

Final Year Projects Catalogue 2023–24



Department of Computer Science
Institute of Business Administration, Karachi



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Project abstracts catalogue 2023-24

MedQR

Mirza Musab (23043), Maryam Bibi (22844), Yousuf Ali (22987), Ahmed Raza (22785), and Farida Khanam (22836)

ZAHHEERUDDIN ASIF AND ASIF BILGRAMI

In the healthcare landscape, managing medical records faces challenges of data security, accessibility, and patient-doctor interactions. Traditional methods yield data vulnerabilities, medication errors, and hinder communication. MedQR is a blockchain-powered mobile app that redefines healthcare record management, empowering patients to securely manage medical data, prescriptions, and medication schedules. It provides doctors with swift access through QR codes. Combining blockchain security, mobile app flexibility, and user-friendliness MedQR promises to revolutionize healthcare. It ensures data integrity, boosts patient engagement, and promotes treatment plan adherence. MedQR is poised to elevate patient care, streamline processes, and enhance healthcare's overall quality.

Technologies used

- Flutter (front end)
- Node JS (back end)
- Ethereum (block chain)
- Render (backend deployment)

Methodology

Blockchain Integration:

MedQR utilizes Ethereum blockchain to secure medical records, ensuring immutability and traceability. Each transaction (like adding or accessing records) is verified and recorded on the blockchain, offering a robust security framework.

Flutter Development: The mobile application is built using Flutter, facilitating a seamless and responsive user interface that is compatible across multiple mobile platforms. This choice enhances the user experience by providing a consistent look and feel. **Node.js Backend:** The server-side operations, including API management, user authentication, and data handling, are developed using Node.js, which supports asynchronous operations and efficient data processing.

QR Code Functionality:

The app integrates a dynamic QR code generator and scanner to facilitate easy sharing and retrieval of medical records. This allows healthcare providers to quickly access patient data by scanning a code.

Medication Alarm System: Utilizing device-native functionalities, MedQR implements medication reminders and alarm systems that prompt users according to their prescription schedules, improving adherence to treatment plans.

Specifications

User Authentication:

Secure login mechanisms ensure that only authorized users can access the application. The system uses cryptographic techniques to safeguard credentials and session data.

Medical Record Encryption:

All medical records stored and shared via the app are encrypted using advanced encryption standards, which are only decryptable by authorized parties, thereby protecting sensitive information.

Data Access and Sharing:

Patients can grant or revoke data access to healthcare providers. Access logs are maintained on the blockchain for transparency and auditability.

Cross-Platform Compatibility:

Developed with Flutter, MedQR supports both iOS and Android platforms, ensuring wide accessibility without compromising on performance or security.

Backend Deployment on Render:

The application's backend is deployed on Render, a cloud service that provides automated deployments, scaling, and management of applications, enhancing the reliability and scalability of backend services.

Industry Mentor: Asif Bilgrami (Systems Limited)

Internal demo approval status: Approved

RecruitRanks

Muhammad Usman Ahmed Tirmizi(22888), Muhammad Sumair (22995), Osama Abdul Hameed (22737), Khansa Junaid (23074), and Moatasim Bin Hisham (19701)

IMRAN KHAN AND FARHAN.A.SIDDIQUE

Our project introduces an innovative web application designed to modernize and optimize the recruitment process for job applicants, recruiters, and administrators. The platform simplifies job applications and resume screening, allowing recruiters to easily post job openings while candidates can effortlessly submit their resumes and apply for suitable positions. Advanced technologies such as machine learning and Natural Language Processing (NLP) are used to assess and match resumes to job requirements, maintaining confidential rankings to help recruiters identify the best candidates efficiently. Integration with multiple social media platforms enhances job visibility.

The application features three distinct user journeys: candidates, recruiters, and administrators. Recruiters benefit from a user-friendly interface that streamlines the candidate search process, allowing them to apply weights to different criteria and calculate scores based on their own priority (e.g CGPA, skill or experience etc) to rank candidates. A centralized user page enables easy resume downloads and job posting management.

Administrators have robust tools for overseeing the recruitment process, ensuring smooth operation and system maintenance. In summary, our project offers an intuitive, efficient solution for streamlining recruitment, benefiting job seekers, recruiters, and administrators alike through advanced technologies and a seamless user experience..

Technologies used

- NodeJS
- ReactJS,ExpressJS
- MongoDB
- Firebase
- spacy
- scikit-learn (sklearn)

Industry mentors'/Collaborator & company names:

Aashir Shahid (Folio3)

Methodolog

To understand the demands of recruiters, administrators, and job candidates, we do extensive requirements gathering through surveys, interviews, and market research. The design planning, where we painstakingly lay out user journeys and essential functionality for the web application, is informed by this foundational step. After establishing a clear vision, we choose the right technology, paying close attention to security, scalability, and compatibility. Development entails converting the design into functional code and doing thorough testing to guarantee the application's dependability and quality. The shift to live operation is signified by the deployment to a production environment, which will be followed by thorough documentation and training to enable administrators and users.

Specifications

While user profiles allow recruiters to effectively manage job posts and candidates to upload resumes, user authentication procedures guarantee account security. Comprehensive job advertisements include specifications, dates, and prerequisites; resume screening and candidate matching are made easier by machine learning and natural language processing algorithms. Recruiters can modify scoring algorithms to rank prospects. Enhanced job visibility is achieved by integration with social media sites, and administrators can monitor recruitment metrics with analytics tools. Encryption, access control, and frequent audits are examples of security measures; optimization guarantees scalability and performance for efficiently managing high user and job posting volumes.

Internal demo approval status: Approved

SmartGrader

Muhammad Hasan (22839), Jawaid Hanif (22822), Ahsan Ali Khan (22750),
Aurooba Parker (22758), Shehryar Hassan (22750), and Affan Moiz (22126)

SAJJAD HAIDER

This project presents an NLP-powered system for automated short question answer checking, addressing inefficiencies and subjectivity in manual grading. In educational environments, grading short answer questions is often time-consuming and subjective, leading to potential inconsistencies and biases. Traditional grading methods require significant manual effort from educators, detracting from the time available for other critical educational activities such as lesson planning and student interaction. The increasing number of students in classrooms and online learning platforms exacerbates these challenges, making efficient and fair grading methods more crucial than ever. The motivation behind this project is to leverage natural language processing (NLP) and machine learning techniques to develop an automated short question answer checker. By providing a reliable and efficient grading tool, the system aims to support educators in maintaining high standards of assessment while reducing their workload. The proposed solution involves an automated grading system that preprocesses raw text, analyzes the semantic relevance of answers, and generates grades based on predefined criteria, ultimately enhancing the overall quality and fairness of educational assessments and contributing to a more effective and equitable educational system, the system incorporates robust quiz management features, allowing educators to create, modify, and manage quizzes with ease. Educators can set quiz parameters, add or edit questions, and publish quizzes for student access. This comprehensive quiz management system ensures that all aspects of quiz creation and administration are streamlined, further reducing the administrative burden on educators and allowing for efficient and effective assessment of student knowledge. The integration of automated grading with quiz management provides a seamless, end-to-end solution for educational institutions, enhancing the overall learning experience.

Technologies used

- Flutter
- NodeJS
- React JS
- Express JS
- MongoDB
- Firebase
- spacy
- Gensim

- Rouge
- Word2Vec

Methodology

The methodology involves collecting a dataset of short question answers, preprocessing the data to clean and normalize it, and using NLP techniques for feature extraction. These features are used to train a machine learning model, which is evaluated against manually graded answers. A user-friendly mobile application is developed for inputting and retrieving grades

Specifications

Functional requirements include user authentication, quiz management, automated grading, and result display. Non-functional requirements focus on efficient concurrent request handling, secure data storage, a user-friendly interface, high availability, modular maintainability, scalability, and efficient resource usage.

Internal demo approval status: Approved

Time Attendance Access Control System (TAACS)

Nawfal Ahmed (23006), Ahmed Tariq (22780), Jahanzaib Khan (22797),
Rouhan Farooqui (22819), and Arsalan Danyal (23085)

TASBIHA FATIMA AND MUHAMMAD SAEED

Managing employee attendance and access control is a critical challenge for many organizations. Traditional methods, such as manual attendance tracking and physical access control, often result in inefficiencies, security vulnerabilities, and administrative burdens. Moreover, existing systems face significant problems, including lack of integration and interoperability, inadequate real-time monitoring and alerts, and user experience and adoption challenges.

Introducing TAACS, an innovative Time Attendance and Access Control System designed to revolutionize these processes. Our solution offers real-time visibility into employee attendance, access logs, and security alerts, integrating biometric data like facial recognition within a secure, user-friendly interface. By leveraging cutting-edge technologies, TAACS ensures robust data protection and streamlined operations. Real-time analytics and automated updates facilitate optimal HR resource management, significantly reducing administrative delays and enhancing security measures. TAACS effectively addresses the issues of integration and interoperability, provides real-time monitoring and alerts, and enhances user experience to ensure higher adoption rates. Implementing TAACS transforms organizational management of employee attendance and access control. Our system optimizes workflows, improves operational efficiency, and elevates security standards. Join us in this paradigm shift towards technological innovation in workplace management.

Technologies used

- Frontend: Svelte
- Backend: Node.js, ExpressJS
- Database: MongoDB
- APIs: RESTful APIs

Methodology

Agile development methodology with iterative cycles for continuous improvement and feedback integration.

Specifications

- Real-time biometric authentication
- Integrated HR functionalities

- Automated attendance tracking
- Customizable access control policies
- Parking & Room Booking Management

Internal demo approval status: Approved

Asset Inventory Management System (AIMS)

Khizer Hayat (23000), Fatimah Rashid (22733), Fatima Mustafa (17199), Ali Akbar (22950), and Hafsa Ali Khan (23058)

IMRAN KHAN AND MUHAMMAD ALI KHAN

In the current business environment, effective IT asset management is critical yet challenging, especially within the Governance, Risk, and Compliance (GRC) frameworks. Traditional methods, such as using Excel sheets, are prone to errors, inefficiencies, and security issues. Additionally, the high cost of existing asset management solutions restricts their accessibility. The Asset Inventory Management System (AIMS) addresses these issues by offering a user-friendly interface for streamlined asset data management, tracking, and categorization. AIMS enhances visibility and transparency through user roles and activity logs and ensures data security with robust permission management. This cost-effective solution empowers organizations to manage their assets more efficiently, maintain regulatory compliance, and enhance overall operational efficiency, fostering long-term success and sustainability.

Industry collaboration

This project idea was proposed by Mr. Muhammad Ali Khan, former employee at Engro Corporation as an IBA alumni.

Methodology

The development of the Asset Inventory Management System (AIMS) followed an agile methodology, featuring iterative progress in small and manageable increments through bi-weekly to three-weekly sprints. Additionally, our project involved stages of requirement gathering and analysis, design and prototyping, development of core functionalities, testing of code throughout development, and controlled deployment. Continuous feedback from the advisor and supervisors was incorporated throughout to ensure the system met evolving user needs, and post-development reviews were conducted to facilitate improvements and complete all necessary core functionalities to be a viable product.

