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Problem Statements



Themes

1. Healthcare
2. EdTech
3. FinTech
4. Supply Chain and Logistics
5. Environmental Impact
6. Disaster Management
7. Aerial Robotics
8. Blockchain
9. Open Innovation



Healthcare

Technology for Menstrual Waste Segregation and Disposal (Powered by Femease)



1. Overview:

Menstrual waste in India poses a significant environmental challenge, taking 500-800 years to degrade. Even with innovations like organic cotton sanitary pads, proper disposal is crucial for biodegradation. Each year, over 100 billion menstrual waste products are discarded, with much of it ending up in landfills or being incinerated, releasing toxic chemicals into the environment. Improper disposal also leads to menstrual waste entering water bodies, causing water pollution and harming marine life. There is a pressing need for technological solutions to effectively segregate menstrual waste at various stages of waste management and ensure its proper disposal.

2. Goal:

Develop a technology-driven solution for the segregation of menstrual waste at various stages of waste management, ensuring proper disposal that minimizes environmental impact. The solution should focus on preventing menstrual waste from reaching landfills or water bodies and promote safe, sustainable disposal practices.

3. Deliverables:

- A working prototype of the menstrual waste segregation and disposal system.
- Source code and documentation explaining the system's functionality.
- A presentation that outlines the solution's impact, technical implementation, and potential scalability.

Brain Signal Analysis for Attention Identification (Powered by CDAC)



1. Overview:

Analyzing brain signals, particularly EEG (Electroencephalogram) data, offers insights into cognitive functions such as attention. Identifying attention levels from EEG data can have significant applications in various fields, including education, healthcare, and human-computer interaction. This problem focuses on processing and analyzing EEG data to identify attention as a cognitive function, leveraging advanced signal processing and machine learning techniques.

2. Goal:

Develop a solution that processes the provided EEG data to analyze and identify attention levels. The solution should demonstrate the ability to effectively distinguish between different states of attention using the neurodata. The evaluation will be based on the approach taken and the performance of the developed models.

3. Deliverables:

- A well-documented report on the approach and methodology used for analyzing EEG data.
- The developed models and their performance metrics.
- A presentation that demonstrates the results, highlighting the effectiveness of the solution in identifying attention from neurodata.



Edtech

Plagiarism Detector for the EdTech and Recruitment Industries (Powered by Programming Pathshala)



1. Overview:

In the digital age, the integrity of academic work and professional assessments has never been more crucial. As EdTech platforms and recruitment agencies increasingly rely on online assessments, the risk of cheating and plagiarism has escalated, threatening the credibility of educational credentials and recruitment processes. This hackathon challenges you to address this critical issue by building an innovative plagiarism detection system that can be deployed in real-world scenarios.

2. Problem Context:

EdTech Industry: Online learning platforms have revolutionized education, offering students the flexibility to learn at their own pace. However, this flexibility also opens the door to dishonest practices. Cheating and plagiarism undermine the educational process, devaluing genuine efforts and leading to skewed assessments. EdTech platforms need robust tools to detect and deter plagiarism, ensuring that students' grades truly reflect their understanding and effort.

Recruitment Industry: In recruitment, coding assessments and technical tests are often used to evaluate candidates. Plagiarized or copied code submissions can lead to unfair hiring processes, where individuals who cheat might bypass more deserving candidates. Recruitment platforms need efficient ways to ensure that the code submissions are authentic, reflecting the true abilities of the applicants.

3. Motivation:

This problem statement is designed to tackle these pain points head-on by encouraging the development of a plagiarism detection system tailored for online code submissions. Such a tool will enhance the fairness and integrity of both educational and recruitment assessments, ensuring that only genuinely qualified candidates progress.

4. Challenge

Phase 1: Rule-Based Plagiarism Detection

In this phase, you are tasked with developing a rule-based plagiarism detection system. This system should be capable of identifying suspicious similarities between code submissions based on predefined rules.

Examples of Rule-Based Detection:

Exact Matches: Detect when a submission is identical to another, except for minor changes like comments or formatting.

