NUST SEECS -School of Electrical Engineering & Computer Science

SEECS

ABSTRACT BOOKLET

BSCS - Bachelor of Science in Computer Science

CLASS OF
2025

Faculty of
Computing

NUST
SCHOOL OF ELECTRICAL
ENGINEERING & COMPUTER
SCIENCE (SEECS)

Greeting & Message from
Principal NUST-SEECS
Dr. Muhammad Ajmal Khan, SI(M)
PhD (Michigan State University, USA)

It is a pleasure to introduce to you the graduating classes of 2025 in the disciplines of Electrical Engineering, Software Engineering, and Computer Science.

NUST-School of Electrical Engineering and Computer Science (SEECS) is committed to providing first-rate higher education in Pakistan. We emphasize making SEECS a center of excellence for imparting high-quality education in the areas of Electrical Engineering and Computer Science that would lead to the promotion of research and scholarly achievements at National & International levels. We foster a passion for creativity and productivity in our students through an enabling environment of state-of-the-art labs, arranging industry visits, seminars, and international conferences, etc. Besides imparting thorough professional knowledge, we also believe in instilling sound entrepreneurial, social and humanitarian values.

The programs offered at SEECS include Electronics, Digital Systems, RF and Microwave, Telecommunication and Networks, Artificial Intelligence, Machine Learning, Big Data, Cyber Security, and Cloud Computing. Hands-on training in these domains augments the basic knowledge of our students, giving insights into its practical application, an essential prerequisite for potential technical leaders of the 21st century.

The projects showcased in the Open House demonstrate the skill set of our graduating students, and the highly interactive sessions with the industrial professionals provide them a platform for networking. Another aim of holding this event is to address the dire need for industry-academia partnerships in Pakistan. Through Open House, the industry can witness the outstanding research of various disciplines that are being offered at NUST-SEECS. At the same time, the industry feedback helps us update our curriculum according to the contemporary market trends. Henceforth, I take immense delight in presenting the batch of 2025 as the proud product of SEECS and wish them success as they go forward in their respective fields, with all the best for their journey ahead.

Faculty Heads

Message from Associate Dean - Faculty of Computing

Dr. Rafia Mumtaz
Professor
PhD (Remote Sensing And Satellite Image Processing)

Dear Students of the Graduating Batches of Computer Science and Software Engineering,
As you stand at the threshold of completing your undergraduate journey, I want to take a moment to recognize the dedication, resilience, and growth that have brought you to this point. This phase, filled with anticipation, reflection, and excitement, marks the beginning of a new chapter, and it is truly a moment to be proud of.

Over the past few years, you've navigated through complex codes, late-night deadlines, collaborative projects, and unexpected challenges, emerging each time with greater strength and deeper insight. You've not only gained technical knowledge but also learned to think critically, solve real-world problems, and adapt in an ever-evolving digital landscape.

You are entering a world that urgently needs ethical technologists, innovative thinkers, and compassionate leaders. Whether you choose to dive into industry, pursue research, or carve out your path, I have no doubt that you will make a meaningful impact.

We look forward to celebrating your graduation soon and watching you thrive as proud ambassadors of NUST.

May you continue to lead with integrity, dream boldly, and never stop learning.

Dr. Seemab Latif
Associate Professor
PhD (Artificial Intelligence)
University of Manchester
HOD Artificial Intelligence and Data Science (AI&DS)

Dr. Muhammad Imran Malik
Associate Professor
PhD (Machine Learning For Forensic Document Analysis)
Universität Kaiserslautern
HOD Department of Computer Science (CS)

Dr. Mehdi Hussain
Associate Professor
PhD (Steganography)
Universiti Malaya
HOD Department of Information Security (IS)

Dr. Arham Muslim
Assistant Professor
PhD (Learning Analytics)
Rheinisch Westfälische Technische Hochschule Aachen
HOD Department of IT & Innovative Technologies in Learning (IT&ITL)

Dr. Momina Moetesum
Assistant Professor
PhD (Artificial Intelligence)
Bahria University
HOD Department of Software Engineering (SE)

Overview of
OPEN HOUSE

NUST SEECS organizes its annual open house to show case the skills of its graduating students. The idea is to provide a platform where our students and industry representatives can mingle and have informal or formal discussions. The students showcase their final year projects which represent their skill set and enable potential employers to identify any matching requirements. The projects are presented by students from two main departments:

Computer Science (CS)
Software Engineering (SE)

This year Department of Computing has divided the projects into different knowledge areas, including Algorithms and Complexity, Architecture and Organization, Computational Science, Graphics and Visualization, Human-Computer Interaction, Information Management, Intelligent Systems, Platform-based Development, Programming Languages, Social Issues and Professional Practice, Software Development Fundamentals, and Software Engineering. There are around 80 different projects in these categories. You will find a large diversity of

projects including mobile applications, computer vision based intelligent driving assistant, cloud based security resource sharing, an Alzheimer's prediction application and many more. You will not only find potential employees but excellent ideas as well that can be turned into products.

At NUST SEECS, we take pride in molding our bright entrants into well trained and appropriately groomed professionals in Computer Science, Software Engineering & Electrical Engineering disciplines. Our graduates are actively sought by the industry and our Alumni are occupying promising positions in some of the most prestigious industrial and business houses, both in public and private sectors. We hope that you will enjoy the hard work of our students and find the right candidate or the next big idea for your company.

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01 Knowledge Group
Networking and Communications

Use LLMs to write a compiler that converts Kyverno policies into Rego policies

Group Members: Abdul Basit Sajid | Abdul Momin

Advisor: Hassaan Khaliq Qureshi   Co-Advisor: Muneeb Ahmad

This final year design project (FYDP) is focused on leveraging Large Language Models (LLMs) to develop a compiler that translates Kyverno policies into Rego policies. Kyverno and Rego are policy engines used for enforcing security and compliance rules in Kubernetes clusters. This project aims to streamline policy management by automating the conversion process, ensuring seamless interoperability between Kyverno and Rego. The compiler will be designed to accurately translate the syntax and semantics of Kyverno policies into equivalent Rego policies, maintaining policy intent and integrity. This automated conversion will enhance the efficiency of managing Kubernetes policies, reduce human error, and facilitate a more flexible and robust policy management ecosystem.