Technologies used

The Asset Inventory Management System (AIMS) utilizes a cutting-edge technology stack for efficient and scalable IT asset management. This includes robust tools ensuring scalability and maintainability. Key components of this stack include:

- Backend: Node.js with the Express framework
- Frontend: Next.js with TypeScript
- Styling: Tailwind CSS

- Database: PostgreSQL
- Hosting: TBD
- Development Tools: Visual Studio Code (VSCoDe)

Additional Libraries and Tools:

- Redux
- Prisma
- JWT
- NextAuth
- React Hook Form
- Yup
- Classnames
- React Icons
- React Select
- Helmet
- bcrypt, bcryptjs
- Axios
- Morgan
- Cors
- Body-Parser
- Express Validator
- Multer

Specifications

The Asset Inventory Management System (AIMS) defines functionalities for user and asset management, including registration, roles, adding/editing assets, tracking status, check-in/out logs, and reporting. Non-functionally, AIMS prioritizes performance, scalability, robust security (encryption, authentication, audits), and a user-friendly interface.

Internal demo approval status: Approved

Learn n Track

Muhammad Ammar Aleem (22993), Imad Bilal (19729),
Unas Aamir Arain (22799), Uzair Ali Nusrat (21823), and Sadia Amin (23073)

IMRAN KHAN

The Learn n Track (LnT) project addresses a crucial need in education by offering a comprehensive solution to challenges faced by students in accessing affordable tutoring and career guidance. The platform recognizes that despite the vast array of online resources, students encounter difficulties in obtaining personalized guidance, flexible learning options, and comprehensive career counseling. This is evident in studies mentioned in our report, such as the one conducted in the Pakistani province of Punjab, which highlights the scarcity of adequate career counseling services for college-level students, leaving them reliant on friends, and family for career choices.

Moreover, insights from a study involving a digital career guidance platform emphasize the low awareness and usage of such platforms, despite their perceived usefulness. The study found that students often rely on traditional sources like friends, parents, and social media for career guidance, with limited exposure to digital career guidance apps. However, those who utilized these apps found them to be potentially powerful career guidance tools, easy to use, and effective in suggesting career path options. The “LnT” project integrates these insights to emphasize the importance of its approach, featuring both live video sessions with experienced career counselors and AI-driven career counseling that utilizes students’ career information, courses taken with us, to provide tailored career path suggestions. Additionally, the platform introduces a robust student-teacher matching system, wherein both students and teachers undergo detailed personality tests. This innovative model ensures a personalized learning experience, allowing multiple students to benefit from a single teacher’s expertise while fostering improved compatibility based on mentalities and temperaments. By incorporating these advanced features, “LnT” effectively addresses educational gaps, offering not only flexibility in learning but also comprehensive career counseling. In doing so, “LnT” empowers students to confidently navigate their academic and professional journeys, facilitating well-informed decisions about their future paths.

Technologies used

- MongoDB
- Express.js
- React.js
- Node.js
- Firebase
- Socket.io
- Agora.io

Methodology

Our live video sessions and chats utilize WebSockets, employing the Agora and Socket.io libraries respectively for seamless, real-time communication. Quizzes can be created manually or by uploading a PDF, are timed, and automatically display results upon submission. The search functionality incorporates personality compatibility, assessed through a test taken during signup, ensuring optimal student-teacher matches. Our AI career counselor uses a model trained on web-scraped job data and user information to provide career path recommendations, insights into students' current career trajectories, and links to relevant job opportunities. Additionally, our analysis AI employs a simple RAG methodology to analyze student data, including courses, assignments, quizzes, and grades, highlighting weak areas, displaying performance graphs, and recommending helpful resources such as websites and YouTube videos.

Specifications

The functional requirements are:

1. User Management
2. Tutor-Student Matching
3. Live Online Sessions and Chat
4. Integrated Quizzes
5. AI-Based Career Counseling
6. User Interface

And the Non-functional requirements are:

1. Performance
2. Security
3. Reliability
4. Usability
5. Maintainability
6. Support

Internal demo approval status: Approved

EternaTech–Predictive Maintenance

Yousuf Baig (23060), Abdul Samad (22959), Sulait (22958), Ismail (22843), and Razeen Virani (22985)

SAIYED SHAHAB

This project’s objective is to develop predictive maintenance software designed to calculate the remaining useful life (RUL) of machinery and facilitate preemptive maintenance. Utilizing advanced algorithms and machine learning techniques, Eternatech aims to enhance operational efficiency by predicting potential machine failures before they occur. By integrating sensors and data analytics, our software provides monitoring and due maintenance time, thereby reducing downtime and maintenance costs. This proactive approach not only extends the lifespan of machinery but also ensures uninterrupted operations, offering a significant competitive advantage to industries reliant on heavy machinery.

Industry collaboration

This project idea was proposed by SAIYED SHAHAB, current employee at PARCO as an IBA alumni.

Methodology

The methodology for EternaTech involves a systematic approach to predicting the remaining useful life (RUL) of engines using advanced data science techniques. Initially, comprehensive data collection is undertaken, encompassing time-series data from engine sensors, operational data, and environmental factors. This data is then meticulously preprocessed, involving cleaning, feature engineering, normalization, and the labeling of RUL. Various machine learning algorithms, such as linear regression, support vector machines, random forests, K-Nearest Neighbor are evaluated and trained using robust cross-validation techniques to identify the most accurate model. The selected model is rigorously validated against historical data and through sensitivity analysis to ensure reliability and generalizability. APIs facilitating integration with maintenance systems and real-time data processing. Interactive dashboards are developed for visualization, enabling stakeholders to make informed decisions. Continuous monitoring, user training, and a feedback loop ensure ongoing model refinement and system enhancement, thus optimizing engine maintenance strategies and operational efficiency.

Technologies used

EternaTech utilizes a cutting-edge technology stack for efficient and scalable data science model. This includes robust tools ensuring scalability and maintainability. Key components of this stack include:

- **Backend:** Python, Jupyter Notebook

- **Frontend:** Flask integrated with FastApi
- **Dashboard:** PowerBi

Internal demo approval status: Approved

Health app with AI-powered features for symptom checking, diagnosis, medication management, and more

Naseer Ahmed Aziz (22743), Syed Moosa Abbas (22953), Muhammad Saad Moon (22807), Agha Kazim Hussain (23025), and Muhammad Mubeen Anwar (23022)

MUKKARAM SIDDIQUE

Sehat Rasta is a cutting-edge health management app designed to enhance users' well-being through a range of features. Its AI-driven symptom analysis and diagnosis provide personalized health assessments and action recommendations. Moreover, the app securely stores medical records, lab results, and imaging reports. Emergency assistance features include one-tap emergency contact calling. Furthermore, mental health support is offered through mood tracking and access to licensed therapists. The app also includes a medication interaction checker for potential drug interactions. Sehat Rasta promotes an active lifestyle with fitness goals and calorie tracking. For expectant parents, it provides a pregnancy tracker and baby development information, making Sehat Rasta a comprehensive solution for health management.

Technologies used

- Node.js
- React Native
- Firebase
- Python
- GROQ
- RAG

Methodology

User-Centric Design: Conducting user surveys and usability testing to refine the user interface and enhance user experience.

Agile Development:

Implementing an agile development process to accommodate iterative improvements and stakeholder feedback.

Robust Security Measures:

Incorporating secure authentication, authorization, and data encryption techniques to protect user data and ensure privacy.

Scalability:

Designing a scalable architecture to handle a growing user base and increasing data volume.

Client-Server Architecture:

Utilizing React Native for client-side and Node.js for server-side development.

RESTful APIs:

For communication between the mobile app and server.

Specifications

- AI-powered Symptom Analysis
- Medication Management with Reminders
- Emergency Assistance with One-Tap Calling
- Health Records Centralization
- Mental Health Support
- Fitness Challenges and Tracking
- Pregnancy Tracker and Baby Development Information
- Secure Data Storage and Management

Internal demo approval status: Approved

Quantum Query Complexity

Syed Danial Haseeb (12429), Ashnah Khalid Khan (22889),
and Muhammad Rasib Nadeem (22976)

JIBRAN RASHID

Our paper explores new function promises for the Bernstein-Vazirani algorithm, aiming to identify configurations that yield orthogonal basis vectors, a key factor in the efficiency of quantum algorithms. We investigate Svetlichny-like functions and demonstrate that, for these functions, the bits of s can be recovered classically in n queries. Through simulation and analysis, we find that the complexity of the function terms inversely affects the basis size. Additionally, our project included the creation of tutorials on practical quantum programming topics.

Technologies used

- Python
- Qiskit
- NumPy
- matplotlib
- networkx
- Jupyter
- Rust

Specifications

- Extend the theoretical framework of the Bernstein-Vazirani algorithm to find new function promises / orthogonal bases to develop new quantum algorithms.
- Show that s from generalised promise functions can be recovered in 2^n queries, potentially showing exponential quantum advantage.
- Link to works like Recursive BV and the Hidden Linear Function Problem.
- Jupyter notebooks to supplement QWorld's Quantum Annealing course covering quantum semidefinite programming.
- Developed a custom programming language to aid in future linear algebra and quantum research

Internal demo approval status: Approved

AR based Virtual Try-On Platform

Huzaiifa Kashif (22945), Eman Kashif Khan (22969), Fatima Hasnain (23050),
and Sara Ebrahim (22967)

MUHAMMAD SAEED

We present an innovative augmented reality virtual try-on platform (ARTO) that fuses technology with the beauty industry. Our project envisions the development of a standalone AR platform solely dedicated to offering virtual try-ons for beauty products. E.g. a customer can use their smartphone or webcam to try a lipstick shade from Loreal's product catalogue on our site, which will be set on their face displayed through the screen. ARTO will revolutionize e-commerce by enabling users to virtually experience renowned beauty brands' products in real-time, while ensuring an authentic and personalized preview in the comfort of their homes. Our platform's mission is to create an interactive shopping experience, effectively driving sales and amplifying customer engagement.

Technologies used

Our program engine was written in python using OpenCV and MediaPipe face-mesh solutions which helped in facial landmark detection. Our web platform used NodeJS, ReactJS, ExpressJS, SocketIO and Flask. We used MongoDB for our database.

Specifications

ARTO provides seamless AR-based virtual try-on functionality with real-time face tracking, facial landmark detection and 3D product rendering. ARTO also allows integration with beauty product catalogs from various brands, increasing their customer engagement and boosting sales. ARTO is fully compatible with major web browsers ensuring a smooth experience for the user. The user can register with their own account and manage their profile by adding details and maintaining a list of favorite products.

Methodolog

We began with research on products similar to ours that were already available on the international market. This helped us set goals for what we want our product to be like. Next, we looked into AR solutions which would help us in facial landmark detection and successful product overlay. We implemented the Agile Development methodology throughout our project allowing us to make iterative changes and improvements to our product according to feedback.

