

FinTech

Problem Statement 1:

Have you ever thought that there is a scientific way to determine the age of your mobile battery? We want you to build a model from scratch to estimate the battery life in terms of Cycle Life elapsed, based on the battery usage data collected from various smartphones.

Task:

Modern day smartphone batteries usually last for a Cycle Life in the range of 600-750 charging cycles before the battery reaches its end of life (when the remaining capacity of the battery falls down to 70-80% of the original capacity). A Charging Cycle is equivalent to a complete discharge of a battery from a full to an empty state. As the battery ages due to the repetitive usage over time, its capacity degrades resulting in elapsing of the charging cycles till battery can no longer be used. Battery Capacity basically represents the total charge that the battery can store during charging or the total current that is capable of supplying during discharging.

For instance, a brand new 3300mAh battery will discharge a current equivalent to 3300mA for 1 hour and can store a total energy of 3300mAh when charged with 3300mA current for 1 hour. To get an estimate of how old is the battery it is important to estimate the number of Charging Cycles that could have been elapsed by the battery in problem, which can be done on the basis of the remaining capacity of the battery at any given point in time. The given problem requires the following tasks to be completed:

1. Write a logic which will be used to predict the remaining capacity of the battery based on the energy stored in the battery during charging periods for any given charging cycle
2. Using the remaining capacity calculated and other factors given in the data, build a model that will estimate the current age of battery in terms of how many charging cycles have been elapsed by the battery in question
3. Give a final list of the variable importance of all the predictors used while estimating the current age of the battery

List down all the assumptions that you will be making while building this model. For instance, you should be assuming different numbers of the total cycle life of the battery as well as the criteria for defining end of life capacity of the battery to get the final optimal model.

Relevant Datasets & Sources:

The data collected is in the CSV format for multiple smartphones running on various capacities of different technologies of the batteries. The CSV file contains information about impact factors such as charging/discharging current, battery voltage, battery temperature, screen on/off, network connected etc for multiple charging and discharging periods.

Assessment:

The model should run on the testing data from different phones for which we will have the rough age of the battery. The error rate of the predicted age to the actual age will be used to rank the candidates.

Problem Statement 2:

Can you extract readable datasets from an image or a scanned document? Given a set of structured documents, build an OCR (Optical Character Recognition) model, which will spew out the field name, and corresponding field values that a user is interested in.

Task:

One important aspect of any intelligent OCR solution is to efficiently extract the field names (keys) and corresponding field values (values) from a set of structured documents (template). In this task, you will be given different sets of documents that follow a particular structure. The task will be to train the OCR model to detect the given field name and field values as accurately as possible.

Relevant Datasets & Sources:

The data contains multiple purchase invoices from the retail industry having numerous key, value pairs.

Assessment:

Out of the total given field name and field values, how many were identified correctly and also for each field name and corresponding value what is the “word detection and recognition” accuracy.

Problem Statement 3:

When you call any customer support, invariably you have to wait to connect to the customer care executive. After the call gets connected, the customer care executive would ask you some details. On the basis of those details some action needs to get triggered. These are redundant, repetitive and non-productive tasks. We can save this

time by building an automated Chatbot system that handles all types of customer queries.

Task:

Build an automated Chatbot system. When a user opens the chat-box terminal, it will ask the user relevant queries and continue the conversation by asking pertinent questions in order to solve the customer's problem.

Relevant Datasets & Sources:

We will provide API end points and corresponding request/response format.

Assessment:

Ranking would be based on:

- How accurately the bot answers the customer's questions?
- How intelligently the bot is navigating the customer to the right set of questions?
- How is the bot handling the edge/corner cases?

Note: Datasets for the above mentioned problem statements will be given on the spot



EdTech

Problem Statement 1 – Revolutionizing the coding experience for school kids

Context: Programming has become the hottest trend among school going kids in India. Programs like Google Code-In offers high school kids to showcase their programming skills by contributing to open-source projects. Programming is the “hot chick” that every student wants but not everyone can get it. What if there was an innovative way to excite high school students and ease their learning experience?

Hack: You are supposed to make a mobile app/web app/hybrid app that eases the coding experience for high school students. You need to make this hack keeping in mind that it is specifically meant for school going kids.

For example, you may use AR/VR/MR to explain the compilation process happening under the hood or apply some AI/ML/DL to personalize the experience, determining areas that need improvement etc.

This hack is all about innovation, creativity, and ease of learning.

Problem Statement 2 – Revisiting the history with gamification

Context: History has always been the most boring subject for the majority of the students. But history is always more than just remembering dates and emperor names. It has helped us understand the evolution of mankind, the major wars that happened in the past, the flourishing of trade business, slavery, etc.