Variable Renaming: Identify when variable names have been changed, but the overall structure of the code remains the same.

```
# Original code
def sum_two_numbers(a, b):
    return a + b
```

```
# Plagiarized code
def add_numbers(x, y):
    return x + y
```

Structural Similarity: Catch plagiarism where code logic remains unchanged, even if the syntax or structure is slightly altered.

```
# Original code using for loop
for i in range(10):
    print(i)
```

```
# Plagiarized code using while loop i=0
while i < 10:
    print(i)
    i += 1
```

Phase 2: AI-Enabled Plagiarism Detection

Once the rule-based system is functional, the challenge progresses to implementing AI-enhanced detection methods.

Use machine learning models to detect more subtle and sophisticated forms of plagiarism, including code obfuscation and logic cloning.

Examples of AI-Enabled Detection:

Obfuscated Code Detection: Identify when a submission has been deliberately obfuscated to hide its similarity to another submission.

```
# Original code
def multiply(a, b):
    return a * b
```

```
# Plagiarized and obfuscated code
def calc_product(num1, num2):
    result = 1
    for i in range(num2):
        result += num1
    return result - num1
```

Semantic Similarity: Detect when the same logic is implemented differently, such as using different algorithms to achieve the same result.

```
# Original code using list comprehension  
squares = [x**2 for x in range(10)]
```

```
# Plagiarized code using map function  
def square(x):  
    return x*x  
squares = list(map(square, range(10)))
```

5. Deliverables

Phase 1: A working rule-based plagiarism detection system with a clear explanation of the rules and techniques used. The system should include a reporting mechanism for flagged submissions.

Phase 2: An AI-enabled system that builds upon the rule-based foundation, offering enhanced detection capabilities. Provide documentation of the AI models used, the training process, and performance metrics.

6. Impact

The solutions developed in this hackathon have the potential to be game-changers for the EdTech and recruitment industries. By ensuring the authenticity of submissions, you will contribute to a fairer and more trustworthy system for assessing knowledge and skills.

Note : You are free to use language/tools/technologies of your own choice.

Adaptive Learning Platforms for Neurodiverse Students

1. Overview:

Neurodiverse students, including those with ADHD, dyslexia, or autism, often face challenges in traditional educational environments where a one-size-fits-all approach to learning is prevalent. An adaptive learning platform powered by AI can revolutionize education by catering to the unique needs of these students. Such a platform would adjust content delivery, learning pace, and methods dynamically, based on real-time feedback from students' interactions and progress, making education more inclusive and accessible.

2. Goal:

Develop an AI-powered adaptive learning platform that personalizes educational content for neurodiverse students. The platform should improve educational outcomes by providing tailored learning experiences that accommodate individual learning styles. It should also reduce barriers faced in traditional learning environments by incorporating various multimedia formats and offering real-time progress tracking for educators and parents.

3. Deliverables:

- A functional prototype of the adaptive learning platform with real-time content adaptation.
- Source code and documentation detailing the AI algorithms and decision-making processes used.
- A presentation showcasing the platform's effectiveness in improving educational outcomes for neurodiverse students, including user scenarios and potential scalability.



Fintech

AI-Driven Insider Trading and Market Manipulation Detection

1. Overview:

Insider trading and market manipulation pose significant risks to the integrity of financial markets, potentially leading to unfair advantages, loss of investor confidence, and regulatory penalties. Detecting these activities is challenging due to the vast amount of trading data across multiple markets and asset classes. An AI-driven platform can enhance the ability to monitor and analyze trading patterns, identifying unusual activities that may indicate insider trading or market manipulation, thus helping institutions protect their reputation and comply with regulations.

2. Goal:

Develop an AI-powered platform that monitors trading activities across multiple markets and asset classes, detecting and flagging unusual patterns that may indicate insider trading or market manipulation. The solution should assist institutional compliance teams in investigating and preventing illegal activities, ultimately enhancing market integrity and avoiding costly regulatory penalties.

3. Deliverables:

- A working prototype of the AI-driven detection platform.
- Source code and documentation explaining the AI models and algorithms used.
- A presentation demonstrating the platform's ability to detect and flag suspicious trading activities, with case studies or scenarios showing its effectiveness and potential scalability.



Supply Chain & Logistics

Electric Scooter Sales and Distribution Platform (Powered by BIKESETU)

BIKESETU™

1. Overview:

BIKESETU aims to simplify the process of buying electric scooters in India, focusing on Tier 2, 3, and 4 cities. It serves as a multi-brand Electric 2-Wheeler Sales & Distribution Platform and an AI-based expert advisor for EV2W (Electric 2-Wheeler) purchases. The platform requires a comprehensive technical and business solution to manage and track scooters from the manufacturer to the end customer, ensuring efficient operations and customer satisfaction.