External Supervisor

Mr. Faraz Ahmed from Folio3

Internal demo approval status: Approved

TutorSpace (a web application that connects students with qualified teachers)

Muhammad Saad Ali (22821), Sadia Shaikh (23016), Abdullah Anwer (21710),
Abdul Basit (22860), and Suffiyan Ul Hassan Farooqui (22106)

ZAHEERUDDIN ASIF

In an era where personalized education is paramount, the Tutor Space project aims to bridge the gap between students seeking tailored academic assistance and tutors offering their expertise. This Software Requirement Specification (SRS) document outlines the comprehensive requirements for Tutor Hub, a web-based platform designed to facilitate efficient and effective tutor-student connections. The platform addresses critical challenges such as matching students with the right tutors based on expertise, location, and availability, and provides a seamless experience for both parties through features like real-time communication, advanced filtering, and secure data management.

Technologies used

- Node
- React
- MongoDB

Methodolog

To achieve our objectives, we adopted the Model-View-Controller (MVC) architectural style, ensuring a clear separation of concerns and facilitating parallel development. The system's backend is developed using Node.js and Express.js, while the frontend leverages React for a responsive and dynamic user interface. MongoDB serves as the primary database, ensuring efficient data storage and retrieval. Key methodologies include:

1. User-Centric Design: Conducting user surveys and usability testing to refine the user interface and enhance user experience.
2. Agile Development: Implementing an agile development process to accommodate iterative improvements and stakeholder feedback.
3. Robust Security Measures: Incorporating secure authentication, authorization, and data encryption techniques to protect user data and ensure privacy.
4. Scalability: Designing a scalable architecture to handle a growing user base and increasing data volume.

Internal demo approval status: Approved

Visual Search

Amna Anjum (22818), Amna Salman (22782), and Ahsant Shahid (22974)

TARIQ MEHMOOD

The objective of this project is to develop a visual search engine software for the Pakistani retail brand Bagallery. The visual search engine will come as an alternative to the traditional text-based search and filtering of the product catalog. Using YOLOv8, and pytorch our model aims to cater to the retail market and give Bagallery a competitive edge. The ideal user journey requires the user to just select an image from their gallery or click one using their camera. Following this, the user will get a list of items and recommendations that are tailored to their needs.

External Company Name

Bagallery

Technologies used

1. Backend: Python Flask
2. Design: Figma / Lucid Charts
3. Frontend: React JS / Bootstrap
4. Database: MongoDB
5. Model Training: Ultralytics / Pytorch / CLIP (Imgbedding)

Methodolog

1. User cropped/ original image will be uploaded to the backend server.
2. The backend will run it through the different YOLO models each for different type of article.
3. The results will be collected, all the products will be searched and those with the same categories as the results will be collected.
4. The input images embedding will be generated and compared against the embeddings of all the products with the same categories and will be ranked using cosine similarity.
5. Results will be returned based on categories to ease the filtering of the products for the client.

Specification

1. Upload images from mobile gallery or take a picture from your camera.
2. Facilitates cropping of images before uploading.
3. Upon upload of the image, user will receive a list of categories with which the image identifies.
4. User can filter their search based on the result categories they have received.
5. Reselect a new section of the image and re-upload it for identification of other objects in the image if they did not previously crop it/missed it in the crop.

Internal demo approval status: Approved

Urdu Braille Recognition System

Muhammad Uzair Siddiqui (22769), Muhammad Ali Haider (23047), Muhammad Arham Bin Johar (23018), Muhammad Aarij (22874), and Ayesha Ashraf (22960)

MUHAMMAD SAEED AND TAHIR SYED

We propose developing a mobile application that captures Urdu Braille images and converts them into readable Urdu text, encompassing grade 1 and grade 2 Braille. The proposed app includes an auditory feature for text-to-speech conversion, a Braille locator for visually impaired users, and a Braille learning platform. It would also feature an innovative Braille language framework enabling the translation of Braille content into the desired language, with an initial focus on Urdu, and possible extensibility to other languages.

Technologies used

- Flutter
- Python
- SQFLite
- Deep Learning
- Image Processing

External Company Name

Pakistan Disable Foundation (PDF)

Methodology

Our Application provides the user with the ability to scan the Urdu braille images/pages. We use image processing using open-cv to extract braille and convert it to Urdu text accurately. The image processing involves edge detection, applying the adaptive threshold, shadow removal, finding contour, row/column-wise separation, and braille segment detection. The detected 2x3 matrix of Urdu braille is further processed to find the raised dots and then we predict what the scanned braille corresponds to using the mapping we have defined.

Specifications

User Interface Requirement includes Braille Grade and Language Selection.

Functional Requirement includes Translation Feature, Braille Locator Feature, and Braille Language Framework.

Non Functional Requirement includes quick processing of the image and scalability to multiple language.

Internal demo approval status: Approved

FYP Management Application

Syed Owais Ali (23053), Taha Mirza (22808), Hamza akbar (09364), Vishal Das (22752), and Hasin Zaman (23010)

MUHAMMAD SAEED

Capstoned aims to develop a system to address the inefficient management of Final Year Projects (FYPs) at the Institute of Business Administration (IBA). It is a comprehensive solution designed for students, supervisors, co-supervisors, and industry mentors. Key features include AI-powered project assessment, predictive success analysis, unique idea detection, real-time communication, document management, progress tracking and supervisor availability. Capstoned will stand out with its modern UI/UX and comprehensive documentation, making it a distinct and improved solution compared to existing options. It aims to empower students, enhance FYP management, and foster collaboration among stakeholders. It uses Next.js for front and backend along with FAISS Vector Store and FastEmbed for powerful AI functionality.

Technology used:

Technologies used

- Programming Languages: Python, JavaScript
- Web Development: Next.js, FastAPI, Tailwind, -
- Artificial Intelligence and Machine Learning: Langchain, FAISS, FastEmbed
- Database: MongoDB
- Real-time Communication: WebSockets
- Deployment: Render

Methodology

- Agile Software Development (Scrum)
- User-Centered Design (UCD)
- Iterative and Incremental Development
- Continuous Integration and Continuous Deployment (CI/CD)

Specifications

User-friendly and responsive web interface
AI-powered project assessment and predictive analysis
Real-time collaboration and communication
Secure document management and version control
Skill-based matchmaking for project group formation
Integration with industry mentors and experts

Internal demo approval status: Approved

Community driven job-sharing platform with AI vetted job opportunities

Hamza Faisal (22971), Muhammad Aun (23084), Muhammad Hassan Nami (22735), Younas Mahmood (22854), and Umar Khalid (22979)

ABEERA TARIQ

“Chips” is a mobile application designed exclusively for the IBA community to streamline job and internship applications. It addresses the challenge of tracking deadlines and relevant opportunities by providing personalized job postings (“chips”), deadline alerts, and AI-vetted content for authenticity and relevance. The app allows users to add jobs through text-based description, images, and OCR, with AI ensuring appropriate content. Features include customizable notifications, user profiles, and robust security measures. Our structured development plan covers research, development, testing, and deployment, aiming to create an efficient, user-friendly platform. By leveraging the IBA network, Chips will enhance job market success for students and alumni, reinforcing IBA’s reputation as a corporate powerhouse.

Technologies used

- Flutter
- Firebase
- Python
- Flask
- PowerBI

Methodology

- Agile Framework (Two-Week Sprints, Weekly Meetings with Supervisor, Feedback and Improvement Cycles)
- User Centric Design (Intuitive and Easy Navigation, Customizable User Profiles)
- Continuous Integration/Continuous Deployment (CI/CD)
- Robust Security Measures
- Scalability

Specifications

- Clean and User Friendly Experience
- AI-Vetted Content
- Email and Push Notifications reminder
- Sharing of Job Posts using Deep Linking
- Secure Authentication using OTP
- Continuous Monitoring and Optimization
- Exclusivity for IBA Students and Alumni

Internal demo approval status: Approved

Elev8.ai–Financial Advisory System

Syed Ali Mashoud (23068), Hassan Yahya (22965), Amanullah Faisal (22944),
and Ibrahim Abdul Rehman (22748)

BEHRAJ KHAN AND MR. RAHEEL SIDDIQUI (SYSTEMS LTD.)

Elev8.ai is a financial advisory system that will help/advise retail investors new in the investment field or not currently engaged with a financial advisor. Our tool will be Leveraging LLM for and Machine Learning to generate simple yet meaningful investing advice and report cards for public listed securities. Our target is to facilitate the retail investor’s long-term and short-term investing activities by providing him with a report based on comprehensive analysis and intelligent tools.

Technologies used

- MongoDB
- ExpressJS
- ReactJs
- NodeJs
- FastAPI

Industry Mentor: Raheel Siddiqui, VP Product Sales, Systems Limited

Internal demo approval status: Approved

Smart Parking System

Muhammad Adil Rizwan (22977), Talha Ahmed (22846),
and Hasan Shahab (22747)

SHAHID HUSSAIN

Unmanaged parking spaces contribute to traffic congestion, decreased productivity, and safety hazards, especially in busy environments like offices, schools, and malls. ParkSense, our innovative and smart parking system solution, addresses these issues by harnessing computer vision and QR codes. The system includes a mobile app for real-time parking space location and payments, and a web app for efficient lot management and analysis.

Inspired by challenges observed at IBA's parking facilities, ParkSense aims to provide a scalable and cost-effective solution for parking. By integrating computer vision, QR codes, and data analytics, it streamlines parking operations and bypasses traditional methods and increases operational efficiency. Our project employs technologies such as Azure SQL Database, Firebase, React, React Native, Node.js, Express.js, Python, and OpenCV. By addressing immediate parking inefficiencies and fostering long-term socio-economic benefits, ParkSense promotes smoother mobility and productivity.

Technologies used

- Azure SQL Database
- Firebase
- React
- React Native
- Node.js
- Express
- Python
- OpenCV

Specifications

- Real-time parking updates
- Cost-effective implementation
- Seamless user experience (UX)
- Hassle-free payment processing
- Robust data analytics

- Platform compatibility with iOS and Android
- QR code integration for authentication and payments
- Strong security and privacy measures
- Scalability and performance optimization
- Maintenance and support protocols

Internal demo approval status: Approved

AutoFloor.ai–Floor Plan Generator

Saad Riazzudin (22803), Danish Badar Qureshi (22890), Shaz Shoaib (21554),
and Hashir Muzzafar (22816)

TAHIR SYED

Our project specializes in generating Floor Plan Blueprints for residential buildings, using textual inputs via an input wizard. The application is web based and uses Transformers (Stable Diffusion) to interpret text and generate relevant floor plans. The motivation comes from the prevalent usage and popularity of LLMs and Transformer models in computer science research and the need to implement and experiment with them to solve real-life problems. There is prevalent literature on generating text from text and images from text, so to be novel in our approach, we decided to work on a unique application. Our focus was to stay in the domain of architecture, which would give way to future implications in other domains where structure and planning is important. Our idea and application would pave the way and give access to learn and visualize people’s ideas of their homes without the need of expertise in architecture and systems like AutoCAD.

Technologies used

Our project utilizes Python, Google Colab, Flask, Stable Diffusion, and Hugging Face. We used Vertex AI to make Stable Diffusion iteratively adds and removes noise to transform textual descriptions into detailed images, refining them step by step based on the text prompt until a clear, accurate floor plan is produced. The final output is a color-coded floor plan tailored to user inputs via the web platform, with different colors representing various rooms, such as yellow for living spaces, blue for bedrooms, and pink for bathrooms.