URL Classification Using Artificial Intelligence

Group Members: Abdul Basit | Muhammad Ahmad Raza Khan | Muhammad Aleem Siddique Khan

Advisor: Muhammad Zeeshan   Co-Advisor: Hasan Tahir

This project utilizes Artificial Intelligence techniques such as Machine Learning, Deep Learning, Large Language Models, Transformers and Neural Networks to categorize URLs into distinct categories. The goal is to streamline the identification of URLs belonging to various categories, facilitating diverse tasks.

Algorithms and Complexity

Student Assessment and Feedback System Using LLMs

Group Members: Muhammad Bilal Ahmad | Muhammad Sunaam | Syed Aon Raza

Advisor: Sohail Iqbal   Co-Advisor: Arham Muslim

This project proposes an innovative solution to revolutionize student self-assessment systems by leveraging the capabilities of Language Model Models (LLMs). The objective is to streamline the assessment process for both subjective and objective papers, while also providing personalized feedback to students to enhance their learning outcomes. The proposed system automates the evaluation of exams, eliminating the need for manual grading and significantly reducing turnaround time. By harnessing the power of LLMs, the system can comprehend and analyze textual responses with a high degree of accuracy, ensuring reliable assessment results without bias. Furthermore, the system goes beyond mere grading by identifying weak areas in students' understanding. Through advanced analysis techniques, it pinpoints specific concepts or topics where students are struggling. Subsequently, tailored feedback is generated to guide students on areas requiring improvement, fostering a deeper understanding of the subject matter. To reinforce learning and address identified weaknesses, the system generates customized exercises and practice materials targeting the areas of concern. These exercises are designed to provide students with ample opportunities to practice and master challenging concepts, thereby facilitating continuous learning and skill development. Overall, the proposed automated self-assessment system not only simplifies the assessment process but also empowers students to take ownership of their learning journey. By providing personalized feedback and targeted exercises, it aims to enhance student engagement, comprehension, and academic success. In short, our proposed system will contribute for the enabling environment for students through improved assessments and feedback.

Route Optimization using Satellite Imagery

Group Members: Ali Awais Safdar | Muhammad Khizer Tariq | Syed Usman Ali Shah

Advisor: Momina Moetesum   Co-Advisor: Zuhair Zafar

The scope of work for this project includes development of a system that uses satellite imagery to generate an optimized route that allows traversing through each road, in each direction of travel of a specified network (via a shapefile) exactly once, without any repetitions. The objective of this study is to minimize the distance and time required to physically traverse the route identified in the shapefile.

Lance AI: AI-Powered Freelancer Platform

Group Members: Abdul Rehman | Muhammad Mubashir Zaman | Muhammad Wasam Khan

Advisor: Sohail Iqbal   Co-Advisor: Nabeel Safdar

The rapid expansion of freelance work has created a daunting landscape for freelancers to navigate, with an abundance of opportunities leading to inefficiencies in project discovery and client communication. To address these challenges, we present an innovative AI-powered platform designed to streamline the freelance workflow. Leveraging the capabilities of Artificial Intelligence (AI), our platform seamlessly integrates with popular freelance platforms, preferably through their API, to provide freelancers with tailored project recommendations based on their skills and preferences. Moreover, formal paperwork will be done by our software. Through web crawling and ranking algorithms, the system identifies and prioritizes suitable projects, generating comprehensive proposals for clients.   An integrated Chat bot facilitates communication, while sentiment analysis enhances understanding of client feedback. Additionally, our platform introduces a groundbreaking cross-platform application feature, automatically applying similar projects found across different platforms. One of the objectives of this FYP will be to provide a service that will become the essential need of any progressive freelancing platform. By automating key aspects of the freelance process, our platform empowers freelancers to focus on their craft and efficiently close deals, ultimately transforming the freelance experience.

AI-based home tutoring app for early year education

Group Members: Adnan Hassnain | Mohsin Khan | Muhammad Adeel

Advisor: Ayesha Kanwal   Co-Advisor: Sana Qadir

An AI-based home tutoring app for early year education can provide personalized and engaging learning experiences for young children, while also helping parents and teachers monitor their progress.

Interactive Wellness Monitoring System with KIOSK

Group Members: Muhammad Ahad Sajjad | Muhammad Uzair Khan

Advisor: Fahad Ahmed Satti   Co-Advisor: Muhammad Moazam Fraz

Wellness management through the use of automated and user-friendly interfaces, and based on neuro-symbolic AI is an active R&D area, where several prototypes, catering to the personalized needs of the developed world have been produced. In the context of the Pakistani market however, these solutions are extremely costly and lack the local context, which prevents their application and deployment in Pakistan. In order to fulfil this market gap, the Interactive Wellness Monitoring System (IWMS) is proposed, which utilizes Kiosk and mobile based interfaces, incorporating gamification elements, and based on data and expert driven knowledge in the context of Neuro-Symbolic AI application. This endeavor also contributes new insights to the existing knowledge pool by advancing the integration of wellness monitoring and gamification, and the application of these technologies in the Pakistani market, with its own socio-economic caveats.

NextGen E-Commerce

Group Members: Ali Hanzala | Habib Ullah Khan

Advisor: Syed Imran Ali   Co-Advisor: Maajid Maqbool

Simplifying Online Retail with AR for a Better Shopping Experience   The E-commerce Project aims to develop a cutting-edge parallax website and mobile application, integrating Augmented Reality (AR) technology for virtual try-ons. This comprehensive platform will feature a diverse array of product domains, including apparel, footwear, watches, hats, home decorations, and artistic pieces like paintings and calligraphy. The E-commerce Project represents a forward-thinking approach to online retail, blending advanced technology with a rich diversity of products and cultural influences. By leveraging AR for virtual try-ons, we aim to redefine customer engagement and provide an immersive shopping experience that bridges the gap between digital browsing and physical interaction.

P2PSkillX: Mobile Platform for Skill Exchange and Gamified Learning with AI- Powered Matching

Group Members: Ahmed Mustafa | Muhammad Taosiq

Advisor: Farzana Jabeen   Co-Advisor: Tahira Lashari

This project proposes a mobile skill-sharing platform that enables users to exchange skills through both time-based credits and currency. The platform incorporates gamified learning progress, allowing users to level up and earn badges. Users will also have the ability to showcase personal portfolios, verify skills through AI-generated multiple-choice questions (MCQs), and engage in AI-powered skill matching to optimize skill exchange. Additionally, the platform promotes inclusivity by enabling users to share a broad spectrum of skills, both professional and daily life skills. A social feed for skill-sharing stories further fosters a community of engagement and knowledge sharing. The project aims to address the limitations of existing platforms by providing a flexible, inclusive, and user-centered experience.

