Group member: Miku, Deeksha, Swen, Divyaa

1. **Which real world problem have you chosen to work on? Why is it an important problem?**

We believe that there is currently a problem with coin laundries since most washing machines and driers are old and lacking IoT technology, thus there is no way of checking the machines' status without physically being there. This is an important problem in poor, high crime rate areas around world as there is no technology to monitor laundry theft. Additionally, if we can fix this problem, it can also contribute towards a more efficient coin laundry system which can make the user's lives better and also the business more profitable. Furthermore, recording the usage patterns of the users will allow for a more efficient laundry usage as the app can let the users know which timeslot the laundry machine is usually free and can also be applied for energy saving (turn off some of the machines during less busy timeslots).

2. **What will your app do and how will it help solve or mitigate the problem?**

The simplest solution to this problem is to replace the washing machines with ones that have IoT capabilities. However, due to budget constraint faced by coin laundry businesses, we believe that finding a simpler, more cost-effective solution will be beneficial. Thus, we decided to tackle this problem by installing sound recognition devices in laundry rooms and keep track of the sound that the washing machines makes when they start/finish and also check for human sounds to see if someone might start using the washing machine. This will allow users to know when the washing machines are free and when their laundry is finished from anywhere.

3. **What is the central algorithm or class of algorithms that will enable this app to work?**

>Audio fingerprinting algorithm, searching & sorting algorithm, and matching & verification algorithm

What would the algorithm need to do (you can illustrate this with a flow chart) in your app?

>Generate a unique fingerprint (which is a compact representation of key features in the audio) for a short snippet of audio from the washing machines (such as the starting music, doors getting slammed, etc.).

> Then, the algorithm automatically submits an audio snippet for recognition, which the app searches its database of precomputed fingerprints from a library of sounds to find matching fingerprints.

> Once potential matches are found, the app uses a matching and verification algorithm to confirm the sound's authenticity.

Group member: Miku, Deeksha, Swen, Divyaa

What resources (i.e. textbooks, authoritative web pages/blogs, YouTube videos, etc) have you found explaining the algorithm that you will use?

>Wang, A. (2003, October). An industrial strength audio search algorithm. In Ismir (Vol. 2003, pp. 7-13). (https://www.ee.columbia.edu/~dpwe/papers/Wang03-shazam.pdf)

>Jovanovic, J. (2018). How does Shazam work? Music Recognition Algorithms, Fingerprinting, and Processing. (https://www.toptal.com/algorithms/shazam-it-music-processing-fingerprinting-and-recognition)

> https://github.com/toonketels/Notes/blob/master/how-shazam-works.md

What are the prerequisites to understand these resources and how easily do you think you will be able to understand them? (e.g. does it require coding ability, some type of math, etc)

>We need some understanding of the fingerprinting algorithm and how sound is turned into hashes and bits.

>Regarding the searching & sorting algorithm, we have learned it in class so it will be easier.

>Verification algorithm also should be easier as it is only used to verify whether the sound is really correct or not (and the level of "correctness" of the output)

4. **Under what circumstances do you expect users to use your app? (e.g. will they use it in the office as part of their job, part of their leisure time, will they use it on the move, etc)**

>They will use it when they are doing (coin) laundry but cannot wait in the laundromat since they don't have time

What is (are) the target demographic(s) for your app? (eg. students, working professionals, young, elderly, etc)

>Students and other people who uses the coin laundry regularly.

What issues, if any, might your users run into while using your app and which you have to keep in mind?

>May pickup sounds that are not related to any of the washing machines and mistakenly recognize it as a sound from a washing machine.