Methodology

We began with a literature review, exploring various AI techniques for generating floor plans from textual inputs. We rejected the use of CLIP-VLM and GAN models due to unsatisfactory results for our specific needs. By leveraging Transformers, Stable Diffusion, and Vertex AI, we designed a system that generates accurate, user-tailored floor plans, allowing users to visualize home ideas without needing architectural expertise or tools like AutoCAD.

Specifications

Our web-based application processes text inputs to produce detailed and accurate floor plans. The system uses Stable Diffusion to iteratively refine noisy images into clear floor plans, with each step guided by the textual prompt. The final floor plans are color-coded, making it easy to distinguish between different types of rooms, such as living spaces, bedrooms, and bathrooms.

Internal demo approval status: Approved

Refund Frauds and Customer Health Monitoring

Abdur Rehman Abbasi (22043), Maryam Tauqeer (22862), Minal Sarwar (22756), Sameer Alam (22739), and Ramsha Munawar (22738)

SAMI UL AHBAB, MUHAMMAD SAEED, SYED NOUMAN HASANY,
AND MOHAMMAD HASSAN

This project seeks to strengthen Foodpanda's customer health monitoring and fraud detection efforts, specifically concerning refund claims. Leveraging an unlabelled dataset comprising comprehensive customer profiles, including order history and personal information, alongside customer-submitted images for refunds, the primary objective is to categorize orders into three distinct categories: fraudulent, suspicious, and genuine. The project employs a multifaceted approach, applying image analysis to identify potentially counterfeit images and using machine learning models to analyze transaction history and user behavior to check for fraudulent claims. The aim is to provide Foodpanda with an enhanced ability to distinguish legitimate refund requests from those that require further scrutiny or may involve fraudulent activity. By developing these measures, we aim to help Foodpanda mitigate financial losses caused by fraudulent refund claims and streamline its time-consuming refund determination processes, ensuring a more efficient and cost-effective system.

Methodology

- Agile Software Development (Scrum)
- User-Centered Design (UCD)
- Iterative and Incremental Development

Specifications

- User-friendly and responsive web interface
- AI-powered real time customer flagging
- AI-powered real time image similarity calculation

Technologies used

- MySQL (Database)
- Python Flask (back end)
- Python - Scikitlearn, torchvision, DeepImageSearch, Vision Transformer
- React (front end)

Industry Mentor: Mohammad Hassan (Foodpanda)

Internal demo approval status: Approved

AI Gym Instructor

22790, 22970, 23005, 22812, 22787

MUKARRAM SIDDIQUI, TAHIR SYED, AND BAHAWAL BALOCH

Fitness Visionnaire.ai is a mobile application powered by efficient computer vision techniques that revolutionize fitness with real-time form feedback to minimize injury and maximize results. The core pose detection model relies on a Convolutional Neural Network architecture, in conjunction with a pre-trained model MoveNet Lightning. The model is trained on a massive dataset of 17,834 labeled data features. It analyzes exercises in real-time using video, pinpointing key body joints for accurate form checks. To replicate a real-life experience, it provides real-time visual cues and instructions, guiding the user towards a perfect form. Furthermore, the application tracks users' progress with a user profile system, storing workout history for personalized training. This comprehensive approach, with potential for fitness professional collaboration, paves the way for the future of effective and personalized workouts.

Technologies used

- Tensorflow
- Flutter
- Firebase
- Flask

Methodology

The methodology for Fitness Visionnaire.ai begins with extensive data collection and preprocessing, leveraging a dataset of 17,834 labeled features. Data augmentation techniques enhance dataset variability, ensuring robust model performance. Using the pre-trained MoveNet Lightning model as a base, the approach involves fine-tuning this model through transfer learning, focusing on accurate detection of key body joints in various exercises. The model employs a Convolutional Neural Network (CNN) architecture to process video frames in real-time, providing precise pose estimation. Video input from the mobile device's camera is analyzed frame-by-frame, allowing the system to offer immediate feedback on form accuracy. The user interface is designed to overlay visual cues on the video feed, complemented by real-time audio instructions to guide users towards optimal exercise form. Additionally, a user profile system tracks workout history and progress, enabling personalized training recommendations and ongoing improvement.

Specifications

Fitness Visionnaire.ai is designed to be compatible with modern smartphones, utilizing their camera capabilities for real-time video analysis with a minimum resolution of 720p. The application supports both iOS and Android platforms and relies on TensorFlow Lite and OpenCV for on-device machine learning and video processing. The core model, MoveNet Lightning, operates within a CNN framework, processing video frames of at least 256x256 pixels and outputting key joint coordinates. Performance metrics prioritize high accuracy and minimal latency, targeting under 100ms per frame for real-time feedback. The user interface emphasizes ease of use with clear visual and audio cues for form correction. Security measures include data encryption and explicit user consent for camera and storage access, ensuring privacy and protection of user data.

Industry Mentor: Bahawal Baloch (Folio3)

Internal demo approval status: Approved

Indoor Navigation for Indus Hospital

Zahrah Abidi (23054), Laiba Khan (19137), Zainab Javed (23056),
and Eeshah Abrar (22980)

ABEERA TARIQ AND RAYYAN TAQDEES

Our Augmented Reality (AR) Indoor Navigation app is tailored for Indus Hospital's new building to assist visitors in navigating its complex layout. Our app allows the hospital to map their locations using Azure Spatial Anchors and AR Core. Leveraging Simultaneous Localization and Mapping (SLAM) technology, the app provides real-time, visual path guidance to selected destinations. The user can select a destination, and with the implementation of the A^* algorithm in the backend, they receive the optimal path to their location. Additionally, the app allows users to add new locations, enhancing its adaptability and ensuring up-to-date navigation. This innovative solution aims to improve user experience and efficiency in finding desired destinations within the hospital.

Technologies used

- ARCore
- Azure
- Firebase
- Java

Methodology

The ARION project follows a structured methodology based on the Software Development Life Cycle (SDLC) and Agile Scrum practices to ensure a robust and user-centric indoor navigation solution. The process begins with detailed requirements analysis through stakeholder interviews, followed by system design using UML diagrams to visualize system components and interactions. Development is conducted in iterative sprints using Android Studio and ARCore SDK, with new features integrated every two weeks. Rigorous testing, including unit, integration, and user acceptance testing, is performed continuously to ensure functionality and performance.

Specification

The ARION project specification encompasses detailed functional and non-functional requirements, system architecture, and design considerations essential for developing a robust AR-based indoor navigation solution. Functionally, it includes secure user account management, indoor mapping, AR path guidance, and navigation instructions. Users can select destinations, search for locations, and reset or end navigation. Non-functional requirements ensure performance with accurate positioning within ± 3 to 5 meters, compatibility with Android devices, user-friendly

design, and secure data handling. The system architecture follows a client-server model, utilizing cloud-based data storage, with pathfinding algorithms for efficient route calculation. These specifications aim to deliver a comprehensive, user-centric indoor navigation solution, enhancing navigation efficiency and user experience in complex indoor environments.

Industry Mentor: Ahmed (Indus Hospital)

Internal demo approval status: Approved

SSRS report generation tool (HBL)

Abdul Ahad Imtiaz (22751), Muhammad Arham (22833), Naeema Gohar (23009), Saba Yousuf (23034), and Umme Habiba Abdul Latif (22988)

IMRAN KHAN, ZIA, AND ASMA JAMIL

In financial services, effective data reporting is essential. HBL's traditional methods involved emailing daily transaction reports manually. We created a web portal for HBL that generates reports automatically, enabling the MIS team to independently build and edit transaction reports. The MIS team may configure reports, choose data fields, and automatically collect transaction data with this SSRS replica tool. Reports are now sent to customers via email in CSV, Excel, or PDF formats, with big files compressed before transmission. Customers can also access their allocated reports through a web portal. This solution guarantees the timely delivery of customized reports, lowers reliance on IT, and improves operational efficiency.

Technologies used

- Node.js and Express.js for Backend
- MongoDB for web portal
- SQL Server for reporting
- React.js for frontend

Methodology

Requirement Analysis:

- Gathered information by holding discussions with experts in banking and users of related reporting systems.
- Analyzed and recorded user requirements to establish the goals and scope of the project.

Design:

- Using Figma, we created wireframes and mockups with an emphasis on the web portal's user interface.
- Conducted iterative reviews to improve the design with our industry advisors.

Development:

- Created the development environment and started working on the backend with Node.js.
- Establish the database and create reports using SQL server, making sure that data is handled effectively.

- Implemented the reporting tool, giving the MIS team the ability to choose data fields, schedule automated report generation, and configure reports.
- Emailing reports in CSV, Excel, or PDF formats is supported, and big CSV files can benefit from file compression.

Testing

- To guarantee functionality and dependability, unit, system, and integration testing were carried out.
- Continuous feedback was taken from our industry advisors and Dr. Imran Khan and a fully functional web portal was ready after much feedback.

Specifications

The web-based automatic report generating tool for HBL simplifies the production and distribution of personalized transaction reports. The MIS team may set up to 40 data fields per report and maintain client profiles thanks to it. Based on the customer ID, the system retrieves transaction data and generates reports in CSV, Excel, and PDF formats. Large CSV files are compressed before being sent via email. The creation and delivery of reports can be scheduled by users. The user-friendly online interface, created with Figma and improved with input from the industry, enables clients to view reports on their own. By integrating with HBL's systems, it ensures safe data processing through common encryption and authentication techniques. Comprehensive testing guarantees dependability and functionality. The tool's scalable architecture facilitates future expansion, while its design improves accessibility. Ensuring optimal performance and security requires regular maintenance, expert support, and continuous monitoring.

Internal demo approval status: Approved

Skills Targeted Assessment and Review

Maaz Shamim (22792), Muhammad Maaz Arsalan Batla (22794), Muhammad Abdur Rafae (22828), Saifullah Khan (22877), and Hasaan Ahmed Saeed (22955)

JAWWAD AHMED FARID

Skill Targeted Assessment and Review (STAR) is a cutting-edge project focused on transforming the landscape of educational assessments through its flagship product, Arete. Arete is a transformative assessment platform designed specifically for educational institutions. It empowers educators to personalize the learning experience and unlock the potential of every student. Arete is ideal for educators who want to move beyond one-size-fits-all assessments, make data-driven decisions to improve student outcomes, personalize learning for every student, and save time and resources while achieving better results.

Technologies used

- Frontend: React, Tailwind
- Backend: NodeJS, Express
- Microservices & Containerization: Kubernetes, Docker
- Monitoring Algorithms: TensorFlow
- Database Management: MongoDB
- Deployment: Microsoft Azure

Methodology

The development of Arete adhered to Agile principles, focusing on flexibility, collaboration, and customer-centricity. Detailed user stories for different personas (teachers, students, administrators) guided feature prioritization and sprint planning. Organized into two-week sprints, the development process involved regular prototyping, feedback sessions, and continuous testing to ensure stability and relevance. Retrospectives after each sprint promoted continuous learning and improvement, ensuring the platform evolved based on user needs and feedback.