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05 Knowledge Group
Information Assurance and Security

VeriVote: Affordable End-to-End Verifiable Voting System for Developing Countries

Group Members: Aleena Ahmad | Qudsia Tariq

Advisor: Syed Taha Ali   Co-Advisor: Wajahat Hussain

As the demand for transparent election mechanisms grows, there is a critical need for systems that ensure the integrity and trustworthiness of voting processes. Existing end-to-end verifiable voting mechanisms often require significant financial and technological resources, limiting their use in developing countries. VeriVote addresses this challenge by developing a low-cost, verifiable voting machine tailored to the specific needs of developing nations. The system integrates QR code-based encryption for secure vote processing and tallying, using low-cost cameras and advanced computer vision techniques to accurately scan QR codes from any angle. By providing a reliable and transparent voting process, VeriVote seeks to enhance voter confidence and trust in the electoral system. This project showcases the practical application of affordable technology to improve election verifiability and transparency in resource-constrained environments, fostering greater democratic participation and trust.

Cloud Vulnerability Scanner

Group Members: Abdullah | Muhammad Ali

Advisor: Ayesha Kanwal   Co-Advisor: Sana Qadir

Cloud computing offers scalability and flexibility but also introduces new security challenges. Vulnerabilities within cloud environments can expose sensitive data and disrupt critical services. This final year project focuses on developing a Cloud Vulnerability Scanner to proactively identify and assess security weaknesses in cloud deployments. The scanner will leverage existing vulnerability databases and cloud APIs to scan cloud resources for known vulnerabilities. It will analyze configurations, identify misconfigurations, and detect potential security gaps. The project aims to achieve the various objectives.

Cerberus: A Blockchain-Based Accreditation and Degree Verification System

Group Members: Prithvi Raj | Shujaullah | Taha Ahmed

Advisor: Syed Taha Ali   Co-Advisor: Sana Qadir

This project involves implementing a blockchain-based accreditation and degree verification system using the Ethereum blockchain for secure and immutable record-keeping. The system will feature a mobile application that allows users to scan QR codes on physical degree certificates, enabling instant verification of credentials through smart contracts on the blockchain. This approach streamlines the verification process and enhances data privacy and integrity, providing a comprehensive and user-friendly solution to verify academic qualifications.

06 Knowledge Group
Information Management

UNISYNC: A Comprehensive University Management App

Group Members: Afaq Ahmad | Allah Rakha | Muhammad Danish Azeem

Advisor: Shah Khalid   Co-Advisor: Bilal Ali

UNISYNC is a robust and integrated application designed to streamline and enhance the student and administrative experience within a university setting. It consolidates various modules, each handling a different aspect of university management, into a single, cohesive platform. The app includes features for managing learning, content, projects, hostels, co-curricular activities, and administrative tasks, facilitating efficient and effective operations for educational institutions.

FindMyStay: Off-Campus Housing Solution

Group Members: Muhammad Faizan Qureshi | Tarteel Imran | Umama Zainab

Advisor: Maajid Maqbool   Co-Advisor: Muhammad Khuram Shahzad

This project aims to facilitate the search for student housing by using advanced technologies to simplify the process of finding off-campus accommodation. The resultant app will leverage user-friendly interfaces and robust databases to provide a comprehensive platform where students can browse verified listings, connect with landlords, and secure their ideal homes near their universities. By incorporating features like detailed filters, virtual tours, and real-time availability updates, the aim is to create a seamless and efficient experience for users. The goal is to empower students with the tools they need to make informed decisions about their housing, ensuring a comfortable and convenient off-campus living experience.

RAISC: Revolutionizing Mental Health through AI-Driven, Stigma-Free Integrated Care

Group Members: Abdullah Khan | Hammad Ahmed | Yusuf Haroon

Advisor: Bilal Ali   Co-Advisor: Shah Khalid

The web application is designed to integrate psychiatrists, psychologists, individuals with previous psychiatric treatment experiences, and patients currently seeking help into a unified platform. The goal is to create a supportive environment where patients can access treatment and resources without the fear of social stigma. This will be facilitated through expert-supervised chat rooms, providing a safe space for discussion and support.   We are also integrating a feature of providing chat rooms to users, which under the guidance of a specialist aims to provide a

haven for people seeking treatment. It will improve the treatment process by bringing people of the same mindset together.   The main feature of the application is the integration of artificial intelligence, specifically through the use of personalized chatbots. These AI-driven chatbots will assist psychiatrists by engaging with patients, asking pertinent questions, and collecting valuable information. This process will not only streamline the initial assessment but also enhance the overall treatment process by ensuring that psychiatrists have comprehensive data to inform their decisions. Patients will also be able to select their appointments so that they can have a meeting according to their own free time.   In summary, the web application aims to revolutionize the mental health landscape by combining professional expertise with innovative technology. By fostering a stigma-free environment and leveraging AI to support psychiatric care, we aspire to improve accessibility, efficiency, and outcomes in mental health treatment.

NUST Societal Management System

Group Members: Muhammad Abubakar | Muneeb Ahmad

Advisor: Muhammad Khuram Shahzad   Co-Advisor: Farzana Jabeen

The NUST Societal Management System is an integrated platform designed to enhance the management and engagement of university societies and events. The system allows users to register through their NUST email, view and participate in events, and interact with other NUST students and societies. The platform includes a responsive web application developed using Next.js and a mobile application developed using React Native. With features like event registration, profile management, and real-time notifications, the system aims to streamline the operations of university societies and improve student engagement. Users can register using their NUST email. Email verification for secure access. Profile creation with BIO, department, CMS ID, social media handles, and profile picture. Search functionality to find fellow students and societies. Badges are awarded based on portfolio performance and society involvement. Event Management: Event details include title, description, category, type, location, time, date, and ticket price. Host society details and other events by the same society. Easy registration for events with "going" and "interested" options. Event sharing via WhatsApp. Notification system for event reminders and proximity alerts. Mapping and Calendar Integration: Interactive map with Snapchat-like feature showing event locations. Swipeable cards linked to map markers with highlighted and color-changed markers. Clickable cards for detailed event information. Calendar with clickable dots for event dates to help users manage their schedules. Society Management: Society registration and automatic member enrollment based on CMS IDs. Society profiles with logos, descriptions, OB contact information, and event listings. Role assignment and performance tracking for society executives and members. Administrative Tools: Presidents can manage portfolios, events, recruitment, and membership. OBs can oversee portfolios, rank directors, and communicate with team members. Executives can manage society details and view team performance. Directors and HR can add/remove executives and rate their performance.   Given the diverse range of societies and events at NUST, there is a significant need for a centralized management system to reduce administrative overhead and enhance user experience. The system will incorporate Big Data Analytics (BDA) for personalized event recommendations and AI-driven features to optimize event scheduling and improve user interaction. This approach ensures a data-driven, efficient, and engaging platform for all stakeholders.