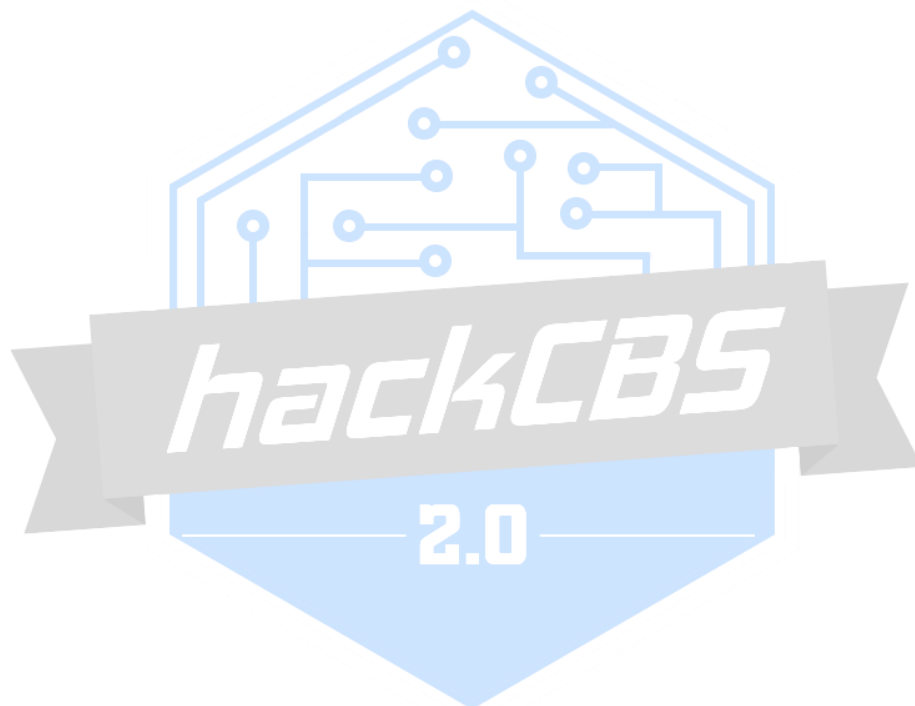
As much as it sounds interesting, it is quite the opposite for students because of the way it is being taught at schools.

Can we make this subject interesting by integrating gamification? According to Wikipedia, “Gamification is the application of game-design elements and game principles in non-game contexts. It can also be defined as a set of activities and processes to solve problems by using or applying the characteristics of game elements.”

Hack: You are supposed to make a mobile app/web app/hybrid app that makes learning history interesting by including gamification. For example, you can include gamification

in explaining the major events that happened in the French Revolution (you can build a Protagonist like Napoleon and explain his role while having him play as a character in a game).

This hack entirely revolves around your creativity and innovation. You may focus on one or two major events of history (French Revolution, World War II, etc.) and build your solution on that timeline.



Social Impact

Problem Statement 1 – Stop climate change from destroying the Earth!

Context: According to a recent and widely published report by the UN, the Earth would be so tormented by us humans that the CO₂ levels would approximately rise by 45% till 2030 as compared to 2010. A major role player in this is the non-recycled decomposition of food waste. If nothing is done, this food waste could rise to over 120 million tonnes by 2020 which not only is an ethical and economical issue but also an environmental hazard.

Hack: Invent a mobile application to ease the pain of food wastage in the above context. Use the concept of dynamic pricing where food retailers are able to market their products on the basis of best before date/shelf life to the restaurants and caterers in their periphery, preventing excessive wastage of food. Imagine a Grofers/Bigbasket-like system but with dynamic pricing and hyperlocal user base.

Relevant Datasets & Sources:

<https://www.un.org/en/sections/issues-depth/climate-change/>

Problem Statement 2 – Improvising the waste management system

Context: Clean India is one of the finest programs that has raised awareness among people to keep our environment clean. For the same reason, Govt. of India has put dustbins in public places and has segregated them into green and blue dustbins for a different type of waste. But as it has been observed that people really don't seem to care to differentiate between the two. That is the reason there is a lot of manual work in waste management.