Specification

- User Management: Secure authentication, authorization, and profile management for students, educators, and administrators.
- Assessment Management: Tools for creating, tagging, scheduling, and delivering quizzes and exams tailored to specific skill sets and difficulty levels.
- Analytics and Reporting: Comprehensive dashboards and reports for deep insights into student performance and progress.

- Behavior Monitoring: Features to track user interactions, ensuring academic integrity during assessments.
- Adaptive Testing: Dynamic adjustment of question difficulty based on individual student performance.

Internal demo approval status: Approved

Home Health Module (HHC) For IHHN

Zaid bin Haris (24351), Atta Ali (22857), Saim saudagar (22791),
and Nimra Nasrullah (23077)

IMRAN RAUF

Our mobile app is designed exclusively for Indus Hospital in Karachi to address the overwhelming patient load and accessibility challenges. Currently, the hospital manages around 500,000 patients monthly without a dedicated mobile solution, placing immense pressure on emergency services and making frequent visits impractical for many patients. The app will cater to hospital administrators, healthcare providers, and patients, ensuring secure data handling and personalized healthcare experiences. Nurses can log in, view patient medical records, and visit patients' homes to provide services. The head nurse will assign patients to nurses and manage appointments. The app will integrate seamlessly with the hospital's existing Hospital Management System (HMS), allowing medical professionals to access and act upon patient information efficiently. By alleviating the workload on emergency services and enhancing healthcare accessibility, the application aims to improve operational efficiency, patient outcomes, and the overall quality of healthcare delivery at Indus Hospital.

Technologies used

- Flutter
- Node
- SQL

Methodolgy

The app will cater to hospital administrators, healthcare providers, and patients, ensuring secure data handling and personalized healthcare experiences. Nurses can log in, view patient medical records, and visit patients' homes to provide services. The head nurse will assign patients to nurses and manage appointments. The app will integrate seamlessly with the hospital's existing Hospital Management System (HMS), allowing medical professionals to access and act upon patient information efficiently

Industry Mentor: Indus Hospital and Health Network

Internal demo approval status: Approved

A No-Code platform to build customized chatbots/AI agents for personal use/business

Zohaib Azam (22732), Shariq Anwar (22736), Umme Labib Asif (21749) Ibrahim Shaikh (22892), and Hussain Murtaza (22991)

TAHIR SYED AND NABEEL MOOLJI

NoCodeBot.ai is a platform designed for building personalized AI chatbots without the need for coding. Emphasizing user control, customization, and detailed documentation, it ensures data privacy and provides industry-specific templates and multi-channel deployment. Utilizing technologies like Large Language Models (GPT and Mistral) and vector databases, the platform caters to various business needs through user-friendly interfaces.

Overview

Built on a microservice architecture with Nest JS backend, FastAPI for ML Service and AWS Suite used for authentication and deployment, and a Next.js frontend, our SAAS platform offers high scalability and flexibility. A key feature of NoCode - Bot.ai is the seamless integration of chatbots into any website and the ability to generate JSONL data from diverse sources such as PDFs, URLs, and documents. This enables businesses to efficiently use existing data and enhance their AI capabilities without requiring extensive technical knowledge.

Technologies used

NoCodeBot.ai uses NestJS for the backend, FastAPI for ML services, and Next.js for the frontend. It integrates GPT and Mistral models, vector databases, and AWS services (Cognito, S3, ECR, ECS) for secure deployment and data handling. It also generates JSONL data from various sources, as mentioned above.

Methodology

The platform employs a microservice architecture for scalability, with a user-centric design for easy customization. It provides comprehensive documentation, industry-specific templates, and multi-channel deployment for seamless chatbot integration.

Specification

NestJS and FastAPI power the backend and ML services, while Next.js ensures a responsive frontend. GPT, Mistral, and vector databases enable advanced AI functions. AWS services support secure, scalable infrastructure, and the platform efficiently processes data into JSONL format.

Internal demo approval status: Approved

ML-Driven Security Enhancements for the Purdue Model: Detecting Network Threats in ICS

Musab bin Saad Zuberi (22731), Safwan Khan (23029), Zarish Khan (22994),
and Saad Afzal (22876)

FAISAL IRADAT

The security of Industrial Control Systems (ICS) is paramount, particularly in the context of increasing cyber threats targeting critical infrastructure. This research explores the implementation of a machine learning-based security layer within the Purdue Model architecture, focusing on Level 1 to Level 3, and the Industrial Demilitarized Zone (DMZ). By leveraging advanced machine learning techniques, we aim to detect and mitigate network scanning, live host enumeration, and other network attacks characteristic of the discovery phase outlined in the MITRE ATT&CK framework. Our approach involves the development of an adaptive layer of a network-based intrusion detection capable of identifying potential threats in real-time, thereby enhancing the overall resilience of ICS environments. The results demonstrate significant improvements in the early detection of malicious activities, contributing to the fortified defense of industrial networks.

Technologies used

To emulate a real-time Industrial Control System (ICS), we utilized a custom configuration of the GRFICSv2 with an Industrial Demilitarized Zone (DMZ) using a Pfsense firewall. This setup included a custom portal for monitoring IP camera feeds within the DMZ and a monitoring and control pane for IoT brokers. For adversary emulation, we employed a Kali virtual machine, utilizing tools such as Nmap for network scanning (with equivalent Python scripts for real-life use cases), ARP spoof for ARP spoofing, and the Metasploit Modbus module for Modbus spoofing. For packet classification, we implemented four basic machine learning algorithms: Support Vector Machine (SVM), Random Forest, K-Nearest Neighbors (KNN), and XGBoost.

Methodology

We emulated an Industrial Control System (ICS) environment configured according to the Purdue Model for ICS security, incorporating monitoring and control panels for IP cameras and IoT brokers. An industrial Demilitarized Zone (DMZ) was deployed using an open-source firewall, and the network was segmented using VLANs. Six different attack scenarios, including network scanning and spoofing, were emulated to cover the network discovery phase as outlined in the MITRE ATT&CK Framework. Wireshark was used to record network data, and Python scripts were employed to extract packet features and flags. The network packets were divided into uniflows and biflows, and machine learning (ML) was used to perform binary

classification on benign instances, unflows, and biflows to accurately classify malicious packets.

Specification

The ML layer is designed keeping in mind its integration with the Purdue model for ICS security and implementation as a part of Network IDPS. Since Industrial Control systems are prone to malfunction even through aggressive network scanning without the need for exploitation, our proposed layer and high accuracy in detecting most of these instances proves as an effective addition to the Purdue model.

Internal demo approval status: Approved

GUARD: Geo-Locational Unmanned Aerial Rescue Drone

Syed Muneeb Hoda (22809), Mirza Bilal Baig (22811), Usman Ghani Bawany (22850), Usaid Bhirya (22734), and Muhammad Hamza Wala Qadr (22759)

SYED ALI RAZA AND HASHIR KHILJI (SYSTEMS LIMITED)

GUARD (Geo-Locational Unmanned Aerial Rescue Drone) enhances search and rescue operations with a partially autonomous drone system designed to detect and locate humans in distress in real-world scenarios, and fully autonomous in simulations. Leveraging advanced AI algorithms, the drone integrates flight control, GPS, and high-resolution imaging for real-time navigation and monitoring. It uses geolocation data and camera feeds to identify distressed individuals, with AI models enhancing distress recognition. Simulation environments support comprehensive testing and validation, while the actual implementation demonstrates high accuracy in human detection and precise location tracking. This combination significantly improves search and rescue efficiency, positioning GUARD as a vital tool for enhancing safety and saving lives in disaster situations.

Technologies used

- Hardware: PixHawk flight controller, GPS module, camera
- Software Platforms: Gazebo, ArduCopter, ROS Noetic, MAVROS, Streamlit
- AI and Computer Vision: YOLO v2 on Darknet, MediaPipe
- Programming Language: C++, Python

Methodology

The project involves data collection and preprocessing through real-time video feed from the drone's camera, utilizing MediaPipe for identifying distress signals in the actual implementation. Model development includes YOLO v2 on Darknet for object detection in simulations, integrated with MediaPipe for enhanced distress recognition. System integration is achieved using PixHawk for flight control, a GPS module for accurate coordinate logging, and ROS Noetic with MAVROS for executing control programs and enabling component communication. Simulation and testing are conducted with visualization in Gazebo and drone simulation using ArduCopter.

Specifications

The system is compatible with modern drones equipped with PixHawk flight controllers. Performance metrics include high accuracy in human detection, precise location tracking, and real-time navigation with low latency.

Industry Mentor: Hashir Khilji, Systems Limited

Internal demo approval status: Approved

CuSnapStyle: Measurement Calculator, Custom Fashion Designer and Virtual Try-On

Muhammed Hur (22760), Hamza Khan (23062), Mohsin Ahmed (22841), Misbah Iradat (23001), and Muhammad Mustafa (22206)

ZAHHEERUDDIN ASIF

SnapStyle is an AI-based fashion solution that addresses challenges in obtaining body measurements, designing custom apparel, and visualizing final products. Traditional methods are often time-consuming and imprecise. SnapStyle employs four advanced AI modules: SMPLX for body measurements from a single image, Stable Diffusion for custom design creation, HR-Viton for realistic fitting visualization, and virtual try-ons for seeing how custom-designed clothing fits and looks. Our technology stack includes CUDA, PyTorch, Python, and React. Collaborating with industry leaders like Gul Ahmed and guided by Amjad Ashraf, Director of Data and BI, we developed a seamless, personalized solution. Rigorous testing and refinement ensure accuracy and user satisfaction. SnapStyle has received internal demo approval, indicating its readiness for further development and deployment. By transforming the fashion experience, SnapStyle bridges the convenience of online shopping with in-store fitting, significantly reducing product returns.

Technologies used

- CUDA
- PyTorch
- Python
- React

Methodology

Our methodology for SnapStyle ensures accuracy and user satisfaction through a multi-step approach. We began with extensive research to select the best AI models, such as SMPLX for body measurements and HR-Viton for clothing visualization. Rigorous testing and user feedback sessions were conducted to refine the models and user interface. Collaboration with industry experts provided valuable insights, guiding our development. Additionally, we created a React-based frontend for a seamless user experience. Recognizing a market gap where no similar ML-based products existed, our iterative process combining technical expertise and user-centric design has resulted in a robust and reliable solution.

Specifications

- Four AI modules: body measurement generation (SMPLX model), custom design creation (Stable Diffusion), design visualization (HR-Viton), virtual try-on
- Frontend on ReactJs

Industry Mentor: Gul Ahmed and Amjad Ashraf, Director of Data and BI

Internal demo approval status: Approved

ML-TISS Enhancing Cybersecurity through Machine Learning

Muhsham Elahi (23011), Bilal Ahmad (22867), Arsalan Jawed (23008), Azeem Khan (23052), and Yousuf Khalid (23045)

FAISAL IRADAT

The rapid evolution of cyber threats necessitates sophisticated, adaptive security measures. The Machine Learning Driven Threat Intelligence and Scoring System (ML-TISS) presents an innovative solution that utilizes machine learning to detect and evaluate cybersecurity threats with higher accuracy. This paper discusses the development and implementation of ML-TISS, highlighting its dual functionality as both a detection system and a scoring mechanism, which facilitates targeted and efficient cybersecurity responses. Through rigorous testing and evaluation, ML-TISS demonstrates the potential to significantly enhance network security operations.

