AMITY UNIVERSITY

INNOVATIONS @

Amity Centre for Artificial Intelligence

Building a smarter world with Artificial Intelligence.

OUR MENTORS

DR. ASHOK K. CHAUHAN

Founder President, Ritnand Balved Education Foundation
(The Foundation of Amity Institutions and the sponsoring
body of Amity Universities), Chairman, AKC Group of Companies

DR. ATUL CHAUHAN

Chancellor, Amity University
President, Ritnand Balved Education Foundation
CEO, AKC Group of Companies

PROF. (DR.) BALVINDER SHUKLA

Vice Chancellor
Amity University Uttar Pradesh

DR. W. SELVAMURTHY

President, Amity Science, Technology and Innovation
Foundation (ASTIF), Director General, Amity Directorate
of Science and Innovation (ADSI), Chancellor, Amity University,
Chhattisgarh

AMITY CENTRE FOR ARTIFICIAL INTELLIGENCE

The Amity Centre for Artificial Intelligence (ACAI) is dedicated to providing top-tier education, uphold cutting-edge research, and promoting interdisciplinary collaboration in the field of Artificial Intelligence. Our state-of-the-art facilities and experienced faculty are committed to guiding students toward becoming future leaders in this dynamic domain. This AI Centre will serve as a platform to nurture their creativity, empowering them to actively participate in the latest developments in AI technology and make meaningful contributions to the project through hands-on projects, research efforts and collaborative projects. Together we aim to cultivate a vibrant community of students, thinkers and practitioners who are ready to shape the future of artificial intelligence and make a positive difference in the world. Through education, research, and outreach ACAI aims to shape the future of artificial intelligence for the benefit of society.

The Centre is powered with Supercomputing AI Machines: NVIDIA DGX2 A100 GPU Servers @10 peta-Flop Computing Power. The CUDA based GPU servers will provide opportunities to our students and faculty to train huge amounts of data and train complex AI models. The Centre have offered courses for Students in the latest areas of Deep Learning, Machine Learning, Computer Vision, Generative AI etc. We are among the first in the country to start a full UG course in Generative AI in the B.Tech Program. Our Students have won many awards, hackathons and published many high quality research work in the area of Artificial Intelligence.

Amity being a University of Diverse Nature there are areas of study like Engineering, Applied Sciences, Management, Biotechnology, Life Sciences, Pharmacy and many more and this centre will act as a to hub foster Artificial intelligence in course curriculum with customized courses for all possible areas. Also, inter-disciplinary research projects is a priority to apply AI in various research problems in diverse areas. With a diverse range of programs and courses designed to meet the needs of students at every stage of their academic journey, ACAI will be working to shape the next generation of AI professionals.

ACAI represents a bold vision for the future of education and technology in Artificial Intelligence. By combining academic excellence with a forward-thinking approach to research and innovation, we are paving the way for a brighter, more AI-driven future for all. We in ACAI are committed to make this Centre as one of the finest AI hub in the country and to build a smarter world with AI.

Best Wishes

PROF. M.K.DUTTA
Director, Centre for Artificial Intelligence.
Amity University, Noida.

ACAI-Lab - Infrastructure

The Amity Centre for Artificial Intelligence has the most advanced Supercomputing facility, NVIDIA DGX2 A100, the world's most powerful AI system to fuel research, development, and innovation with 16 state-of-the-art NVIDIA A100 GPUs and 10 Petaflop computing power. This high-speed AI server delivers unparalleled performance, speed, and precision, allowing you to accelerate AI workloads and unlock new opportunities. Researchers working on machine learning, deep learning, or data science, this NVIDIA DGX2 A100 server is the perfect tool for the job. Its advanced hardware and software stack provides a seamless and efficient environment for training, inference, and deployment, enabling you to achieve breakthrough results and insights.

Key features and benefits:

- Two NVIDIA DGX2 servers with 16 A100 GPUs for unparalleled performance and efficiency.
- 10 Petaflop computing power for lightning-fast processing and high-bandwidth connectivity.
- High-speed AI server for accelerated workloads and improved productivity.
- Advanced hardware and software stack for seamless and efficient training, inference, and deployment.
- Ideal for machine learning, deep learning, and data science applications.
- Unmatched performance, speed, and precision for breakthrough results and insights.
- DGX A100 which is equipped with eight NVIDIA A100 Tensor Core GPUs, providing a combined total of 320 GB GPU memory

Powered with the Most Advanced Supercomputing Facility

Resources available:

Access to Nvidia NGC Catalog: NVIDIA NGC is **the hub for GPU-optimized software for deep learning, machine learning, and HPC** that provides containers, models, model scripts, and industry solutions so data scientists, developers and researchers can focus on building solutions and gathering insights faster.

Cloud Native Support:

DGX Cloud provides dedicated clusters of NVIDIA DGX AI supercomputing, paired with NVIDIA AI software. The service makes it possible for every enterprise to access its own AI supercomputer using a simple web browser, removing the complexity of acquiring, deploying, and managing on-premises infrastructure.

Hardware Specification:

CPU: -

- Dual AMD EPYC 7003 series processors with up to 64 cores per processor
- Support for PCIe Gen4
- Support for up to 4TB of DDR4 memory

GPU: -

- NVIDIA A100 Tensor Core GPU with 6,912 CUDA cores and 40GB or 80GB of high-bandwidth memory (HBM2)
- Up to 19.5 teraflops of single-precision (FP32) performance or 156 teraflops of mixed-precision (FP16/FP32) performance
- Support for NVIDIA NVLink and PCIe Gen4 for GPU-to-GPU communication
- Support for NVIDIA Tensor Cores for accelerated AI training and inference
- Support for NVIDIA Multi-Instance GPU (MIG) technology, which allows multiple users to share a single GPU.

Storage: -

- Support for up to 12 NVMe SSDs
- Support for up to 8 hot-swappable SAS/SATA drives

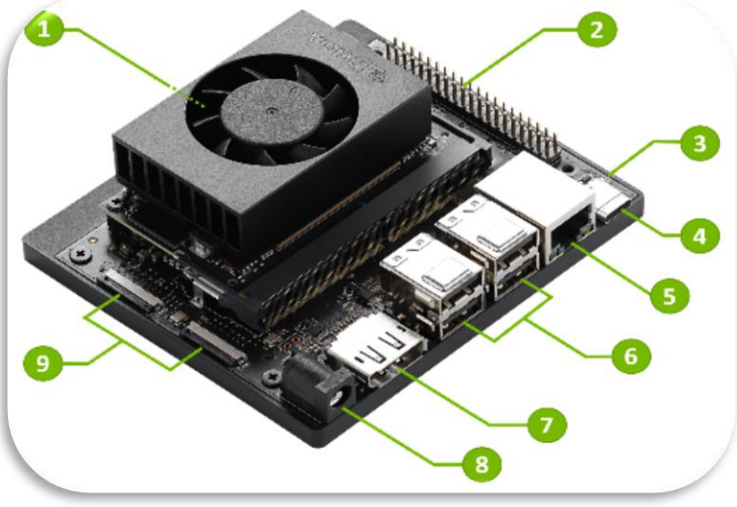
Networking:

To this end, DGX A100 provides:

- **Next generation NVLink—10x faster than 4th generation PCIe**.
- **NVSwitch—8 Mellanox ConnectX-6 HDR InfiniBand adapters, each of them running at 200 GB/s**.
- **Magnum IO software SDK**—makes it possible to distribute workloads across thousands of GPUs.

NVIDIA® Jetson Nano Module: -

- The Jetson Nano is a small, low-cost, single-board computer developed by NVIDIA for AI and robotics applications.
- It is specifically designed for tasks related to artificial intelligence (AI) and robotics,
- The Jetson Nano features a 128-core Maxwell GPU, which provides hardware acceleration for AI and deep learning workloads, significantly improving performance.
- It is designed to be cost-effective, making it accessible to hobbyists, students, and developers interested in AI and robotics.



❖ **Jetson Nano Module Key Features:**

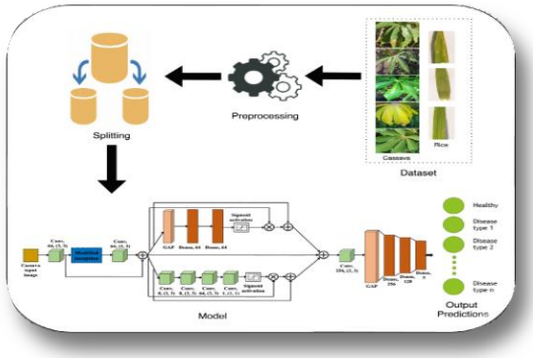
- 1x Gbe, 4x Usb 3.0, 1x 4kp60 Hdmi Outputs, 1x Dp.
- Stacked Outputs.
- 2x2 Lane Mipi Csi-2.
- 1x4 Lane Mipi Csi-2.
- 40-pin Expansion Header.
- 12-pin Button Header.
- 1x Micro-SD Card Slot.
- Operating Temperature: 0ºC ~ 65ºC

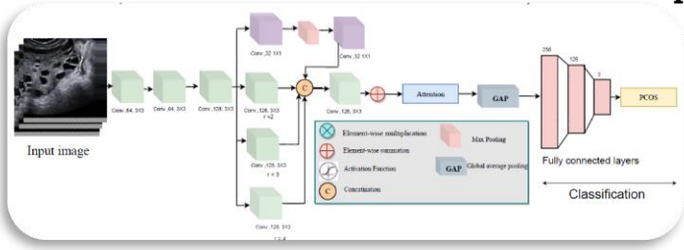

STUDENT
INNOVATORS
@ ACAI

STUDENT INNOVATIONS

Deep Learning and computer vision for Plant Disease Identification

Rashi Chauhan
B.Tech Student (2021-25)
Amity School of Engineering & Technology



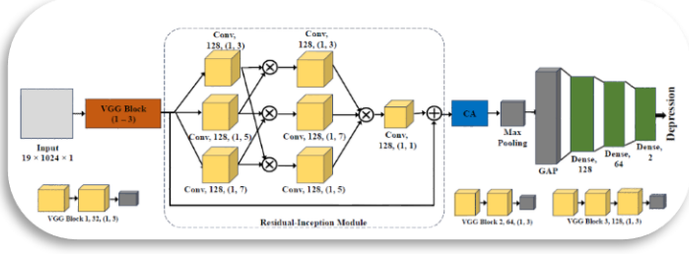


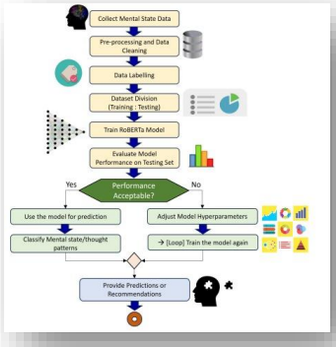
Attention-based Multi-scale Deep Neural Network for Diagnosis of Polycystic Ovary Syndrome from USG Images

Suzain Rashid
B.Tech Student (2021-25)
Amity School of Engineering & Technology

Attention-based VGG-Residual-Inception Module for EEG-Based Depression Detection

Gautam Verma,
B.Tech Student (2020-24)
Amity School of Engineering & Technology



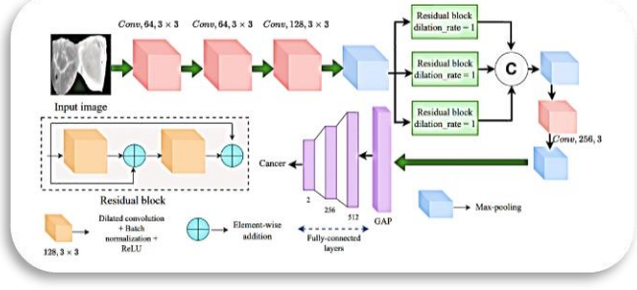


Leveraging Transformers for Early Detection of Depression Tendency in Textual Data

Srishti Verma & Vishal
B.Tech Student (2021-25)
Amity Institute of Biotechnology

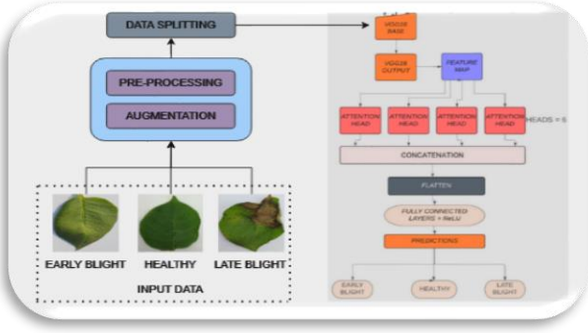
Dilated Multi-scale Residual Block-based Deep Network for Detection of Breast Cancer from MRI Images

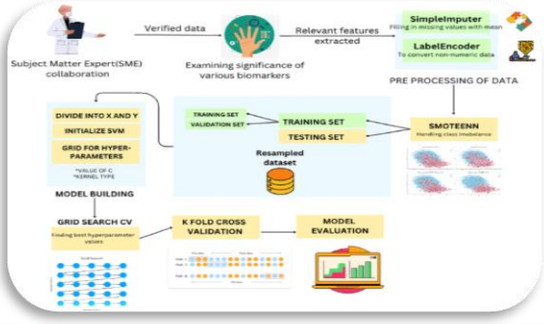
Himanshi Sinha
B.Tech Student (2021-2025)
Amity School of Engineering & Technology



Multi-Head Attention-Based Transfer Learning Approach for Plant Disease Detection

Rudra Shaurya
B.Tech Student (2021-25)
Amity School of Engineering & Technology





Machine Learning Pipeline for Multi-Grade Classification in Pancreatic Cancer Detection Using Urinary Biomarkers

Pragya Pandey
B.Tech Student (2020-24)
Amity School of Engineering & Technology

Combining Focal loss with Cross-entropy loss for Pneumonia Classification with a Weighted Sampling Approach

Parth Thirwani
B.Tech Student (2022-26)
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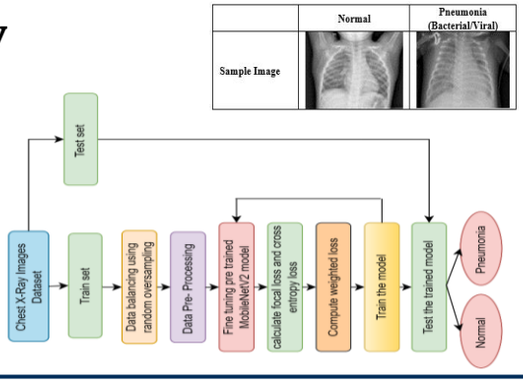

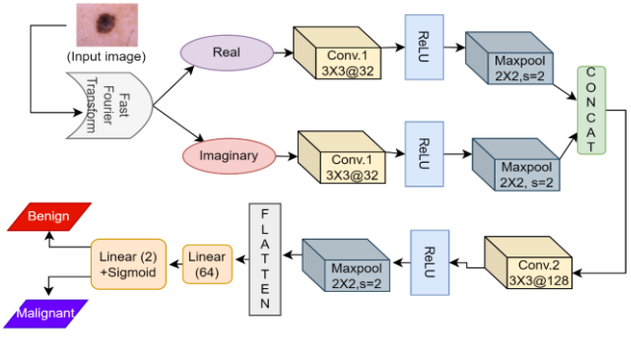

Skin cancer Classification using Convolution Neural Network Fortified with Fast Fourier Transform

Ambica Pradhan
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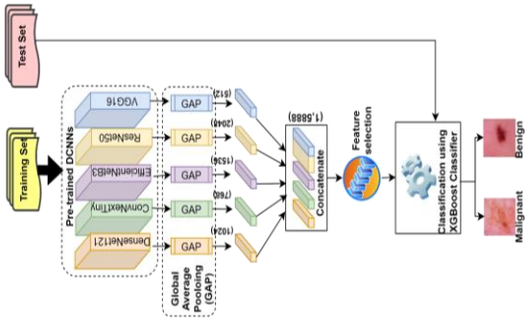
Amity School of Engineering & Technology

Skin Lesion Classification using Deep Feature Fusion and Selection Using XGBoost Classifier

Anant Krisn Bais
Integrated Bachelors and Masters, Biotechnology
(2019 – 2024) Amity Institute of Biotechnology



Multi-scale Attention Network for Early Detection of Alzheimer's Disease from MRI images

Vaishali Aggarwal
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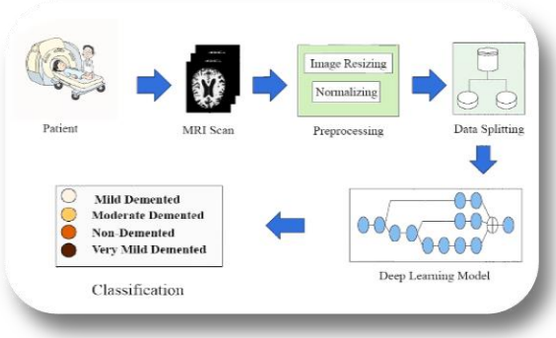
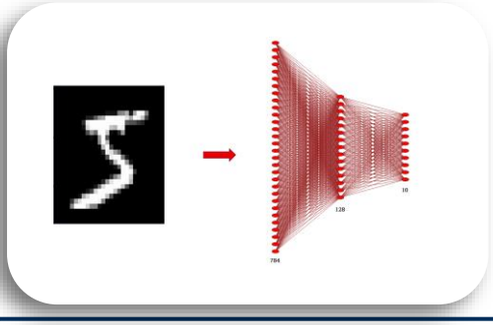
Amity School of Engineering & Technology





Enhancing Deep Neural Network Convergence and Performance: A Hybrid Activation Function Approach by Combining ReLU and ELU Activation

Divyam Aggarwal
B.Tech. AI Student (2022-26)
Amity School of Engineering & Technology

Optimized TBNet: Building a Robust Neural Network for Precise Tuberculosis Diagnosis

Avaneesh Garg
B.Tech. AI Student (2022-26)
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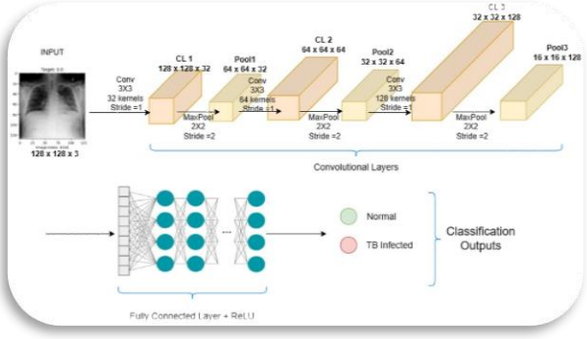

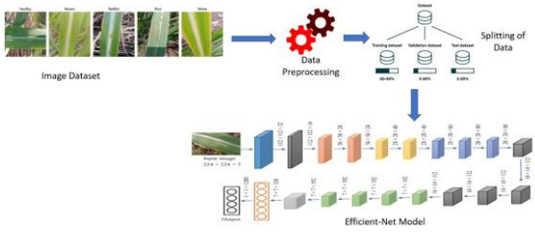

CaneGuard: A Cutting-Edge Approach to Sugarcane Leaf Disease Classification!

Siddharth Sharma & Divyam Tiwari
B.Tech. Student (2022-26)
Amity School of Engineering & Technology

AI-driven Classification and Segmentation Framework for COVID-19 Diagnosis from Chest X-ray Images

Anshika Chauhan
B.Tech. Student (2021-25)
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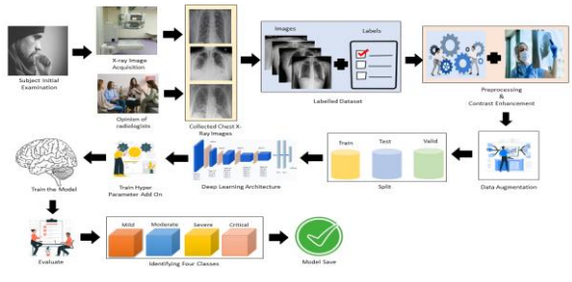
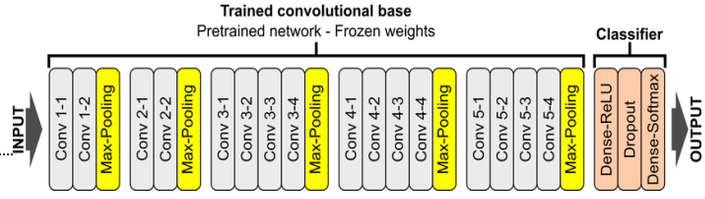
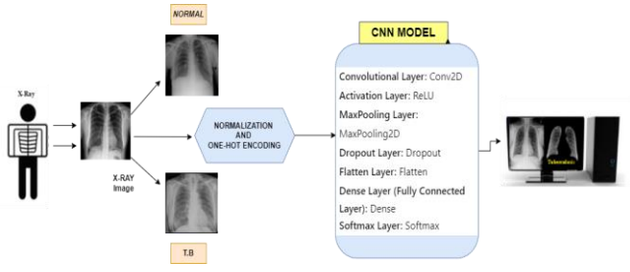


Early Detection of Pediatric Pneumonia using Transfer Learning

Hiyaa Malik
B.Tech. Student (2022-26)
Amity School of Engineering & Technology



AI framework used for Training



Tuberculosis detection using Convolution Neural Network

Janga Bharat Reddy
B.Tech Student (2022-2026)
Amity School of Engineering & Technology

A Convolutional Neural Network for Multi-Class Classification of Student Stress Levels

Dereddy Hitesh Reddy
B.Tech Student (2022-2026)
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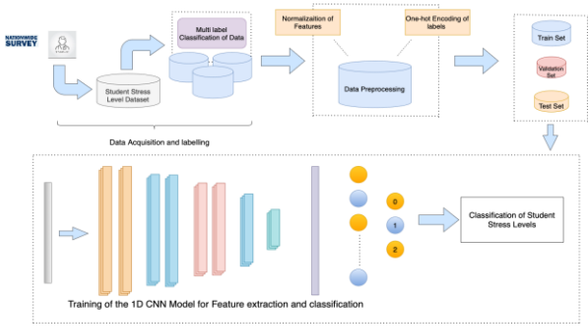

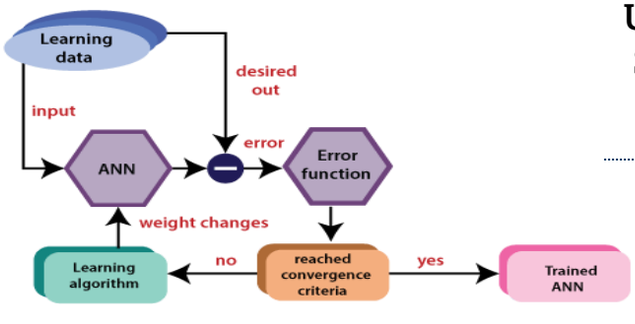

Unveiling Safer Skies: Cutting-edge Space Debris Detection with DNN Model

Shreya Rajesh
B.Tech Student (2022-2026)
Amity School of Engineering & Technology

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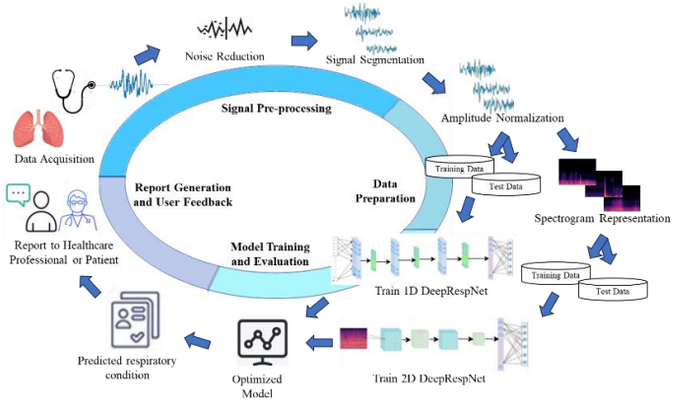
1. DeepRespNet: A Deep Neural Network for Classification of Respiratory Sounds



Summary: A deep learning-based framework to create an automatic, non-invasive, diagnostic method of categorizing pulmonary sounds. Two deep learning architectures, 1D DeepRespNet and 2D DeepRespNet are developed in this work that were trained and evaluated with normalised 1- D time series and 2-D spectrograms of acoustic signals of six types of lung sounds (normal, aortic, wheezing, bronchial, crepitation and rhonchi).

