DJCSI

CODESHASTRA X

Elements Unleashed : The Decade Alchemy

Problem Statements

Participants are requested to go through the problem statements thoroughly

PS1- Web

Summary:

Participants are tasked with building a dynamic portfolio construction platform that allows users to create, simulate, and track diverse portfolios comprising cash, stocks, and more. The platform must support user registration/login, portfolio management, real-time data integration for ticker prices, application of various investment strategies, and generation of performance metrics and reports.

Features:

Portfolio Management:
Each user should be able to manage multiple portfolios, with functionalities to add or remove cash, stocks from a predefined Ticker Universe with specific allocation percentages. Transactions, including adding or removing cash and stocks, can be simulated within the platform without the need for real trading accounts.

Investment Strategies: Link

Portfolio Details:
When a new portfolio is created, the default position is Cash - 100% always. Users can manually add cash, stock to the portfolio along with allocated percentages. If an allocation is less than 100, the difference will always show as a Cash Position. The user can also select a Strategy. Maintain all audit history for the portfolio; only show positions with % allocation > 0.

Performance Metrics Display:
Showcase key performance metrics directly on the dashboard, providing investors with an easy-to-access overview of their portfolio.

Real-time Data Integration:
Fetch end-of-day pricing for all assets in the Ticker Universe (at 5:00 PM IST automatically and a button to run it manually).
- Run the Strategy Engine to calculate all the positions in various strategies based on the latest data.
- Update all the Positions & Metrics for the Portfolio.

PS 1 - Web

Interactive Dashboard: Update the web app's dashboard in real-time to reflect the latest portfolio positions, metrics, and charts.

Bonus:

- **Responsive Design (Mobile Web Browser)**
- **Generate and send comprehensive reports and charts via email and WhatsApp, including portfolio changes, strategy updates, and more.**

Portfolio Metrics:

- **CAGR -** https://www.investopedia.com/terms/c/cagr.asp
- **Annualized Volatility -** https://www.investopedia.com/terms/s/standarddeviation.asp
- **Sharpe Ratio -** https://www.investopedia.com/terms/s/sharperatio.asp
- **Sortino Ratio -** https://www.investopedia.com/terms/s/sortinoratio.asp
- **Equity Curve (100$) -** https://www.investopedia.com/terms/e/equity-curve.asp
- **Max Drawdown -** https://www.investopedia.com/terms/d/drawdown.asp
- **Charts -** https://github.com/ranaroussi/quantstats

Dataset: Link

PS 2 - App

Title: Empowering Farmers through Multilingual Audio Assistant

Background:

There is a lot of information spread on the internet that can help a farmer. Farmers are not tech savvy, barely use smart phones and are unable to consume this information. We want to facilitate farmers to consume information over a simple, multilingual interface that works like "Alexa/Hello Google" and the farmers can get curated information. We want to help them at all the stages of the farming process.

Features:

Smart Assistant:
Create an assistant that the farmers can interact using voice and in multiple regional languages.It should support 5+ languages (Hindi, 2 languages from south, 2 languages from north). Leveraging the capabilities of the Bhashini API, developed by the government, which emphasizes open data and open-source software principles, we aim to integrate multilingual support into our Research Assistant module. Integrate it with the default "Hello Google" app or Alexa device.

Integrate with IVR auto-assistants (Bonus)

Some of the examples of questions/problems that farmers may have are mentioned below.
 1. Where can I find "Urea"?
 2. Which is the best retailer around me?
 3. What are the pests danger around me?
 4. What is the price of rice in my mandi?
 5. Search fertilizer products with parameters such as product name, company name, location
 proximity.
6. Search dealers with parameters such as dealers selling particular products/brands, in a particular
 location, dealers with particular products in-stock
 7. What is my soil health?

PS 2 - App

Agricultural Input Marketplace:
Build an app that connects farmers with suppliers of agricultural inputs such as seeds, fertilizers, pesticides, and equipment. The app can feature product catalogs, pricing information, user reviews, and ordering capabilities for seamless procurement of inputs.

Crop Management:
Develop features to assist farmers in managing their crops effectively, including planting schedules, crop rotation recommendations.

Weather Forecasting:
Integrate weather forecasting APIs to provide farmers with accurate and timely weather updates, enabling them to make informed decisions regarding irrigation, planting, and harvesting.

Market Information:
Incorporate functionalities to provide real-time market prices, trends, and demand forecasts for agricultural produce, allowing farmers to make strategic decisions on crop selection and sales timing.

Community Collaboration:
Create a platform for farmers to connect, share knowledge, and exchange experiences, fostering a supportive community where farmers can learn from each other and access expert advice.

Financial Management:
Offer features to assist farmers in financial planning, budgeting, and accessing agricultural loans or grants to improve their operations and investment decisions.