Technologies used

- Python
- flask
- tensorflow
- next.js
- Seikit-learn
- cherryPy
- Scapy

Methodology

The methodology of our research on ML-TISS is comprehensive and structured into two distinct parts. The first part of our methodology utilizes traditional machine learning algorithms for effective pattern recognition and anomaly detection based on established features within the data. The second part of our methodology employs advanced neural network models that enable our system to analyze raw network data dynamically, providing a deep, nuanced understanding of ongoing network activities and potential threats as they develop. The methodology encompasses several pivotal stages: data acquisition, preprocessing, model training and tuning, model evaluation, and threat scoring. Each stage is crucial for ensuring the effectiveness of our machine learning models in identifying and scoring cyber threats accurately. Below, we detail each stage of our methodology.

Specifications

The Machine Learning-Driven Threat Intelligence and Scoring System (ML-TISS), is a framework that achieves a great leap in cybersecurity by skillfully blending cutting-edge neural networks with traditional machine learning algorithms. The primary purpose of ML-TISS is to be able to identify and score potential cyber threats in a highly effective manner, which then allows the organization to deploy only those security measures that are essential and focused. During system installation, it has shown how often transmission collisions take place hinting at its potential superiority over legacy security solutions. Further probes might refine algorithmic processes, and boost predictive capabilities perhaps by weaving real-time data streams into dynamic threat assessment. As an evolution beyond the present cybersecurity frameworks, ML-TISS paves the way for proactive management towards new cyber threats in this digital age far unlike any already witnessed.

Internal demo approval status: Approved

An app that re-defines retail experience

Syed Jazil Ali (23015), Zinneerah Rafiq (23015), Hammah Faizan (23082), Izma fatima (22942), and Eisha Haq 23077

TARIQ MEHMOOD AND WALEED ARSHAD

Aasaish, a fashion retail app, enhances shopping in Pakistan by smoothly connecting digital and physical stores to offer an improved omnichannel experience. This platform tackles common challenges like checking real-time product availability and navigating stores efficiently by offering features like real-time tracking, product availability, and updates on trending products. Designed with Pakistan's shopping culture in mind, Aasaish not only makes shopping easier but also equips businesses with effective tools for managing inventory and optimizing delivery costs. With Aasaish, shopping becomes more enjoyable and straightforward, enriching the retail experience for consumers and retailers alike in Pakistan's bustling cities.

Technologies used

- MongoDB for the database
- React JS for the frontend
- Node JS for the backend
- Microsoft Power BI for analytics
- Flutter for app development and Firebase

Methodology

The methodology used for the Aasaish can be described as an iterative and user-centric approach. The development of Aasaish began with a thorough analysis of the challenges faced by urban shoppers in Pakistan, leading to the idea of creating a comprehensive shopping application. Extensive research was conducted to gather information on shopping trends and user preferences. The software design and requirements were documented, and the UI was iteratively designed to be intuitive with continuous user feedback. Next, the database was set up for optimal performance, and the backend and frontend of both the app and the portals were developed simultaneously, with a focus on testing and iteration to ensure functionality and user-friendliness. The database was integrated with Power BI for analytics and deployed after thorough testing and refinement, ensuring a seamless shopping experience for users.

Specifications

The app offers a user-friendly interface for urban shoppers in Pakistan, facilitating seamless online browsing and in-store purchases. Users can easily see a diverse range of products accessible by category, brand, or specific search, with real-time

availability checks at nearby stores. It offers budget-based shopping suggestions and allows users to reserve items for in-store pickup, with an option for flexible omnichannel fulfillment. The app's cart system allows for easy item management, including adding, viewing, editing, and removing items. Additionally, a comparison feature aids in informed decision-making by enabling users to compare products from different brands. The vendor portal of the app offers robust tools for managing inventory, processing orders, and analyzing performance. The portals allow efficient inventory management, including updating product information, setting pricing and stock levels, and processing orders promptly. The integrated Power BI dashboard provides access to vital metrics for informed decision-making. Vendors can easily list new products, edit existing information, and categorize products. The admin portal of the app provides full control over vendors, customers, and the app itself. They have the authority to add, delete, and edit vendors and customers, assigning and managing their rights and permissions. The admin portal allows for comprehensive management ensuring smooth operation and user satisfaction.

Internal demo approval status: Approved

AR Virtual Try-On for clothing items using Unity and Pose Detection

Adeen Atif (22999), Mir Hamza Ali (22767), Dania Ahmed (22795), and Saad Tariq (22947)

SYED ALI RAZA AND ARSALAN RASHID

Buying clothes online and receiving ill-fitted items 7 or more days later is a problem compounded by the increasing popularity of online shopping. Our application - DASHFit - is an AR solution to this dilemma we like to call 'size surprise'. DASHFit is a virtual try room that allows online shoppers to see how a piece of clothing fits them. Choose clothing items of your liking, click the try room button and stand in front of your camera to see the clothes overlaid on yourself. Our application allows a 180-degree view while also encompassing arm movements so users can have a holistic view of the clothes they try on. What's different in our application is its depth perception mechanism without the need of sensors or other external hardware. Using Unity's AR Core framework and Google's Mediapipe for real-time coordinates of the person's body, DASHFit gives users a realistic fit of their chosen items before they move to checkout.

Technologies used

- Unity
- ARCore
- Google's Mediapipe
- One Euro Filter
- Blender
- Rootmotion FinalIK
- Unity Inverse Kinematics
- Unity Cloth Physics
- ARCore Light Estimation

Methodology

The development of the AR virtual try-on application began with extensive research on existing AR solutions and the technologies involved. We selected ARCore for its robust augmented reality capabilities, including precise tracking and environmental understanding. Google's Mediapipe was chosen for real-time pose tracking and human segmentation due to its accuracy and performance. To address the common issues of noise, jitter, and lag in tracking data, we implemented the One Euro filter.

Blender was used for creating and attaching clothes to rigged characters because of its powerful 3D modeling and rigging capabilities. Additionally, Rootmotion FinalIK and Unity’s Inverse Kinematics were utilized to achieve realistic arm movements in a 2D space. To enhance the realism of the virtual try-on experience, we combined ARCore depth maps with Mediapipe segmentation to accurately estimate the depth of the human subject.

The development environment was set up with Unity as the primary platform, given its extensive support for AR and compatibility with Android devices. Necessary plugins and SDKs, including ARCore, Mediapipe, Rootmotion FinalIK, and Unity Cloth Physics, were installed. We implemented Mediapipe for real-time pose tracking and human segmentation, ensuring accurate capture and isolation of the user from the background.

Depth estimation was achieved by combining ARCore depth maps with Mediapipe segmentation, providing accurate depth data for the human subject. The One Euro filter was applied to the tracking data to smooth out noise and jitter, ensuring a stable and smooth user experience. Clothing for the virtual try-on was modeled and rigged in Blender, then integrated with Unity’s character rigging system. Unity Cloth Physics was utilized to simulate realistic cloth movement and behavior, enhancing the realism of the virtual clothing.

For realistic arm movements, Rootmotion FinalIK and Unity Inverse Kinematics were employed, allowing for responsive and natural interaction. The application also included features for users to adjust clothing sizes, rotate the model, and change body orientation, providing a customizable and interactive experience. Extensive testing was conducted on various Android devices to ensure compatibility and optimal performance, with the application optimized to run smoothly without requiring external hardware.

To further enhance realism, ARCore’s light estimation feature was incorporated, adjusting the virtual clothing’s appearance based on real-world lighting conditions. This comprehensive approach, leveraging advanced technologies and techniques, resulted in a seamless and realistic AR virtual try-on experience for users on Android devices.

Specifications

- Platform: Android
- Development Environment: Unity
- AR Technology: ARCore
- Pose Tracking: Google’s Mediapipe
- Noise Reduction: One Euro Filter
- 3D Modeling and Rigging: Blender
- Inverse Kinematics: Rootmotion FinalIK and Unity Inverse Kinematics
- Cloth Simulation: Unity Cloth Physics

- User Features:
 - Real-time virtual try-on for upper wear clothing
 - Cloth model movement according to user arm movements
 - Adjustable clothing sizes
 - Rotation and body orientation adjustment
- Performance:
 - Optimized for smooth performance on Android devices
 - No external hardware required beyond the device itself
- Additional Features:
 - Light estimation for realistic appearance
 - Depth estimation combining ARCore depth map and Mediapipe segmentation

Industry Mentor: Arsalan Rashid (Systems Limited)

Internal demo approval status: Approved

Aagah (An app that provides automatic real-time predictive traffic updates by monitoring your preferred routes and delivers location-based news tailored to your interests and vicinity)

Syed Danial Ali Naqvi (22771), Laiba Shah (23003), Danial Merchant (22775), Shehzad Khuwaja (22852), and Maaz Siddiqui (22997)

MUHAMMAD SAEED, WALEED ARSHAD, MUHAMMAD SALMAN,
AND SYED SAAD HASSAN IMAD

Navigating through traffic can be challenging, and relying solely on current updates from Google Maps often falls short. Introducing Aagah - your ultimate traffic companion. Unlike Google Maps, which only provides real-time traffic conditions, Aagah offers predictive traffic updates to keep you ahead of the curve. With Aagah, you can plan your routes more efficiently and receive tailored news updates relevant to your journey. Stay informed and proactive with Aagah, and transform your commuting experience with advanced traffic insights.

Technologies used

- Flutter
- Dart
- MongoDB
- NodeJS
- Figma
- Selenium
- Google Maps API
- Git

Methodology

The development of the Aagah mobile application followed a structured and comprehensive approach to ensure a robust, scalable, and user-friendly solution. We began with thorough requirements gathering, conducting research and collecting user feedback via surveys and interviews to understand the needs of Karachi commuters.

In the design phase, we created detailed wireframes and mockups using Figma and designed the database schema and data flow diagrams for a well-structured backend.

For development, the frontend was built using Flutter and Dart, creating a cross-platform mobile application. The backend was developed with Node.js, using MongoDB for data storage. We integrated Google Maps API for real-time traffic data and News API for news aggregation. Selenium was used for web scraping additional traffic updates and news.

By following this methodology, we delivered a high-quality mobile application that effectively addresses commuting challenges, providing users with timely and relevant information to improve their daily journeys.

Specifications

- Frontend: Framework: Flutter, Programming Language: Dart
- Backend: Framework: Node.js, Database: MongoDB
- APIs: Google Maps API: Real-time traffic data and geolocation services, News API: Aggregates relevant news articles.
- Web Scraping: Tool: Selenium
- User Authentication: Technologies: JWT, OAuth
- Version Control: System: Git, Repository Hosting: GitHub

App Features

- Provides users with up-to-date traffic conditions and incidents.
- Displays relevant local news based on user preferences and location.
- Offers an interactive map with real-time traffic data and user-generated content.
- Allows users to customize alert preferences for traffic and news updates.
- Enables users to post updates, images, and videos related to traffic and local news.
- Sends real-time notifications to users based on their preferences and location.
- Secure login and registration with options to authenticate using email or social media accounts.
- Allows users to manage their profile information, including name, bio, age, and saved routes.

