Association for Computing Machinery
NITK Student Chapter

CSEA

Spider
R&D Club

TRI - NIT HACKATHON

29th January 2022

Development

Problem Statements:

DEV01

Topic: Drag and drop elements to create a website

Building a website is quite fun but at times it might get frustrating and take up a lot of time. Instead, an application which allows us to build a website just by dragging and dropping elements would be much more efficient and user friendly than coding each and every part of the website (Similar to Wix). Also people with no prior knowledge of web development could also build a website.

Develop a solution through which a person can create a website just by dragging and dropping elements.

Main features :

1. The user should be able to add basic components like buttons, cards, nav bar, footer, text-area, images, etc... just by dragging and dropping the component.

2. The user should be able to determine the color, shape, size and position of the added component.

3. The user should be able to determine the font features like font color, font size, font style, text-alignment.

4. Basic animations like hover animations, on click animations, position animations, etc.. should be included.

Brownie Points :

1. Making the website responsive.
2. Feature to generate the HTML/ CSS/ JS files of the corresponding website created.
3. Feature to host the website.
4. Any other additional creative features.

DEV02

Topic: Bug Tracking System

A bug tracking system can prioritize bugs and assign issues. This helps to spot repetitive problems and concentrate on important issues. The development team will be able to focus on high-priority bugs rather than wasting time on smaller issues. This improves the team's productivity and reduces the cost of development.

Design a fully functioning bug tracking web application, which enables users to add, remove or resolve bugs in their software. The bugs are prioritized and categorized and are then assigned to members of the organization based on their roles. The status of the bugs should be regularly updated.

Main Features:

a. The organization lead creates his team and assigns them roles on the application.

b. Bugs can be raised by both the users as well as by the development team of the concerned software.

c. There should be restrictions on the visibility of the bugs based on the employee's role.

d. The members in higher roles can assign bugs to employees while those at lower levels can request access to / assignment of a particular bug.

e. The status of the bugs is regularly updated in the following categories – Raised, Resolved, Threat Level, and Deadline of resolution.
Resolved bugs need to be posted onto a public reporting interface.

f. Discussion thread should be enabled for a bug to communicate with the user that raised it, which will be closed once the issue is resolved.

Brownie Points:

a. Create a dashboard with statistical information (in graphical representation) about the performance of an employee.

b. Generate weekly and/or monthly reports which are mailed to the lead in PDF form.

c. Cross-platform application / remote access via secure header.

d. Any creative methods to maintain, resolve and track bugs.

DEV03

Topic: Data Pipelining and Visualization

In recent times , we have seen the introduction of a new concept called Industry 4.0 in which the emphasis lies on data driven decision making . The data is usually collected from customers or clients who use the services of the firm or various equipment used for production of goods for the firm. The accumulated data is then extracted and processed and visualized with different filters to aid in the decision making process.

Design a website for visualizing data , such that it contains pre-built modules that can be selected and put together to create a fully functioning data pipeline right from taking data from the source to displaying it on the website and sending notifications to the user. Once the pipeline is assembled the user should be able to visualize the data. The participant is expected to create options to apply different filters and provide mechanisms to apply statistical and analytical methods such as regression , so that the end user can derive useful insights from the provided raw data.

Main Features:

1) The data to be used as input must strictly be the datasets provided by the organisers which will be in the form .csv files.

2) There should be multiple pre-built modules available on the website that the user can click, select , drag and connect to one another to create a working pipeline (like creating a flowchart)

3) There must be a pre-built module that supports uploading the data from a .csv file
   Link to the dataset :
   https://www.kaggle.com/atombalan/electrical-energy-audit-data

4) There must be pre-built modules that support the extraction of data ATLEAST from MongoDB and MySQL

5) The user interface must allow the user to select the required features and plot them in different graphs . It must also allow the user to apply filters to select records from a particular ranges only.

6) The user interface must allow the application of atleast a few statistical and analytical methods.

7) Any changes in the database should reflect in real time while visualizing the data

8) The user-interface must be user-friendly and self-explanatory.

Brownie Points:

1) The platform must also be able to send real-time notifications to the user in cases of anomalies such as an exceptionally large value or exceptionally small value for a parameter.

2) The platform must allow downloading the graphs and charts chosen by the user to the local PC.