Relevant Publication: Rinki Gupta, R.Singh, Carlos M. Travieso-González, Radim Burget & Malay Kishore Dutta, "DeepRespNet: A Deep Neural Network for Classification of Respiratory Sounds" Biomedical Signal Processing and Control, Elsevier Publishers, DOI: doi.org/10.1016/j.bspc.2024.106191, 2024, SCI indexed Impact Factor - 5.1.

Team: Prof. Rinki Gupta and Prof. M. K. Dutta.

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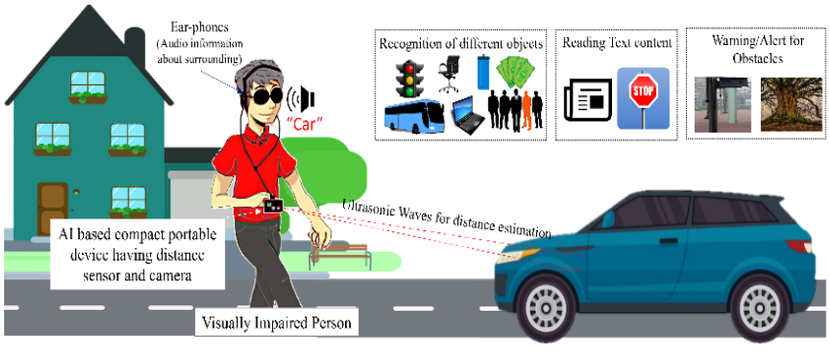
2. AI-SenseVision: A Low-cost Artificial Intelligence-based Real-time Assistance for Visually Impaired People

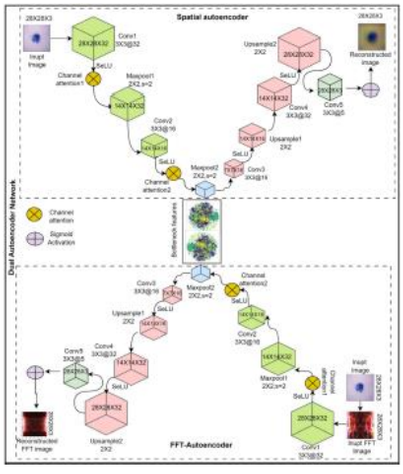


Summary: An artificial intelligence-based innovative wearable assistive device — AI-SenseVision, to analyse visual and sensory information about the objects and obstacles present in the scene to perceive the surrounding environment using advanced deep learning and object detection algorithms. The trained deep learning models have been integrated into a low-cost single-board processor to make a standalone cost-effective device.

Relevant Publication: R.C. Joshi, M. K. Dutta, Anuj Kumar Sharma and Radim Burget "AI-Sense Vision: A Low-cost Artificial Intelligence-based Robust and Real-time Assistance for Visually Impaired People" IEEE Transactions on Human-Machine Systems, DOI: 10.1109/THMS.2024.3375655, 2024, SCI indexed Impact Factor – 3.6.

Team: Rakesh Chandra Joshi and Prof. M. K. Dutta.

3. Skin cancer detection through attention guided dual autoencoder approach with extreme learning machine

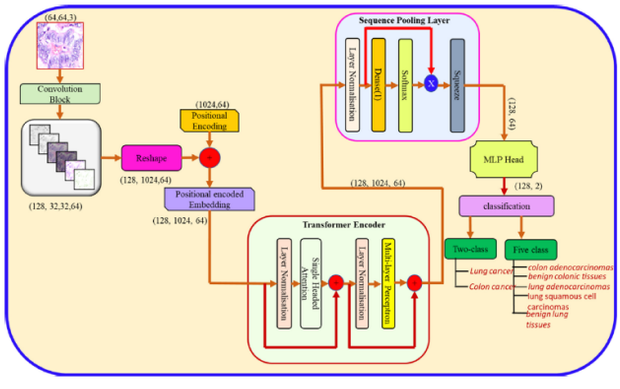


Summary: Skin cancer is a serious disease where early detection is crucial to prevent its spread. AI-based methods can significantly aid in early detection. This study introduces a novel AI approach, 'DualAutoELM,' for identifying different types of skin cancers effectively. The proposed method utilizes a network of autoencoders consisting of two types: Spatial Autoencoder and FFT (Fast Fourier Transform) Autoencoder. The Spatial Autoencoder focuses on learning spatial features from skin lesion images, while the FFT Autoencoder captures textural and frequency patterns in transformed images. Attention modules incorporated within the encoders enhance their ability to learn distinguishing features. An Extreme Learning Machine (ELM) classifier is trained on features extracted from the bottleneck layers of these autoencoders to classify skin malignancies. The method was evaluated on two public datasets, 'HAM10000' and 'ISIC-2017', achieving high performance with an AUC of 0.98, precision of 97.68%, and accuracy of 97.66% on the HAM10000 dataset, and an AUC of 0.95, precision of 86.75%, and accuracy of 86.68% on the ISIC-2017 dataset. The results demonstrate the accuracy and robustness of the proposed method for detecting skin cancer.

Relevant Publication: Ritesh Maurya, Satyajit Mahapatr, Malay Kishore Dutta, Vibhav Prakash Singh, Mohan Karnati, Geet Sahu & Nageshwar Nath Pandey, Skin cancer detection through attention guided dual autoencoder approach with extreme learning machine. Sci Rep 14, 17785 (2024). https://doi.org/10.1038/s41598-024-68749-1 [SCIE] (IF. 3.8)

Team: Dr. Ritesh Maurya and Prof. M. K. Dutta.

4. Breaking Barriers in Cancer Diagnosis: Super-Light Compact Convolution Transformer for Colon and Lung Cancer Detection

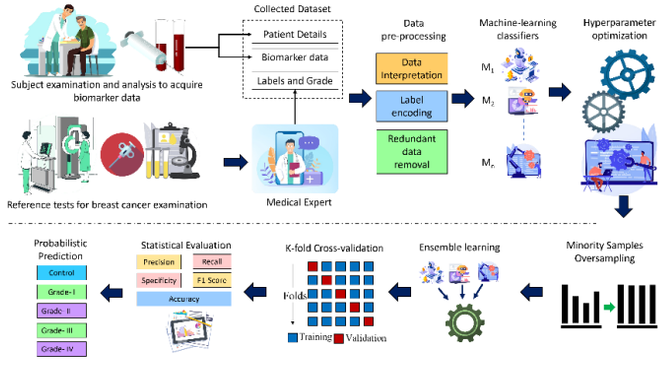


Summary: Lung and colon cancers have high mortality rates, emphasizing the importance of early diagnosis. However, the limited availability of histopathology images used for diagnosing these cancers presents a challenge in developing AI-based detection systems. Due to this data limitation, it is crucial to minimize the number of parameters in AI models. This study proposes a compact and efficient convolution transformer architecture, named C3-Transformer, for diagnosing colon and lung cancers using histopathological images. The C3-Transformer employs a convolutional tokenization and sequence pooling approach, combining the benefits of Convolutional Neural Networks (CNNs) with transformers while reducing the number of parameters. The novelty of this approach lies in its ability to efficiently classify colon and lung cancers with a minimal parameter count. The model was evaluated on the 'LC25000' dataset and achieved an average classification accuracy of 99.30%, precision of 0.9941, and recall of 0.9950 while using only 0.0316 million parameters**. These results demonstrate the model's effectiveness in accurately detecting colon and lung cancers from histopathology images with a high level of efficiency.

Relevant Publication: Ritesh Maurya, Nageshwar Nath Pandey, Mohan Karnati, Geet Sahu, Breaking Barriers in Cancer Diagnosis: Super-light Compact Convolution Transformer for Colon and Lung Cancer Detection, International Journal of Imaging Systems and Technology. Doi: https://doi.org/10.1002/ima.23154 [SCIE] (IF. 3.0)

Investigator: Dr. Ritesh Maurya.

5. An Artificial Intelligence-based Ensemble Approach for Breast Cancer Identification and Multi-Grade Prediction

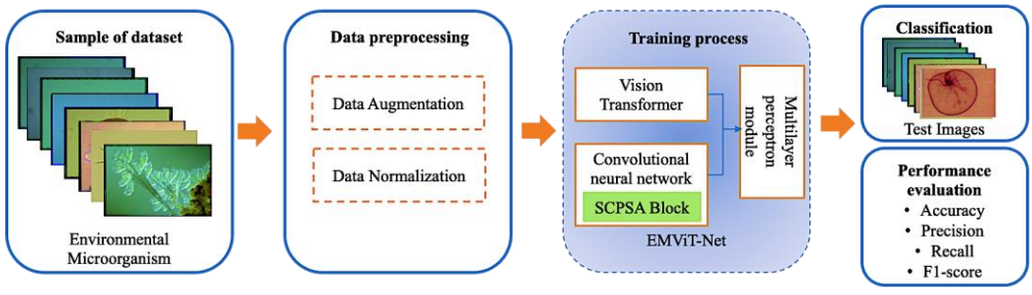


Summary: The developed innovative ensemble-based machine learning framework confronts the complexities inherent in predicting tumor grade amidst multifaceted variations and offers a comprehensive analysis of multiple biomarkers. It addresses the intricate nuances of diagnosis and prognosis by integrating diverse classifiers and incorporating rigorous biomarker analysis. The model attains significant performance through meticulous fine-tuning of hyperparameters utilizing particle swarm optimization.

Relevant Publication: Rakesh Chandra Joshi, Pallavi Srivastava, Rashmi Mishra, Radim Burget, M. K.Dutta. "Biomarker Profiling and Integrating Heterogeneous Models for Enhanced Multi-Grade Breast Cancer Prognostication" Computer Methods an Programs in Biomedicine, Elsevier Publishers, 2024, DOI: doi.org/10.1016/j.cmpb.2024.108349, SCI Indexed Impact Factor : 6.1.

Team: Rakesh Chandra Joshi and Prof. M. K. Dutta.

6. EMViT-Net: A transformer-based network utilizing CNN and multilayer perceptron for the classification of environmental microorganisms using microscopic images

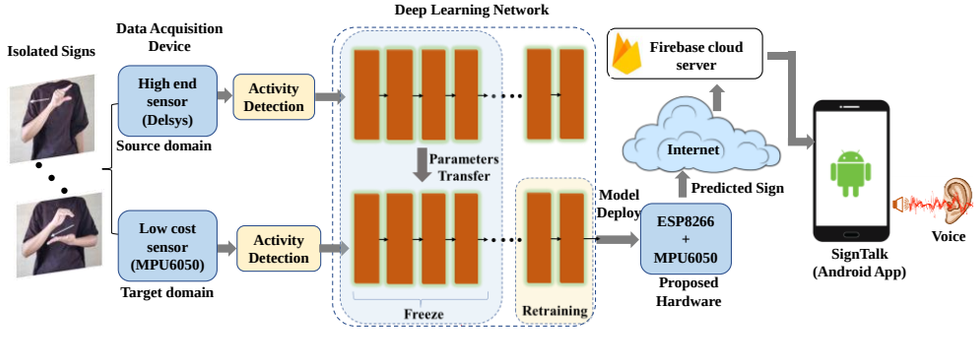


Summary: A vision-transformer-based deep neural network is proposed for classifying environmental microorganisms with microscopic images. The model uses CNN and multi-layer perceptron models for classification. A new separable convolutional parameter-sharing attention (SCPSA) block is introduced for capturing local and long-distance dependency at once. The AI method efficiently extracts discriminatory local and global features from a small microorganism image dataset

Relevant Publication: Dwivedi, Karnika, Malay Kishore Dutta, and Jay Prakash Pandey. "EMViT-Net: A novel transformer-based network utilizing CNN and multilayer perceptron for the classification of environmental microorganisms using microscopic images." Ecological Informatics (2023): 102451. https://doi.org/10.1016/j.ecoinf.2023.102451, IF: 5.1

Investigator: Prof. M. K. Dutta.

7. A TinyML solution for an IoT-based Communication Device for Hearing Impair

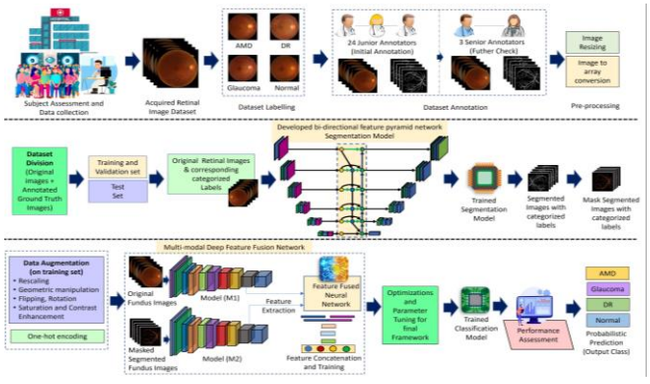


Summary: A tiny machine learning (TinyML) solution is proposed for sign language recognition using a low-cost, wearable, internet-of-things (IoT) device. A lightweight deep neural network is deployed on the edge device to interpret isolated signs from the Indian sign language using the time-series data. The recognized sign is transmitted to a cloud platform in real-time. A mobile application, SignTalk, is also developed.

Relevant Publication: Sneha Sharma, Rinki Gupta, Arun Kumar, "A TinyML solution for an IoT-based Communication Device for Hearing Impaired" Expert Systems with Applications, Elsevier Publishers, SCI Indexed Impact factor 8.5, Accepted 2-Jan 2024, Area: Time series and Deep learning, 2024, DOI:10.1016/j.eswa.2024.123147

Team: Dr. Sneha Sharma and Prof. Rinki Gupta.

8. Deep Learning-based Retinal Blood Vessels Segmentation and Multi-class Classification Framework for Eye Diagnosis

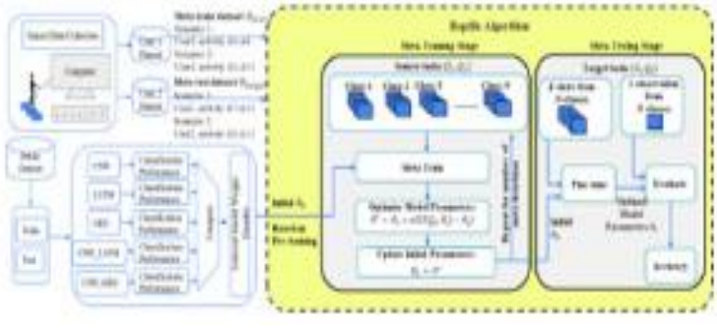


Summary: A segmentation-classification framework is developed for retinal vessel segmentation and multi-class classification. A weighted bi-directional feature pyramid network and U-Net backbone architecture-based customized deep-learning model is built to segment blood vessels which enhances feature extraction and multi-scale feature fusion. The architectural design comprises an end-to-end encoder-decoder network featuring six-depth layers with varying resolutions, enabling the extraction of high-level descriptors and lower-level, fine-grained characteristics.

Relevant Publication: Rakesh Chandra Joshi, A.K.Sharma, M.K.Dutta, "VisionDeep-AI: Deep Learning-based Retinal Blood Vessels Segmentation and Multi-class Classification Framework for Eye Diagnosis"- Biomedical Signal Processing and Control, Elsevier Publishers, SCI indexed Impact Factor - 5.1, 2024, DOI : 10.1016/j.bspc.2024.106273

Team: Rakesh Chandra Joshi and Prof. M. K. Dutta.

9. Few-shot transfer learning for wearable IMU-based human activity recognition



Summary: A novel few-shot transfer learning (FSTL) approach is proposed for classification of human activities using just few instances (shots) of the data obtained from a wearable system assembled to collect inertial sensor data for different human activities, performed by two users. The model parameters of such a model are then fine-tuned using the Reptile algorithm to determine the optimal initial parameter set using which, the model will classify activities with just few-shots of data from the target task.

Relevant Publication: H. S. Ganesha, Rinki Gupta, Sindhu Hak Gupta, Sreeraman Rajan, "Few-shot transfer learning for wearable IMU-based human activity recognition", Neural Computing and Applications, Mar 2024, https://doi.org/10.1007/s00521-024-09645-7.

Investigator: Prof. Rinki Gupta.

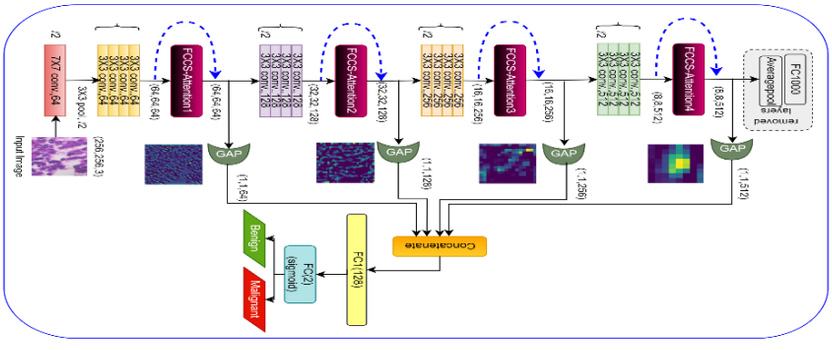
10. A Hybrid Residual and Capsule layer-based CNN Model for Yoga Pose Estimation

Summary: A novel hybrid residual and capsule based CNN network is proposed for yoga pose estimation on complex yoga pose classes. The performance of the proposed model is analysed and compared with the existing models. It captures hierarchical image structure and improves feature transfer (capsule layers). It handles noise and deformations in yoga images due to body variations, camera angles, and different poses.

Relevant Publication: Sneha Sharma, Aman Gupta, Kamakhya Chaturvedi., A Hybrid Residual and Capsule layer-based CNN Model for Yoga Pose Estimation" at 4th International Conference on Information Technology, 2024 on the theme "Adaptive Intelligence: Evolve your World" March 2024, Publisher: Springer Nature publishers.

Investigator: Dr. Sneha Sharma.

11. FCCS-Net: Breast Cancer Classification Using Multi-Level Fully Convolutional-Channel and Spatial Attention-based Transfer Learning Approach

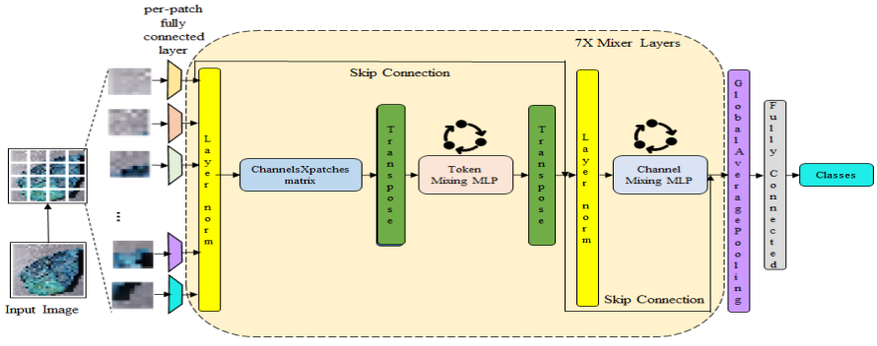


Summary: A multi-level, complete convolution-driven attention-based transfer learning approach named 'FCCS-Net' has been proposed, for breast cancer classification. The proposed deep learning-based approach employs a fully convolutional attention mechanism to focus the important cellular features in inter-channel and intra-channel feature space. This proposed attention is applied across multiple levels of a pre-trained ResNet18 model, supplemented with additional residual connections.