Industry Mentor: Muhammad Salman, Syed Saad Hassan Imad (Folio 3)

Internal demo approval status: Approved

Football Data Generation and Analysis with Deep Learning Models

Muhammad Hama Shariq (22863), Ali Ahmed (23017), Ali Sohail Shaikh (22788), and Muhammad Maaz Adnan (22763)

ABEERA TARIQ

Football Analytics (FAN) is a one-stop solution to football analytics aimed to empower clubs/players/coaches of all tiers and regions with the power of data. We have three main models for the users. Firstly, Pitch and players 2D mapping: Our model takes match footage as input and maps all data collected onto a 2D pitch, turning this raw data into meaningful insights. Secondly, Football Event Detection: Detecting events accurately using Computer Vision and Deep Learning. It classifies what type of event occurred in the footage input. There are nine main classes: Cards, Centre, Corner (Left or Right), Tackle, Substitute, Free-Kick, or Penalty. Lastly, Search for any Match. Takes input on any football match that ever took place. Then, using our pipeline it extracts data and gets a detailed dashboard, allowing users to perform meaningful analytics.

Technologies used

- Flask
- Celery
- GCP VM
- MYSQL hosted on GCP
- React.js
- MUI
- PYTorch
- CUDA
- Yolo

Methodology

The development of our Football Analytics system starts with a comprehensive analysis of existing literature and technology in sports analytics and computer vision. We then outline the project requirements, including video processing, player and ball tracking, and data analysis. Our design phase involves creating detailed architectural diagrams and user interfaces to ensure a clear and efficient workflow. Leveraging a client-server architecture, we implement the system using React.js for the frontend, and Flask for the backend microservices. Deep learning models for computer vision tasks are integrated using Flask, with asynchronous processing

managed by Celery. Regular testing is conducted to ensure accuracy in detection and robustness in system performance, employing Agile methodology to iterate and refine the system based on test feedback.

Specifications

The functional specifications of the Football Analytics (FAN) system include:

Video Upload and Processing:

Users can upload match videos, which are processed to detect and track players and the ball.

Pitch and Players 2D Mapping:

Transforms match footage into a 2D pitch mapping, providing meaningful insights.

Football Event Detection:

Detects and classifies events (Cards, Centre, Corner, Tackle, Substitute, Free-Kick, Penalty) using Computer Vision and Deep Learning.

Search for Any Match:

Allows users to query any football match and generates a detailed analytics dashboard. Data Cleaning and Extraction: Ensures data from video analysis is clean and ready for visualization.

Data Storage:

Utilizes MySQL on Google Cloud Platform (GCP) for robust data storage.

Interactive Dashboard:

Provides visual reports, heatmaps, and performance metrics through a user-friendly interface.

Backend Infrastructure:

Flask handles processing tasks; the VM and celery manages user interactions and video uploads.

Video Storage:

Uses a CDN for fast and reliable video file access.

Security:

Implements HTTPS and authentication/authorization mechanisms to ensure data security.

Industry Mentor: Salesflo

Internal demo approval status: Approved

Supply Chain Management and Inventory Optimization

Abdul Suhaib (23066), Nada Waqar (22849), Shaheer Imran (22810), Mehrab Ahmed (23061), and Sameer Ahmed Khan (22954)

BEHRAJ KHAN AND SAMI UL AHBAB

SupplySync, our Final Year Project, aims to revolutionize inventory management for Bagallery, a leading e-commerce player, by addressing issues like stockouts, overstocking, and rising operational costs. By integrating advanced ML-driven forecasting models with Bagallery's existing Odoo platform, SupplySync transforms manual and error-prone processes into data-driven decision-making tools. The solution features an intuitive interface for the purchase team, allowing seamless SKU selection and time period definition for precise forecasts. Leveraging LSTM and other neural network-based models, SupplySync ensures optimized inventory levels and enhanced operational efficiency. This integration not only streamlines workflows but also empowers Bagallery to maintain optimal product availability, aligning sales strategies with anticipated demand. Our project highlights the synergy between ML-driven and ERP systems in modernizing inventory management.

Technologies used

The SupplySync project leverages advanced machine learning (ML) models, particularly Long Short-Term Memory (LSTM) networks, for time-series forecasting. The integration is implemented within the Odoo ERP system (used by Bagallery) by creating a custom app. The ML code along with Odoo's backend uses Python whereas Odoo's frontend uses XML.

Methodology

The project followed an agile methodology, involving iterative development and continuous feedback from stakeholders. Key stages included:

- Problem Identification: Analyzing existing inventory management issues at Bagallery.
- Data Extraction: Extracting product and purchasing data from Odoo ERP.
- Model Development: Designing and training LSTM models for demand forecasting. Data is passed to the ML model periodically via scheduled automation and can also be triggered manually from the UI.
- System Integration: Embedding the trained ML models into the Odoo ERP system. Forecasting of products is performed using the trained model, periodically via a defined automation and can also be triggered manually from the UI.

- **Data Storage:** Storing the forecasting results back into Odoo's Postgres database via its ORM.
- **Data Visualization:** Displaying forecasted quantities, product priority rankings, and last forecasted dates in a table view for each product. This feature lets stakeholders easily search and review forecasts for all their products.

Specifications

LSTM ML model integrated into a custom Odoo ERP app (Python and XML) that will be deployed to their existing Odoo server.

Industry Mentor: Abdul Wahab (Bagallery)

Internal demo approval status: Approved

SAFAR (A Local Urban Transportation App)

Faizan (22948), Arham (21917), and Dileep singh (22887)

RIZWAN AKRAM

“Safar,” a comprehensive mobile application designed to address the transportation challenges faced by residents of Karachi. Safar integrates the three major public bus services—Red, Green, and Orange line which are subsidized by the Government of Sindh into a single, user-friendly platform. This application facilitates the purchase of bus tickets and reservation of travel slots online, utilizing locally accepted payment methods such as Easypaisa, JazzCash, and credit/debit cards. Safar also provides real-time schedules and optimal route suggestions, guiding users to the nearest bus stops via the shortest paths. Built with a tech stack comprising Node.js, React Native, and MongoDB, Safar aims to empower Karachi’s populace by streamlining public transportation access, enhancing user experience with the latest technological advancements, and fostering digital literacy.

X-ray Auto Reporting for IHHN

Aiza Khan (21604), Kamil Akhtar (22830), Kundan Kumar (22968), Syeda Maham Jafri (22769), and Umema Ahmed (22982)

MUHAMMAD SAEED AND AHMED SB(INDUS HOSPITAL)

Pneumonia is a severe respiratory infection with significant global health impact, particularly in resource-limited areas. Early and accurate diagnosis of pneumonia is crucial for effective treatment, yet traditional methods relying on manual analysis of chest X-rays are often slow and prone to error. This project aims to address these challenges by developing an automated system for classifying pneumonia in chest X-ray images. Our approach involved training different classification models on a large dataset of labelled chest X-ray images to differentiate between normal and pneumonia infected cases. We employed various feature extraction techniques to capture critical patterns and characteristics from the images. These features were then utilized across a range of models, from basic machine learning models to deep learning and ensemble models. Feature reduction techniques were subsequently applied to enhance model efficiency and performance. Our comprehensive evaluation metrics included accuracy, F1 score, precision, recall, as well as prediction and training times, ensuring a robust assessment of model performance. This automated system provides a rapid, reliable diagnostic tool to assist radiologists, particularly in areas with limited medical resources, reducing diagnostic workload and human error. It serves as a preliminary screening tool for assisting radiologists in early pneumonia detection, facilitating timely medical intervention.

Technologies used

- Pneumonia Classification in chest X-rays: CNN, ResNet 50
- Web Application (Backend): NodeJS, Flask
- Web Application (Frontend): React
- Database: MongoDB
- Blob Storage: Azure Blob Storage

Methodology

Our application provides automated chest X-ray reporting by utilizing advanced machine learning models and a user-friendly web interface. The preprocessing phase involves normalizing and reshaping the images to 224 by 224 pixels to ensure consistency and compatibility with our models and applying data augmentation techniques such as rotation and scaling to increase dataset diversity. For feature extraction, we use the ResNet50 model, which captures high-level features from the images. These features are then input into a Convolutional Neural Network (CNN) for classification. Using the web application, an input image is uploaded and tested using the trained ML model, with the result displayed to the user.

Specifications

- User Interface Requirements: Uploading chest X-Rays, scheduling appointments and report generation
- Functional Requirements: Pneumonia classification
- Non-Functional Requirements: Quick processing of the image and scalability for multiple image uploads.

Industry Mentor: Indus Hospital and Health Network (IHHN)

Internal demo approval status: Approved

SIS—A Women’s Security App

Dua Qadeer (22820), Madiha Abid (22823), Warda Fatima (22832), and Isha Haseeb (22772)

ABEERA TARIQ, ZAYAN THARANI, AND HAMZA HUSSAIN
(FOLIO3)

In 2021, Pakistan ranked as the fourth worst country on the Women, Peace, and Security Index among 179 nations, highlighting significant safety concerns for women. Addressing this issue, we developed ‘SheIsSafe’, a user-friendly mobile application to enhance personal security for women in Pakistan. SheIsSafe features an SOS button for immediate help, real-time location sharing, and direct contact with emergency helplines. The user can start the journey, and the app shares the user’s location with trusted contacts at regular intervals or if they deviate from the planned route. The app includes customizable emergency contacts, safety zones, voice-activated SOS alerts, and fake calls.

Methodology

We performed a market review of other safety closed-source solutions in Pakistan, ensuring we had a comprehensive list of features to offer before moving to the design stage. With three rounds of prototyping on Figma, we were able to establish an ideal user flow for the application and divided development into modules. Using an agile development method, all modules were separately tested before being merged into a development branch and tested again, and final user-based testing was performed in the final leg of the project.

Technology and Specifications

Our Android application is developed using Kotlin with Jetpack Compose, with Firebase as the backend and Firestore as our NoSQL database of choice. For displaying users’ locations on a map to their contacts, we crafted a responsive frontend using React, with Material-UI. We integrated a third-party service that allowed the app to send messages to the user’s trusted contacts. ‘SheIsSafe’ empowers women with tools to enhance their safety and access help swiftly, contributing to a safer environment and fostering a sense of security and independence in Pakistan.

Internal demo approval status: Approved

HSE Web App

Nabeel Mustafa (22773), Meshaal Fatima (23041), Zaiyan Soorty (23055), and Saad Siddiqui (23030)

FARHAN A. SIDDIQUE AND SAIYED SHAHAB AHMED

Our project aims to develop an advanced Health Safety Environment (HSE) Reporting System to address inefficiencies in processing unstructured documents like PDFs. By integrating Natural Language Processing (NLP), the system will transform raw data into structured, actionable information. Key features include automated information retrieval, data structuring, event prioritization, and interactive visual reports. The system will also ensure rigorous data cleaning, secure user access, and advanced search capabilities, all designed to enhance decision-making processes. This system will enable stakeholders to efficiently retrieve and analyze information, facilitating swift identification of major causes and trends in HSE operations. It will enhance the organization's ability to respond proactively to critical events, streamline decision-making, and improve overall HSE efficiency, leading to a more informed and agile organizational framework.