Education and Training:
Provide access to educational resources, tutorials, and training modules on modern farming techniques, technologies, and best practices to empower farmers with the necessary skills and knowledge for success.
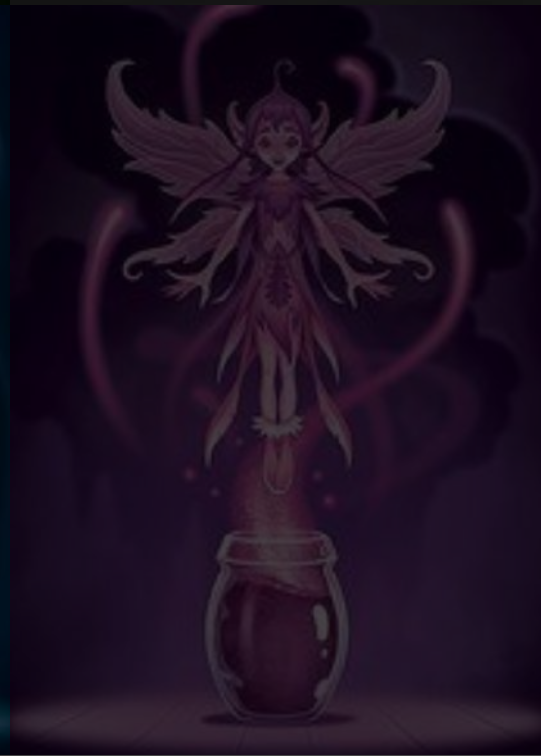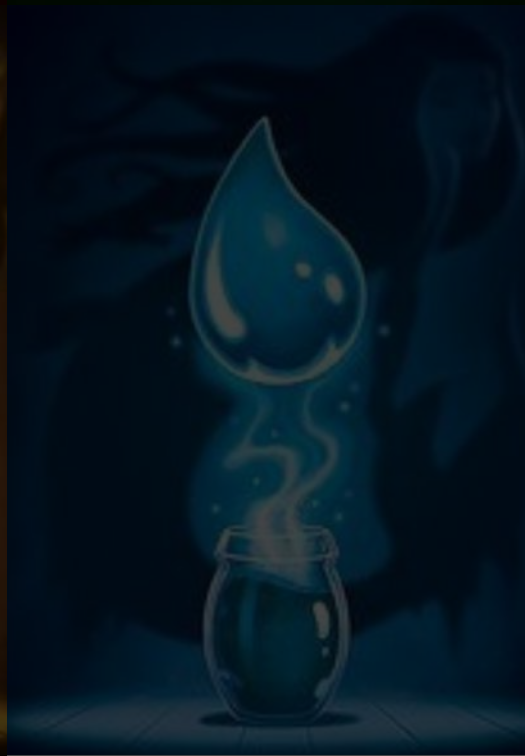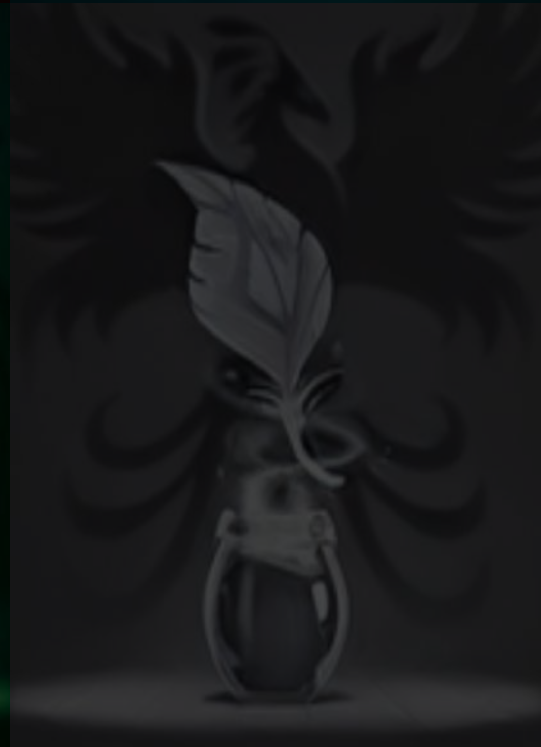
PS 2 - App

Supply Chain Tracking:
Enable farmers to track the entire supply chain journey of their agricultural products, from production to distribution and sale.

Dataset:

User has to find curated list of websites to fetch this information

PS 3 - AI/ML

The goal of this Problem statement is to develop an innovative, real-time voice assistant within the AI/ML domain that offers these core capabilities:

Highly Accurate Speech Recognition:
The assistant must excel at understanding spoken commands and queries, even in potentially noisy environments.

