Institute presently situated at Laitumkrah, Shillong, India. The Institute has five Engineering Departments as Mechanical Engineering, Civil Engineering, Electrical Engineering, Electronics and Communication Engineering and Computer Science and Engineering. Since 2017, we are consistently maintaining our position in NIRF in top 100 institutes of India. In 2024, we are ranked at 68 by NIRF.

SHILLONG
Shillong is the capital city of Meghalaya and the District headquarter of East Khasi Hills. It is the only hill station in the country that is accessible from all sides. The name Shillong is derived from U-Shyllong, a powerful deity and is situated at an altitude of 1,491m above sea level. Shillong is very well connected by air (Guvahati and Umroi Airport), by road (NH, connecting Guvahati-Shillong and by railway station. NIT Meghalaya campus is located at about 35 km from Umroi airport, 120 km from Guvahati airport and about 97 km from Guvahati railway station.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
The Department of Computer Science & Engineering, NIT Meghalaya offers B. Tech degree in Computer Science and

Engineering discipline. This U.G Programme in Computer Science and Engineering is perhaps the most popular Programme in NIT Meghalaya, with an average intake of 30 students per year. The department has adequate facilities to support these teaching activities. It has a well-qualified and experienced faculty team. The Computer Science and Engineering department makes all efforts in imparting high-quality education to its highly motivated students. One of the aims of this department to play its role of producing Computer Engineers ready to satisfy the needs of the Computer and IT world. The Department is also actively involved in various Research activities.

PATRON
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Director, NIT Meghalaya

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Dr. Tanupriya Choudhury, University of Petroleum and Energy Studies (UPES) Dehradun

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Dr. Monika Mangla, Dwaradas J Sanghvi College of Engineering Mumbai

Information Brochure



5th International Conference on Intelligent Systems and Machine Learning (ICISML-2025)
(May 09-10, 2025) (Hybrid Mode)

Organized by
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National Institute of Technology Meghalaya - 793003, Meghalaya (INDIA)

Editorial Board



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