Technologies used

- NLP based Model
- Python (Streamlit)
- Langchain
- nltk
- FAISS (vector Storage)

Methodology

The methodology involves a dataset of parco's hazardous events, preprocessing the data to clean and normalize it, and using NLP techniques for feature extraction. These features are used to train a machine learning model. A user-friendly web application is developed for Dashboarding, prediction and also includes a Chatbot for evaluation and processing of reports

Industry Mentor: Saiyad Shahab Ahmed (Head of digitalization - Total Parco)

Internal demo approval status: Approved

Hostify (Airbnb for hostels accommodations)

Zawiyar Khan (22972), Maham Furqan (19656), and Majeed Hussain (22882)

IMRAN KHAN

Technologies used

- Flutter
- Node.js
- MongoDB
- Express
- BLoC

Methodology

Hostify will serve as a one-stop solution for finding, comparing, and booking hostels in various locations. The platform will feature listings of hostels that cater specifically to the needs of students and employees, including long-term stay options, affordable pricing, and proximity to educational institutions or workplaces.

Specifications

User Registration and Authentication:

- Users (students, employees, and hostel owners) should be able to register and create accounts securely.
- Authentication mechanisms like email verification or two-factor authentication should be implemented.

Accommodation Search and Filtering:

- Provide a search functionality allowing users to find accommodations based on criteria such as location, price, duration of stay, proximity to educational/work institutions, and facilities.
- Implement filters for refining search results based on specific user requirements.

Accommodation Listing and Details:

- Hostel owners should be able to list their properties with comprehensive details, including room types, amenities, pricing, availability, and images.
- Users should be able to view detailed accommodation information, including photos, descriptions, pricing, and availability.

Booking and Reservation Management:

- Enable users to book accommodations securely through the platform.
- Implement a reservation management system for hostel owners to update availability, confirm or reject bookings, and manage reservations efficiently.

Transparent Booking Process:

- Ensure a transparent booking process with clear pricing, breakdown of fees, and no hidden costs.
- Provide secure payment gateways for transactions ensuring user data safety.

User Profile Management:

- Allow users to manage their profiles, including viewing past bookings, updating personal information, and managing preferences.

Review and Rating System:

- Implement a review and rating system allowing users to provide feedback on accommodations after their stay.
- Display average ratings and reviews to assist users in making informed decisions.

Notifications and Alerts:

- Provide notification features for users regarding booking confirmations, reservation updates, and important announcements.
- Hostel owners should receive alerts for new booking requests and updates on their properties.

Cancellation and Refund Policy:

- Establish a clear and fair cancellation policy for users.
- Automate the refund process according to the policy in case of cancellations.

Language and Accessibility Options:

AI powered chatbot for Travel Assistance:

- **24/7 Availability:** AI-powered travel chatbots provide round-the-clock assistance, ensuring travelers can get support and information at any time, regardless of time zones or business hours.
- **Instant Responses:** These chatbots offer immediate answers to common queries about flights, hotels, car rentals, and local attractions, enhancing the travel experience with quick and accurate information.
- **Personalized Recommendations:** Leveraging data analytics, AI chatbots can suggest personalized travel plans, accommodations, and activities based on the user's preferences, past behaviors, and current trends.

Internal demo approval status: Approved

Bone Bank Module

Natesh Kumar (22938), Suneel Kumar (22962), Syed Mohsin Ali (22992),
and Faisal Ahmed (22870)

MUHAMMAD SAEED

The management of bone grafts is a critical challenge faced by many hospitals. The cumbersome conventional way of managing bone grafts, requiring staff and surgeons to manually check and confirm the availability of required grafts for each surgery, often leads to delays in scheduling surgeries and long wait times for patients. This project proposes a sophisticated digital solution to revolutionize the bone grafts management process.

The proposed system equips hospitals with a digital bone grafts management platform, providing real-time visibility into the graft inventory status, including availability, reservations for upcoming surgeries, and expiration dates. This consolidated digital platform integrates donor and recipient data within a secure, user-centric interface that enhances interoperability with existing medical systems.

Leveraging advanced data protection and access controls, the system not only fortifies data security but also streamlines operational efficiencies through real-time analytics and automated inventory updates. This ensures the optimal allocation of resources, markedly reducing procedural delays and enhancing surgical outcomes.

- By implementing this transformative digital solution, hospitals can seamlessly manage their bone graft inventory, optimize workflow, and improve overall patient care. This project represents a paradigm shift in healthcare resource management, equipping medical institutions with the power to elevate patient care standards and operational agility through technological innovation.

Technologies used

- NodeJS
- ReactJS
- ExpressJS
- MongoDB

Methodology

Our methodology begins with a comprehensive understanding of the requirements of surgeons, medical staff, and hospital administrators, achieved through meticulous consultations and analysis of current bone graft management processes. This foundational step informs our design planning, where we intricately outline user journeys and essential functionalities for the digital platform. Following a clear vision, we meticulously select the appropriate technology stack, prioritizing security, scalability, and compatibility. Development entails the translation of design into functional code, followed by rigorous testing to ensure the application's reliability

and quality. Deployment marks the transition to live operation, supported by thorough documentation and training to empower hospital staff in effectively utilizing the system.

Specifications

The digital bone grafts management platform offers real-time inventory management, tracking bone graft availability, reservations, and expiration dates, while ensuring the confidentiality of donor and recipient information. Robust user authentication procedures bolster security, and seamless integration with existing hospital information systems is facilitated through API endpoints. Advanced encryption and role-based access control ensure data integrity, while performance optimization enables real-time updates and low-latency responses. Scalability is achieved through efficient cloud resource utilization, enabling the system to accommodate increasing data volumes. High availability is maintained with redundant server configurations, and the technology stack includes ReactJS, NodeJS, ExpressJS, and MongoDB, hosted on a secure cloud platform.

Industry Mentor: Ahmed Ali

Internal demo approval status: Approved

FYP Connect (FYP Management System)

Nimrah Lutfi (22804), Sallama Yusuf (22802), Nawal Irfan (22805),
and Vandna (22275)

SYED ALI RAZA

The FYPCConnect project aims to create an innovative and collaborative platform that facilitates the sharing of ideas among students for their Final Year Projects (FYPs) while ensuring active participation from university supervisors. This system will not only connect students with potential team members but also provide a bridge to industry experts and university supervisors who can offer mentorship and guidance. By fostering a dynamic ecosystem for idea exchange and mentorship, FYPCConnect seeks to empower students, enhance project quality, and encourage real-world application of academic work.

Technologies used

- Node.js
- NestJS
- Swagger
- MongoDB
- React
- Tailwind
- Firebase

Methodology

The development of FYPCConnect begins with an in-depth understanding of the needs of students, supervisors, and industry professionals through extensive surveys, interviews, and focus group discussions. These insights drive the design phase, where we meticulously map out user journeys and create interactive prototypes, refining them iteratively based on stakeholder feedback. We then carefully select technologies that ensure robust security, scalability, and compatibility. Using Agile methodology, we translate our designs into functional code, performing rigorous testing to ensure the platform's reliability and quality.

Specifications

The functional specifications of the FYPCConnect platform include secure user registration and authentication, allowing users to create accounts and log in with unique credentials. Students can submit detailed FYP ideas and form teams based on shared interests and project goals. The platform facilitates seamless idea sharing and collaboration through integrated real-time chat and messaging tools. Supervisors can review and select projects, while industry professionals can browse projects and offer mentorship. Users can track project progress with milestones and deadlines, receiving notification updates via email. Additionally, platform administrators can manage user accounts, monitor content for compliance, and resolve technical issues. The platform supports mini-project management and includes phases for development and proposal stages.

Internal demo approval status: Approved

Employee Training Portal

Danish Rohail Mirza (18095), Syed Meeran Tajalli (19726), Syed Waleed Raza (17907), Syed Bilal Mohsin (17871), and Izhan Sohail (23118)

RIZWAN AKRAM

Our ambitious Learning Management System (LMS) project supports a comprehensive and user-friendly software platform, ensuring that the online content for training and learning efficiently reaches the organization's employees. This corporate LMS aims to skill individuals through courses, quizzes, and certifications. The system consists of three main components: an LMS website, an LMS dashboard for employees, and an admin panel for user and course management. Key features include a course enrollment system, employee progress tracking, and interactive learning materials, which make the learning experience more vivid and engaging for employees.

Technologies used

- Application Platform: Creation of a corporate subject's website with an interactive administrative panel
- Make Human: Adobe Photoshop CC, Adobe Illustrator CC
- Tools Used for: Postman/Thunder Client, Visual Studio, Meroku, MongoDB Atlas, Robo 3T
- Platform Specifications: Any Web Browser (Chrome, Firefox, Safari)
- Technology Stack: MERN Stack (MongoDB, Express.js, React.js, Node.js)

Methodology

The Learning Management System is developed progressively using the approach described above.

1. Requirement Analysis:
 - Collect and analyze complete user requirements.
 - Define the Project Scope and Objectives.
2. Design:
 - Design wireframes and mockups with Adobe Photoshop and Illustrator CC.
 - Develop the most intuitive UI for LMS and admin panels for the website.
3. Development:
 - Create the development environment in Visual Studio.

- Set up the backend in Node.js for the MongoDB database in MongoDB Atlas.
- Use React.js to animate dynamic user interfaces.
- Test the authentication of the APIs in Postman or Thunder Client for 'Add' or 'Transfer' APIs.
- Deploy the app to Heroku and enable continuous deployment.

4. Testing:

- Perform unit testing, system testing, and integration testing for functionality and reliability.
- Conduct UAT with sample employees and managers.

5. Deployment:

- Push the final version of LMS to Heroku.
- Provide end-user and supervising agent training and documentation.

6. Maintenance:

- Monitor the system to avoid failure, offer assistance, and continuously update.

Specifications

User Interface (Employees - Web):

- Home Page with dynamic segments such as new courses, upcoming trainings, testimonials.
- About Us: This section presents the company's history and core values.
- Updates page with a timeline of LMS achievements.
- Gallery page with snapshots of events and activities.
- Authentication pages for registration and login.
- Dashboard with analytics about enrolled, active, and completed courses.
- My Profile page showing personal and professional information.
- Courses page with categories of available courses.
- Individual Course Page with enrollment, lessons, quizzes, and certification.
- Enrolled Courses page with progress tracking.
- Books page for library management.
- Settings page for profile updates and password resets.

- Administrator login screen.
- Dashboard with metrics and analytics.
- User management section with lists of active, blocked, and pending approval users.
- Courses management section for adding, activating, and deactivating courses.
- Books management section for library resources.
- Training management section for scheduling and recording training events.
- Settings for managing admin profiles and system configurations.

This full-proof approach ensures the development of an LMS that is robust, scalable, and user-friendly, meeting the requirements of both employees and administrators.

Internal demo approval status: Approved