DEV04

This Problem statement is brought to us by our Title Sponsor, BharatX

Topic: Derive a user’s LinkedIn Profile URL as Output using only the linked e-mail address as input.

Requirement:

Any sort of interface (CLI, API, Website etc.) which accepts e-mail address as input and provides a user’s LinkedIn profile URL.

We don't evaluate based on

How pretty your code is. This is a hackathon, not a piece of code that will go into production. What interface you chose. A simple CLI program gets the same brownie points as a beautifully designed iPhone App. If you're focusing on how elaborate your interface looks, you're doing it wrong.How fast you submit. Deadlines the same for all, rather focus on making it more accurate than submitting the solution faster!

A Note:

We do not mind you using other already existing APIs/ Products for this solution (trial versions), so you don't necessarily need to build things from scratch. However, most of those products don't work accurately for the Email Address provided below, so the real challenge is to build an accurate product rather than just building it.

(No reimbursement will be provided by the organizers
for the use of paid APIs (if any) in your solution).

Final Validation

If it works for mehuljindal18@gmail.com, you will probably win. (Please don’t hardcode this to your solution. We might reject you immediately ;).

Perks of attempting this Problem Statement: Teams who submit the best solutions for the BharatX problem statement, will be eligible for a Full-Time Hiring interview with BharatX as a Software Development Engineer (SDE).

Machine Learning

Problem Statements:

ML01

During this pandemic, the healthcare industry has developed rapidly in order to combat covid in the best way possible. One can have several questions regarding Covid-19 and one's health which should be addressed quickly. However, doctors and healthcare workers have been working on the frontline, due to which, they cannot answer these questions for everyone. In order to tackle the problem, you have to design a chatbot that will answer all people's questions related to Covid-19.

Objectives:

The task is to design a chatbot using machine learning, specifically trained on Covid-19 data that can answer questions regarding Covid-19 accurately.

Brownie points will be awarded if you design an application for this purpose with multiple features that you can think of. One feature for example could be prediction of COVID-19 using Lung X-Ray.

ML02

Malware is intrusive software that is designed to damage and destroy computers and computer systems. The most common types of malware include computer viruses, computer worms, Ransomware, Keyloggers, Trojan horses, spyware and other forms of malicious software.
These malicious software may destroy important data or remove our access from it. To prevent this anti-malware software were created. Anti-malware is a computer program used to prevent, detect, and remove malware. Antivirus software was originally developed to detect and remove computer viruses, These antimalware software's help in the detection and thereby prevention of attacks on systems. The security and integrity of one personal computer or an organization's systems are as important as their performance. Blocking attacks on the system by malware files, viruses and other such practices is of main concern. The aim of this problem statement is to provide an ML-based approach to increase the security of a system against such attacks by detecting these malicious software before any damage is caused.

Objectives:

The task is to provide an AI/ML-based application prototype that helps in the detection of any such kind of malicious attack that helps in increasing the security of a system. For eg. To detect mails having malicious content. The app should interrupt any such entry of malicious content and display the source of malware.

ML03

CCTVs have been around for over 20 years. Traditionally security agents and operations managers have been tasked with real-time CCTV camera monitoring to detect abnormal behaviour or situations in areas under surveillance or for post-event investigation. They have needed to review hours or days of footage to extract evidence and understand what occurred at the time of the incident. Due to time constraints, it is difficult to catch on all the relevant data required to solve the issue. Also, humans are prone to errors making it more difficult to efficiently process the data. The aim of this problem statement is to build a system for the CCTV industry that independently identify and classify objects and patterns to configure intelligent alerts or gather evidence of the incident

Objectives:

The task to achieve is using video metadata and machine learning to build a system for real-time alerts, triggering real-time calls to action when certain objects or behaviours are detected or when anomalous activity occurs

Additional points if the system derives quantifiable insights like extract actionable intelligence and derives informed decisions for safety, operations and security. Eg- police departments tracking how many cars fail to stop at a particular stop sign

ML04

Forecasting stock market prices have always been a challenging task for many business analyst and researchers. Your friend, who is interested in investing in the stock market shares of the well-known company IBM is unable to predict the company's stock market. The rate of his investment and his business opportunities in IBM's Stockmarket can increase if an efficient algorithm could be devised to predict the short term price of an individual stock.