2. Goal:

Develop a solution that:

- Tracks the journey of a scooter from the manufacturer to the end customer.
- Manages the entire lifecycle of the scooter through various stages: Manufacturer > BIKESETU Yard > Franchisee Store > Customer > Ownership with Customer.
- Integrates an end-to-end CRM system to handle customer interactions, sales, and support.

3. Deliverables:

- A tracking system that monitors the scooter's journey from the manufacturer to the end customer, including its presence at the BIKESETU Yard and Franchisee Store.
- An AI-driven component to enhance the buying advisor feature, providing personalized recommendations and improving the purchasing experience.
- An end-to-end CRM system that manages customer data, interactions, and support throughout the lifecycle of the scooter.
- Documentation and a presentation demonstrating the technical and business solutions, including the use of AI and technology to streamline the entire process.

Enhancing Customer Interaction Management at Amazon (Powered by SAY Design)



1. Overview:

You are the newly hired Product Manager at Amazon, a large-scale e-commerce platform, brought on board by Jeff Bezos to tackle pressing challenges in managing customer interactions effectively. As the company has grown, it faces significant issues in handling order fulfillment, returns, and customer loyalty programs. The existing manual processes are often cumbersome, leading to inefficiencies, increased costs, and a lack of insight into customer behavior.

2. Challenges:

- Inefficient Manual Processes:** The current system relies heavily on manual intervention for tasks such as processing returns and enrolling customers in loyalty programs. This not only slows down operations but also increases the risk of human error.
- Lack of Visibility:** Without a centralized dashboard, it is difficult for the team to get a comprehensive view of customer interactions, return rates, and loyalty program engagement. This lack of visibility hampers decision-making and strategy formulation.
- Customer Dissatisfaction:** Customers frequently express frustration with the return process, which can take days to resolve. Similarly, the loyalty program has low enrollment rates, indicating that customers are not aware of or do not understand the benefits.
- Inconsistent Policies:** The absence of a streamlined workflow leads to inconsistent decision-making. For example, different team members may handle return requests differently, leading to confusion and dissatisfaction among customers.

1. What they want

What they want is a robust solution that includes a dashboard designed to automate decision-making processes and provide real-time insights into customer behavior. This dashboard should enable the team to streamline workflows, adapt policies based on data analysis, and enhance customer satisfaction while minimizing risks associated with returns and disengagement.

3. Challenges:

- **Risk Mitigation:** Strategies to reduce potential negative impacts on the business. For example, identifying customers with high return rates allows the company to flag potential abuse of the return policy.
- **Workflows:** A series of steps followed to complete a task. For instance, the return workflow includes steps like receiving a return request, validating it, and processing the refund.
- **Policies:** Guidelines dictating how situations are handled. For example, a return policy may state that items must be returned within 30 days for a full refund.
- **Decision Points:** Critical junctures where choices must be made. In the return process, a decision point might involve determining if a customer qualifies for a full refund based on their purchase history.

4. Conclusion

Your challenge is to design a dashboard that effectively addresses these issues by incorporating automation, data analysis, and customer feedback mechanisms. By focusing on the pain points of the current manual system, you can create a solution that enhances customer experiences, streamlines workflows, and ultimately drives business success. Will you rise to the occasion and transform the face of e-commerce, tackling these formidable challenges head-on?



Environmental Impact

AI-Driven Hazardous Chemical Substitution Platform

1. Overview:

The use of hazardous chemicals in manufacturing and industrial processes poses significant risks to both human health and the environment. These chemicals can lead to pollution, health issues, and safety hazards. An AI-driven platform designed to suggest safer, eco-friendly alternatives can help mitigate these risks by providing tailored recommendations based on specific applications and environmental impact. This platform aims to enhance sustainability and promote the adoption of safer chemicals in various industries.

2. Goal:

Develop an AI-powered platform that:

- Analyzes the hazardous chemicals used in manufacturing or industrial processes.
- Suggests safer, eco-friendly alternatives that are suitable for the specific application and minimize environmental impact.
- Provides insights into the potential benefits and risks associated with the suggested substitutes.