Relevant Publication: Ritesh Maurya, Nageshwar Nath Pandey, Malay Kishore Dutta, Mohan Karnati, FCCS-Net: Breast Cancer Classification Using Multi-Level Fully Convolutional-Channel and Spatial Attention-based Transfer Learning Approach, Biomedical Signal Processing and Control. SCI indexed, Impact Factor: 5.076. DOI : doi.org/10.1016/j.bspc.2024.106258

Team: Dr. Ritesh Maurya, Prof. M. K. Dutta

12. A Lightweight Meta-Ensemble Approach for Plant Disease Detection Suitable for IoT-based Environments



Summary: The lightweight MLP-Mixer and the faster Long Short Term Memory (LSTM) models have been deployed to build a meta-ensemble which can be used with the low-powered microcontrollers (MCUs) present in the IoT devices deployed for plant disease detection. The MLP Mixer model is based on a simple multi-layer perceptron network. The predictions made by the trained models (MLP Mixer and LSTM) present at the first level, are used to train the machine learning classifier present at the next level.

Relevant Publication: Ritesh Maurya, Satyajit Mahapatra, Lucky Rajput, A Lightweight Meta-Ensemble Approach for Plant Disease Detection Suitable for IoT-based Environments, IEEE ACCESS, IEEE Publisher, SCI indexed, Impact Factor: 3.476. DOI: 10.1109/ACCESS.2024.3367443

Investigator: Dr. Ritesh Maurya.

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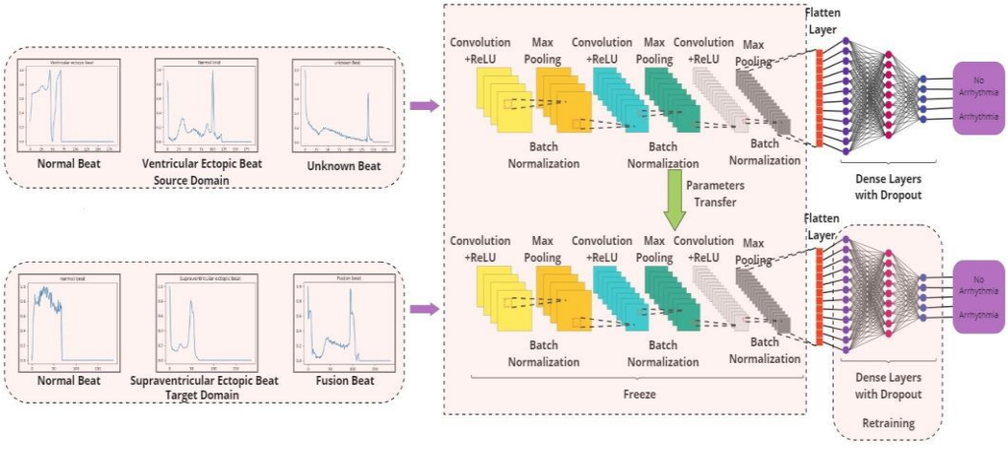
13. Cross-Domain Cardiac Arrhythmia detection using Deep Transfer Learning on ECG Signals

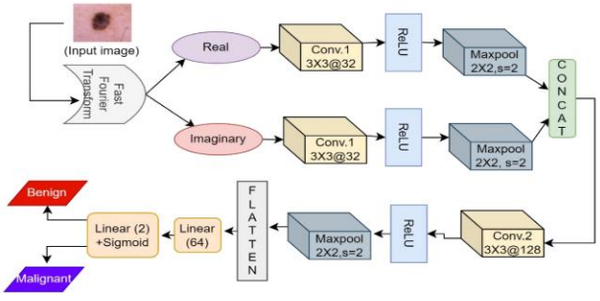


Summary: A Novel frame work for automatic Cross domain. Cardiac Arrhythmia detection is proposed by embedding deep transfer learning, with ECG signals. To address the class imbalance issue, the data was up-sampled using up sampling. The performance of proposed architecture has been analysed on different transferring layers to determine the number of layers required to be retrained.

Relevant Publication: Sharma, S., Chaturvedi, K., Gupta, A., "Cross-Domain Cardiac Arrhythmia detection using Deep Transfer Learning on ECG Signals". Accepted in 3rd International Conference on Advanced Communication and Intelligent Systems, 2024, Springer Nature Publication.

Investigator: Dr. Sneha Sharma.

14. FourierCNN: Skin cancer Classification using Convolution Neural Network Fortified with Fast Fourier Transform



Summary: Skin cancer is one of the most prominent types of cancer, and prompt intervention in its detection can lead to faster treatment. The aim of this work is to discern and delineate the existence of cancerous cells within tissues, differentiating them from ordinary skin ailments that may mimic the appearance of malignancy to the naked eye. In this paper, the 2D Fourier transform has been applied to the input data before passing them to a convolution neural network for the classification of benign and malignant skin cancer images. 2D Fourier transform transforms the spatial information in the image into the frequency domain. The Fourier transform can reveal patterns and features in images that may not be immediately apparent in the spatial domain. Thus, the proposed model can reveal the distinguishing features present in the spatial and frequency domain.

Relevant Publication: Ritesh Maurya, Ambica Pradhan, G. Thirumoorthy, P. Saravanan, Geet Sahu and Mohan Karnati, "FourierCNN: Skin cancer Classification using Convolution Neural Network Fortified with Fast Fourier Transform," 2024 IEEE International Conference on Interdisciplinary Approaches in Technology and Management for Social Innovation (IATMSI), Gwalior, India, 2024, pp. 1-4, doi: 10.1109/IATMSI60426.2024.10502458.

Investigator : Dr. Ritesh Maurya

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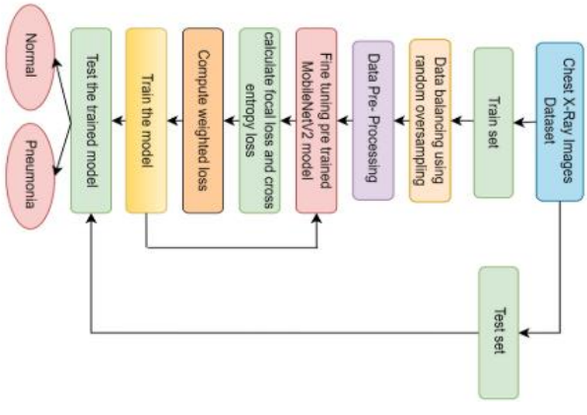
15. Combining Focal loss with Cross-entropy loss for Pneumonia Classification with a Weighted Sampling Approach



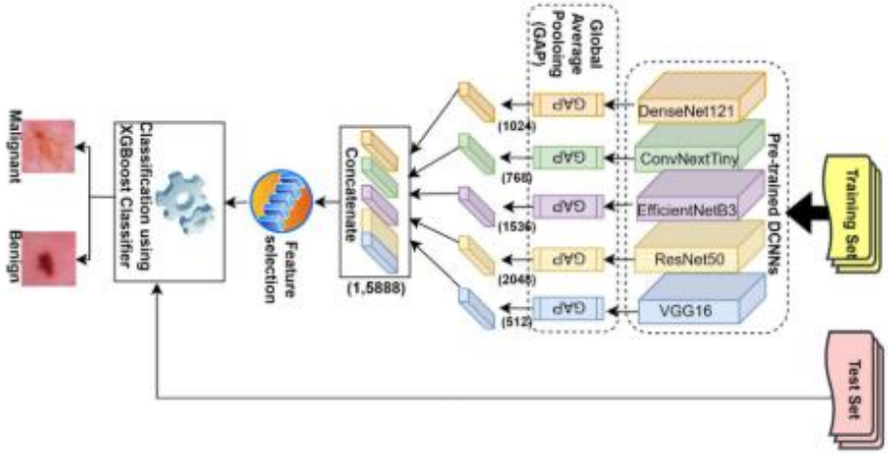
Summary: Pneumonia, a severe respiratory infection affecting the lungs, stands as a leading cause of child mortality worldwide. The conventional method for detecting Pneumonia from chest X-rays relies on expert Pulmonologists manually identifying visual patterns, a time-consuming and specialist-dependent process. To address these limitations, this research introduces an automated Pneumonia detection system employing deep learning techniques with chest X-ray images

This study leverages the fine-tuned MobileNetV2 model for Pneumonia detection, incorporating a hybrid of two loss functions: crossentropy and focal loss. Focal loss assigns greater importance to misclassifications within the minority class, while cross-entropy ensures that misclassifications in the majority class are adequately considered.

Relevant Publications: Ritesh Maurya, Part Thirwarni, T. Gopalakrishnan and Mohan Karnati, "Combining Focal loss with Cross-entropy loss for Pneumonia Classification with a Weighted Sampling Approach," 2024 IEEE International Conference on Interdisciplinary Approaches in Technology and Management for Social Innovation (IATMSI), Gwalior, India, 2024, pp. 1-5, doi: 10.1109/IATMSI60426.2024.10502684.

Investigator: Dr. Ritesh Maurya

16. Skin Lesion Classification using Deep Feature Fusion and Selection Using XGBoost Classifier



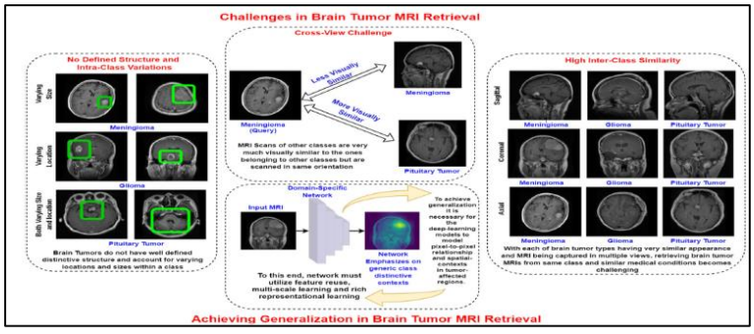
Summary: —Skin cancer is a potentially fatal condition that needs to be detected as soon as possible in order to be treated effectively. Deep convolutional neural networks (DCNNs) have shown promising results in the prediction of skin cancer in recent years. This study presents a novel approach for skin cancer identification using deep feature fusion and selection based on the significance score obtained with the XGBoost classifier.

The proposed method combines features from the state-of-the-art pre-trained DCNNs, such as EfficientNetB3, ResNet50, VGG16, ConvNeXtTiny, and DenseNet121, to extract high-level features from dermoscopic images. These features capture the intricate patterns and textures associated with malignant and benign skin cancers. Based on the relevance score that the XGBoost classifier awarded to each feature, the K-Best (K=1000) features were chosen for classification.

Relevant Publications: Ritesh Maurya, Anant Krishna Bais, T. Gopalakrishnan, Malay Kishore Dutta, N. N. Pandey and S. M. Y V, "Skin Lesion Classification using Deep Feature Fusion and Selection Using XGBoost Classifier," 2024 IEEE International Students' Conference on Electrical, Electronics and Computer Science (SCEECS), Bhopal, India, 2024, pp. 1-5, doi: 10.1109/SCEECS61402.2024.10481955.

Team: Dr. Ritesh Maurya, Dr. M.K. Dutta

17. Content-Based Brain Tumor Retrieval System for Magnetic Resonance Images

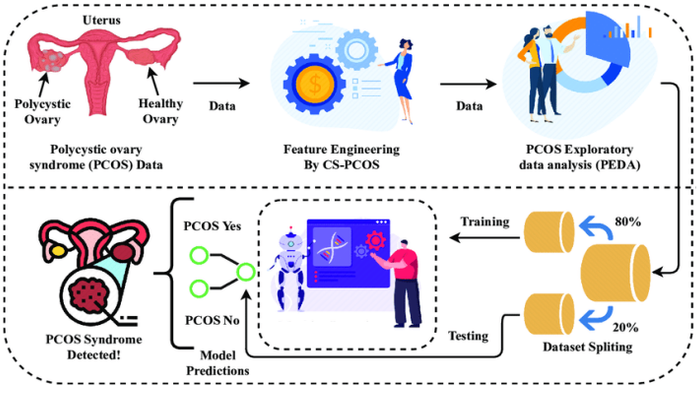


Summary: The work propose a Weight Initialization Framework with Densely Connected Networks to improve generalization for Brain Tumor MRI retrieval. The proposed framework uplifts DenseNet-based models for feature extraction as they incorporate feature reuse and feature learning in a multi-scale manner. Further, a weight Initialization Framework (WIF) is used for improvising the representational learning.

Relevant Publication: V.P.Singh, Aman Verma, Dushyant Kumar Singh & Ritesh Maurya, "Improved content-based brain tumor retrieval for magnetic resonance images using weight initialization framework with densely connected deep neural network". Neural Computing & Applications (2023), Springer Nature Publishers. DOI: https://doi.org/10.1007/s00521-023-09149-w, December 2023, Neural Computing and applications, SCI indexed Impact Factor: 6.1.

Investigator: Dr. Ritesh Maurya.

18. AMCNN - Attention-based Multiscale Deep Neural Network for Diagnosis of Polycystic Ovary Syndrome Using Ultrasound Images

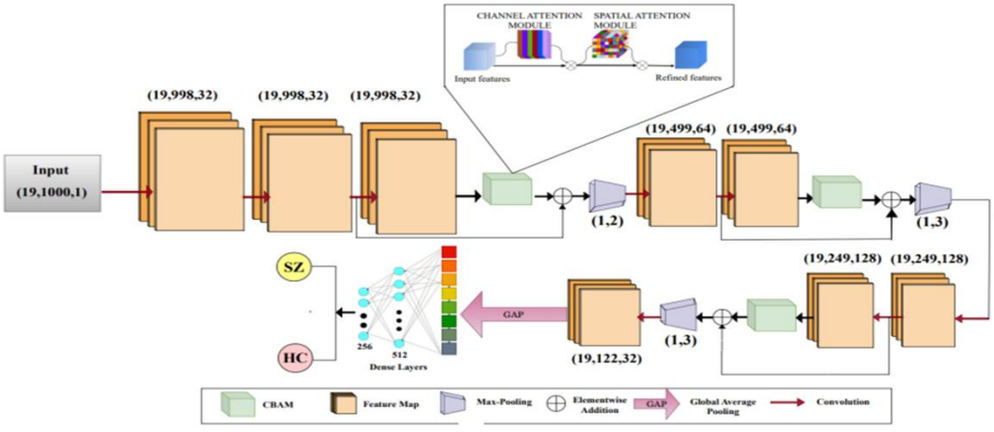


Summary: A novel attention-based multiscale convolutional neural network (AMCNN) is proposed for early detection of PCOS. The utilization of dilated convolution aids in preserving the multi-scale features with fewer parameters. The integration of multiscale characteristics is achieved by the attention mechanism, which enhances the importance of features within significant channels.

Relevant Publication: Suzain Rashid, M.K.Dutta, Mohan Karnati, Garima Agarwal, Pavel Sikora, Radim Burget, "AMCNN: The utilization of dilated convolution aids in preserving the multi-scale features with fewer parameters" DOI:10.1109/ICUMT61075.2023.10333275 , October 2023, 15th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops (ICUMT), Belgium, European Union.

Team: Prof. M. K. Dutta and Dr. Garima Agarwal.

19. SZ-RAN: A Deep Neural Network for Schizophrenia detection using EEG signals



Summary: Schizophrenia (SZ) is a complex and debilitating mental disorder which affects 1% of the global population. EEG emerged as a promising, low cost and non-invasive tool for recording, understanding and scrutinizing the neurological underlying factors of SZ to refine diagnostic procedures. SZ-RAN incorporates the advantage of residual connection to aid in removing vanishing gradient problems and attention mechanism to focuse on significant features and reduces transmission of irrelevant features.

Relevant Publication: Sunidhi Singh, Srishti Singh, Geet Sahu, Jitendra Singh Jadon, M.K.Dutta "SZ-RAN: A residual attention network for early detection of Schizophrenia using EEG signals" IEEE Xplore DOI: https://doi.org/10.1109/ICSC60394.2023.10441475

Team: Jitendra Singh Jadon and Prof. M. K. Dutta.

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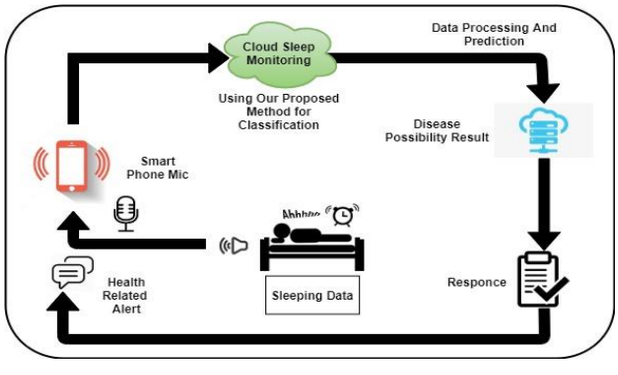
20. Nocturnal Sleep Sounds Classification with Artificial Neural Network for Sleep Monitoring

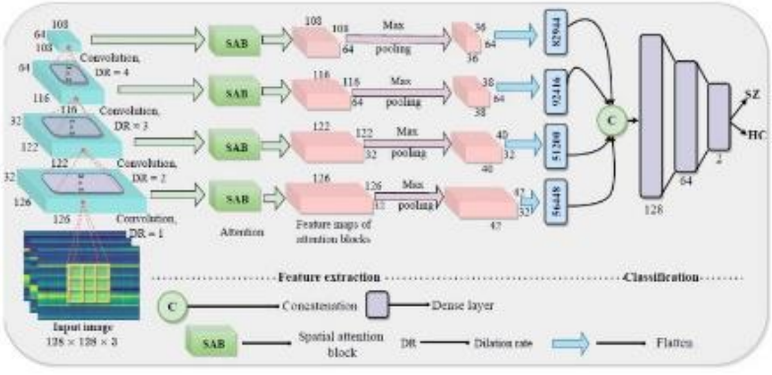


Summary: Nocturnal human sounds are analysed to develop an AI-based personal sleep monitoring system. Multiple audio-related features are extracted from the spectrograms of sleep sounds and given as input to a fully-connected Artificial Neural Network (ANN) to classify the sleep sounds. The proposed neural network based approach classifies the considered seven categories of sleep sounds with an accuracy of 97.4%.

Relevant Publication: Pandey, C., Baghel, N., Gupta, R., & Dutta, M. K., "Nocturnal sleep sounds classification with artificial neural network for sleep monitoring," Multimedia Tools and Applications, Springer Nature Publishers, DOI:10.1007/s11042-023-16190-3, 1-17., 2023 Impact Factor – 3.6.

Team: Prof. Rinki Gupta and Prof. M. K. Dutta.

21. Automatic Diagnosis of Schizophrenia from Electroencephalography Signals Using Artificial Intelligence

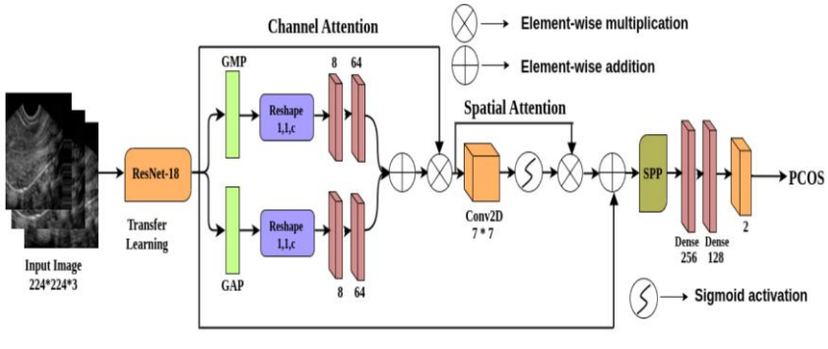


Summary: Electroencephalography (EEG) signals, a non-invasive diagnostic technique, are being investigated to distinguish SZ patients from healthy people by proposing a pyramidal spatial-based feature attention network (PSFAN). The proposed PSFAN consists of dilated convolutions to extract multiscale deep features in a pyramidal fashion from 2-dimensional images converted from 4-sec EEG recordings. Then, each level of the pyramid includes a spatial attention block (SAB) to concentrate on the robust features that can identify SZ patients.

Relevant Publication: Geet Sahu, K. Mohan et.al. "A Pyramidal Spatial-based Feature Attention Network for Schizophrenia Detection using Electroencephalography Signals" IEEE Transactions on Cognitive and Developmental Systems, DOI: 10.1109/TCDS.2023.3314639, 2023, Impact Factor – 5.

Team: Dr. Geet Sahu and Dr. Karnati Mohan.

22. ASPPNet: A Deep Neural Network for Diagnosis of Polycystic Ovary Syndrome

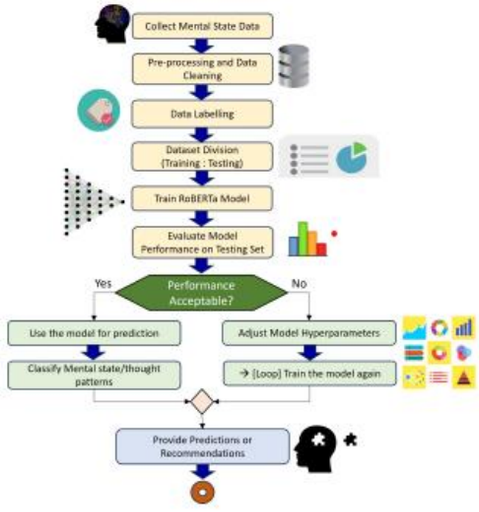


Summary: Many pregnant women are affected by PCOS, or polycystic ovarian syndrome, a metabolic condition. A Spatial Pyramid Pooling Network (ASPPNet), a novel attention-based transfer learning approach for PCOS identification from ultrasound images is developed which might help prevent the detrimental effects of PCOS.

