**System Design and Ethical Considerations for Project Proposals**

**Project Title: Ibotta Capstone Project**

**Team Members: Unmesh Mali, Tiziano Franza**

1. ***Machine Learning System Design***

From the System design perspective let's consider the three aspects:

1. Data:
2. Process (Models, iterations)
3. Outcome (output and recommendations)

What are the system design considerations for your deployable ML model? Describe the iterations, delivery formats and limitations you may face and some solutions to overcome the limitations

**System design considerations:**

**Data Ingestion and Retrieval**

1. How do we want to set up data storage? -
   1. Currently, we are using MariaDB MySQL storage that is maintained by someone. If we are to continue using the same/similar data structure, do we need to design an ETL pipeline to ingest data into the existing tables?

**Iterations**

1. How often do we want to retrain the model?
   1. Do we want to retrain the model only when there’s a request for a loan or a credit card?
   2. What if there are multiple loan requests in a day? Would we retrain the model multiple times in a single day?
   3. What if the loan request comes from someone who has applied for a loan before? Are we going to retrain the model in this scenario or just check the person’s rating in the database and make a decision accordingly?
   4. Where do we retrain the model? AWS? How do we trigger re-training? How do we split the data between training, testing, and validation? How do we balance the imbalance classes ?

**Delivery**

1. How are we going to display/recommend the output of the model?
   1. What information will we need for any new loan request that comes in?
      1. Shall we only ask for information on features that our previously trained model selected (e.g. district, card, and bank transaction information, or ask for all features information?
      2. Since the transaction table for a particular account ID is already with us (the bank), it shall be unpleasant to ask the transaction information from the loan requestee. How do we include the transaction information we possess into the model?
      3. Will our model handle the exception when we don’t have any transaction for a particular new account that is requesting a loan (e.g. A person opening an account just so he can apply for a loan.)
   2. It is a binary classification problem. So the output will either be yes or no for a loan request. Having said that, do we need the model to justify its decision? If yes, then how? What if the reason for loan rejection is because of a feature that is under ethical consideration (e.g. a loan request coming in from a district that has a high crime rate, low median income level, or low median education level)
2. ***Ethical Considerations***

Are there any ethical considerations of your project? Consider the data source, the intended outcome, and/or the eventual use cases.

* Did you modify anything about your plan based on these considerations?
* Can you anticipate any issues that might arise during the process?

The provided database is public, hence data has been anonymized in such a way so that every Personally Identifiable Information was removed in order to avoid going back to the real identity of the bank clients. Still it contains some personal information regarding the clients (date of birth and sex) and the district they reside into, along with some demographics about it, namely: district name, region, number of inhabitants, number of municipalities, number of cities, ratio of urban inhabitants, average salary, unemployment rate for year 1995 and 1996, number of enterpreneurs per 1000 inhabitants and number of crimes for year 1995 and 1996.

Building a classifier that takes into account all this information could result in a potentially biased model whenever there’s a clear disparity of distribution among these features for the considered imbalanced labels. For instance the model could be trained so that it won’t give loans to people coming from a district with a high crime rate a-priori, or maybe coming from a poor district, or having a certain age or sex.

For this reason, in order to make the built model fair towards minority classes, it is necessary to handle this problem accordingly. The planned way to do it is to apply standard feature selection towards all the features and then have a glance at which ‘sensitive’ bias-prone features have been selected for the learning process. If some of them are included, we could consider to either remove them or give them a lower weight with respect to the other selected features.