Objectives:

The link below contains a dataset, where the TIME_SERIES_DAILY_ADJUSTED give the stock market's close value of every day with a date. Your task is to devise a model to predict the 'adjusted close' value of the next day given the stocks of all days until the current day, and developer a front-end UI (either Web app or Mobile app) that can help your friend invest the right amount of money.

Brownie points will be given if the front-end system can recommend other companies that provide a better opportunity to invest in. (higher the adjusted close, the better investment opportunity)

Link to dataset:
https://www.alphavantage.co/documentation/

Link to getting an API key:
https://www.alphavantage.co/support/#api-key

Blockchain

Problem Statements:

BC01

Topic: Anonymous Company Review System

Confidential and anonymous reviews from employees allows for more truthful data. Most survey systems in existing companies fail to instill in their employees belief that their input will remain anonymous.

The aim is to use blockchain technology to ensure a system that enables honest open input from employees to reach their company.

Primary Goals and objectives:

1. Feedback must only be given by verified members of the company.
2. Given a choice the user can opt for their feedback to be completely anonymous.
3. The company must be able to view all feedback on the system.
4. Enable comments from other employees on issues.
5. Ability to categorize feedback by department, nature of feedback, date etc.

Additional possibilities:

1. **Private anonymous channels on the network to resolve specific issues.**
2. **System must be able to open, track and resolve complaints.**
3. **Create visualizations that can help the company better analyze the feedback based on its type and frequency**

Useful Links:

What is zero knowledge proof?
https://appinventiv.com/blog/zero-knowledge-proof-blockchain/

How to setup Hyperledger Fabric certificate authority
https://blog.knoldus.com/hyperledger-fabric-certificate-authority/

MSP implementation with Identity Mixer
https://hyperledger-fabric.readthedocs.io/en/release-2.2/idemix.html

One time ring signature approach to anonymization
https://monero.stackexchange.com/questions/40/how-one-time-ring-signatures-anonymise-the-sender-of-a-transaction

References:

SHINE + Levi's collab on blockchain based wellness survey
https://www.hsph.harvard.edu/news/hsph-in-the-news/blockchain-worker-health-safety/

Professional service that facilitates blockchain based review
https://www.orgvitals.com/

Anonymous Professional Network
https://www.teamblind.com/

BC02

Topic : Sports Betting in Real-Time

The Sports Betting industry has registered a consistent growth within the past few years, with more and more sports betting software providers entering this industry. According to a report, betting holds about 71% of the global gambling revenue, more than any other sector, including casinos and poker. The 2020-21 pandemic rocked the sports betting industry, but the sudden popularity and acceptance of decentralized online gaming changed digital sports betting.

Objective :

With the help of blockchain ledgers and digital currencies, improving transaction efficiency to make sports betting more attractive than other alternatives available in the market.

Basic requirements of the application:

1. Users don’t have to register or create an account.
   The application must connect MetaMask wallet, and the user can start betting instantly.

2. Users are allowed to make multiple bets in a variety of sports.

3. Live scores updates on the application so that the users can make decisions quickly during the match.

4. Show helpful notifications to the users to get them updated about events, win, losses, offers, etc.

5. Show the leader board of betters corresponding to every sports match. User can also see their final status whether they lost or won the bet.

6. Display details of all ongoing and upcoming match schedules on the dashboard.

7. As soon as the match ends, the betted money will be awarded to the user's wallet if the user wins a bet.

Additional features that can be implemented:

1. Multi-Language Support to the application.

2. Display the popular public betting trends to the users.

3. Notification for the change in the match schedule, updates on major players(whether they are going to play or not).

4. Chatting option to let users communicate with each other on the same platform itself.

5. Features like gift cards and bonuses to the users based on their participation and wins to purchase new stuff from the shop section of the application.

BC03

Topic: Track NGO expenditure

A non-governmental organization (NGO) is a charitable organization that operates independently of any government. NGOs are community, national, and worldwide organizations that work to achieve a social or political purpose, such as humanitarian reasons or environmental protection.

The focus of this track is to involve blockchain technology for making the processes involved in the functioning of an NGO, easier and transparent.

Main Requirements of the track:

1. Show all donations that the NGO received, in the portal.
2. People must be able to send money to a verified existing address in the platform
3. The NGO should get consensus from at least a specific percentage of donators/ elected independent bodies to send money outside the blockchain network.
4. Verified existing address: The user should have undergone verification (similar to KYC).