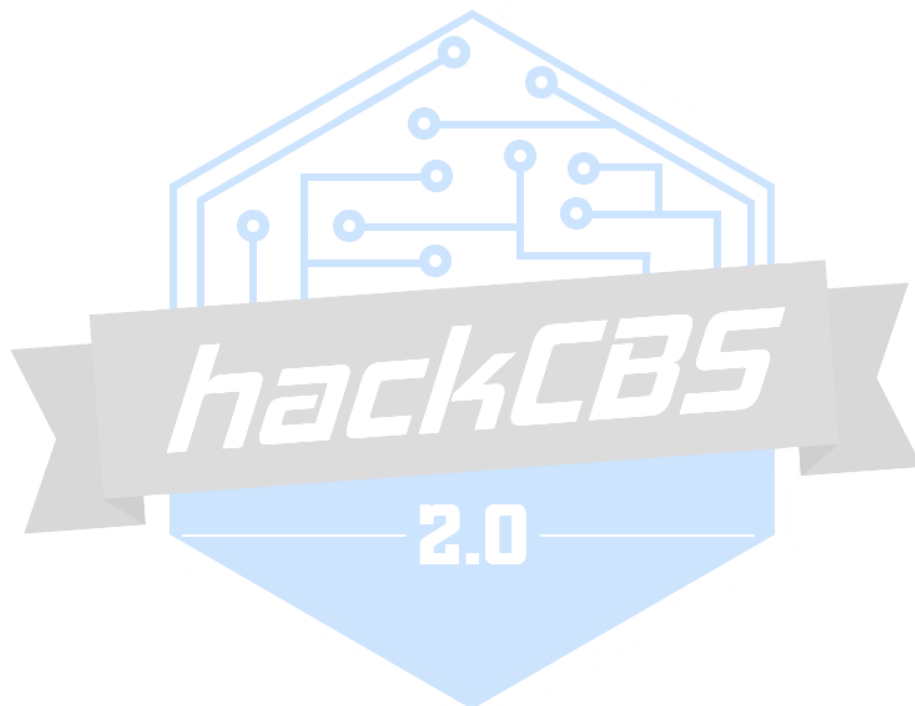
Hack: The hack is to make an intelligent system that can monitor real-time movement of garbage trucks from bins to finally the dumping yard. The system is programmed such that it can even record if a bin has been missed during the operations. It should also have access to real-time locations of all trucks so that if some trucks are not completely

filled then they can meet at a certain checkpoint and collect the garbage in lesser number of trucks.

Relevant Datasets & Sources:

<https://qphs.fs.quoracdn.net/main-qimg-13c6efeba4ed7283f3763c2bf539ede-c>

<https://www.kaggle.com/c/waste-classification/data>



Mobility

Problem Statement 1 – Tackle Urban Mobility Problems

Context: Mobility should allow people in the cities to move more freely and easily, through better utilization of existing infrastructure and sharing of transport systems. Developing cities like Delhi and Mumbai are facing crippling traffic jams on a daily basis, costing them billions of dollars annually. Developed cities like Taipei are working on reducing car dependency while creating safer streets and smarter cities.

Hack: How can the metro cities such as stated above create new data sources, utilize existing data, or better capture missing data, to address those problems and improve mobility in cities?

Relevant Datasets & Sources:

https://data.gov.in/catalog/road-transport-year-book-2015-16?filters%5Bfield_catalog_reference%5D=4903921&format=json&offset=0&limit=6&sort%5Bcreated%5D=desc

https://data.gov.in/catalog/number-newly-registered-motor-vehicles-and-number-registered-motor-vehicles-delhi?filters%5Bfield_catalog_reference%5D=101163&format=json&offset=0&limit=6&sort%5Bcreated%5D=desc

<https://developer.here.com/documentation/traffic-data-service/topics/concept-realtime-traffic-data.html>

https://www.researchgate.net/publication/232906167_Harvesting_Real_Time_Traffic_Information_from_Twitter

Problem Statement 2 – Modernise route planning and navigation in city bus networks

Context: To promote the usage of public transport among the masses it is important to increase the reliability and improve the user experience of the commuters. The problem arises due to poor allocation of bus routes in absence of commuter data, traffic congestion, bus break down, poor roads, etc. which either leads to unreliable bus timings, over or underutilized passenger loads. Smart Cities aims to use AI to deliver

better, reliable and precise real-time information to commuters and officials by using commuter (anonymized) movements data.

Hack: Design a solution to help city bus authorities/undertakings to schedule city buses on different routes using passenger mobility data. The scheduling algorithm should leverage real-time navigation using the GPS sensors installed on each city bus being mapped on the network. The same navigation interface should be exported for use to any commuter on the basis of their route preference selected on the same interface. This should be done dynamically means routes should be decided as per need.

Problem Statement 3 – Smart Parking System

Context: In pursuance to the huge population, India has a problem of insufficient parking space. With families getting smaller and the total number of motor vehicles exceeding the total number of heads per family, the parking scenario is woefully falling short of the current requirements in the country. The situation is such that on any given day, approximately 40% of the roads in urban India are taken up for just as parking space. The number of families with cars has become much more than what the country is able to manage.