Relevant Publication: Geet Sahu, Mohan Karnati, Ayush Singh Rajput, Mayank Chaudhary, Ritesh Maurya, "Attention-based Transfer Learning Approach using Spatial Pyramid Pooling for Diagnosis of Polycystic Ovary Syndrome" 9th International Conference on Signal Processing and Communication. IEEE Xplore: DOI: 10.1109/ICSC60394.2023.10441101

Team: Ayush Singh Rajput, Mayank Chaudhary, Dr. Ritesh Maurya

23. AI-enhanced Mental Health Diagnosis: Leveraging Transformers for Early Detection of Depression Tendency in Textual Data



Summary: This study tries to identify depression tendencies based on linguistic and cognitive characteristics by utilizing a transformer-based language model and self-attention. A variant of the BERT (Bidirectional Encoder Representations from Transformers) model, trained on a larger corpus and for a longer duration, results in improved performance due to its strong capabilities in understanding natural language in the context of detecting depression using text data.

Relevant Publication: Srishti Verma, Vishal, Rakesh Chandra Joshi, Malay Kishore Dutta, Stepan Jezek and Radim Burget, "AI-enhanced Mental Health Diagnosis: Leveraging Transformers for Early Detection of Depression Tendency in Textual Data" 15th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops (ICUMT), 2023, Belgium, Publisher: IEEE Xplore Digital Library. DOI:10.1109/ ICUMT61075.2023.10333301.

Team: Rakesh Chandra Joshi and Prof. M. K. Dutta.

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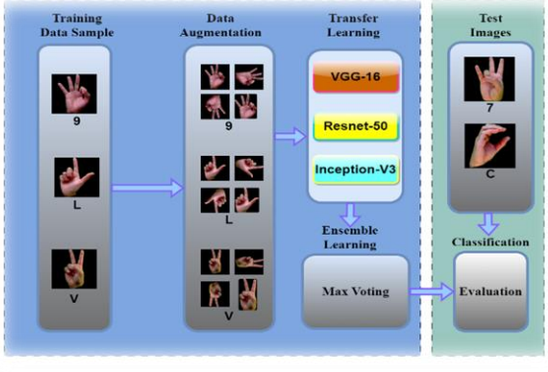
24. Improved Ensemble-based Transfer Learning Approach for Indian Sign Language Recognition



Summary: This study presents a collection of transfer learning techniques for the recognition of Indian Sign Language detection. The proposed approach employs deep neural networks and subsequently, the ensemble learning technique is employed to combine the predictions generated by the three models. The ensemble is based on a weighted voting method. The performance of the proposed framework has been quantitatively analyzed on multiple evaluation parameters to demonstrate its effectiveness for ISL recognition.

Relevant Publication: Sneha Sharma, Anshul Agarwal, Siddhant Kumar, Avaneesh Pandey. Improved Ensemble-based Transfer Learning Approach for Indian Sign Language Recognition 9th International Conference on Signal Processing and Communication (ICSC 2023), Publisher: IEEE Xplore Digital Library, DOI: 10.1109/ICSC60394.2023.10441332.

Investigator: Dr. Sneha Sharma.

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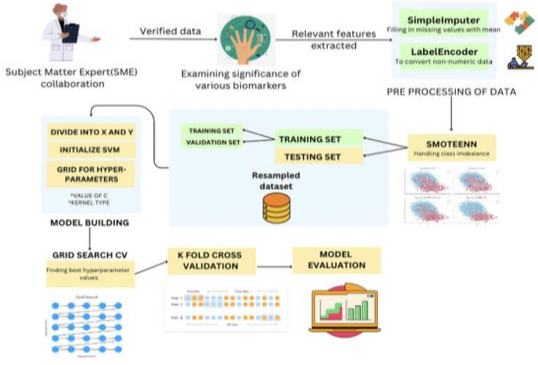
25. Machine Learning Pipeline for Multi-Grade Classification in Pancreatic Cancer Detection Using Urinary Biomarkers



Summary: The present model introduces a machine learning pipeline, meticulously designed to leverage demographic data and crucial urinary biomarkers for a holistic approach to pancreatic cancer detection. The current model demonstrates outstanding performance, surpassing alternative classifiers, and reaffirming the imperative for early detection in pancreatic cancer. The work underscores the pivotal role played by urinary biomarkers in advancing the early identification of pancreatic cancer, aligning with the primary focus on these biomarkers.

Relevant Publication: Pragya Pandey, Param Verma, Garima Aggarwal and Malay Kishore Dutta, "Machine Learning Pipeline for Multi-Grade Classification in Pancreatic Cancer Detection Using Urinary Biomarkers" SCOPUS Indexed Springer Book Series, 'Smart Innovation, Systems, and Technologies'.

Team: Dr. Garima Aggarwal and Prof. M. K. Dutta.

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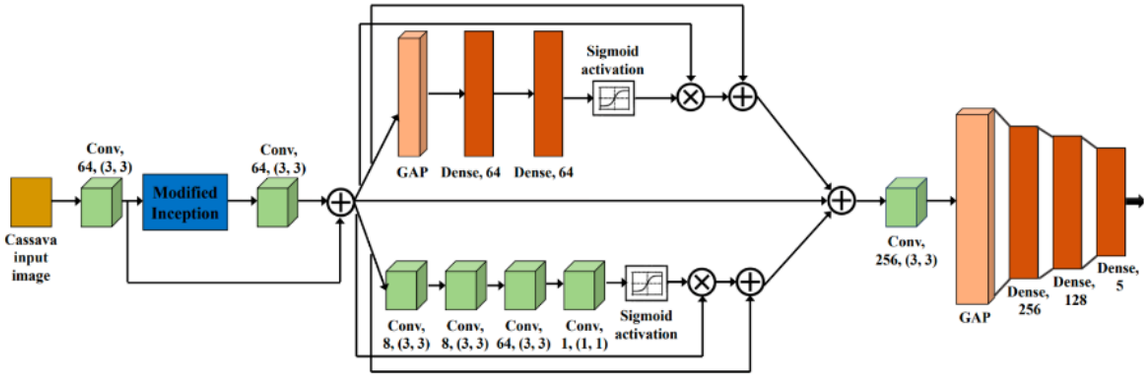
26. Modernizing Farming: Deep Learning for Plant Leaf Disease Identification.

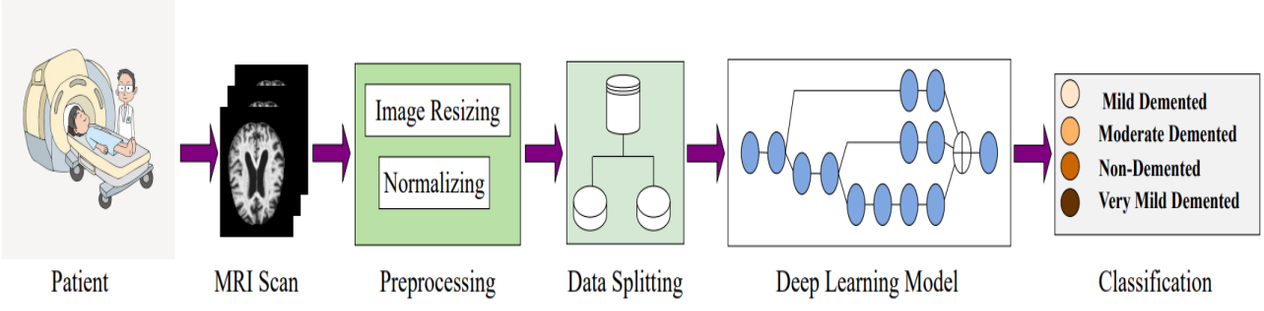


Summary: This study introduces a novel DL model utilizing a dual self-attention modified residual-inception network (DARINet), which integrates the multi-scale, self-attention, and channel attention features with the residual connection. The proposed approach is evaluated on two plant disease datasets such as Cassava and Rice leaf, achieving an accuracy of 77.12% and 98.92%.

Relevant Publication: Rashi Chauhan, Mohan Karnati, M.K.Dutta and Radim Burget "Plant Disease Identification Using a Dual Self-Attention Modified Residual-Inception Network". The 15th International Congress on Ultra-Modern Telecommunications and Control Systems and Workshops (ICUMT), Belgium, DOI:10.1109/ ICUMT61075. 2023. 10333302.

Team: Dr. Karnati Mohan and Prof. M. K. Dutta.

27. Multi-scale Attention Network for Early Detection of Alzheimer's Disease from MRI images

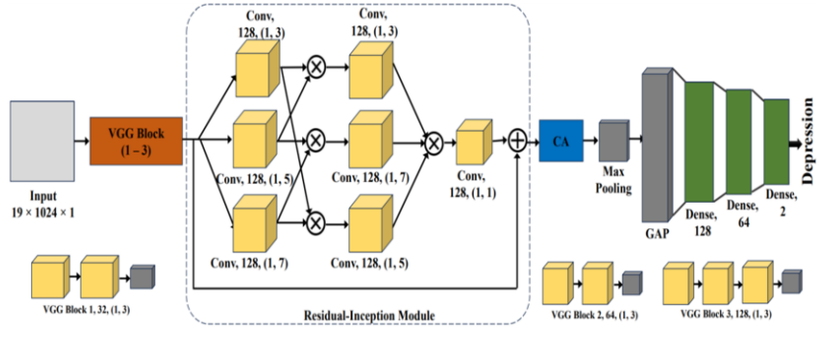


Summary: Deep Neural Networks are used to design an automated system that can detect and classify AD in the early stages. A novel multi-scale attention network (MSAN-Net) is introduced in this study. The proposed technique uses brain magnetic resonance imaging (MRI) to categorize images into four stages; non-demented, mild demented, very mild demented, and moderate demented.

Relevant Publication: Vaishali Aggarwal, Geet Sahu, Malay Kishore Dutta, Martin Jonak and Radim Burget, "Multi-scale Attention Network for Early Detection of Alzheimer's Disease from MRI images" 15th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops (ICUMT), 2023, Belgium, Publisher: IEEE Xplore Digital Library, DOI: 10.1109/ICUMT61075.2023.10333096

Team: Dr. Geet Sahu and Prof. M. K. Dutta.

28. Attention-based VGG-Residual-Inception Module for EEG-Based Depression Detection

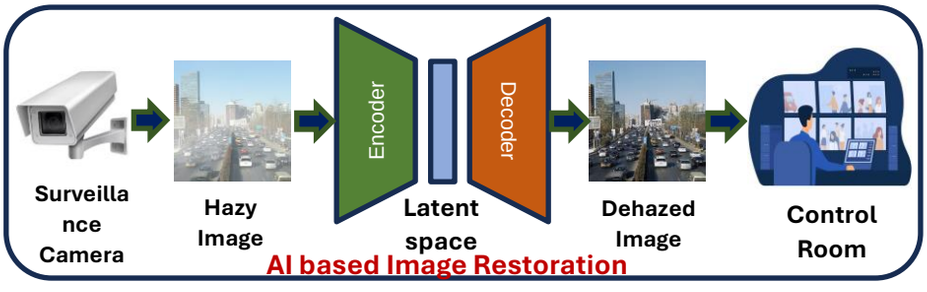


Summary: Depression is a prevalent factor contributing to the increasing instances of suicide globally. This study offers a novel attention-based visual geometry group-residual-inception module (A-VGGRI) for classifying EEG data from healthy and major depression disorder people. The Patient Health Questionnaire-9 score is utilized to measure the depression level in this case. A-VGGRI's performance is examined using a depression dataset; the findings obtained by A-VGGRI have an accuracy of 96.35%.

Relevant Publication: Gautam Verma, Mohan Karnati, Vojtech Myska, Anzhelika Mezina & Malay Kishore Dutta "Attention-based VGG-Residual-Inception Module for EEG-Based Depression Detection" 15th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops (ICUMT), 2023, Belgium, Publisher: IEEE Xplore Digital Library. DOI: 10.1109/ICUMT61075.2023.10333270.

Team: Dr. Karnati Mohan and Prof. M. K. Dutta.

29. Restoration of Images Distorted by Atmospheric Phenomenon using Computer Vision and Artificial Intelligence

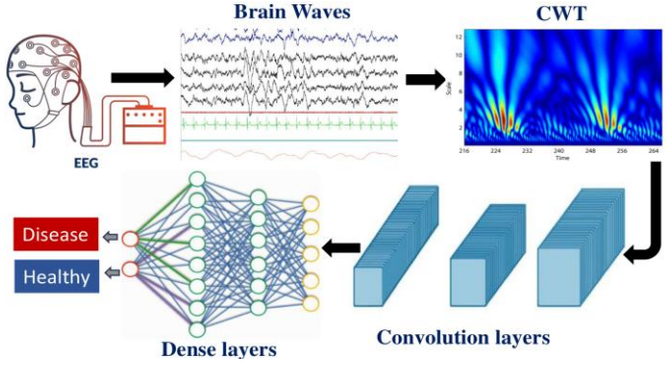


Summary: A novel attention-based end-to-end dehazing network named oval-net has been proposed in this study to restore clear images from its counterpart without employing the atmospheric scattering model. The oval-net is an encoder–decoder architecture that uses spatial and channel attention at each stage to focus on dominant and significant information while avoiding the transmission of irrelevant information from the encoder to the decoder, allowing quicker convergence.

Relevant Publication: Geet Sahu et al. "Single Image Dehazing via Fusion of Multi-level Attention Network for Vision-Based Measurement Applications." IEEE Transactions on Instrumentation and Measurement. DOI: 10.1109/TIM.2023.3271753, 2023, Impact Factor – 5.6.

Investigator: Dr. Geet Sahu.

30. Automatic Diagnosis of Neurological Disorders from Brain Waves Using Artificial Intelligence

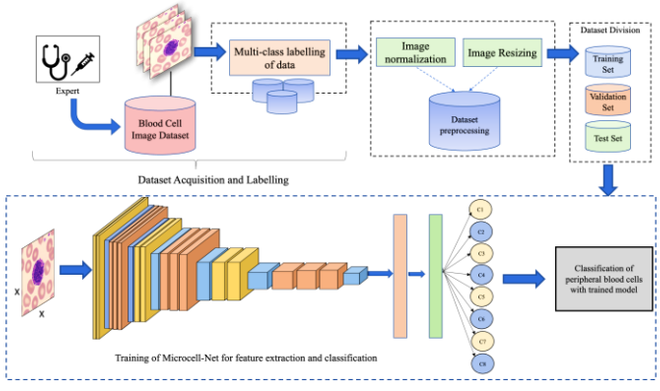


Summary: Using EEG data, this study proposes an automatic Schizophrenia (SCZ) detection method using separable convolution attention network (SCZ-SCAN). The proposed network employs depth-wise separable convolution and attention networks on high-level and low-level to aggregate characteristics of 2-D scalogram images acquired from the continuous wavelet transform. The depth-wise separable convolutions help to create a lightweight framework, while attention techniques concentrate on significant features and reduce futile computations by removing the transmission of irrelevant features.

Relevant Publication: Geet Sahu, K. Mohan et.al. "SCZ-SCAN: An automated Schizophrenia detection system from electroencephalogram signals" Biomedical Signal Processing and Control, DOI: https://doi.org/10.1016/j.bspc.2023.105206, 2023, Impact Factor – 5.1.

Investigator: Dr. Geet Sahu and Dr. Karnati Mohan.

31. A Deep Neural Network for Multi-Class Classification of Microscopic Blood Cell Images.

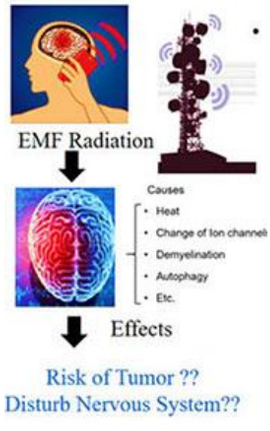


Summary: A CNN-based architecture *Microcell-Net* is proposed which is trained on a microscopic image dataset of peripheral blood cells in eight different classes. The images have several inter-class and intra-class diversity with different magnification levels and the noise present in the images makes the classification task significantly challenging. Artificial intelligence-based systems can help in the automatic diagnosis and monitoring of an individual's health.

Relevant Publication: Dwivedi & Malay Kishore Dutta, "Microcell-Net: A deep neural network for multi-class classification of microscopic blood cell images" Expert Systems, Wiley Publishers, DOI: https://doi.org/10.1111/exsy.13295, 2023.

Investigator: Prof. M. K. Dutta.

32. Study on Mobile-Phone EMF Radiation Effects on Brain using Artificial Intelligence

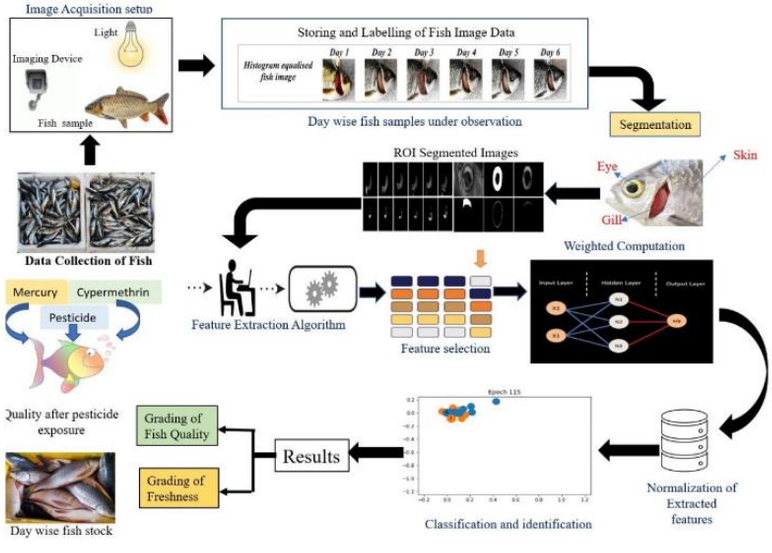


Summary: This work presents a novel pilot study to identify changes in brain morphology under EMF exposure considering drosophila melanogaster as a specimen using machine learning. The brain is automatically segmented, obtaining microscopic images from which discriminatory geometrical features are extracted to identify the effect of EMF exposure. The geometrical features of the microscopic segmented brain image of drosophila are analyzed and found to have discriminatory properties suitable for machine learning.

Relevant Publications: Ritesh Maurya, Neha Singh, Tanu Jindal, Vinay K Pathak, Malay Kishore Dutta, "Machine Learning based Identification of Radiofrequency Electromagnetic Radiation (RF-EMR) effect on Brain Morphology: A Preliminary Study" Medical and Biological Engineering & Computing, Springer Nature Publishers- DOI: 10.1007/s11517-020-02198-6, 58(8), pp. 1751-1765, SCI indexed Impact Factor – 3.2 More ongoing work in this problem using advanced AI methods.

Investigator: Prof. M. K. Dutta.

33. AI based Fish Freshness and Quality Assessment (Pesticides/Heavy metals Exposure)



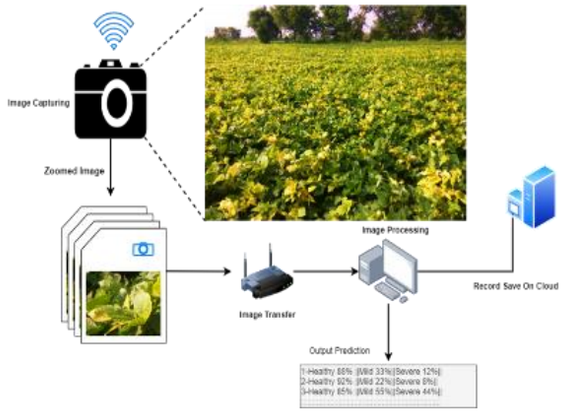
Summary: Classical chemical-based methods for the assessment of fish quality are destructive and at the same time, they also require costly machines and expert manpower. In the present work, a machine learning-based methodology has been employed in which the suitable color and texture features have been identified and have been genetically optimised for the classification of heavy metal exposed and non-exposed fish using a machine learning classifier.

Relevant Publication: Ritesh Maurya, Ashutosh Srivastava, M.K.Dutta et.al. "Computer aided detection of mercury heavy metal intoxicated fish: an application of machine vision and artificial intelligence technique" Multimedia Tools and Applications, DOI:10.1007/s11042-023-14358-5, 2023, Impact Factor – 3.6.

More ongoing work in this problem using advanced AI methods.

Team: Dr. Ritesh Maurya and Prof. M. K. Dutta.

34. Artificial Intelligence-based Automatic Disease Diagnosis of Plants



Summary: An automatic deep-learning-based viral infection detection method has been proposed for a leguminous plant, Vigna mungo which is grown largely in the Indian subcontinent. It is quite challenging to make an automatic disease detection method and perform the detection tasks in real-time. The convolutional neural network VirLeafNet is trained with different leaf images consisting of healthy, mild-infected and severely infected leaves for multiple epochs. The proposed methodology can be integrated with drones for wider crop area analysis

Relevant Publication: Rakesh Chandra Joshi, Manoj Kaushik, M,K.Dutta, Ashish Srivastava & Nandlal Choudhary, "VirLeafNet: Automatic Analysis and Viral Disease Diagnosis Using Deep-Learning in Vigna Mungo Plant" Ecological Informatics, doi.org/10.1016/j.ecoinf.2020. 101197, Elsevier Publishers, SCI indexed Impact Factor – 5.1.
More ongoing work in this problem using advanced AI methods.

Team: Rakesh Chandra Joshi and Prof. M. K. Dutta.