LabEase: Streamlined Issue Management and reporting system for Campus Labs

Group Members: Hakima | Sheeza Aslam

Advisor: Ayesha Kanwal   Co-Advisor: Farzana Jabeen

This project aims to streamline the reporting and resolution of issues encountered in campus laboratories. Users can log in using their ID and password to report various problems, such as PC malfunctions, furniture damage, electrical issues, or any other concerns. They simply specify the nature of the problem and the location of the lab. Once a problem is reported, lab engineers receive notifications and promptly acknowledge the issue. They provide repair estimates and, upon resolving the problem, notify the users. Additionally, "Lab Aid" generates monthly reports that detail the issues reported and their resolution times. This feature fosters proactive maintenance and ensures that potential problems are addressed before they escalate.

AI-Driven Gym POS System

Group Members: Abdullah Shamshad Cheema | Ghulam Hussain Khan Sherwani | Umer Tariq

Advisor: Shams Qazi   Co-Advisor: Muhammad Daud Abdullah Asif

Commerical project based on user requirements:
1.   Online Sign Up and Payment Gateway Process.
2.   Accounts and Bookings Management made easy through Mobile App
3.   App will be made on flutter(cross platform)
4.   Integration with 3rd party apps through OpenAPI
5.   Online Live Classes Streaming for Clients to workout from home
6.   Client Retention Predictions through AI
7.   Automate Client communication and Tasks Scheduling for the ease of Clients and Gym Staff aswell
8.   Generate QR codes and biometrics for quick, simple checkout and walkins
9.   Analyze financial performance for Gyms by using ML models. Co-Pilot in our app can assist users with various aspects of their gym experience, such as:

- Answering questions about gym policies, class schedules, and equipment usage
- Providing recommendations for supplementary activities, like nutrition, sleep, and stress management
- Giving reminders and offering tips for optimizing the gym environment, such as layout, capacity management, and equipment maintenance

07 Knowledge Group
Intelligent Systems

PakAgri- A one-stop solution for digital farming as a Service
Group Members: Syed Arsal Rahman | Syeda Eman Fatima

Advisor: Rafia Mumtaz   Co-Advisor: Muhammad Daud Abdullah Asif

Pakistan is an agricultural country but is still unable to produce surplus crops for its population due to a lack of technology-based solutions. The current farming system leverages manual approaches and is very far from digital farming solutions. In this context, we propose a one-stop solution for digital farming services based on Industry 4.0. The solution will cover multiple aspects of agriculture including disease detection and classification, multimodal data fusion from heterogeneous imaging platforms, classification of soil health based on nitrogen, phosphorus, and potassium, and computation of several vegetation indices to determine crop vigor and overall crop health, and integration of IoT and low altitude remote sensing data to develop crop health maps. By integrating advanced technologies such as machine learning, spectral analysis, and IoT, our platform will offer comprehensive services and actionable insights to optimize resource allocation, enhance productivity, and promote sustainable practices.

Zameen Zarien: Empowering Farmers with Real-Time Price Intelligence
Group Members: Muhammad Suhaib Aslam | Wahaj Ahmad Butt

Advisor: Shah Khalid   Co-Advisor: Bilal Ali

The agricultural sector in Pakistan faces significant challenges due to fluctuating market prices and limited access to timely information. The Zameen Zarien App addresses these issues by offering farmers a comprehensive tool for price monitoring and forecasting. The app aggregates daily price data from online retailers such as Foodpanda, Daraz, and Naheed.pk, providing real-time updates on current produce prices. Additionally, it offers access to historical price data and visualizes price trends over various time periods. By leveraging machine learning algorithms, the app predicts future prices based on historical data, giving farmers valuable insights into market trends. Customizable alerts notify farmers when prices become favorable for selling specific produce. The app's architecture includes data scraping, API integration, cloud-based storage, and deployment on Microsoft Azure, ensuring scalability and reliability. By empowering farmers with actionable data, Zameen Zarien aims to increase their profits, improve market efficiency, and enhance production planning, ultimately making a significant impact on the agricultural sector in Pakistan.

Intelligent Driver Safety System Using Real-Time Fatigue Detection
Group Members: Iqra Rasool | Mahnoor Ijaz

Advisor: Shah Khalid   Co-Advisor: Bilal Ali

Falling asleep while driving is a prevalent issue in Pakistan, leading to numerous accidents and endangering lives. To address this critical problem, we propose a real-time drowsiness detection system that monitors the driver's facial features to identify signs of fatigue. The system will utilize the YUNet model for face detection, followed by dlib and OpenCV for facial landmark detection. Key indicators such as the Eye Aspect Ratio (EAR) and Mouth Aspect Ratio (MAR) will be calculated to detect prolonged eye closure and yawning, respectively. The system will also monitor head tilting as an additional sign of drowsiness. Upon detecting these signs, the system will alert the driver to take a break, thereby enhancing road safety. This project focuses on creating an affordable solution for drivers in Pakistan, particularly for long-route truck drivers, and aims to mitigate the risk of accidents caused by driver drowsiness.

Fake News Detection System - Integrating Deep Learning with FastText and Explainable AI
Group Members: Muhammad Darab Ahsan | Muhammad Waleed

Advisor: Shah Khalid   Co-Advisor: Bilal Ali

The project aims to enhance the detection of fake news by leveraging advanced techniques in deep learning and explainable AI. Traditional methods often struggle to effectively discern between real and fake news due to the increasing sophistication of deceptive content. By employing a hybrid deep learning approach that combines FastText embeddings with neural network architectures, the system can capture both semantic and syntactic features of the text, improving classification accuracy.   Furthermore, the integration of explainable AI techniques ensures that the model's decisions are transparent and interpretable, providing users with insights into why a particular news article is classified as fake or real. This fosters trust in the system and allows users to critically evaluate the reliability of the predictions.