3. Deliverables:

- A functional AI platform that provides recommendations for chemical substitutions based on application requirements and environmental considerations.
- A database of hazardous chemicals and their eco-friendly alternatives.
- Documentation detailing the AI algorithms, platform functionality, and the rationale behind recommendations.
- A presentation showcasing the platform's impact on improving safety, sustainability, and compliance with environmental regulations.

Integrated Medication Adherence and Management Platform

1. Overview:

Medication adherence is crucial for effective treatment, but managing drug interactions and ensuring patients follow their prescribed regimens can be challenging. An integrated platform that combines AI-driven drug interaction alerts with medication adherence monitoring can significantly enhance patient safety and health outcomes. By integrating with electronic health records (EHRs), this platform can provide real-time warnings for drug interactions and use patient-specific data to track and improve medication adherence.

2. Goal:

Develop a comprehensive platform that:

- Integrates with EHRs to provide real-time alerts for potential drug interactions.
- Utilizes AI to analyze patient-specific data and predict potential issues.
- Includes features for medication adherence monitoring, such as reminders, automated refills, and visual prompts.
- Enhances patient safety, improves adherence to prescribed treatments, and reduces the likelihood of hospitalizations due to medication-related issues.

3. Deliverables:

- A fully functional platform with AI-driven drug interaction alerts and medication adherence features.
- Integration with EHR systems for real-time data and alerts.
- User interface components for reminders, automated refills, and adherence tracking.
- Documentation and a presentation demonstrating the platform's capabilities, its impact on patient safety, and potential benefits in terms of health outcomes and cost reduction.



Disaster Management

Crowdsourced Disaster Reporting Tool

1. Overview:

During disasters, accurate and timely information about conditions such as flood levels, blocked roads, and damage is crucial for effective emergency response. A crowdsourced disaster reporting tool can empower users to report real-time conditions, which can then be aggregated and analyzed by emergency services. This solution aims to enhance the coordination of response efforts and improve communication between affected individuals and emergency responders.

2. Goal:

Develop a comprehensive platform that:

- Allows users to report real-time conditions related to disasters, including but not limited to flood levels, road blockages, and damage.
- Aggregates and analyzes reported data to provide actionable insights to emergency services.
- Facilitates communication between affected individuals and responders, ensuring that urgent needs are identified and addressed promptly.

3. Deliverables:

- A functional reporting tool that enables users to submit real-time reports on disaster conditions.
- A data aggregation and analysis system that provides emergency services with actionable insights.
- Features for integrating with other services, such as maps, alerts, and communication channels.
- Documentation and a presentation demonstrating the tool's capabilities, its impact on disaster response, and its potential to improve coordination and communication during emergencies.

AI-Powered Early Warning System

1. Overview:

Early detection of natural disasters such as earthquakes, tsunamis, and hurricanes can be critical in saving lives and reducing damage. An AI-powered early warning system that analyzes weather patterns, geological data, and other relevant factors can provide timely alerts to communities, allowing them to prepare and respond effectively. This system aims to enhance disaster preparedness and response through advanced predictive analytics and real-time monitoring.

2. Goal:

Develop a comprehensive platform that:

- a. Analyzes a wide range of data, including weather patterns, geological data, and other relevant factors, to detect potential natural disasters.
- b. Provides early warnings with sufficient lead time to enable communities to prepare and take protective measures.
- c. Integrates with existing alert systems to disseminate warnings efficiently to affected populations.

3. Deliverables:

- A functional AI-powered system that processes and analyzes data to generate early warnings for natural disasters.
- Real-time monitoring and predictive analytics features to assess and forecast disaster risks.
- Integration capabilities with alert systems for timely dissemination of warnings.
- Documentation and a presentation highlighting the system's predictive capabilities, impact on disaster preparedness, and potential to minimize damage and save lives.



Aerial Robotics

Aerial Precision Agriculture with AI-Powered Crop Analysis

1. Overview:

Precision agriculture aims to optimize resource use and improve crop health through advanced technologies. By utilizing drones equipped with multispectral cameras, this system will capture detailed images of crops and employ AI to analyze these images for detecting crop stress, disease, and nutrient deficiencies. This approach enhances agricultural productivity and sustainability by providing actionable insights for more efficient irrigation, fertilization, and pest control.