Additional features that can be implemented:

1. Identify and give a token of love to the donators as an NFT. Use your creativity to design the NFT. Or allow donators to design it themselves. (except donation amount)

2. Allow coin exchanges within the platform.

3. Allow organizational donation from multiple people associated with an organization to donate along with the organization wallet and user wallet. (multisig)

Useful links:

NFT ERC720 standard -
https://ethereum.org/en/developers/docs/standards/tokens/erc-721/

Create and deploy ERC20 tokens -
https://dev.to/abdulmaajid/how-to-create-an-erc20-token-in-solidity-1a9h

Interface for creating ERC20 token -
https://vittominacori.github.io/erc20-generator/create-token/

Circle API - Converting USDC to cash deposit and vice versa -
https://www.circle.com/en/usdc-express

References:

Ocular - Anti-money laundering compliance platform -
https://builtin.com/company/ocular

UK-government to track how benefits are spent -
https://www.zdnet.com/article/uk-govt-looks-to-blockchain-tech-to-track-how-you-spend-your-benefits/

BC04

Topic: Identity Management

The problem with current identity management systems:

Identity has a problem. If it’s paper-based, such as birth certificates sitting idly in a basement of a town hall, it’s subject to loss, theft or fraud. A digital identity reduces the level of bureaucracy and increases the speed of processes within organisations by allowing for a greater interoperability between departments and other institutions. But if this digital identity is stored on a centralised server, it becomes a target for hackers. Since 2017 alone, more than 600 million personal details – such as addresses or credit card numbers – have been hacked, leaked or breached from organisations.

Most of the current identity management systems are weak and outdated and hence companies “outsourced” their identity management to major corporations like Google or Facebook who have an economic interest in ammassing such large databases of personal data, so we see options like “Login with Google” or “Login with Facebook” functionalities. This raises privacy and security concerns as Facebook or Google are being called as the “middlemen of trust”.

Objective:

Currently, people need the right way to manage their identity rather than paper-based documents. Create a blockchain-based solution for identity management to help people to verify and authenticate their identity in real-time.

Basic Requirements:

1. A decentralized application where users can create their profile and the application gives them a unique identification number.

2. Users will have an option to upload their govt issued / important documents on this app.

3. The application will also do a self certification of user's uploaded details. Smart contracts to be used to generate trust scores for the users.

4. Each time a third party company wants to authenticate the user or a bank wants to offer the user a loan based on his/her trust score, the user will be notified first.

5. Personal information or documents need not be stored on blockchain. For documents storage, the application may also subscribe to some third party applications.

6. Only when each time a transaction will be made between a company and a user, it will be recorded on the blockchain.

Brownie Points:

1. Multiple language support for the application.

2. Briefly telling the users on the application how the trust scores will be generated so as to make the application more transparent.

Electronics

EC01

Topic: Morse code decoder

Morse code was an important milestone in the field of wireless communication. It was intensively used by the military and was also used for urgent communication for the public in the name of Telegraph. However, transmitting and deciphering a received Telegraph is not everyone's cup of tea. The problem statement demands you to make a circuit capable of deciphering a received morse code and displaying the same in ASCII characters to the user.

Rules and regulations:

1. The input should only be provided from a single source OR should only come from one data line.

2. The circuit must be created using basic elements of digital electronics only.

3. Other basic circuit requirements like transistors, resistors, clock, displays, switches, power supply etc. can be used, if required.

4. Any elements that abstract the decoding logic used, are not allowed to be used. In case of any doubt regarding the component you're planning to use, clarify the same through the discord server.

5. Use of microcontrollers is not allowed.

6. The circuit should be capable of decoding sentences that are electrically encoded adhering to the rules and regulations of the international morse code.