Secure Electronic Voting System with Blockchain
Group Members: Muhammad Azan Siddiq | Syed Hussain Hamad Naqvi | Umer Mehmood

Advisor: Shah Khalid   Co-Advisor: Madiha Khalid

This project involves developing an electronic voting system that utilizes blockchain technology to ensure transparency, security, and anonymity throughout the voting process. The system will enable voters to cast their votes securely, maintain an immutable record of votes on the blockchain, and provide mechanisms for verifying the integrity of the election results.

Kissan Connect: Cultivating Connections Between Farmers and Skilled Labor in Pakistan's Agriculture

Group Members: Ali Shahzad | Muhammad Shayaan Malik | Muhammad Sheharyar

Advisor: Momina Moetesum   Co-Advisor: Arham Muslim

The KISSAN CONNECT project aims to address the challenge of connecting farmers with qualified workers by developing a user-friendly mobile app tailored to the local language. The methodological approach involves implementing video profiles for farmers to showcase their skills and experience, along with keyword tagging for easy searchability by employers. Advanced filters will refine searches based on factors such as experience level and location. By prioritizing simplicity and accessibility, KISSAN CONNECT seeks to streamline the recruitment process in the agricultural sector, ensuring effective communication and seamless connections between farmers and job seekers.

Secure Electronic Voting System with Blockchain

Group Members: Abdullah Tahir | Muhammad Zaeem Khalid | Umer Mehmood

Advisor: Momina Moetesum   Co-Advisor: Nazia Perwaiz

This project aims to develop an advanced flood prediction system for high-risk areas in Pakistan, enabling early warning systems and proactive measures to mitigate the impact of flooding. By leveraging machine learning algorithms, geographic information systems (GIS), and historical weather data, this project will provide accurate long-term flood predictions, saving lives and reducing economic losses in vulnerable communities.

Biomass Calculation and carbon stock estimation using aerial imagery

Group Members: Ali Murad | Huzaifa Jawad

Advisor: Faisal Shafait   Co-Advisor: Adnan Ul-Hasan

Traditional methods of acquiring biomass is one of the biggest inconveniences of forest inventories since it consumes a huge amount of money and time spent in the field measurement. As an alternative approach, airborne LiDAR (Light Detection and Ranging), has become a powerful tool to characterize forest canopy with accuracy and effectiveness. The LiDAR sensor is deployed on an Unmanned Aerial Vehicles (UAVs) to generate 3D point cloud of the ground inventory. In this project, we will aim at using various imaging modalities to create point cloud data and correlate the Digital Elevation Model (DEM) / Digital Terrain Model (DTM) with the acquired Digital Surface Model (DSM) representing the tree canopies. The results will be utilized to calculate the tree parameters and average biomass for the sample plots using the species-specific allometric equation. The obtained results will be validated with the on-ground data.

Segmentation of Post-Fire Burned Regions in low-resolution satellite imagery

Group Members: Azka Basit

Advisor: Faisal Shafait   Co-Advisor: Adnan Ul-Hasan

By using AI, the project aims to accurately delineate burned regions in low-resolution satellite imagery. As a first step, the resolution of open-source satellite imagery will be enhanced using image super-resolution techniques. As a second step, burned image segmentation in the images will be performed using state-of-the-art techniques.

Application for Real Time detection of Rabid Dogs using Deep Learning Models

Group Members: Arslan Tariq | Maliha Manal

Advisor: Hashir Moheed Kiani   Co-Advisor: Muhammad Daud Abdullah Asif

Rabies is a prevalent issue in Asia, especially Pakistan. Although no official data is available, estimates show that 2000-5000 people die of rabies, in Pakistan alone. These statistics have created a hostile behavior of both the general public and the authorities towards stray dogs, resulting in fear among the masses, and ultimately leading towards elimination of such dogs. Our proposed solution would consist of a mobile application that would allow users to monitor the behavior of stray dogs using phone cameras, and identify potential cases of rabies. Our application would also allow people to report such incidents to the authorities to take action, and in case of dog bites inform the users about the nearest facility for medical attention.

Imaginari: A Unified Tool for Image and Video Generation and Editing

Group Members: Hafiz Ahmed Hassan Chohan | Mahnoor Zamir | Rameen Aamir

Advisor: Rafia Mumtaz   Co-Advisor: Mehdi Hussain

Imaginari aims to develop a system capable of generating high-quality images and videos from textual descriptions and seed images. Using the latest advancements in deep learning, particularly Generative Adversarial Networks (GANs) and Diffusion models, Imaginari will create visually coherent and contextually accurate multimedia content. This project will explore various architectures and methodologies, with applications in creative industries, digital content creation, and automated media generation. Additionally, Imaginari will empower users to edit the generated images and videos, providing flexibility and creative control over the multimedia content.

Dementia Detection Using Deep Learning Techniques with Multi-Modal Data Fusion

Group Members: Areeba Tanveer | Hunaina Ehsan | Zainab Kashif

Advisor: Shah Khalid   Co-Advisor: Bilal Ali

This project aims to develop an advanced deep learning model for early detection of dementia by integrating various types of datasets, including speech, neuroimaging, and other relevant data sources. The amalgamation of these diverse datasets will enhance the model's accuracy and robustness, providing a comprehensive approach to diagnosing dementia at its early stages.

From Data to Decisions: A Robust Framework for Predictive Smog Analysis

Group Members: Abduhu Khan | Hajra Mohsin | Varda Sarfraz Cheema

Advisor: Qaiser Riaz   Co-Advisor: Mehdi Hussain

This project tackles the critical issue of smog formation in Pakistan by developing a comprehensive and robust predictive analysis framework. Utilizing a wide array of historical data, including air quality indices, meteorological conditions, geographic information, and socio-economic factors, the project aims to identify and predict areas at heightened risk of smog formation.   The primary objectives of this initiative are threefold: firstly, to accurately forecast smog-prone regions through advanced data analytics and machine learning algorithms; secondly, to identify and analyze the key factors contributing to smog formation, such as industrial emissions, vehicular pollution, and climatic conditions; and thirdly, to provide actionable, evidence-based recommendations to stakeholders, policymakers, and the general public. By integrating diverse data sources, the project not only enhances the precision of smog predictions but also deepens the understanding of the underlying causes. This multi-faceted approach is designed to raise public awareness, support strategic decision-making, and inform policy interventions aimed at improving air quality.   The outcomes of this project are expected to be far-reaching, enabling more effective measures to combat smog and its detrimental health and environmental impacts. By fostering collaboration among government agencies, environmental organizations, and the scientific community, the project aspires to contribute significantly to the sustainable development and well-being of Pakistan's population.