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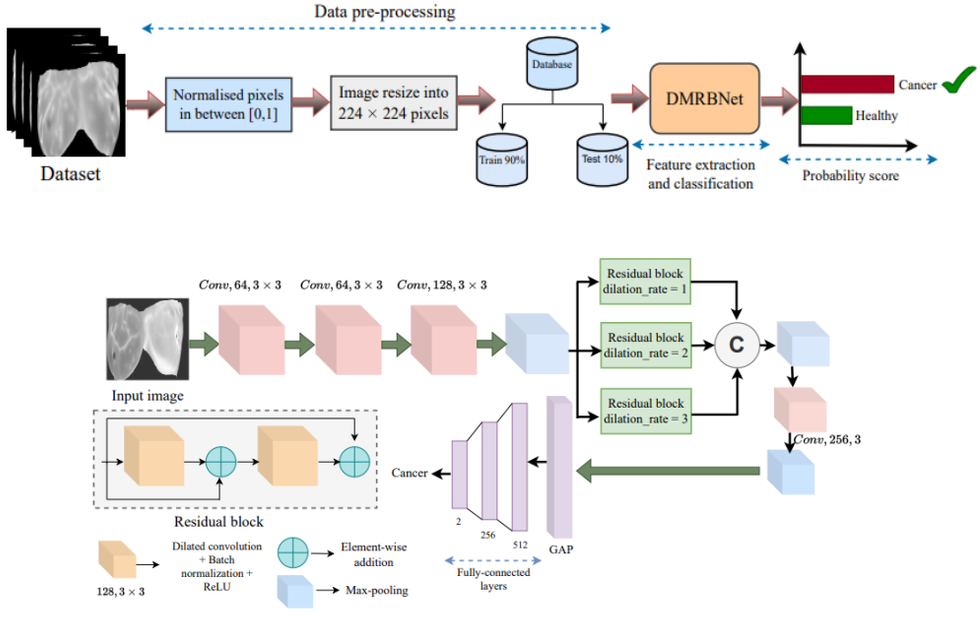
35. DMRBNet: Dilated Multi-scale Residual Block-based Deep Network for Detection of Breast Cancer from MRI Images

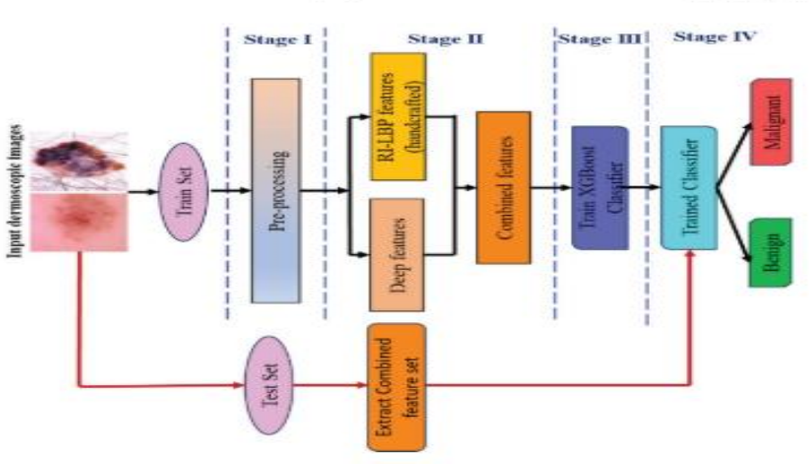


Summary: To improve breast cancer diagnosis, a computer-aided diagnostic system using MRI images was developed. The system utilizes a novel deep neural network called dilated multi-scale residual block-based convolutional neural network (DMRBNet), which effectively extracts features from various image regions. Compared to seven recent advanced approaches, DMRBNet demonstrated superior performance on the BC-MRI dataset.

Relevant Publication: Himanshi Sinha, Mohan Karnati, Garima Mehta, Malay Kishore Dutta, Anzhelika Mezina, Radim Burget, "DMRBNet: Dilated Multi-scale Residual Block-based Deep Network for Detection of Breast Cancer from MRI Images" 15th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops (ICUMT), 2023, Belgium, Publisher: IEEE Xplore DOI:10.1109/ICUMT61075. 2023. 10333297.

Team: Dr. Karnati Mohan and Prof. M. K. Dutta.

36. Combining Deep features with the Invariant Local Binary Pattern features for Skin Cancer Classification

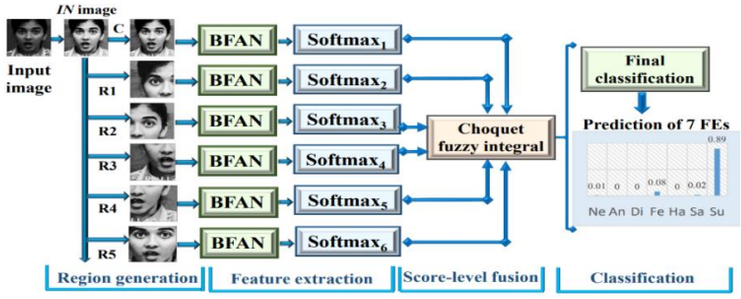


Summary: Melanoma, a potentially fatal form of skin cancer, represents a global health concern, necessitating efficient and precise detection for improved patient outcomes. However, the subjective and daunting nature of manual examination and diagnosing skin lesions by dermatologists often leads to delayed identification or misdiagnosis. This research paper introduces a novel technique for automated melanoma classification to address this pressing problem. The proposed research methodology combines deep features with rotation-invariant handcrafted local-binary pattern (RI-LBP) features for skin lesion classification. RI-LBP extracts microstructures present at the local level whereas deep features capture the high-level intuitive features present in a skin lesion image. After combining RI-LBP with the deep features, the combined feature vector is used to train and test the XGBoost machine learning classifier for classification purposes.

Relevant Publications: Ritesh Maurya, Drishti Arora, T. Gopalakrishnan, A. R. Deshpande, Malay Kishore Dutta and Mohan Karnati, "Combining Deep Features with the Invariant Local Binary Pattern features for Skin Cancer Classification," 2023 IEEE Pune Section International Conference, India, 2023, pp. 1-5, doi: 10.1109/PuneCon58714. 2023. 10450106.

Team: Dr. Ritesh Maurya, Dr. M.K. Dutta

37. Human-computer Interaction Based System for Facial Expression Recognition in-the-wild using Artificial Intelligence

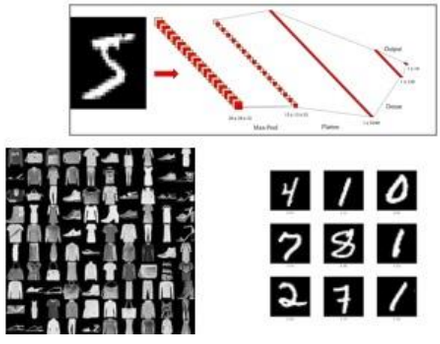


Summary: A modified homomorphic filtering (MHF) is employed to normalize the illumination, then the normalized face image is cropped into five local regions to emphasize expression-specific characteristics. Finally, a unique blended feature attention network (BFAN) is designed for FER. BFAN consists of both residual dilated multiscale feature extraction modules and spatial and channel-wise attention modules. These modules help to extract the most relevant and discriminative features from the high-level and low-level features.

Relevant Publication: Karnati Mohan et.al. "Facial Expression Recognition in-the-wild using Blended Feature Attention Network" IEEE Transactions on Instrumentation & Measurement, DOI: 10.1109/TIM.2023.3314815, 2023, Impact Factor – 5.6.

Investigator: Dr. Karnati Mohan.

38. Enhancing Deep Neural Network Convergence and Performance: A Hybrid Activation Function Approach by Combining ReLU and ELU Activation Function

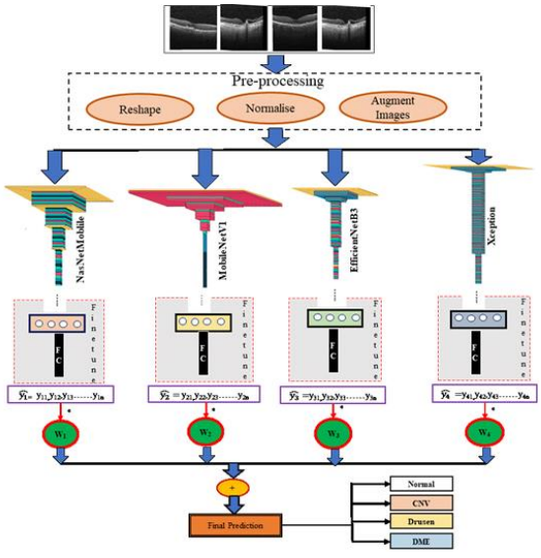


Summary: - Activation functions play an important role in Deep Neural Networks. The activation function can learn nonlinearities present in the data; therefore, it can learn intricate patterns present in the data. Rectified Linear Unit (ReLU) is an activation function that helps in encountering the problem of vanishing gradient. However, it suffers from 'dying ReLU' problem for the negative values. Leaky ReLU can solve the problem of 'dying ReLU'; though it still suffers from a vanishing gradient problem due to the small gradient at for negative values, which results in slow convergence. Therefore, in this work, a combination of ReLU and Exponential Linear Unit (ELU) has been proposed considering the smoother convergence of the ELU activation function for the values on the negative side.

Relevant Publication: Ritesh Maurya, Divyam Aggarwal, T. Gopalakrishnan and Nageshwar Nath. Pandey, "Enhancing Deep Neural Network Convergence and Performance: A Hybrid Activation Function Approach by Combining ReLU and ELU Activation Function," 2023 Second International Conference on Informatics (ICI), India, 2023, pp. 1-5, DOI: 10.1109/ ICI60088.2023.10421353.

Investigator: Dr. Ritesh Maurya

39. MacD-Net: An automatic artificial Intelligence method for macular pathology detection using optical coherence tomography images.

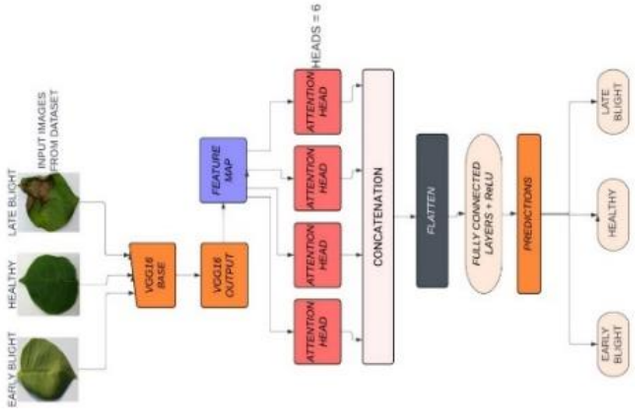


Summary: In this work, a novel guided-ensemble approach has been proposed for an automated diagnosis of three different types of retinal disorders, such as drusen, choroidal neovascularization (CNV) and diabetic macular edema (DME). These conditions, if left untreated, can lead to vision loss. In the proposed approach, deep neural networks have been fine-tuned for that purpose and the prediction score obtained by each CNN in an ensemble has been combined based on their validation accuracies.

Relevant Publication: Maurya, R., Pandey, N. N., Joshi, R. C., & Dutta, M. K. MacD-Net: An automatic guided-ensemble approach for macular pathology detection using optical coherence tomography images. International Journal of Imaging Systems and Technology, Wiley Publishers, https://doi.org/10.1002/ima.22954, SCI Indexed Impact Factor - 3.3.

Team: Dr. Ritesh Maurya, Rakesh Chandra Joshi and Prof. M. K. Dutta.

40. Multi-Head Attention-Based Transfer Learning Approach for Potato Disease Detection

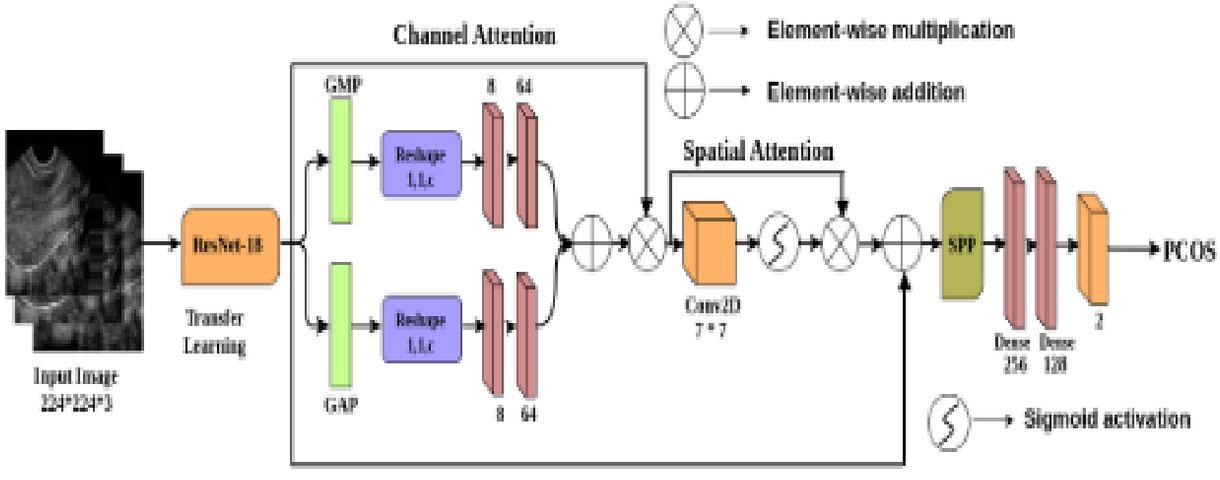


Summary: In this work, a deep learning model has been fine-tuned with a multi-head attention layer for identifying useful patterns for the classification of potato plant leaf diseases. The multi-head attention mechanism is useful since it can capture the relationship that exists in different parts of an input potato disease leaf image.

Relevant Publication: Ritesh Maurya, Rudra Shaurya, Malay Kishore Dutta, Radim Burget, Martin Kiac, "Multi-Head Attention-Based Transfer Learning Approach for Potato Disease Detection" 15th International Congress on Ultra-Modern Telecommunications and Control Systems and Workshops (ICUMT), 2023, Belgium, Publisher: IEEE Xplore Digital Library. DOI:10.1109/ICUMT61075.2023.10333272.

Team: Dr. Ritesh Maurya and Prof. M. K. Dutta.

41. Attention-based Transfer Learning Approach using Spatial Pyramid Pooling for Diagnosis of Polycystic Ovary Syndrome

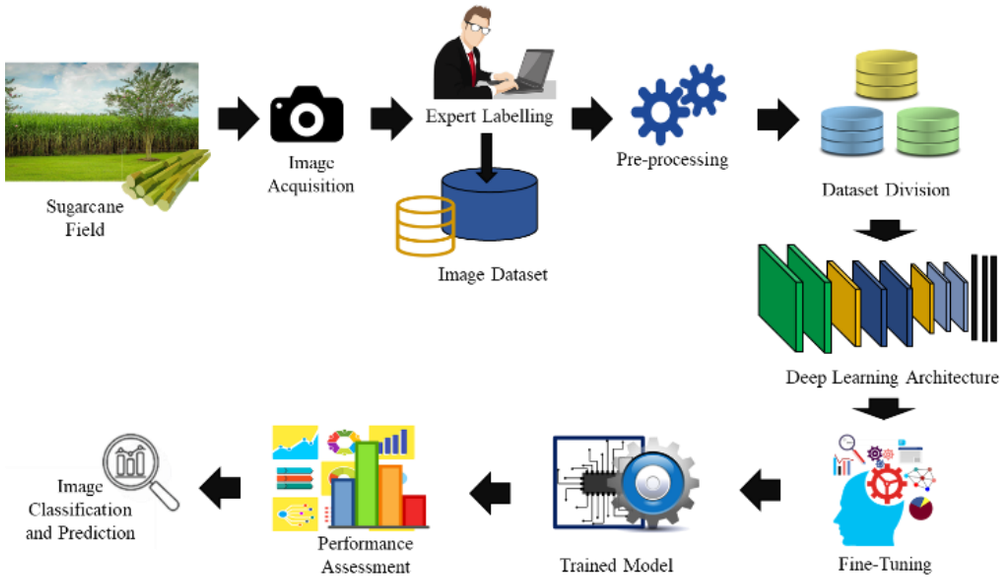


Summary: A considerable percentage of pregnant women are affected by PCOS, or polycystic ovarian syndrome, a metabolic condition. It causes higher amounts of androgens, or male hormones, and irregular menstrual periods. Follicles, which are tiny sacs packed with fluid that form on the ovaries and impede the regular release of eggs, are a common side effect of PCOS. Initial detection and weight control might help prevent the detrimental effects of PCOS, even though the exact aetiology is still unknown. With the help of the Spatial Pyramid Pooling Network (ASPPNet), a novel attention-based transfer learning approach for PCOS identification from ultrasound pictures is developed in this work. Initially, ResNet-18 is used to extract fundamental features, and the attention module is applied to extract significant disease-related features. Later, the Spatial pyramid pooling technique is utilized to preserve multi-scale features by adopting a fixed-length illustration that is not affected by image size/scale. Spatial pyramid pooling is additionally resistant to image component distortions.

Relevant Publications: G. Sahu, M. Karnati, A. S. Rajput, M. Chaudhary, R. Maurya and M. K. Dutta, "Attention-based Transfer Learning Approach using Spatial Pyramid Pooling for Diagnosis of Polycystic Ovary Syndrome," 2023 9th International Conference on Signal Processing and Communication, 2023, pp. 238-243, doi: 10.1109/ICSC60394.2023.10441101.

Team: Dr. Ritesh Maurya, M.K. Dutta

42. Multiclass image classification of sugarcane insect pest damage using deep convolutional networks based on transfer learning

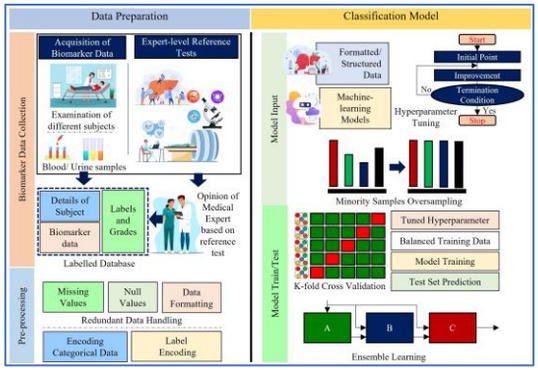


Summary: India, the world's second-largest sugarcane producer, has a manual insect and pest diagnosis system that is inefficient and limited by a lack of skilled manpower. Utilizing artificial intelligence can help detect pests and reduce economic losses in the sugar industry. A study evaluated multiple Convolutional Neural Network architectures to recognize sugarcane insect damage. The convolutional neural network with dense connections outperformed other networks with higher accuracy and precision. This study is the first to classify images of multiple insect pests and has the potential to be used in diagnostic tools for monitoring pests in remote locations.

Inference: The study successfully demonstrates the use of deep convolutional networks with transfer learning to classify sugarcane insect pest damage. The model's high accuracy and precision highlight its potential for improving pest diagnosis, offering a valuable tool for the sugarcane industry, especially in remote areas.

Team: Rakesh Chandra Joshi, Prof. M. K. Dutta

43. Diagnosis of Liver Cancer and Multigrade Classification using Ensemble Machine Learning and Evolutionary Algorithms

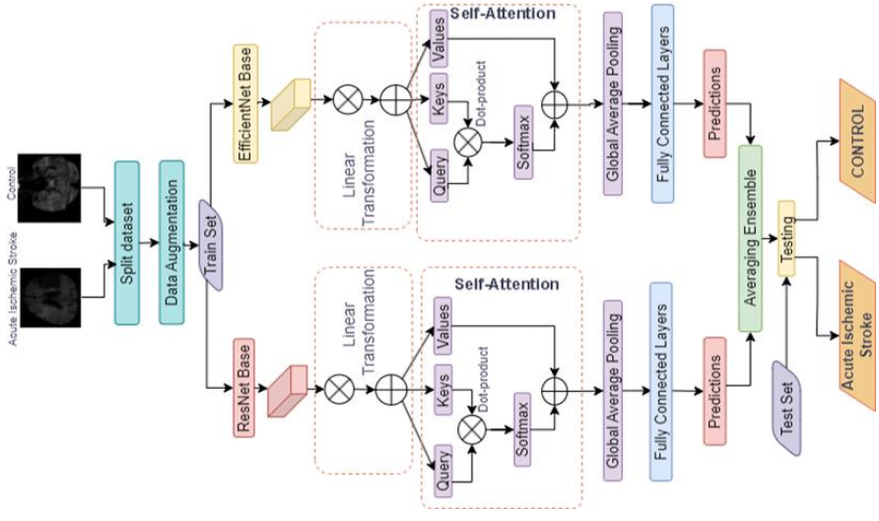


Summary: A novel, hybrid and heterogeneous ensemble learning-based prediction technique has been proposed for the thorough analysis of collected data about the subject and associated biomarkers from highly diverse and broad age groups. The model's heterogeneity involved applying multiple distinct learning algorithms to the same training dataset, with the outcomes of each classifier used to expand the feature space and guide decision-making in subsequent stages. The proposed ensemble model is characterized by an iterative methodology incorporating both bagging and boosting techniques. The Paper is submitted and is under review.

Inference: Based on 5-fold cross-validation and various statistical parameters for multiclass classification, the proposed methodology achieved an accuracy of 93.33% and an F1-score of 94.29% on the unseen test samples. The Paper manuscript is submitted and is under review.

Team: Dr. Rakesh Chandra Joshi and Prof. M. K. Dutta.

