

TSEC Hacks Past Problem Statements

2020

Machine Learning

1. Make a Movie Recommendation System.

The prototype should be able to solve the following problems.

- a. Given a particular user_id, find the genre he is most likely will love watching.
- b. Given a particular user_id, find the users he is most similar with
- c. Given a particular movie_id, find the other movies which are the most similar to it.

Dataset: <https://grouplens.org/datasets/movielens/> give the recommended education and development section FULL dataset of 265 MB.

2. Topic Detection System

if-else is a popular topic in Computer Programming in the Java language. The application is given a statement from a random chapter. The detection should be to tell whether that statement is from the chapter of if-else or not.

Dataset: Give the text from any textbook which explains the topic of if else. Also, give random non-programming related statements which do not belong to that chapter but do contain the word **if**.

Blockchain

1. Blockchain-based E-Voting system

Currently voting in India is done using an Electronic Voting Machine(EVM), which has several problems namely, time-consuming, needs a human resource for counting votes/managing, can be tampered etc.

A Blockchain-based e-voting system can not only make the whole voting procedure, secured and tamperproof but also allows voters to vote from their smart devices, thus reducing the time consumed.

Counting votes would also be easier and will be subject to lesser inaccuracies and more transparency.

2. Blockchain in Healthcare

Healthcare is an industry where the ability to access information or any omission in a patient's record could be the difference between life and death.

Maintaining patients' previous records is an important part of the Healthcare Industry. The current scenario puts the onus on the patients to maintain physical copies of their medical history which pose inherent challenges like portability and accessibility.

A blockchain-based solution is required that allows hospital staff to securely add a patient's medical records to the blockchain. This information should be encrypted and only accessible by authorized personnel. Such a tamper-proof and secured system would easily bypass the drawbacks of the current paradigm, without sacrificing functionality.

Ecommerce

According to [a recent report by Accenture](#), 91% of consumers are more likely to buy from companies who remember them and provide relevant offers. Further, 83% of them are also willing to share their data in exchange for a personalized experience.

Personalisation can change the current scenario in the Ecommerce Industry.

Make a personalised Ecommerce Website of your choice.

Suggestions :

- 1) Websites should be able to track customers purchases and social media account and make a profile out of them.
- 2) Using this profile:
 - a) A personalised Home Page can be made, for example, a fitness enthusiast can be automatically redirected to the sports section. (Pick up where you left off).

- b) Recommendations can be made based on the customers browsing history and 11 purchases/inventory.
- c) Further geotargeting can be used to make campaigns based on the user's location.
- d) Special campaigns can be made for the customer during special occasions, for example - 10% discount on cakes on birthdays.
- e) Exit-intent campaigns can be used to encourage customers to complete transactions.

Social Cause (NGO - The Apprentice Project)

Brief :

The Apprentice Project (TAP) team (alumni from IIM, TFI, and YIF) aims to build life skills in low-income kids by placing selected high-skilled volunteers in under-resourced schools for a period of one year.

Currently, TAP works with 2500 students across 20+ schools with 200 facilitators.

Every Saturday for three hours the volunteers/facilitators mentor and teach in one of the following verticals based on their own skills Drama, Dance, Music, Public Speaking, Ultimate Frisbee, Electronics & Coding and Visual Arts.

Problem Statement:

1) Selection

The primary job of the TAP team is to select 250 facilitators from 2500 applications, for this, they currently use manual and excel based methods for sending emails and keeping information about the volunteer.

Create a volunteer management solution that can help the TAP team select the facilitators from the three-stage process so that all the emails are automated, the serial numbers are generated automatically, etc.

The solution should make it easier for one person to manage everything, similar to CRM and ERP software.

2) Operation

For TAP's Operations team create a solution that can automate the communication with facilitators & provide a dashboard to the admin for facilitator management.

Currently, they use Google forms & sheets to collect data from facilitators, and admin staff manually do everything including sending out Whatsapp messages.

2019

Machine Learning

Cancer is the second leading cause of death globally and is responsible for an estimated 9.6 million deaths in 2018. Globally, about 1 in 6 deaths is due to **cancer**. Can we use open data available to gain insights to help with the human effort against cancer by aiding any of the given objectives?

Objectives:

- Personal point of view: To predict the likelihood of incidence using a person's demographic/medical history
- Insurance company point of view: To assess cancer risk and decide appropriate policy premium
- Medical researchers point of view: To devise a method to infer the effectiveness of two different treatment plans
- Pharmaceutical companies point of view: To decide which research areas are promising in the coming decade

Suggested Data Sources:

<https://public.opendatasoft.com/explore/dataset/cancer-databases/table/>

<https://archive.ics.uci.edu/ml/datasets/lung+cancer>

<https://www.kaggle.com/c/msk-redefining-cancer-treatment>

<https://www.ruralcenter.org/population-health-portal/data/using-claims-data>

<https://healthdata.gov/>

Focus on which features in a dataset provide maximal insight and how they can be preprocessed for efficiency and effectiveness. Only a minimal UI (GUI/CLI) is required, but there has to be some convenient way to interact with the ML model to make new inferences.

You can also use any open data sources that have not been suggested. There is no restriction on the country/region to which data relates to or the type of cancer that is under consideration.

Gamification/Web/App Development

1. Gamification of Engineering Studies

The Engineering syllabus consists of up to 6 new subjects every semester. The concept is “Serious learning, not so boring.” The intent of this problem statement is to develop a smart and engaging solution to gamify learning experiences. Choice of engineering subject is left to you.