Confidentiality-Focused Localized Language Model with RAG Integration for Office Automation

Group Members: Mariam Babar Khan | Muhammad Uneeb Bin Aftab

Advisor: Seemab Latif   Co-Advisor: Maajid Maqbool

Catering to the confidentiality concerns of organizations handling sensitive data, this project aims to develop a localized language model integrated into an office automation application. The model will provide context-specific responses tailored to the organization's needs, without requiring data to be uploaded to open-source models like GPT. By employing a RAG-based approach, the solution ensures proprietary information security while enhancing operational efficiency through customized AI interactions.

Adaptive Web Interaction: Leveraging Reinforcement Learning for Comprehensive Action Support

Group Members: Aniqa Tufail | Muhammad Hamza Aamir | Muhammad Sarwar Khan

Advisor: Faisal Shafait   Co-Advisor: Adnan Ul-Hasan

The rapid evolution and increasing complexity of B2B websites necessitate more intuitive and efficient methods for user interaction. Our project aims to revolutionize web navigation by expanding the range of supported actions in our AI-driven system. Currently, the system interprets and executes user commands involving clicking and typing. To enhance versatility and handle a broader spectrum of user interactions, we propose extending the system's capabilities to include hovering, dragging, scrolling, and multi-step workflows.   Moreover, we are exploring the application of reinforcement learning to further improve the system's performance. Reinforcement learning enables the development of models that can learn optimal strategies for executing tasks through continuous interaction and feedback. This method can lead to more robust and efficient web interaction capabilities, as the model adapts to new and complex tasks autonomously. By combining a wider variety of actions with advanced learning techniques, our project aspires to create a highly adaptable and powerful system for autonomous web navigation, significantly enhancing user accessibility and efficiency on complex websites.

Lesson Capture 360

Group Members: Abdullah Saim | Mehran | Onkar

Advisor: Aimal Rextin   Co-Advisor: Fahad Ahmed Satti

This project aims to build an Android app that runs on an interactive screen. It will comprehend the teacher voice and content on the screen such as whiteboard and teacher showing an image. Based on this data, it will generate a well formatted and quality lecture notes.   This project can also include a module to encode the notes to better understand the content of the teacher.   There can be many other additional features that can be added.

Cultivating Profits

Group Members: Abdullah Riaz | Hina Naeem | Mujtaba Shafqat

Advisor: Muhammad Moazam Fraz   Co-Advisor: Fahad Ahmed Satti

The agricultural sector faces a constant struggle to maximize yields, optimize resource use, and navigate market fluctuations. Traditional methods often rely on intuition and experience, leading to inefficiencies and missed opportunities. This project proposes an innovative platform, Cultivating Profits, that empowers farmers with data-driven insights to revolutionize farm management. The platform includes three main modules: Farm Management

System to keep track of resources, expenses, sales, profits, etc. Personalized and user tailored recommendations through Reinforcement Learning (RL), and a chatbot powered by a Large Language Model (LLM), fine-tuned on vast agriculture data of Pakistan. The platform aims to promote sustainable practices, improve financial literacy among farmers, and foster innovation within the agricultural sector.

Tracefy - Generating sketches of perpetrators for efficient identification

Group Members: Abdul Rafay Khan | Mahad Mohtashim | Mehar Ali Ahmed

Advisor: Rafia Mumtaz   Co-Advisor: Muhammad Daud Abdullah Asif

With the increasing crime rate in metropolitan cities identifying perpetrators is becoming more difficult. Traditional techniques like sketches of criminals have rendered the apprehension process slow and inefficient. These sketches not only take time but are entirely dependent on the untrustworthy perception of the details given by the victim. Therefore, it is high time that we incorporate technology into this process in order to expedite it quickly and accurately. Furthermore, mainstream image generation models like Dall-E are riddled with bias. This bias leads to wrongful convictions, especially of marginalized communities. Hence, a model is necessary to have as minimum bias as possible to make the imaging fair. Tracefy is a forensics model to create accurate police sketches based on user detail input. This will allow multiple generations of high-quality sketches for use in investigations, allowing for speedy apprehension.

Sign Language Production from Natural Language Input Prompts

Group Members: Rohail Zulfiqar | Usman | Zohair Shakeel

Advisor: Neelma Naz   Co-Advisor: Muhammad Jameel Nawaz Malik

This project aims to produce sign language sentences given the natural language sentences. The project will have three sub parts (1. Natural language Text to Gloss, 2. Gloss to Sign, 3. Sign Stitching).

Bridging UAV Precision and Satellite Scope for Advanced Large-scale Crop Phenology Estimation

Group Members: Faizyab Ali Shah | Manahil Ahmad | Muhammad Shayan Khan Niazi

Advisor: Muhammad Moazam Fraz   Co-Advisor: Zuhair Zafar

Phenology estimation is crucial for advancing breeding efforts and enhancing cultivation management. Effective solutions are needed to address the challenges of resource management, including optimizing water and fertilizer use and improving decision-making processes to maximize yield potential and profitability. While satellite imagery offers publicly available, year-round data with high temporal resolution, it suffers from coarse spatial resolution. Conversely, UAV imagery provides high accuracy but typically has lower temporal resolution and requires significant resources and expertise for field monitoring on regular intervals. This project aims to combine both UAV and satellite data to leverage the benefits of each. Additionally, to enhance accuracy, both spatial and temporal

information are incorporated into the model. Most existing research often uses simple computer vision models for phenology labeling which does not incorporate temporal information, or vegetation index curve-based methods which are not real-time. This project integrates features from a computer vision model into a sequence model resulting in more accurate real-time phenology classification.

Large-scale Early/In-Season Crop-Type Mapping Framework For Pakistan

Group Members: Muhammad Umer Khan | Shalina Riaz | Syed Hashir Ahmad Kazmi

Advisor: Muhammad Moazam Fraz   Co-Advisor: Zuhair Zafar

This project introduces an advanced framework for early and in-season crop-type mapping to improve crop yield estimation in Pakistan. The initiative addresses significant threats to food security posed by population growth and climate change, which demand timely and reliable crop data for yield prediction and agricultural planning. Traditional methods relying on field surveys are slow and subjective. Project Pineapple leverages quasi real-time satellite imagery and cutting-edge AI to provide accurate and efficient agricultural data. The framework includes a distributed data hub, user-friendly access, AI-powered analytics, and predictive insights to support decision-making. Key components feature data ingestion, a frontend interface, an AI engine, and a predictive analytics dashboard. This project aims to visualize crop maps, estimate yields, monitor sowing patterns, and assess weather impacts, addressing food security and broader environmental applications.