44. Acute Ischemic Brain Stroke Classification Using Attention-Augmented Ensemble Approach

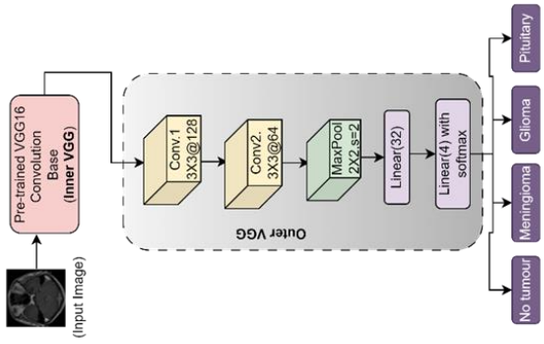


Summary: Acute Ischemic Brain Disorder, also known as an (AIS) Acute Ischemic Stroke, takes place when a blood clot blocks a brain blood vessel, leading to oxygen deprivation and potential brain damage. Clinical analysis techniques with the help of Computer Tomography (CT) scans with Magnetic Resonance Imaging (MRI) helps in visualizing the brain and in the assessment of blockage related characteristics. This procedure is not always quick and accurate for the detection of mild, atypical or the variety of other patterns related to symptoms present in an MRIs. This research is an attempt to address these limitations with the development of AI-based automated deep learning technique. In this work, an ensemble consists of fine-tuned ResNet50 and EfficientNetB0 models and the output obtained from these models present in an ensemble are passed to the self-attention module which helps in focusing the relevant features. Finally, these features were used for the classification of MRI images affected with the Acute Ischemic brain stroke.

Inference: The experimental results imply that the proposed method has achieved a classification accuracy of 95.00% in classifying the brain stroke MRI images which proves the effectiveness of the proposed method in the classification of Acute Ischemic stroke.

Investigator: Dr. Ritesh Maurya

45. NestedVGG: A Novel Deep Learning-based Architecture for Brain Tumour Diagnosis

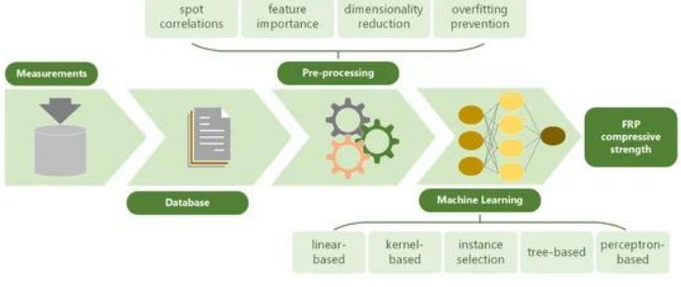


Summary: Brain tumours are abnormal growths of cells in the brain or on its surface, classified into gliomas, meningiomas, and pituitary adenomas. The conventional approach to brain tumour classification relies on manual visual inspection of Magnetic resonance imaging (MRI) scans by radiologists. This process is time-consuming and prone to expert-to-expert variation. To address these limitations, recognizing the intricate complexities and subtle variations within MRI images of the three distinct brain tumour types, this research introduces an automated brain tumour classification system harnessing the power of deep learning with MRI images. This study uses deep learning with MRI images to introduce an automated brain tumour classification system. The "NestedVGG" model utilizes transfer learning, combining an "Outer VGG" for feature extraction and an "Inner VGG" for fine-grained classification.

Inference: The proposed model has achieved a identification accuracy of 97.10% in classifying three different types of brain tumours: Meningioma, Pituitary and Glioma.

Team: Dr. Ritesh Maurya

46. Comprehensive Analysis using Machine Learning Algorithms for Predicting Bond Strength of Reinforced Concrete

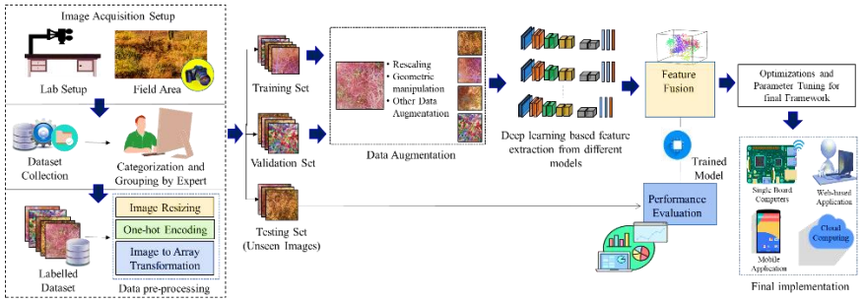


Summary: Machine learning-based architectures have been utilized for prediction of bond strength of concrete. Features affecting the bond strength of concrete like diameter of the reinforced steel bar, the extent of the bond, the length-to-diameter ratio, the compressive strength of concrete, thickness of concrete cover, cover-to-diameter ratio, the volume percentage, and most importantly, the temperature were taken as input parameters. This is a comprehensive exploration of predicting the bond strength of concrete through the application of 12 diverse machine learning algorithms.

Inference: The highest accuracy of 94.17% was achieved by XGBoost algorithm compared to other Machine Learning algorithms. The effectiveness of the proposed model was evaluated by calculating the performance metrics RMSE, MSE, MAE and R2 score. Manuscript drafting in process.

Team: Mayank Chaudhary and Prof. M. K. Dutta.

47. AgriDeep-Net: A Deep learning-based Robust Framework for Fine-grained Agricultural Image Classification

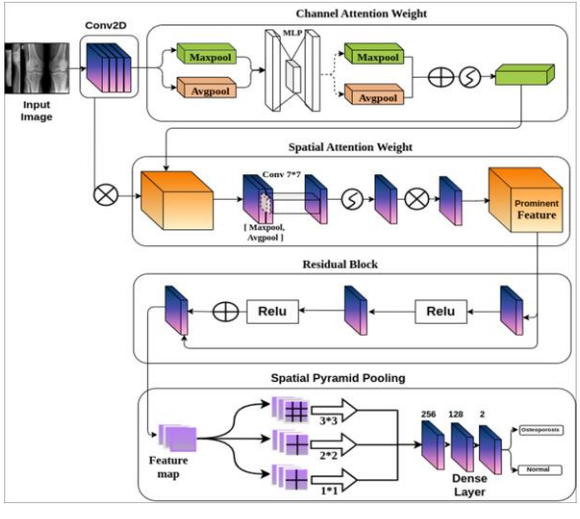


Summary: Addressing the intricate challenges of fine-grained agricultural image classification, AgriDeep-Net is introduced as an innovative multi-model deep learning framework, strategically incorporating advanced techniques to navigate complexities in the field. This precision-driven methodology distinguishes AgriDeep-Net, offering a strategic approach to extract salient and discriminative features from diverse deep learning models involving highly similar agricultural images marked by low inter-class visual discrimination.

Inference: Rigorous experimentation underscores AgriDeep-Net's exceptional performance, achieving a peak testing accuracy of 93.29% for the ACHENY dataset and an even more impressive 98.44% for the Indian Basmati seeds dataset. Paper submitted and is under review.

Team: Rakesh Chandra Joshi and Prof. M. K. Dutta.

48. Artificial Intelligence and Computer Vision -based Automatic Diagnosis of Osteoporosis from X-Rays

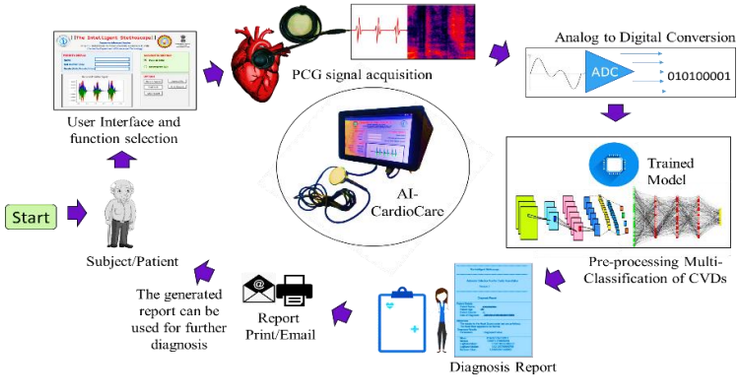


Summary: A fusion of attention mechanisms, residual connections, and spatial pyramid pooling model has been developed that integrates a convolutional neural network (CNN) and multilayer perceptron (MLPs) to classify healthy & affected osteoporosis knee X-Rays. The Combined, attention fusion, residual connections, and spatial pyramid pooling offer a potent approach that surpasses traditional techniques to improve the classification accuracy of osteoporosis contaminated X-ray knee.

Inference: Initial experimental results indicate a classification rate of 98% which is encouraging for automatic osteoporosis diagnosis using bone X-ray images. Manuscript drafting in process.

Team: Ayush Singh Rajput and Prof. M. K. Dutta.

49. AI-CardioCare: Artificial Intelligence-based Device for Cardiac Health Monitoring

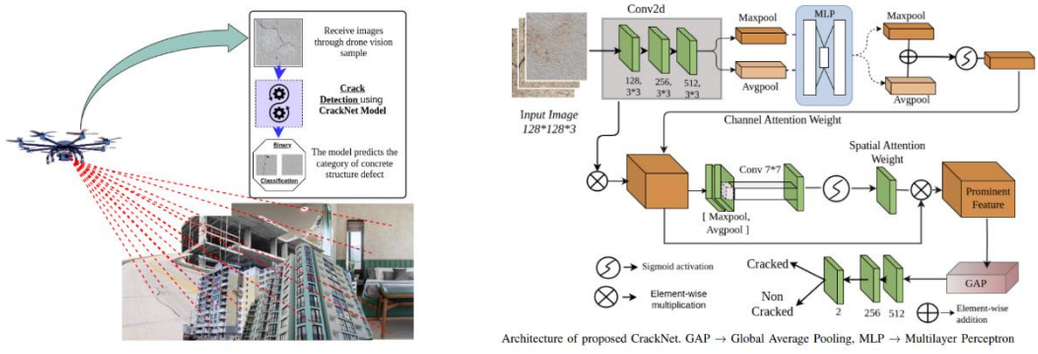


Summary: An AI based device has been developed for an automatic and real-time diagnosis of cardiac diseases (Aortic Stenosis, Mitral Regurgitation, Mitral Stenosis, and Mitral Valve Prolapse) based on deep learning techniques where the phonocardiogram signal from customized designed stethoscope. Two deep learning-based neural networks, 1D-CNN and spectrogram-based 2D-CNN models has been integrated with a low-cost single- board processor to make a standalone device.

Results: Data augmentation techniques are applied to make the model robust, and the model undergoes 10-fold cross-validation to yield an overall accuracy of 98.879% on the test dataset to diagnose multi heart diseases from PCG signals. The proposed model is completely automatic, where signal pre-processing and feature engineering are not required. The conversion time of power spectrogram from PCG signals is very low range from 0.10 s to 0.11 s. Work ongoing in clinical trials.

Team: Rakesh Chandra Joshi and Prof. M. K. Dutta.

50. CrackNet: An Attention-Based CNN model for structural crack detection in Concrete Surfaces



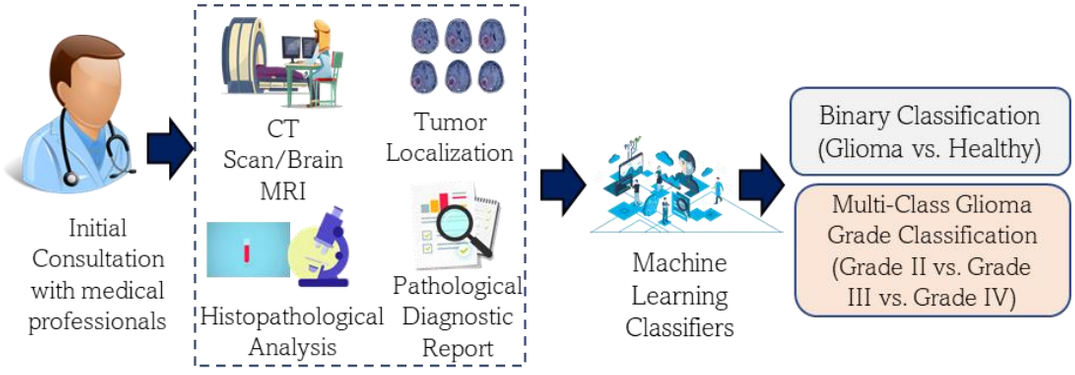
Architecture of proposed CrackNet. GAP → Global Average Pooling, MLP → Multilayer Perceptron

Summary: An attention-based deep learning network named CrackNet has been proposed to identify cracks in the monuments and buildings where the initial convolution layers of CrackNet aids in extracting base features of cracked images, followed by channel and spatial attention modules to focus on dominant and significant information required to detect cracks, allowing quicker convergence.

Inference: Experimental results show high performance with an accuracy of 97.75% for the classification of Crack detection. The manuscript is submitted and is under review.

Team: Ayush Singh Rajput and Prof. M. K. Dutta.

51. Early Diagnosis of Glioma and Multi-grade Classification using Artificial Intelligence



Summary: In this study, a novel two-stage ensemble of an ensemble-type machine learning-based predictive framework for glioma detection and its histograde classification is proposed. Different characteristics were examined using distinctive ensemble-based machine learning classifiers and combination strategies to develop a computer-aided diagnostic system for the non-invasive prediction of glioma cases and their grade.

Inference: Developed ensemble-based approach achieved 94.07% and 83.33% cross-validation accuracy for Glioma-Healthy classification and multi-grade identification of Glioma, respectively. Some other AI methods are being worked upon.

Team: Rakesh Chandra Joshi and Prof. M. K. Dutta.

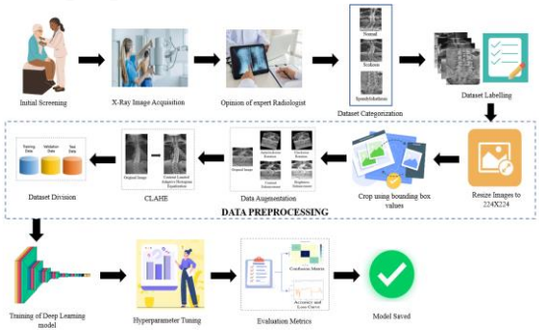
52. AI Based Risk Prediction of Cervical Cancer using Cytokene Gene Variants and Socio-Demographic Characteristic

Summary: This study was designed to apply a machine learning-based model using these risk factors for better prognosis and prediction of cervical cancer. This study includes the dataset of cytokine gene variants, clinical and socio-demographic characteristics of normal healthy control subjects, and cervical cancer cases. Different risk factors, including demographic details and cytokine gene variants, were analysed using different machine learning approaches.

Inference: Ridge classifier achieved the classification accuracy of 84.78%. Results signify that the proposed method is more practical and scalable to predict the vulnerability to cervical cancer. More advanced AI methods are being developed for the same.

Team: Rakesh Chandra Joshi and Prof. M. K. Dutta.

53. Attention-Guided Convolutional Neural Network for Spinal Lesion Diagnosis and Multi-Class Classification of X-ray Radiographs

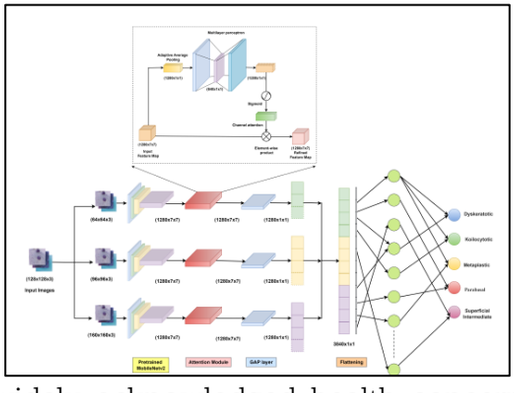


Summary: Spinal lesions can cause pain, weakness, and loss of function, leading to discomfort and limitations. Early diagnosis is essential to prevent worsening symptoms. This study proposes a CNN model for accurate identification of spinal lesions in X-ray images, achieving decent diagnostic accuracy. The model automates the diagnostic process, reduces overfitting, and adapts to various medical imaging tasks, improving the effectiveness and efficiency of spinal lesion diagnosis.

Inference: The proposed attention-guided CNN model effectively automates the diagnosis of spinal lesions in X-ray images, enhancing diagnostic accuracy and efficiency. Its adaptability to various medical imaging tasks makes it a valuable tool for improving spinal lesion diagnosis and patient care.

Team: Rakesh Chandra Joshi, Prof. M. K. Dutta

54. Cervical Cancer Classification using Multi-Scale, Multiple-Attention-based Deep Learning Approach

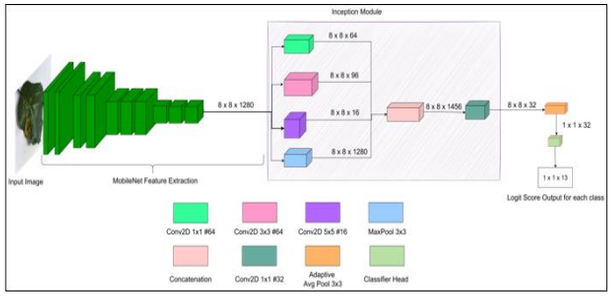


Summary: Cervical cancer is a widely acknowledged health concern, especially in the areas lacking appropriate medical treatment. The early diagnosis and the explicit categorization of cervical lesions may bring about effective therapy and restrict the expansion of the disease. This paper proposes a novel approach that employs a multi-scale, multi-attention-based MobileNetV2 architecture for the classification of cervical cancer. The intended model ascends the efficiency of MobileNetV2, a lightweight convolutional neural network (CNN), while integrating multiscale and multi-attention mechanisms to enhance the feature extraction capability and to enhance the classification accuracy. By incorporating multi-scale component, the suggested model can effectively detect features at different resolutions. Moreover, the integration of multi-attention mechanism allows the model to dynamically highlight salient features over multiple scales.

Inference: The proposed MobileNetV2 model has been attained, with a classification accuracy of 92.4% achieved for cervical cancer classification.

Team: Dr. Ritesh Maurya

55. A Novel MobileInceptionNet Architecture for Apple Leaf Disease Classification

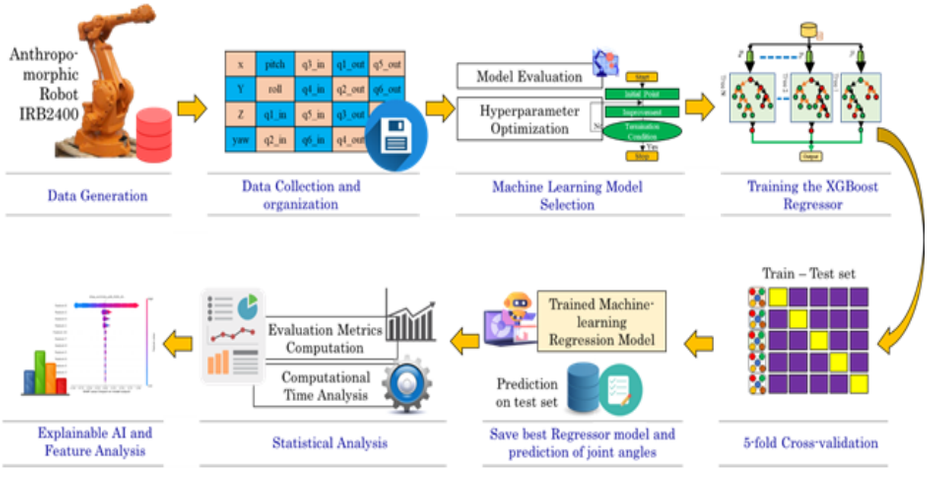


Summary: Diagnosis of agricultural plant leaf diseases is a significant, but a time-taking process, if performed manually. Therefore, automated systems are much required for the early diagnosis of the leaf diseases. Recent advancements in Deep Learning have accelerated the development of these autonomous systems. This study introduces a novel deep learning model designed, particularly to classify apple leaf diseases accurately, hence, addressing the critical aspect of agricultural management. The proposed model combines the efficiency and lightweight-nature of the MobileNet architecture with the strong feature extraction properties of Inception module and hence, is named MobileInceptionNet.

Inference: The proposed MobileInceptionNet model, has achieved average precision, recall and F1-score of 0.947, 0.946 and 0.946 for the classification of thirteen different types of apple leaf disease.

Investigator: Dr. Ritesh Maurya

56. Machine Learning-Driven Inverse Kinematics and Joint Angle Prediction for Six-DoF Anthropomorphic Robots with Explainable AI

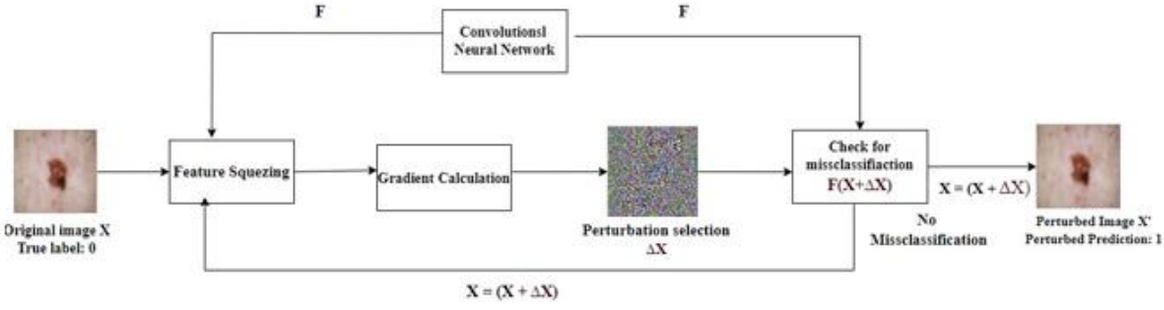


Summary: Inverse kinematics, crucial in robotics, entails the computation of joint configurations for robots to achieve desired end effector positions and orientations, particularly challenging in six-degree-of-freedom (six-DoF) anthropomorphic robots. This study leverages artificial intelligence (AI) techniques to enhance efficiency. It rigorously evaluates diverse machine learning regression models with hyperparameter tuning done using Bayesian optimization.

Inference: Evaluation using five-fold cross-validation on a publicly-available dataset substantiates its reliability, with the model demonstrating performance in predicting six joint angles for end effector configuration, yielding an average mean square error of 0.001934 to 0.003522. The manuscript is submitted and is under review.