The solution must contain the following application of typical elements of game playing such as:

- Point scoring and competition with others
- Rules of play to ensure a captivating yet educating experience
- Rating sub topics based on quizzes and repeating or revising the course after a 30-day cycle, meeting daily goals, having alternate solutions to one problem and having diagrammatic presentations to show the challenges, objects and scenarios
- Progressively harder difficulty ‘levels’
- Incentives beyond points, badges or leaderboards that could be applied in this specific context in order to make learning courses that people actually enjoy
- Adaptability to students with different strengths and weaknesses. The games for users should teach content and help in memory retention and focus, rather than being “learning theory” games.
- An incentive to make repeating a lesson intrinsically motivating and not boring, as repetition aids long-term retention.

Don’t overwhelm with detail—keep it as simple as possible, and stay general, if you can, so that you do not lose attention or hinder creativity. The focus should be on the creativity of features and how appealing your application will be to students.

2. Natural Calamities Alert

- Natural calamities can affect people of different regions at a time. Build an application will be helpful to the victims and volunteers.
- The volunteers should have real-time and updated news on the potential natural disaster in a region.

- Alerts on natural hazards along with safe locations officially declared by the government should be shown along with capacity and how occupied they are.

3. Fire Station

- Major fires in our city has been rising at an alarming rate and we must be prepared at any moment to tackle such situations and reduce the effect of damages as much as possible.
- Come up with the idea for a website or an app where they can display important information pertaining to the safety of the general public regarding major fires.
- It shall also track areas where a fire hazard occurs based on emergency calls, social media updates and any other such reliable sources of information.

Ecommerce

Identity Management | Verification, Personalization and more

Problem statement: We need the ability to identify a customer interacting with our site:

1. Across devices - Mobile, Laptop/Desktop
2. Across multiple sessions - should be able to identify users over multiple sessions
3. Channels - Store, Mobile app, Website
4. Source - Organic search, Social media, Paid to advertise, Print Campaigns, TV commercials

Once identified, a complete profile of the customer should be created based on all available data, including but not limited to multiple social media identities, personal preferences based on all interactions, verified address book.

The expected solution: needs to have the presented ideas fleshed out as a working prototype. API's, Database design, Co-relation logic needs to be working. The UI focus will not be on the e-commerce platform but to demonstrate multiple interactions with a brand.

An e-commerce business should be able to personalize their online site based on the data collected. Possibilities for personalization need to be demonstrated with a minimum of three examples

Cyber Security

Security is the main concern for data sharing due to its vulnerabilities and confidentiality.

Create a portal for sharing of files and data between many clients (users), keeping in mind security concerns that such an application would have to take into account.

Sample Objectives:

- Confidentiality - files should be visible only to desired parties. Use of encryption should be made where ever necessary
- Authorization - decrypted data must be visible only to users authorized to view it
- Authentication - Secure login is a must. Consider password security and two factor authentication
- Privacy - file sharing permissions must be strictly enforced
- Database security- Consider how your data is stored and how it can be protected against unauthorized access
- Malware protection - protect against files that could potentially damage your application or other systems
- Usability- an end user should not be intimidated by security features or by many complicated options

The focus should be on anticipating various security attacks and provisioning against them. Clearly mention the strengths and vulnerabilities of your system.

Social Cause

Design a Mobile or a Web Application that uses the concept of Data Visualization and provides Logistics Information for the smooth running of a Non-Governmental Organization. The NGO would be the one that directly benefits children by helping them in Education, Healthcare and Livelihood in remote villages and slums across different states of India.

Objectives related to the following areas that contribute to an integrated approach to logistics could be targeted:

- Fundraising.

The typical fundraising process includes: soliciting funds from the public, mechanisms for donations, keeping track of donors, providing Donation certificates, releasing information about how funds were used to donors

- Keeping a track of the child's academic statistics such as grades, consistency in marks and overall development.
- Efficient long-term strategic planning.
- Greater cooperation with mass media.
- Efficient Resource management, including human resources and warehousing of supplies and materials.
- Offering feedback to the community at large.

Keep in mind that an NGO has different departments such as Marketing, Administration, Purchase, Compliance etc and their separate needs must be considered by the application.

The focus should be on innovative features with ease of use for NGO workers using the App, so that insight can be gained effectively.

Blockchain

1. Government subsidies

- The government initiates multiple subsidy schemes every year to benefit the citizens and farmers.
- The subsidised supplements, equipment, food ration etc. are filtered through various levels of government bodies before reaching the citizens.
- Due to this, the chances of corruption rises.
- Develop a solution that inculcates Blockchain to ensure transparency, security and process optimization.

2. Defence Procurement

- Defense and National security are the most critical for the Integrity of the nation.
- Defence procurement is the process through which authorities in the field of defence acquire various goods and services.

- Traceability and transparency are the two most significant things when the goods or services are in transit.
- Blockchain in Defense guarantees that the information cannot be changed or altered without the consent of parties involved in the exchange.

3. Infrastructure Spending by Government

- Spending on Infrastructure tends to be high-cost investments and are vital to a country's economic development and prosperity.
- Infrastructure tends to be less volatile than some other asset classes and is sometimes sought as an investment.
- However, there is very less transparency between the taxpayers and the contractors.
- The solution would be appropriately found in Blockchain.

4. Indian Railway Operations Management

- The Indian Railways are one of the largest employers in the world having over 1.50 million employees.
- Handling such a huge employee base manually is a difficult task.
- Blockchain would indeed be of aid for process optimization in such a large organization.