2. Goal:

Develop a comprehensive platform that:

- a. Uses multispectral cameras to capture high-resolution images of crops.
- b. Applies AI and machine learning techniques to analyze the images and detect crop health issues such as stress, disease, or nutrient deficiencies.
- c. Integrates the analysis with farm management systems to provide real-time recommendations for resource optimization, including irrigation, fertilization, and pest control.

3. Deliverables:

- A drone equipped with multispectral cameras and a microcontroller for image capture and initial processing.
- An AI model developed to analyze crop images and detect health issues.
- Software integration with farm management systems to deliver actionable insights and recommendations.
- Documentation and a presentation showcasing the AI model's effectiveness, the drone's image processing capabilities, and the impact of the system on improving agricultural productivity and sustainability.



Blockchain

Blockchain based Verifying System (Powered by Programming Pathshala)



1. Overview:

At Programming Pathshala, we are committed to empowering learners with the skills they need to excel in software engineering. As our community grows, so does the need for a secure and reliable way to validate the accomplishments of our students. Traditional methods of issuing certificates can be cumbersome and vulnerable to forgery, which undermines the trust in these credentials.

2. Challenge:

We invite you to design and develop a blockchain-based system for issuing and verifying course certificates at Programming Pathshala. Your solution should enable us to provide our students with digital certificates that are tamper-proof, easily shareable, and instantly verifiable by potential employers or other educational institutions. The system should be user-friendly for both our platform and the students who receive these certificates.

3. Deliverables:

- The system must utilize blockchain technology to ensure the security and immutability of the certificates.
- Certificates should be easily shareable by the holders, with verification possible through a simple interface.
- Consider scalability, as the system should be able to handle a large number of certificates and users as our platform continues to grow.
- Think about the user experience for both the administrators at Programming Pathshala and the students who will interact with the system.

3. Deliverables:

- Outcome: A working prototype that demonstrates the issuance and verification of course certificates within the Programming Pathshala platform.
- A presentation that explains the problem, how your solution works, the benefits of using blockchain for this purpose, and any potential challenges or limitations.

4. Hints and Suggestions:

1. Blockchain Frameworks:

Consider using Hyperledger Fabric for building your blockchain network. It's an open-source blockchain framework designed for enterprise use, offering modular architecture and strong privacy controls. It's particularly well-suited for creating permissioned networks, which might be ideal for an educational certification system.

Ethereum is another option if you're interested in utilizing smart contracts on a public blockchain. This could allow for a more decentralized solution, though considerations around privacy and scalability should be made.

2. Smart Contracts:

You can use smart contracts to automate the issuance and verification of certificates. For instance, when a student completes a course, a smart contract could automatically issue a certificate and record it on the blockchain.

3. User Experience:

Focus on creating a simple and intuitive user interface. Consider how educational institutions will input data and how end-users (students and employers) will interact with the system. Tools like React or Angular can be useful for developing front-end interfaces.

4. Data Privacy:

Keep in mind that personal information should be handled with care. Consider what data needs to be stored on the blockchain (e.g., the hash of a certificate) versus what can be stored off-chain to maintain privacy.

5. Integration:

Think about how this system could integrate with existing learning management systems (LMS) or educational platforms. You might want to explore APIs for platforms like Moodle or Canvas.

Blockchain-Based Personal Data Sovereignty Platform

1. Overview:

As concerns over personal data privacy and ownership grow, individuals seek more control over their data. A blockchain-based platform can provide a secure and transparent way for users to manage their personal data, track its usage, and receive compensation for sharing it with third parties. This approach aims to empower individuals and create a new economy focused on data privacy and monetization.

2. Goal:

Data Management: Allows users to control their personal data and set permissions for its usage.

Compensation Mechanism: Enables users to receive payments or rewards for sharing their data with authorized entities.

Audit Trails: Provides immutable records of data usage and transactions.

3. Deliverables:

- A blockchain-based platform with user-friendly interfaces for data management and permissions.
- A compensation system for data sharing with third parties.
- Immutable audit trails for tracking data usage and transactions.
- Documentation and a presentation showcasing the platform's features, impact on data sovereignty, and potential for creating a data privacy economy.



Open Innovation

1. Sustainability
2. Music