Team: Rakesh Chandra Joshi, Dr. J. K. Rai and Prof. M. K. Dutta.

57. Adversarial Attacks on Convolution Neural Networks for Skin Cancer Detection



Summary: This research investigates the impact of applying adversarial FGSM attacks to a human melanoma classification model based on the EfficientNetB3 architecture. The model utilizes a comprehensive database containing diagnostic images of both malignant and benign skin lesions. The study contributes to the ongoing discussion about adversarial attacks in medical image analysis, emphasizing the importance of ensuring the safety of deep learning models in healthcare.

Inference: The experimental results show that the FGSM-based adversarial attack results in the consequent decrease in the model classification accuracy from 82.70% to 73.30%.

Investigator: Dr. Ritesh Maurya

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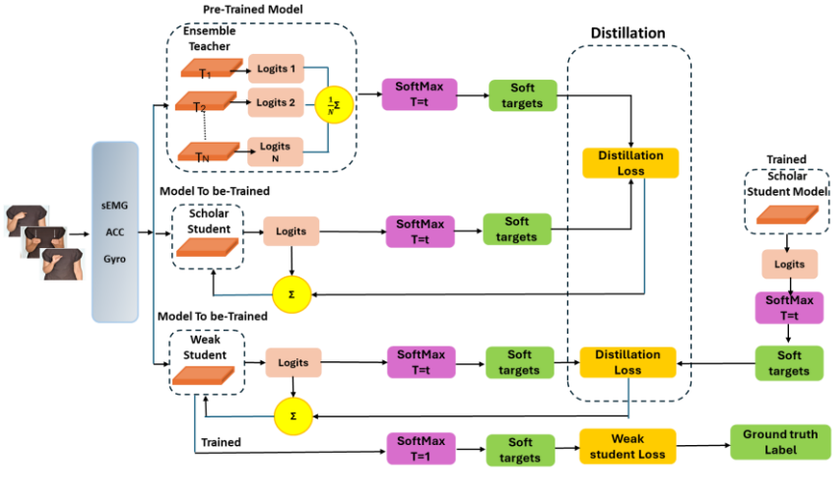
58. Scholar Based Knowledge distillation for hand gesture recognition.

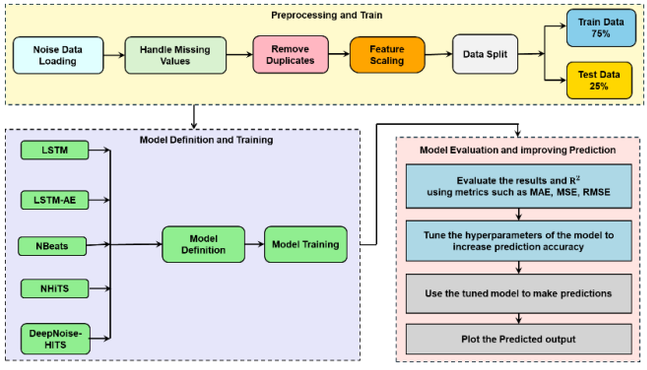


Summary: Scholar-based Knowledge Distillation framework is proposed for improving hand gesture recognition (HGR) using wearable sensors. The study was conducted on a self-recorded Indian Sign Language (ISL) dataset comprising 100 hand gestures, collected using EMG and IMU sensors. The study highlights the potential of hierarchical knowledge distillation in developing compact, high-performance models for HGR applications.

Inference: The weak student model trained using ETAS-KD achieved an accuracy of 78.5%, significantly outperforming models trained via direct knowledge distillation from single or multiple teachers. (*Initial Manuscript for Journal Publication is ready*)

Investigator: Dr. Rinki Gupta and Dr Sneha Sharma.

59. A Deep Neural Hierarchical Interpolation for Time Series forecasting of Noise Levels

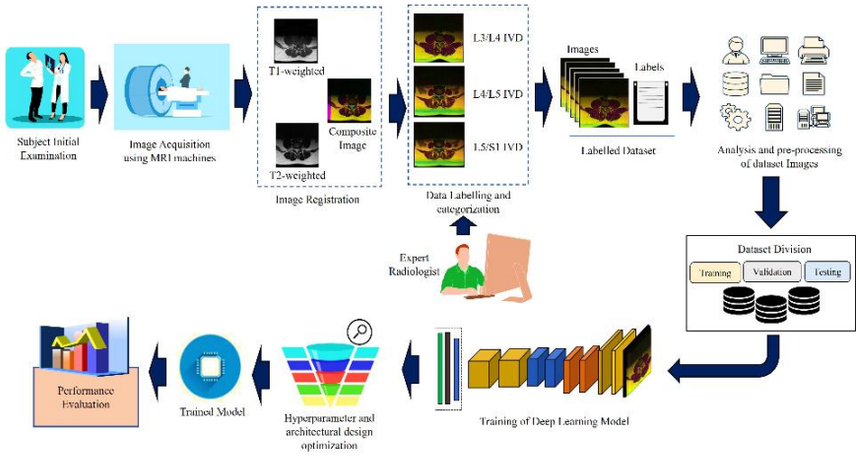


Summary: Introducing the novel DeepNoise hierarchical interpolation model to the realm of Noise level forecasting. The study's contributions also include presenting a novel noise level dataset from 26 real-time monitoring stations and conducting thorough statistical analyses using metrics like MAE, RMSE, R2, and the Friedman test.

Inference: The propose model trained Noise level achieved a lowest error of 0.016, significantly outperforming models trained via other state of art time series forecasting approches. (*Initial Manuscript for Journal Publication is ready*)

Team: Dr Sneha Sharma, Dr Naveen Garg (NPL Scientist), Bhupinder Singh (NPL Scholar), Prof MK Dutta.

60. SpineDeep-Net: Automatic Multi-class Classification of Intervertebral Disc-slices of Lumbar Spine using Artificial Intelligence



Summary: The study proposes a deep learning framework, SpineDeep-Net, for automatically classifying MRI images of different disc slices in the lumbar spine. By accurately identifying disc slices, this tool can assist medical professionals in diagnosing spinal diseases and making critical decisions. Using a diverse dataset and various optimization techniques, the deep learning model showed efficient and accurate results compared to other methods, showing promise for improving diagnostics in clinical settings.

Inference: SpineDeep-Net effectively automates the classification of lumbar spine MRI images, enhancing diagnostic accuracy. Its robust performance shows promise for aiding spinal disease diagnosis in clinical settings.

Team: Rakesh Chandra Joshi, Prof. M. K. Dutta

LIST OF PUBLICATIONS

(Published/Accepted)

Journal Papers (Scopus and Web of Science Indexed)

1. Ritesh Maurya, Nageshwar Nath Pandey, Mohan Karnati, Geet Sahu, "Breaking Barriers in Cancer Diagnosis: Super-Light Compact Convolution Transformer for Colon and Lung Cancer Detection" International Journal of Imaging Systems and Technology · August 2024, Wiley Publishers DOI: https://doi.org/10.1002/ima.23154, SCI Indexed Impact Factor – 3.
   Area: Deep Learning, Computer Vision.

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2. Maurya, R., Mahapatra, S., Dutta, M.K. et al. Skin cancer detection through attention guided dual autoencoder approach with extreme learning machine. Scientific Reports, Nature, 14, 17785 (2024). https://doi.org/10.1038/s41598-024-68749-1, SCI Indexed Impact Factor : 4.3.
   Area: Deep Learning & Computer Vision.

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3. Rakesh Chandra Joshi, Pallavi Srivastava, Rashmi Mishra, Radim Burget, M. K. Dutta. "Biomarker Profiling and Integrating Heterogeneous Models for Enhanced Multi- Grade Breast Cancer Prognostication" Computer Methods an Programs in Biomedicine, Elsevier Publishers, 2024,
   DOI: doi.org/10.1016/j.cmpb.2024.108349, SCI Indexed Impact Factor : 6.1.
   Area: Machine Learning & Medical Informatics

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4. Nageshwar Nath Pandey, Avadh Pati & Ritesh Maurya, "DriSm_YNet: a breakthrough in real-time recognition of driver smoking behavior using YOLO-NAS" Neural Computing and Applications,
   DOI: doi.org/10.1007/s00521-024-10162-w 2024, SCI indexed Impact Factor : 6.0.
   Area: Deep Learning & Computer Vision.

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5. H. S. Ganesha, Rinki Gupta, Sindhu Hak Gupta, Sreeraman Rajan, "Few-shot transfer learning for wearable IMU-based human activity recognition", Neural Computing and Applications, Mar 2024, https://doi.org/10.1007/s00521-024-09645-7, SCI indexed Impact Factor: 6.0
   Area: Transfer Learning and Human Computer Interaction

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6. Ritesh Maurya; M.K.Dutta Dutta; Mohan Karnati, Dr Nageshwar Nath Pandey, "FCCS-Net: Breast Cancer Classification Using Multi-Level Fully Convolutional-Channel and Spatial Attention-based Transfer Learning Approach" Biomedical Signal Processing and Control, Elsevier Publishers, Accepted for Publication, SCI indexed Impact Factor - 5.1.
   Area: Deep Learning & Computer Vision.

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7. Rakesh Chandra Joshi, A.K.Sharma, M.K.Dutta, "VisionDeep-AI: Deep Learning-based Retinal Blood Vessels Segmentation and Multi-class Classification Framework for Eye Diagnosis"- Biomedical Signal Processing and Control, Elsevier Publishers, Accepted for Publication, SCI indexed Impact Factor - 5.1.
   Area: Deep Learning & Computer Vision.

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8. Rakesh Chandra Joshi, Malay Kishore Dutta, Nitin Singh, Anuj Kumar Sharma and Radim Burget AI-SenseVision: A Low-cost Artificial Intelligence-based Robust and Real-time Assistance for Visually Impaired People" IEEE Transactions on Human-Machine Systems,

   DOI: 10.1109/THMS.2024.3375655, 2024, SCI indexed Impact Factor – 3.6.
   Area: Deep Learning, Computer Vision & Edge Devices

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9. Rinki Gupta, R.Singh, Carlos M. Travieso-González, Radim Burget & Malay Kishore Dutta, "DeepRespNet: A Deep Neural Network for Classification of Respiratory Sounds" Biomedical Signal Processing and Control, Elsevier Publishers,

   DOI: doi.org/10.1016/j.bspc.2024.106191, 2024, SCI indexed Impact Factor - 5.1.
   Area: Deep Learning and Time Series Analysis

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10. Mohan Karnati, Ayan Seal, Joanna Jaworek-Korjakowska, Ondrej Krejcar, "Facial Expression Recognition in-the-wild using Blended Feature Attention Network" IEEE Transactions on Instrumentation and Measurement,
    DOI: https://doi.org/10.1109/TIM.2023.3314815, 2023, SCI indexed Impact factor – 5.6.
    Area: Deep Learning, Human-Computer Interaction

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11. Vibhav Prakash Singh, Aman Verma, Dushyant Kumar Singh & Ritesh Maurya. "Improved content-based brain tumor retrieval for magnetic resonance images using weight initialization framework with densely connected deep neural network". Neural Computing & Applications (2023).

    DOI: https://doi.org/10.1007/s00521-023-09149-w. [SCIE indexed] (IF. 6.00)
    Area: Deep Learning Based-Medical Imaging.

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12. Mohan Karnati, Geet Sahu, Abhishek Gupta, Ayan Seal, Ondrej Krejcar, "A Pyramidal Spatial-based Feature Attention Network for Schizophrenia Detection using Electroencephalography Signals" IEEE Transactions on Cognitive and Developmental Systems,

    DOI: https://doi.org/10.1109/TCDS.2023.3314639, 2023, SCI indexed Impact factor – 5.
    Area: Deep Learning, Brain-Computer Interface

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    DOI: https://doi.org/10.1002/ima.22954, 2023, Wiley Publisher, SCI indexed Impact Factor-3.3.
    Area: Deep Learning Based-Medical Imaging

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14. Chandrasen Pandey, Neeraj Baghel, Rinki Gupta & Malay Kishore Dutta, "Nocturnal sleep sounds classification with artificial neural network for sleep monitoring" Multimedia Tools and Applications,

    DOI: 10.1007/s11042-023-16190-3, 2023, SCI indexed Impact factor – 3.6.
    Area: Deep Learning, Time Series

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15. Karnika Dwivedi & Malay Kishore Dutta, "Microcell-Net: A deep neural network for multi-class classification of microscopic blood cell images" Expert Systems, Wiley Publishers,

    DOI: https://doi.org/10.1111/exsy.13295, 2023, SCI indexed Impact factor – 3.3.
    Area: Deep Learning, Computer Vision.

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16. Vojtech Myska, Samuel Genzor, Anzhelika Mezina, Radim Burget, Jan Mizera, Michal Stybnar, Martin Kolarik, Milan Sova, Malay Kishore Dutta, "Artificial-Intelligence-Driven Algorithms for Predicting Response to Corticosteroid Treatment in Patients with Post-Acute COVID-19", Diagnostics,

    DOI: 10.3390/ diagnostics 13101755, 2023, SCI indexed Impact factor – 3.6.
    Area: Machine Learning.

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17. Geet Sahu, Ayan Seal, Joanna Jaworek-Korjakowska, and Ondrej Krejcar, "Single Image Dehazing via Fusion of Multilevel Attention Network for Vision-Based Measurement Applications" IEEE Transactions on Instrumentation and Measurement, vol. 72, pp. 1-15, 2023, Art no. 4503415,

    DOI: 10.1109/TIM.2023.3271753, 2023. SCI Indexed Impact Factor – 5.332
    Area: Computer Vision/Deep Learning

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18. Geet Sahu, Mohan Karnati, Abhishek Gupta, and Ayan Seal, "SCZ-SCAN: An automated Schizophrenia detection system from electroencephalogram signals" Accepted for Publication. Biomedical Signal Processing and Control, Elsevier Publishers, 2023, SCI indexed Impact Factor - 5.076
    Area: Deep Learning and Brain-Computer Interface.

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19. Neha Sengar, Rakesh Chandra Joshi, Malay Kishore Dutta & Radim Burget, "EyeDeep-Net: a multi-class diagnosis of retinal diseases using deep neural network" Neural Computing and Applications, Springer Verlag Publishers,
    DOI: doi.org/10.1007/s00521-023-08249-x, 2023, SCI indexed Impact Factor - 5.102.
    Area: Computer Vision/Deep Learning

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20. Ritesh Maurya, Arti Srivastava, Ashutosh Srivastava, Vinay Kumar Pathak, Malay Kishore Dutta, "Computer-aided detection of mercury heavy metal intoxicated fish: an application of machine vision and artificial intelligence technique" Multimedia Tools and Applications,
    DOI:10.1007/s11042-023-14358-5, 2023, SCI indexed Impact Factor - 2.577
    Area: Computer Vision/Machine Learning

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21. Karnika Dwivedi, Malay Kishore Dutta & Jay Prakash Pandey, "EMViT-Net: A novel transformer-based network utilizing CNN and multilayer perceptron for the classification of environmental microorganisms using microscopic images" Ecological Informatics,
    DOI: https://doi.org/10.1016/ j.ecoinf.2023.102451, December 2023, Elsevier Publishers, SCI indexed Impact Factor: 5.1.
    Area: Computer Vision and Deep Learning

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22. Sneha Sharma, Rinki Gupta, Arun Kumar, "A TinyML solution for an IoT-based Communication Device for Hearing Impaired" Expert Systems with Applications, Elsevier Publishers, SCI Indexed Impact factor 8.5, Accepted 2-Jan 2024
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23. Ritesh Maurya, Satyajit Mahapatra, Lucky Rajput, "A Lightweight Meta-Ensemble Approach for Plant Disease Detection Suitable for IoT-based Environments", IEEE Access Journal, SCI Indexed Impact factor 3.476, DOI: 10.1109/ACCESS.2024.3367443, 2024.
    Area: Computer Vision and Deep Learning

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(Scopus and Web of Science Indexed)

24. Ritesh Maurya, Malay Kishore Dutta, "Combining Deep features with the Invariant Local Binary Pattern features for Skin Cancer Classification" PuneCon2023, Publisher: IEEE Xplore Digital Library.

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25. Ritesh Maurya, Parth Thirwani, Tirumoorthy Gopalakrishnan, Mohan Karnati, "Combining Focal loss with Cross-entropy loss for Pneumonia Classification with a Weighted Sampling Approach", IATMSI2023, IIITM-Gwalior, India. Publisher: IEEE Xplore Digital Library. (Accepted for Publication)

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26. Rashi Chauhan, Mohan Karnati, Malay Kishore Dutta, Radim Burget, "Plant Disease Identification Using a Dual Self-Attention Modified Residual-Inception Network" 15th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops (ICUMT), 2023, Belgium, Publisher: IEEE Xplore Digital Library.

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28. Geet Sahu, Mohan Karnati, Ayush Singh Rajput, Mayank Chaudhary, Ritesh Maurya, Malay Kishore Dutta, "Attention-based Transfer Learning Approach using Spatial Pyramid Pooling for Diagnosis of Polycystic Ovary Syndrome" 9th International Conference on Signal Processing and Communication (ICSC), 2023, Publisher: IEEE Xplore Digital Library, DOI: 10.1109/ICSC60394.2023.10441101.

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30. Sneha Sharma, Anshul Sharma, Siddhant Kumar, Avaneesh Pandey, Malay Kishore Dutta. "Improved Ensemble based Transfer learning approach for Indian Sign Language Recognition" 9th International Conference on signal processing and Communication. Publishers: IEEE Scopus indexed, DOI: 10.1109/ICSC60394.2023.10441332.

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(Published/Accepted)

31. Malay Kishore Dutta & George Arhonditsis, “Empowering novel scholarship at the intersection of machine learning/deep learning and ecology” Editorial in Ecological Informatics, DOI: 10.1016/j.ecoinf.2023.102249, Elsevier Publishers, 2023.

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32. Gautam Verma, Mohan Karnati, Malay Kishore Dutta, Vojtech Myska, Anzhelika Mezina, “Attention-based VGG-Residual-Inception Module for EEG-Based Depression Detection” 15th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops (ICUMT), 2023, Belgium, Publisher: IEEE Xplore Digital Library.

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33. Himanshi Sinha, Mohan Karnati, Garima Mehta, Malay Kishore Dutta, Anzhelika Mezina, Radim Burget, “DMRBNet: Dilated Multi-scale Residual Block-based Deep Network for Detection of Breast Cancer from MRI Images” 15th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops (ICUMT), 2023, Belgium, Publisher: IEEE Xplore Digital Library.

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34. Suzain Rashid, Mohan Karnati, Garima Mehta, Malay Kishore Dutta, Pavel Sikora, Radim Burget, “Attention-based Multiscale Deep Neural Network for Diagnosis of Polycystic Ovary Syndrome Using Ovarian Ultrasound Images” 15th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops (ICUMT), 2023, Belgium, Publisher: IEEE Xplore Digital Library.

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35. Vaishali Aggarwal, Geet Sahu, Malay Kishore Dutta, Martin Jonak and Radim Burget, “Multi-scale Attention Network for Early Detection of Alzheimer's Disease from MRI images” 15th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops (ICUMT), 2023, Belgium, Publisher: IEEE Xplore Digital Library.

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36. Srishti Verma, Vishal, Rakesh Chandra Joshi, Malay Kishore Dutta, Stepan Jezek and Radim Burget, “AI-enhanced Mental Health Diagnosis: Leveraging Transformers for Early Detection of Depression Tendency in Textual Data” 15th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops (ICUMT), 2023, Belgium, Publisher: IEEE Xplore Digital Library.

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37. Ritesh Maurya, Rudra Shaurya, Malay Kishore Dutta, Radim Burget, Martin Kiac, “Multi-Head Attention-Based Transfer Learning Approach for Potato Disease Detection” 15th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops (ICUMT), 2023, Belgium, Publisher: IEEE Xplore Digital Library.

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38. Ritesh Maurya, Divyam Aggarwal, T. Gopalakrishnan, Nageshwar Nath Pandey, Enhancing Deep Neural Network Convergence and Performance: A Hybrid Activation Function Approach by Combining ReLU and ELU Activation Function” ICI-2023 (International Conference on Informatics (ICI-2023)), Noida, India. Publisher: IEEE Xplore Digital Library.

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39. Ritesh Maurya, Anant Krisn Bais, Tirumoorthy Gopalakrishnan, Ankita Deshpande, Malay Kishore Dutta, Skin Lesion Classification using Deep Feature Fusion and Selection Using XGBoost Classifier, International Conference on Artificial Intelligence for Innovations in Healthcare Industries, Raipur, India. Publisher: IEEE Xplore Digital Library. (Accepted for Publication)

ACAI – SEMINAR'S/WORKSHOP'S

AMITY UNIVERSITY

AMITY CENTRE FOR ARTIFICIAL INTELLIGENCE
With most advanced Supercomputing facility & involved in disruptive innovations in the area of AI.

Title: The Art and Science of Synthetic Creation: Generative Adversarial Networks

Research Seminar SERIES
Seminar #1

THURSDAY
05.10.2023

3:30 – 4:30PM

Online Mode:
SCAN or Visit
https://tinyurl.com/54pka5fj

Offline Mode: G-16, E3 Block, Amity University, Noida.

Speaker
Dr. Ritesh Maurya
Amity Centre for Artificial Intelligence

AMITY UNIVERSITY

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Title: Visibility Restoration of Hazy Images using Deep Neural Network

Research Seminar SERIES
Seminar #2

FRIDAY
03.11.2023

3:30 – 4:30PM

Online Mode:
SCAN or Visit
https://tinyurl.com/2hrwpctk

Offline Mode: G-16, E3 Block, Amity University, Noida.