Hack: Design a smart parking system that should obtain information about available parking spaces in a particular geographic area and process in real-time to place vehicles at available spaces. It should also have an option to allow people to reserve parking in advance or very accurately predict where they are likely to find a spot. The hack could be in the form of a mobile application or a website. You may use AI/ML/DL in designing the hack. Any relevant data set may be used.

Health Care

Problem Statement 1 – Universal Medical Identity

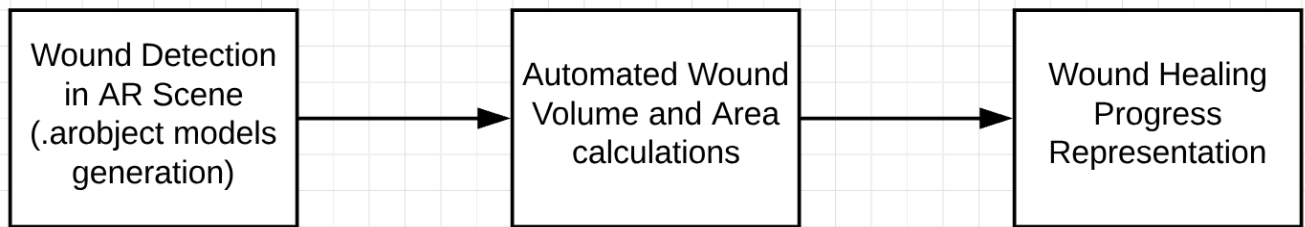
Context: It is very difficult to track a patient's medical history, especially in cases when he/she changes cities, doctors, etc. Having precise knowledge about a patient beforehand can drastically improve how the patient's treatment is done. Doctors will be able to forecast future symptoms that might occur to a patient by tracking down his/her medical history. Not only doctors but other different clients such as Medical Insurance companies can also view the patient's medical history.

Hack: Generate a mobile/web/hybrid app to track a user's medical history. This solution has to be so versatile that it can be used by any doctor, any patient, any medical insurance company pan India, keeping in mind their access scopes can be different. To make this solution even more interesting, you can also use RFID cards to generate a unique medical identity card for each patient which when swiped, the person will be able to view the patient's medical history. If you use this technology in your solution, you should also consider the security risks involved with RFID cards.

Problem Statement 2 – Build a wound analysis and injury prediction system 2.0

Context: Often times it's noticed that extremely severe wounds become highly complicated to treat without a specialized suite of tools, resources, and pupil. It can be noted that in several cases these kinds of situations might inadvertently lead to a potential fatality to the victim even if the injury was treatable.

Use Case:



Example: Imagine a person was found stuck in a highway disaster wreckage. Due to the severeness of the wounds, the medical personnel are opting to call for a special team of doctors from another city which might take a great amount of time whilst the victim might suffer from blood loss, artery rupture or extensive trauma, etc. Having an assessment system in this case might tell the hospital authorities on what measures to perform on the basis of the wounds and/or physical injuries. It could also specify the type of treatment that could be carried out, warn the victims' families using Universal ID (like Aadhaar or SSN) and conduct a search of extra hands pupils that might be required for carrying out the treatment.

Hack: Aforementioned, a solution should be developed to preemptively check, measure and monitor the vitals, blockages, blood loss, tissues, ruptures and organs of the victim affected by the wounds under scan in a comprehensive and reliable manner leading to a lifesaving mechanism to prevent advertent fatalities. Practice the use-case and example to get the foundation of the problem.