AI-Driven Call Center Issue Analysis System

Group Members: Haider Ali Kayani | Laiba Shafqat | Onkar

Advisor: Shah Khalid   Co-Advisor: Bilal Ali

The AI-Driven Call Center Issue Analysis System is designed to revolutionize the way companies handle repetitive calls. By converting call audio to text, storing the text in a structured database, and analyzing the data to identify key issues, this system provides valuable insights into the most common problems customers face. These insights enable companies to enhance their customer service and operational efficiency.   Uniqueness: Unlike many existing solutions that focus on English or widely spoken languages, our system is tailored to handle Urdu, addressing the unique linguistic challenges and nuances of the language.

AI-Driven Health Assistant for Diagnostic Insights, Prescription Interpretation, and Health Guidance

Group Members: Hassaan Tahir | Mohammad Irfa | Zartab Khalid Khan

Advisor: Bilal Ali   Co-Advisor: Shah Khalid

The application allows users to upload MRI or X-ray scans and skin images to receive preliminary diagnostic insights using machine learning models, particularly convolutional neural networks (CNNs). It aims to classify diseases such as skin conditions and bone fractures. Additionally, the app features handwriting recognition to interpret doctors' prescriptions, helping users understand the medication prescribed and suggesting alternative medicines along with their prices. Furthermore, an integrated AI chatbot, using natural language processing (NLP), provides users with information about diagnosed conditions, guidance on next steps, and general health advice in a conversational manner.

Smart Slum Mapping: Deep Learning Techniques for Effective Urban Planning

Group Members: Hamaz Hamza | Omer Farooq

Advisor: Muhammad Imran Malik   Co-Advisor: Muhammad Naseer Bajwa

More than 1 billion population of the world live in informal settlements and it is estimated that in the next 30 years the number will increase to 3 billion. This project aims at detecting informal settlements, also known as "slums", by utilizing deep learning techniques on remote sensing imagery. This FYP focuses on supervised approach to semantic segmentation of slums, especially of Pakistan, carry out change detection and provide insights to organizations and authorities allowing them to take intelligent decisions and make better policies.

Factory Copilot: An Automated Production Line System

Group Members: Jatindar Kumar Mamnani | Samama Farooq | Sohaib Ahsan

Advisor: Bilal Ali   Co-Advisor: Muhammad Imran Malik

Factory Copilot is an innovative solution that is based on artificial intelligence able to enhance productivity and increase the level of quality of Manual and Semi-Automated production lines. It utilizes computer vision to make real-time observations of the assembly tasks, and offers an immediate feedback to the operators via screens and projectors if a mistake is made. The system also allows collection of extensive cycle data to support process reviews and to improve cycle performance. Easily implemented and requiring no engineering skills or changes in the production processes, Factory Copilot augments current production processes to increase efficiency and quality across manufacturing lines.

Semi-Supervised Learning for Slum Segmentation using Remote Sensing & Deep Learning

Group Members: Muhammad Taha Mukhtar | Syed Musa Ali Kazmi

Advisor: Muhammad Imran Malik   Co-Advisor: Muhammad Naseer Bajwa

In Pakistan, a significant portion of the population lives in slums, with millions of people facing extreme poverty

and substandard living conditions. This project aims to address this critical issue by leveraging advanced remote sensing and segmentation techniques to analyze and monitor slums in major cities like Lahore, Islamabad, Karachi etc. Using state-of-the-art deep learning models, including semantic, instance, and other segmentation methods, the project will focus on detecting and mapping slum areas accurately. Furthermore, it will incorporate change detection to track the development or expansion of slums over time. To enhance the efficiency and accuracy of segmentation and change detection, the project will employ techniques like semi-supervised, self-supervised, weakly supervised, unsupervised learning and more. These methods will help in making the models more robust and generalizable, especially in scenarios with limited labeled data. An application will be developed as part of the project to provide insights and actionable information to relevant organizations, enabling better decision-making and resource allocation to address the needs of slum dwellers.

EEG Signal Interpretation and Visual Representation Using Deep Learning Models

Group Members: Abdullah Aleem | Hasib Aslam | Muhammad Talal Faiz

Advisor: Muhammad Imran Malik   Co-Advisor: Syed Imran Ali

Recently there has been active research on generating images from subject's EEG signals, captured while exposing them to visual stimuli. This project aims to enhance our contemporary understanding of the EEG (electroencephalogram) signals, generated from brain activity. The project will involve extensive research work with the aim to both enhance the understanding of EEG signals and image generation process, by combining the state of art deep learning techniques with models like the stable diffusion. The primary goal is to improve image generation accuracy and to extract key information from the EEG signals. The secondary goal is to generalize the models for different subjects - varying in brain activity and EEG signals.

Brainwave: Deciphering Consciousness through Advanced EEG Signal Analysis for Coma Diagnosis and Recovery Prediction

Group Members: Abdul Ahad Qureshi | Hamza Khurshid | Muhammad Talal Faiz

Advisor: Muhammad Imran Malik   Co-Advisor: Muhammad Moazam Fraz

In the realm of neuroscience, the classification and prediction of neurological states, particularly in coma patients, remain a significant challenge. This research proposes an innovative approach leveraging advanced EEG signal analysis techniques to differentiate between normal and abnormal brain activity, identify deep coma versus brain death, and predict the likelihood of recovery. By employing machine learning algorithms and sophisticated signal processing methods, we aim to develop a robust system capable of interpreting the complex patterns inherent in EEG data. Our methodology not only advances the understanding of consciousness but also offers a promising tool for clinicians, potentially revolutionizing the diagnosis and management of coma patients. Through this study, we aspire to bridge the gap between technology and medicine, paving the way for more accurate and timely interventions in critical care settings.

LifeLens: Object Identification for the Visually Impaired and Blind

Group Members: Muhammad Nawal Sultan

Advisor: Farzana Jabeen   Co-Advisor: Bilal Ali

The visually impaired and blind community faces significant challenges in navigating daily life independently. Identifying objects, reading text, and understanding their environment are crucial tasks that can be difficult without assistance. "LifeLens" aims to address these challenges by providing an intuitive, multimodal mobile application that utilizes cutting-edge machine learning and computer vision technologies to assist visually impaired and blind individuals in identifying objects and gaining information about their surroundings.