Speaker
Dr. Geet Sahu
Amity Centre for Artificial Intelligence

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Title: Deep Learning Techniques for Facial Expression Recognition in-the-wild

Research Seminar SERIES
Seminar #3

THURSDAY
23.11.2023

3:30 – 4:30PM

Online Mode:
SCAN or Visit
https://tinyurl.com/4yaczynx

Offline Mode: G-16, E3 Block, Amity University, Noida.

Speaker
Dr. Karnati Mohan
Amity Centre for Artificial Intelligence

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Title: Exploring Generative AI with Diffusion Models

Research Seminar SERIES
Seminar #4

THURSDAY
30.11.2023

3:30 – 4:30PM

Online Mode:
SCAN or Visit
https://tinyurl.com/5n77w7kc

Offline Mode: G-16, E3 Block, Amity University, Noida.

Speaker
Prof. M. Partha Sarathi
Amity School of Engineering and Technology

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Title: Hand Gesture Recognition Methods Using Wearable Sensors for Human-Computer Interaction

Research Seminar SERIES
Seminar #5

THURSDAY
07.12.2023

3:30 – 4:30PM

Online Mode:
SCAN or Visit
https://tinyurl.com/2yu6v4fv

Offline Mode: G-16, E3 Block, Amity University, Noida.

Speaker:
Dr. Sneha Sharma
Amity Centre for Artificial Intelligence.

AMITY UNIVERSITY

Workshop for Amity Students on

Scientific Research Paper Writing Skills

Develop Skills to Write Scientific Research Papers

FREE WORKSHOP
Limited seats available

Talk #6

THURSDAY
21.12.2023

3:30 – 4:30PM

Online Mode:
Scan or Visit
http://tinyurl.com/pdarsm5j

Offline Mode: G-16, E3 Block, Amity University, Noida.

Speaker:
Prof. M. K. Dutta,
Dean, Students Research, AUUP
Director, Amity Centre for Artificial Intelligence

Organized by
DEAN, STUDENTS RESEARCH,
Amity University (AUUP).

Deen Student Research. E3-G12B, Amity University, Noida, Email: DSR@AMITY.EDU

ACAI – SEMINAR'S/WORKSHOP'S

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With most advanced Supercomputing facility & involved in disruptive innovations in the area of AI.

Title: Accelerating End-to-End Conversational AI workflows

Expert Talk SERIES

Talk#7

TUESDAY
09.01.2024
03:30 – 4:30 PM

Online Mode:
SCAN or Visit
http://tinyurl.com/4krvvamw

Offline Mode: G-16, E3 Block Amity University, Noida.

Speaker:
Mr. Megh Makwana,
Solution Architect & Engineering Manager - Applied AI Team, NVIDIA.

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Title: AI in Automotive

Expert Talk SERIES

Talk#8

THURSDAY
11.01.2024
01:00 – 2:00 PM

Online Mode:
SCAN or Visit
http://tinyurl.com/43xs9vyd

ACAI LAB: G-16, E3 Block Amity University, Noida.

Speaker:
Ms. Pankhuri Khanna
Lead Data scientist, Robert Bosch.

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Title: Attention Mechanism in Deep Learning.

Research Seminar SERIES

Seminar #9

WEDNESDAY
08.05.2024
3:30 – 4:30PM

Online Mode:
SCAN or Visit
https://tinyurl.com/3zsab59n

Offline Mode: G-16, E3 Block, Amity University, Noida.

Speaker:
Dr. Sneha Sharma
Amity Centre for Artificial Intelligence.

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Title: Exploring AI-Based Research Project, Startups & APIs Development.

* Empower your AI journey from inception to fruition with advanced Transformer models, LLMs, RAGs & Fine-Tuning. Leverage the Unlimited Power of AI in your own ideas.

AI Innovation SESSION

Seminar #10

Tuesday
07.05.2024
11.45 AM to 1 PM

Venue: ACAI Lab, G-16, E3 Block, Amity University, Noida. (Offline Mode Only),

Confirm your participation by Register:
https://tinyurl.com/4tw3492v

Speaker:
Prof. M. K. Dutta,
Director, Amity Centre for Artificial Intelligence
Dean, Student Research, Amity University, Noida

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Title: Demystifying Transformer Architecture and its Usefulness

Research Seminar SERIES

Seminar #11

THURSDAY
16.05.2024
3:30 – 4:30PM

Online Mode:
SCAN or Visit
https://tinyurl.com/5bs3typ9

Offline Mode: ACAI Lab, G-16, E3 Block, Amity University, Noida.

Speaker:
Dr. Ritesh Maurya
Amity Centre for Artificial Intelligence

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Title: The Impact of Large Language Models (LLM) and Retrieval-Augmented Generation (RAG).

Research Seminar SERIES

Seminar #12

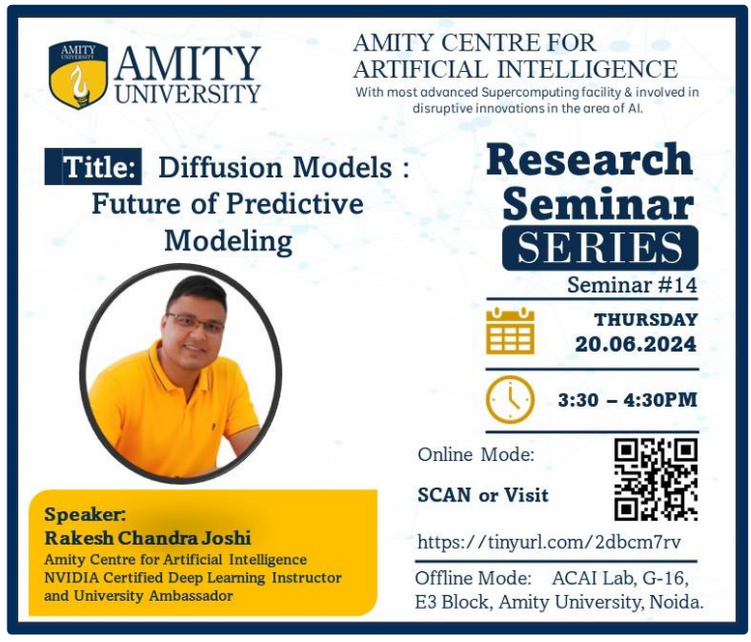
FRIDAY
24.05.2024
12:30 – 1:30 PM

Online Mode:
SCAN or Visit
https://tinyurl.com/44h9n4dy

Offline Mode: ACAI Lab, G-16, E3 Block, Amity University, Noida.

Speaker:
Parth Thirwani
B.Tech Student (2022-26)
Amity School of Engineering & Technology

ACAI – SEMINAR'S/WORKSHOP'S



1 day Workshop on DEPLOYMENT of AI MODELS on Edge Devices organized on 15th May 2024

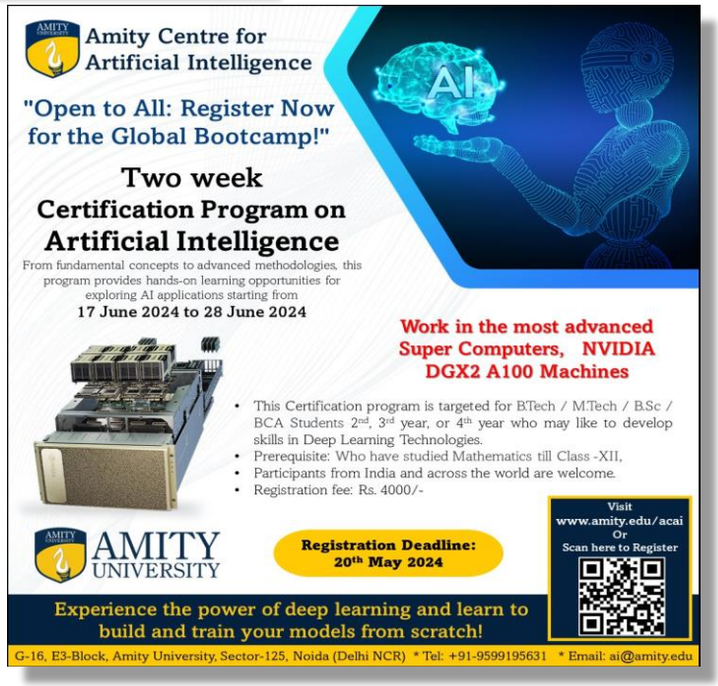
5 Days Online Bootcamp on Deep Learning Technologies organized from 13th May 2024 to 17th May 2024

EVENTS ORGANIZED @ ACAI

Opportunity for curious young minds – the Summer School on Artificial Intelligence at Amity University, Noida

Amity University, Noida is organized an Undergraduate Summer Research Fellowship Programme in June 2024

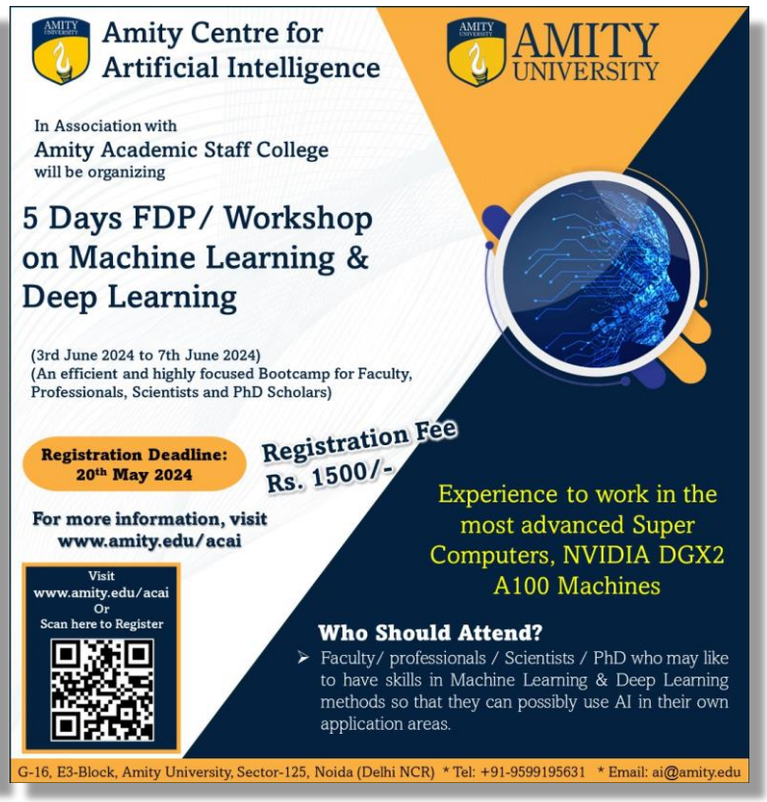
5 Days Bootcamp on Deep Learning Technologies from 17 June 2024 to 21 June 2024



Two-week Certification Program on Artificial Intelligence from 17 June 2024 to 28 June 2024

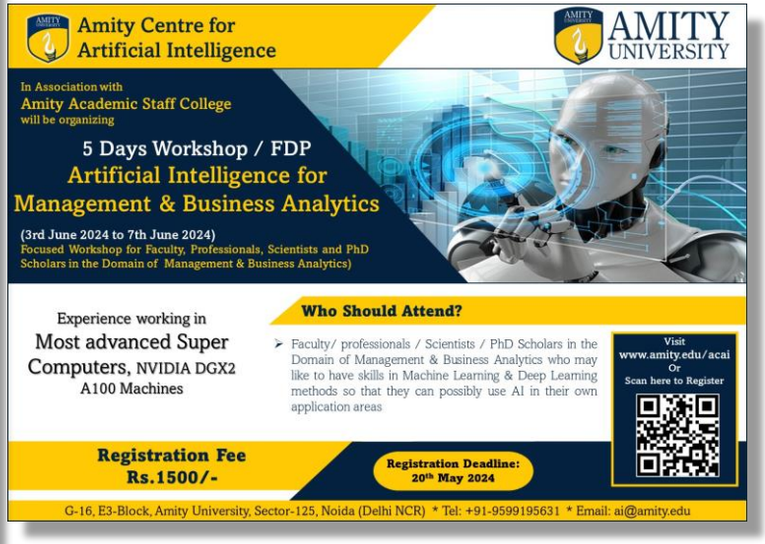
EVENTS ORGANIZED @ ACAI

4-week Summer Internship/Summer Training on Artificial Intelligence from 10th June 2024 Onwards



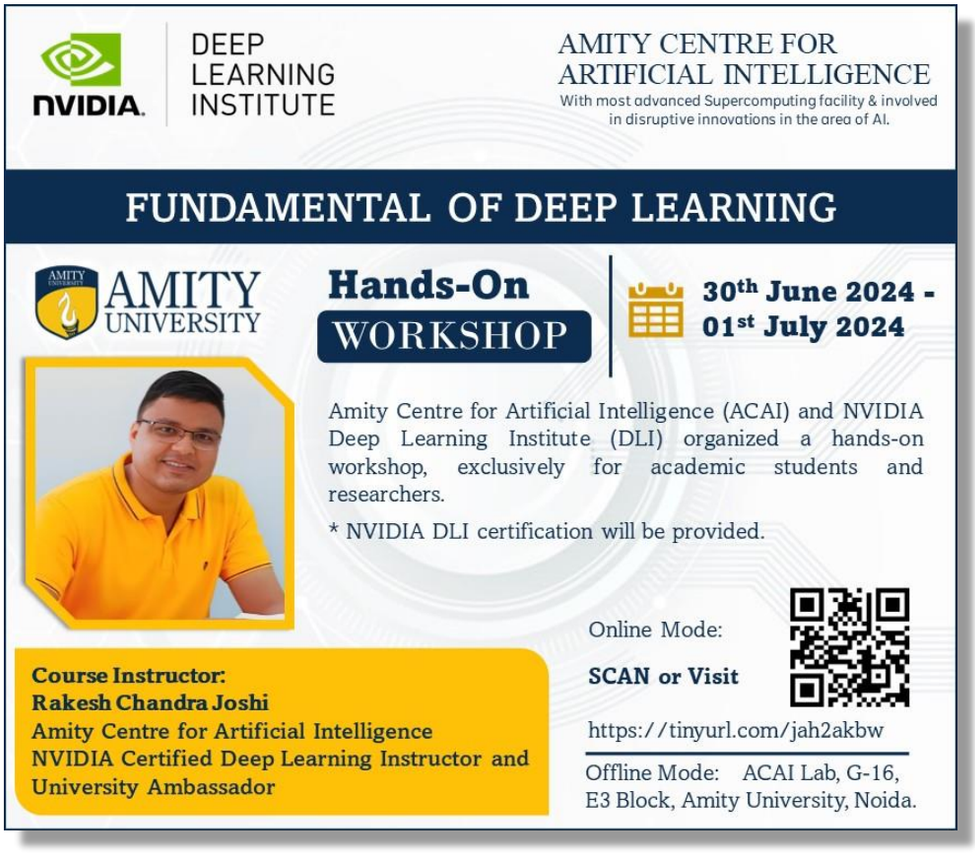
5 Days FDP/ Workshop on Machine Learning & Deep Learning from 3rd June to 7th June 2024

5 Days Workshop on Artificial Intelligence for Life Science, healthcare & Biotechnology from 3rd June to 7th June 2024



5 Days FDP/Workshop on Artificial Intelligence for Management & business Analytics from 3rd June to 7th June 2024

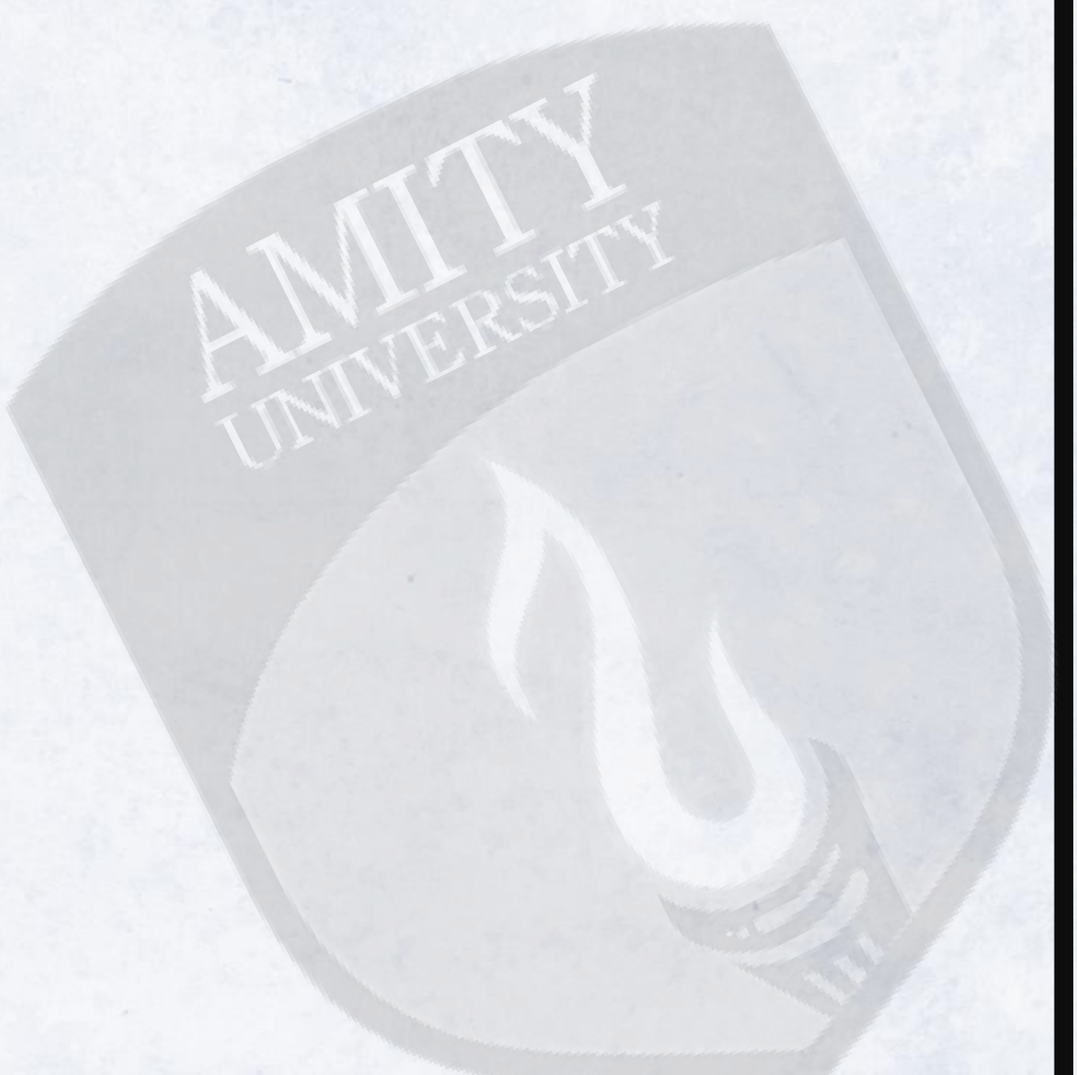
Glimpse of ACAI AICraft-1.1 - (14th March 2024)



2 Days Workshop on the Fundamental of Deep Learning from 30th June 2024 to 01st July 2024

1 Days Workshop on Hands-On Workshop on Deep Learning on 30th August 2024

Some Captured Moments @ ACAI



On December 12, 2023, Prof. M.K. Dutta, the Director of the Amity Centre for Artificial Intelligence, spoke on National Television on the Global Partnership on Artificial Intelligence (GPAI), which the Honorable PM had inaugurated in Pragati Maidan.

On December 29, 2023, Prof. M.K. Dutta, the Director of the Amity Centre for Artificial Intelligence, spoke on National Television in a Discussion on the Issue of Data infringements in the context of the incident of New York Times legal suit against Microsoft and OpenAI

Prof. M.K.Dutta Director of Amity Centre for Artificial Intelligence in a Discussion on AI telecasted by National TV on 9th June 2023

Prof. M.K.Dutta, Director of Amity Centre for Artificial Intelligence in a Discussion on Artificial intelligence based deepfake threats in National Television on 24 Nov 2023.

A Discussion Session on AI applications with the Faculty of BioTechnology

USRF Fellowship Students attending Sessions in ACAI.

USRF Fellowship 2023 Students

Student Participants and Faculty in “Bootcamp in Deep Learning Technologies” organized by Amity Centre for Artificial Intelligence from 30th May to 23rd June 2023

Prof. M.K.Dutta, Director of ACAI delivering an Invited Talk in the Track of Artificial intelligence on 17th Jan 2024 in India International Science Festival in Biotech Science Cluster, Faridabad. https://www.scienceindiafest.org/

Visit of People from our Centre for a meeting with Samsung on 06th January 2024.

Shri Daniel J., Senior Advisor, United Service Institution of India, visited our Amity Centre for Artificial Intelligence (ACAI) Lab.

Visit of People from our Centre for a meeting in NPL (National Physical Laboratory) Delhi on 22nd December 2023.

AMITY UNIVERSITY - RANKED AMONG THE TOP 3% UNIVERSITIES GLOBALLY

Amity University, a leading research & innovation-driven university, has been ranked among the top 3% universities by QS and Times Higher Education, UK (the world's leading university rankings organizations).

The university is also Asia's only not-for-profit university to be awarded US Regional Accreditation by WASC, USA and QAA, UK - setting a new standard of academic excellence in India.

Amity has been ranked among the top universities globally for producing the most employable graduates in a survey conducted among 11,000 employers worldwide by Times Higher Education, UK.

Amity's relentless pursuit of excellence is reflected in its steadfast commitment and continuing investment towards cutting-edge research and innovation. For instance, Amity in the last four years has filed over 2100 patents. It is also engaged in conducting over 400 hi-end Government funded as well as international research projects including those funded by Bill & Melinda Gates Foundation, USAID, and Leverhulme Trust, UK.

E3-G12B, Amity University, Sector - 125, Noida | www.amity.edu/acai | Email: ai@amity.edu