Problem Statement 3 – Keeping you mentally fit

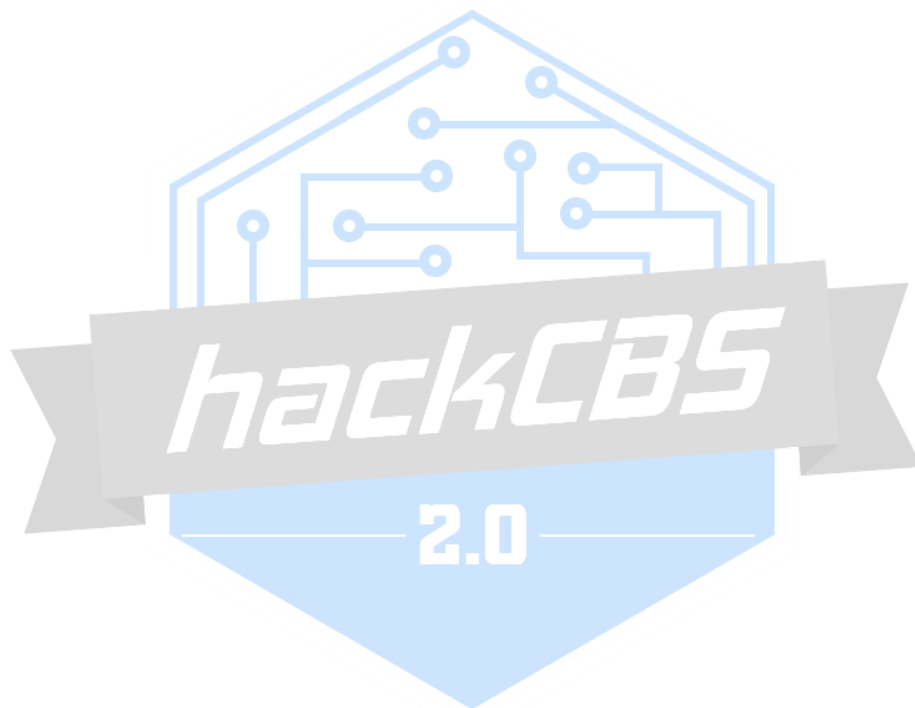
Context: Healthcare isn't just how you see yourself physically, but also how well are you in your mental state. A lot of people, who aren't doing well mentally tend to form a pattern of actions with their day to day activities, first, one being their choice of words, google searches, social media activities etc.

Is there a way to track down the user's mental state using his/her own data and notify him of his mental well-being?

Hack: Generate a mobile app to keep track of a user's mental state by keeping (not limited to) these factors in mind:

- Google Searches
- Social Media Activities
- Word choices

Considering all the relevant factors that can be helpful to keep track of a user's mental state, present it beautifully in a mobile app with relevant stats from above and how you can overcome it.



Cyber Security

Problem Statement 1 – Help curb security threats related to software supply chains!

Context: Just as a hardware supply chain involves a formal system of organizations, information, and resources - a software supply chain also utilizes these aforementioned assets in moving a product or service from development to release to end-users. Since the advent of DevOps changing the landscape of deployment from being completely manual to partly/completely automated via SSH-based scripts on the cloud. Whilst doing so, this *open* software delivery pipeline system becomes a potential point of failure when it comes to security. Anyone with access to the SSH credentials can gain access and modify the deployment settings on the server.

Hack: Build a GUI/web-based software delivery pipeline system that does the following:

- Creates a default superuser/admin which assigns pipeline access to each member of the repository. Assigning push access to the pipeline should be limited only to the members of the repository.
- It should scan all third party libraries and project dependency for any vulnerable components before starting the build for deployment.
- Automates test coverage reports.
- Generates build based on the command set in the script if no vulnerabilities were found, else build terminates.
- Shows deployment status for any particular build on the pipeline dashboard.

Relevant Datasets & Sources:

- <https://techbeacon.com/devops/how-secure-your-software-supply-chain>
- <https://docs.gitlab.com/runner/security/>
- <https://devops.com/continuous-delivery-pipeline/>
- <https://www.atlassian.com/continuous-delivery/principles/devsecops>

Problem Statement 2 – Prevent Violent Extremism in Online Environments

Context: In recent years, there have been many examples of various types of terrorist attacks taking place all over the world, including several severe school shootings that resulted in numerous fatalities. When studying the reason behind why these attacks took place, the Internet often has an important role to play. Due to the nature of the Internet and social media, it is possible to communicate and express radical views and intentions

as well as to connect to other people with similar interests. The ability to widespread information instantaneously over the Internet makes it a key facilitator in the radicalization process and preparations for terror attacks.

Hack: Build a desktop plugin/add-on/utility that scans for any content being added to the popular social media sites like Facebook, WhatsApp, and Twitter since they have the most widespread and unrestrictive user base using *Linguistic Markers, Image Processing, and Real-time Vocabulary Analysis* to trigger warnings and report to the concerned authorities using the data captured whilst scanning.

Problem Statement 3 – Let's solve the spamming problem

Context: Spamming has become a major problem in social media platforms. WhatsApp forwards sometimes contain spam URIs, most of them which are malicious in nature and attempt to spread the virus, steal user's information, and download and install unwanted apps on their smartphones. It affects the elderly the most because they click on links without thinking of any consequences.

Hack: Design a system that detects the malicious URI and prevents the user from proceeding with it. You may choose to implement it in any way you want. For example, you can prompt the user about the malicious URI before the web browser opens it.