AI for Automated Lecture Note Generation

Group Members: Syed Hamza Ali Shah

Advisor: Muhammad Imran Malik   Co-Advisor: Syed Imran Ali

This AI-based lecture note generation app will leverage the power of open-source technologies to streamline the process of note-taking, making it a valuable tool for students. With an intuitive mobile interface and powerful transcription and summarization capabilities, the app will have the potential to become an essential resource in the modern educational environment. The primary objective of this project is to create a mobile app that automates the process of generating notes from a teacher's lecture, making it easier for students to focus on the lecture rather than note-taking. The app aims to provide: 1. Real-time transcription of the teacher's voice during lectures. 2. Automated note creation from transcribed text using an LLM. 3. A user-friendly interface for accessing notes on mobile devices.

Long-term Flood Prediction in Endangered Areas of Pakistan

Group Members: Abdullah Tahir | Muhammad Zaeem Khalid

Advisor: Momina Moetesum   Co-Advisor: Nazia Perwaiz

This project aims to develop an advanced flood prediction system for high-risk areas in Pakistan, enabling early warning systems and proactive measures to mitigate the impact of flooding. By leveraging machine learning algorithms, geographic information systems (GIS), and historical weather data, this project will provide accurate long-term flood predictions, saving lives and reducing economic losses in vulnerable communities.

08 Knowledge Group
Software Engineering

Style Hub: Bridging Pakistani Brands with Digital Consumers

Group Members: Haram Nasir | Huzaifa Liaqat | Muhammad Zain Jee

Advisor: Hashir Moheed Kiani   Co-Advisor: Maajid Maqbool

The objective of this project is to empower the end-consumer with a one-stop solution to all of their clothing and textile purchasing needs. The project revolves around creating a feature-rich multi-vendor storefront for small and medium-sized clothing brands. It's mainly intended for use by people who prefer shopping online for such articles rather than go through the hassle of visiting several physical retail stores, in order to get the articles they're interested in. This is a common problem in Pakistan's growing textile industry, which currently lacks a unified platform for such a use case. The project focuses on developing a comprehensive web application that can accurately fill the void left by the current E-commerce offerings of Pakistan's clothing and textile industry. The application will display a user-friendly interface, where the user can browse from many brands, and smaller bespoke artisans all in one accessible and easy-to-navigate platform. The application will be developed using NextJs, Typescript, and Supabase for the relational DBaaS.

Generating study notes from lecture transcriptions

Group Members: Haram Iqbal Nagra | Muhammad Shavaiz Butt

Advisor: Maajid Maqbool   Co-Advisor: Shah Khalid

Develop an innovative tool capable of generating study notes from lecture transcriptions using advanced voice recognition and natural language processing (NLP) technologies. The objective is to create a versatile app or web-based software that can handle both speech and video content shared via projectors, supporting multiple languages for both input and output. This functionality will make the tool highly valuable in diverse classroom settings.   The primary objectives for this project are: 1. Voice Recognition and NLP:Integration: Utilize state-of-the-art voice recognition and NLP technologies to accurately transcribe lectures and generate concise, comprehensive study notes. 2. Multi-Format Compatibility: Ensure the tool can process both audio and video content, making it adaptable to various teaching methods. 3. Multi-Language Support: Implement support for multiple languages to accommodate the diverse linguistic needs of global classrooms. 4. User-Friendly Interface: Design an intuitive interface for easy use by students and educators. 5. Scalability: Develop the tool with future scalability in mind, allowing for additional features and functionalities based on user feedback and emerging technologies.

Multilingual Visual Literacy Framework: Development and Implementation

Group Members: Abdullah | Hira Toheed Butt | Raja Muhammad Fawad Khan | Ruqia

Advisor: Maajid Maqbool   Co-Advisor: Farzana Jabeen

The project envisages developing a multilingual visual literacy framework, designed as a Package / SDK for Flutter in Dart. This framework will facilitate the creation of service provider applications targeted at uneducated or illiterate workers—such as plumbers, electricians, and mechanics—enabling them to offer their services effectively to customers.   The application will consist of two components: one for service providers to list their services and another for customers to hire these professionals. Key features include queue management, a dual review system for both service providers and customers, advanced booking options, advanced booking & scheduling, real time chatting, GPS Tracking and location-based recommendations. Additionally, the framework will integrate AI and ML analytics for enhanced service recommendations.

09 Knowledge Group
Digital Systems and Signal Processing

Apollo.ai

Group Members: Muhammad Abdullah | Muhammad Hassan Bin Adeel | Muhammad Rouhan Faisal

Advisor: Ahmad Salman   Co-Advisor: Salman Abdul Ghafoor

Apollo.ai is revolutionizing online education by using artificial intelligence to teach in a manner akin to a proficient educator, drawing from videos or texts. By employing advanced transformer models, Apollo.ai meticulously analyzes instructional content and generates dynamic, contextually relevant text, which is then converted into lifelike speech through cutting-edge text-to-speech technology. This synthesized speech is delivered by avatars designed to mimic real teachers' movements and expressions, thereby enhancing student engagement and comprehension. Although the inclusion of dynamically generated visual aids such as slides is not yet confirmed, efforts will be made to integrate them to further enrich the learning experience. With its user-friendly interface and adaptive capabilities, Apollo.ai aims to provide an effective and engaging teaching experience for the courses we are developing, offering a personalized and interactive learning journey that caters to diverse learner preferences and significantly enhances the overall educational experience.

FPGA based benchmarking of lightweight ciphers

Group Members: Jawad Kabir | Mohammad Ahmad Safvi | Muhammad Shameekh Naveed

Advisor: Madiha Khalid   Co-Advisor: Rafia Mumtaz

The project proposes the design and implementation of the FPGA based prototyping framework for the analysis of computational resource requirements of the lightweight ciphers. The framework will facilitate the evaluation of cipher's implementation cost in terms of LUTs only by embedding the protocol specific primitives in the ALU.   The student is expected to implement the framework using hardware description language i.e. Verilog. Furthermore, the designed architecture will be tailored for a specific lightweight ciphers. This will help to build an insight into feasibility of implementing other block ciphers belonging to these two categories for the cost analysis.

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