Voice Profile Recognition:
Develop a voice profile recognition system that can identify individual users based on their unique voice characteristics, allowing the voice assistant to load personalized settings, preferences, and content tailored to each user's profile on voice command detection.

Integrated Terminal:
Enable the assistant to accept terminal-style commands in natural language. Eg. List files, create new files, git commands, etc Allow the assistant to execute these commands within its own terminal window and display the output/results.

Web Search:
Conducts customized searches on the internet based on user queries and presents relevant information within its own browser window.

Versatile Function Calling:
The assistant should be able to execute a variety of predefined tasks based on voice input. These tasks could be internal to the assistant's program or connected to external services or APIs.

Intelligent Task Matching:
If a voice command doesn't perfectly align with predefined tasks, the assistant should provide these options:
- Display a list of the most likely matching tasks for user selection.
- Type and speak a message indicating no exact match was found and offer related actions or search functionality.

Intuitive UI:
The assistant must have a user-friendly interface. Consider both visual

PS 3 - AI/ML

displays for responses/matched options and voice output.

Fast Response and High Performance:
Prioritize quick response time and high performance to ensure a smooth user experience. Due to the emphasis on rapid processing and advanced natural language understanding (NLU), it is advised to focus on implementing efficient AI/ML techniques and custom algorithms tailored to the specific requirements. Query time graphs

Natural Voice:
While not mandatory, a realistic, pleasant voice can significantly enhance user engagement.

Context Awareness:
Develop the assistant's ability to maintain context across conversations and interactions to provide personalized and contextual responses.

Continuous Learning:
Incorporate mechanisms for the voice assistant to learn and improve its performance over time based on user feedback and usage patterns.

Privacy and Security:
Managing context while respecting user privacy and security adds another layer of complexity, requiring careful design of data handling and access control mechanisms.

Multi-Device Account Linking:
Develop a system that allows one user account to be seamlessly linked with multiple devices, enabling consistent user experiences, synchronized preferences, and access to personalized content across different devices.

Next Search Recommendation:
Implement an autocomplete feature for search text inputs, leveraging natural language processing (NLP) techniques and user behavior analysis to suggest relevant search queries, commands, or content based on partial inputs and user context.

PS 3 - AI/ML

Security and Validation:
Ensure security measures and validation mechanisms to protect user data, authenticate user accounts securely, and prevent unauthorized access.

<u>Example Tasks:</u>

Information Retrieval:
Search for and present facts, summaries, news articles, etc.
("What is the capital of France?", "Summarize the concept of neural networks.")

Calculations:
Perform basic or complex calculations based on the user's request.
("What is 15% of 280?", "Calculate the square root of 361.")

Productivity:
Setting reminders, creating calendar events, sending emails/texts.
("Remind me to submit the project at 5 PM tomorrow.", "Add a dentist appointment to my calendar on April 5th at 2 PM.")

Email Actions:
Send emails directly, schedule future emails for sending. ("Send an email to John saying the meeting is postponed.", "Schedule an email reminder for the project deadline on Friday at 10 AM.")

Script Execution:
Trigger specific scripts to run on a server or designated machine.
("Run the data analysis script.", "Execute the backup script.")

Open-Ended Functionality:
Teams are encouraged to be creative! Implement unique AI/ML-focused tasks that demonstrate their skills.

PS 3 - AI/ML

Bonus:

Third-Party Integrations:
Integrate with third-party services, APIs, and platforms to offer additional functionalities such as weather updates, news alerts, sports scores, travel information, and financial data.

Multi-Lingual Support:
Develop the voice assistant to understand and respond in multiple languages. Implement language detection capabilities to automatically switch between languages based on user inputs, ensuring a seamless and inclusive experience for users from diverse linguistic backgrounds.

Federated Machine Learning (FedML):
Explore federated machine learning techniques to improve the voice assistant's performance, personalization, and adaptation capabilities while maintaining data privacy and decentralization.

PS 4 - AI/ML

Title: Human Posture and Action Detection

Description:

Develop an innovative solution using technology to accurately detect human posture and actions in real-time. The context of using a pen in the problem statement is to provide a familiar example; however, the actual object of interest is an asthma pump, emphasizing the need for precise detection and analysis in healthcare scenarios. The solution should be efficient and reliable, capable of identifying the presence or absence of an object and its usage in real-time. For this hackathon, the object to be used will be a ball pen or pocket perfume with a click-to-use function.

Features:

Real-time Posture and Action Detection:
Develop a system that can detect and analyze human posture and actions in real-time, particularly focusing on the use of a pen with click functionality.

Pen Activation and Deactivation Tracking:
Track and count the number of times the pen is activated (on) and deactivated (off) within a predefined timeframe, providing accurate data on pen usage.