Test sentences:

The following sentences are required to be simulated in your circuit and a video displaying the same should be attached in the submission:

- Electronics
- 299792458
- The quick brown fox jumps over the lazy dog
- 28.6139 N, 77.2090 E

Submission guidelines:

Submission should include (Create a drive folder with the following files):

1. Circuit link or file

2. A full circuit downloaded image at high resolution

3. A pdf explaining your logic (with necessary screenshots).

4. A video (screen recording) containing simulation of your circuit by testing it with provided test sentences.
   (Maximum duration: 5 minutes)

5. Approach and other essential information about your circuit that might be important for evaluation.

Partial submissions are also accepted. Remember: The will to participate matters :)

Please follow the below folder structure:

Root folder name: TRINIT_<TeamName>_EC<ProblemCode>

Sub-folders:

TRINIT_<TeamName>_EC01/SimulationFiles –
All circuit simulation files to be kept here.
If you're using an online simulator like circuitverse, add the circuit link in a word/google doc.

TRINIT_<TeamName>_EC01/CircuitExplanation –
The PDF explaining your logic (with necessary screenshots) and high-resolution image of the circuit.

TRINIT_<TeamName>_EC01/DemoVideo – Video(s)
(Screen recording) demonstrating the simulation
(maximum duration: 5 minutes total).
Note: Don't forget to update the root drive folder permissions to "viewable by anyone with the link". Failing to do so can result in your disqualification.

Submitting on D2C:
Create a public github repository with name-
"TRINIT_<TeamName>_EC<ProblemCode>" and upload the drive link in the repository's README. You are free to include any extra files/explanations on the repository. Submit the GitHub repository link on D2C.

Resources:

ITU document mentioning rules and regulations of the International Morse codes
https://www.itu.int/dms_pubrec/itu-r/rec/m/R-REC-M.1677-1-200910-I!!PDF-E.pdf

CircuitVerse simulator
https://circuitverse.org/simulator

Proteus simulator software
https://www.labcenter.com/simulation/

These are just examples of simulators which could be used to build the circuit. However, you are free to use the simulator of your choice.

EC02

Topic: Battery Management System

Lithium cells are extremely sensitive to their surroundings, exposing them to overly harsh conditions or subjecting them to shocks, might result in battery safety issues.In this problem statement you will have to come up with a circuit to monitor and protect the battery pack (in this case 4 li-ion cells connected in series) known as a battery management system(BMS)

The BMS must have the following features:

1. Voltage monitoring
2. Current Monitoring
3. Temperature Monitoring
4. Overcharge protection
5. Over-discharge protection
6. Cell balancing (either passive or active - implementing an active cell balancing fetches you more points)
7. The BMS must be constantly monitoring Voltage,discharge current and the temperature of the battery pack,and if the parameters go beyond the limits , a 5V signal has to be generated which can be used to switch ON/OFF a relay.

The Limits for all the BMS parameters has to chosen for the following cell:
Cell Name: SAMSUNG INR18650-25R

Datasheet:
https://robu.in/wp-content/uploads/2018/03/DATASHEET-SAMSUNG25R.pdf

Rules:

Use of IC's for implementing any feature is not allowed
Using Arduino/other microcontrollers are allowed , in which case the code also must be submitted.

Submission Guidelines:

Submission should include (Create a drive folder with the following files):
The circuit has to be designed in easyeda or proteus

For easyeda:
Create an account in easyeda
Create a new project and make the schematic
Find the share option under advanced and get the link of the project.

For Proteus:
Create a project and make the schematic
Save the proteus project file

The submission must include:

a) The link to the project(easyeda) or the .pdsprj file (proteus)

b) A pdf :
Explaining the overall working of the circuit with necessary screenshots
Explaining the circuit logic for every feature implemented with necessary screenshots

Please follow the below folder structure:

Root folder name:
TRINIT_<TeamName>_EC<ProblemCode>

Sub-folders:

- TRINIT_<TeamName>_EC02/SimulationFiles –
  All circuit simulation files to be kept here. If you're using an online simulator like easyeda , add the circuit link in a word/google doc.

- TRINIT_<TeamName>_EC02/CircuitExplanation – The PDF explaining your logic (with necessary screenshots) and high-resolution image of the circuit.

- TRINIT_<TeamName>_EC02/DemoVideo – Video(s) (Screen recording) demonstrating the simulation (maximum duration: 5 minutes total).

Note:
Don't forget to update the drive folder permissions to "viewable by anyone with the link". Failing to do so can result in your disqualification.

Submitting on D2C:
Create a public github repository with name-
"TRINIT_<TeamName>_EC<ProblemCode>" and upload the drive link in the repository's ReadME. You are free to include any extra files/explanations on the repository. Submit the GitHub repository link on D2C.