Pen Tick Verification:
Implement a feature that can distinguish between correct and incorrect clicks made with the pen, ensuring accuracy in data collection and analysis.

Thumb vs. Finger Differentiation:
Develop a mechanism to differentiate between pen operations performed using the thumb or other fingers, ensuring precise tracking and analysis.

Pen-to-Face Distance Measurement:
Establish a reliable method to measure the distance between a person's face and the pen during usage, providing insights into ergonomic practices and user behavior.

PS 4 - AI/ML

Angle at Which Pen is Held:
Incorporate technology to detect and record the angle at which the pen is held, offering additional insights into user behavior and ergonomic considerations. Implement a 90-degree threshold for angle detection.

Shaking Detection:
Integrate a feature that can detect shaking movements of the pen before it is used, providing insights into pre-action behaviors and enhancing the accuracy of action detection. This feature should include:

- **Count and Frequency Analysis:** Measure the count and frequency of shakes per second, providing data on the intensity and duration of pre-use shaking.
- **Orientation Detection:** Identify the orientation of the shake, distinguishing between horizontal and vertical movements, to understand how users interact with the pen before usage.
- **Visualization of Shake Data:** Visualize the shake count, frequency, and orientation data in the user interface.

Guided Tour:
Implement a guided tour feature similar to providing users with a step-by-step walkthrough of the system's functionalities, helping them understand how to use the technology effectively. Make sure to implement a 90 degree threshold for angle detection.

Privacy and Security:
Implement robust privacy measures and data security protocols to protect user information and maintain confidentiality throughout the detection and analysis processes.

Bonus Features:

Accessibility and Inclusivity: Design the solution with considerations for accessibility and inclusivity, ensuring that it can cater to diverse user demographics and needs effectively.

PS 5 - BLOCKCHAIN

Breaking Barriers in Education: A Blockchain Solution to Democratize Learning

<u>Background:</u>

In the current era of digital transformation, the education sector is witnessing a significant shift. Traditional online learning platforms, while providing a wide array of courses, impose substantial fees on instructors, taking a very high cut of the course price. These platforms also rely on third-party payment systems, which levy additional transaction fees and impose barriers like currency conversion fees and taxes on international transactions.

<u>Challenge Overview:</u>

This hackathon invites developers, innovators to develop a decentralized online learning platform that leverages blockchain technology. The goal is to create a system that democratizes education, making it accessible, affordable, and verifiable, while also rewarding participation and contribution within the community.

<u>Key Objectives:</u>

Empowerment and Control:
Allow instructors to publish/upload their courses freely and set their own prices, eliminating third-party control over pricing. This initiative aims to foster a direct connection between instructors and their audience, enhancing the learning community's engagement and investment.

Affordability through Decentralization:
By operating on a decentralized network, the platform makes learning more affordable. Utilizing cryptocurrencies for transactions can also circumvent the fees typically imposed by traditional payment systems.

Authenticity and Verification:
Employ blockchain technology to issue course completion certificates, ensuring the immutability and easy verification of educational credentials. This enhances the trustworthiness and credibility of the digital education ecosystem.

PS 5 - BLOCKCHAIN

Community Tokens for Engagement and Participation:
Implement a token economy within the platform to reward both instructors and students for their engagement and contributions. These tokens could serve multiple purposes, such as accessing content, obtaining discounts, or participating in exclusive events, fostering a dynamic and involved community.

Global Accessibility:
Overcome international payment barriers by using a standardized cryptocurrency for transactions, making courses accessible and equally priced across different countries, thereby avoiding currency conversion and international transaction fees discrepancies.

PS 6 - OPEN INNOVATION

Description:
Tier 2 and tier 3 college students encounter significant hurdles when seeking placements and internships, often due to a lack of resources and opportunities. Despite their potential, these students struggle to effectively connect with employers, hindering their entry into the job market and perpetuating inequalities. This open innovation challenge is designed to inspire the development of solutions that empower students by enhancing their access to placements and internships.

The primary objective is to mitigate existing disparities by providing a platform that facilitates seamless connections between these students and potential employers. Additionally, the challenge seeks to address recruiters' perspectives, ensuring that the platform offers valuable tools and insights to attract top talent from these colleges.

Suggested Features:
Participants could propose comprehensive functionalities addressing the specific needs of tier 2 and tier 3 college students. Solutions could prioritize the creation of user-friendly interfaces, efficient matchmaking algorithms, personalized career guidance, and networking capabilities. Additionally, they could focus on features for recruiters, like streamlined job posting management, insights into talent pools, and mechanisms for showcasing company culture and values to attract top talent. Prioritizing skill development, seamless application processes, and ensuring data security could be essential considerations for both parties.