Team: Master Consultants	Project Deliverable #4	Date: Oct 23, 2022

Final Draft Problem, Value Proposition & Approach Reports

1. **Final Problem Definition**:

Managing security in large industrial facilities can be difficult, considering the amount of machinery and human assets involved. Traditional security measures, enforcing badge scanning, or having gate readers can be too costly and unsustainable for large factories. It is not easy to monitor or learn where someone is during a certain period of time by using only cameras or security guards. Every minute a machine is not functioning properly can cost the company a loot of money, which can create detrimental financial outcomes. Using locational data we were provided, we were able to observe some patterns and categorize different MAC addresses we have.

Moving forward in the project, we are planning to use these data points to convert our current location to an industrial facility and simulate some cases where it will be useful to use real-time locational data. To address the problems using real Kiana data, we require to find associations between MAC addresses. Thus *additional features* such as "total days", "day of week", "euclidean distance" are necessary to help us further classify the *types (fixed and mobile)*, *professions*, *access levels*, and *machine status*. At the first stage, we aimed to distinguish fixed and mobile devices using euclidean distance, number of days, and number of weekends. We found that most of the data is mobile devices with only a few fixed devices, which is aligned with our assumptions that the fixed devices should not be prevalent. Furthermore, for mobile devices, we will classify professions and access levels using extra logics and explanatory variables and we, therefore, can find associations and solve the proposed problems.

Below is a screenshot of how our data looks after we have added the new columns. Since we were able to derive the information we need from the existing data, external data is not required for our team.

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[64]: df_temp.describe()
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[64]:		max_lat	min_lat	max_lng	min_lng	Distance(Meter)	total_day	total_signal	Weekday	Weekend
	count	32625.000000	32625.000000	32625.000000	32625.000000	32625.000000	32625.000000	32625.000000	32625.000000	32625.000000
	mean	51.460737	51.460624	-0.932404	-0.932557	22.296224	2.588261	1393.963862	2.563648	0.024613
	std	0.000173	0.000178	0.000231	0.000311	35.418779	5.498479	10340.316550	5.330616	0.527483
	min	51.460382	51.460381	-0.933231	-0.933236	0.000000	1.000000	2.000000	0.000000	0.000000
	25%	51.460598	51.460449	-0.932396	-0.932794	0.000000	1.000000	13.000000	1.000000	0.000000
	50%	51.460786	51.460626	-0.932347	-0.932396	1.148873	1.000000	13.000000	1.000000	0.000000
	75%	51.460900	51.460786	-0.932243	-0.932362	30.679037	2.000000	27.000000	2.000000	0.000000
	max	51.460960	51.460960	-0.932221	-0.932221	129.850623	162.000000	605589.000000	116.000000	46.000000

2. **Value Proposition**

Who is the customer we are trying to serve?

We are trying to facilitate factories' transition into Industry 4.0 with the data collection Kiana has to offer. We want to serve, therefore, primarily large factories, but our new solution can also be beneficial to enterprises/offices.

Why would they buy what we are suggesting?

What we are offering is cost efficient, it increases safety & security by providing simple and efficient monitoring. Mainly, our goal is to save the labor cost on managing the security of the facility, as well as have more efficient operations in terms of machinery maintenance.

Why is the problem important to them?

The amount of money a broken machine can cost a factory is immense, and providing the factory with a solution that will provide them with immediate notification regarding the machine is therefore very important. Additionally, our solution will help the company save money while maintaining higher security measures, since they will be able to have information about who has access to where, who has access to operate the machine, and who was where during what time. Having all of this information logged in an organized manner will enable the clients to be able to learn critical information regarding the facility as well as be able to increase their security procedures.

Where the value chain of their (customers) business is your solution adding value? How?

Kiana has expertise in using data to derive real time locational information about their clients, which can then be used to derive various information. The information provided is a valuable asset to the clients as it helps them increase security, decrease costs, and gain more in-depth locational information regarding their facility. Kiana is a great company for clients that are trying to convert their work to Industry 4.0, for example. This is why we are attempting to integrate Kiana's solution to machinery, which will notify users about issues as well as notify the closest technician.

3. Solution Approach:

We use the data to create some new metrics:

1. Track people's function within the facility (visitors, employees and their professions)
   - Assumptions and Rules:
     - Security guard: They usually have day and night shift, Frequency in days > 5, contain data in weekend
     - Employee: Frequency in days > 5, No weekends
     - Visitors: Frequency in days <= 5, No weekends
2. Categorize the devices into fixed or mobile
   - Fixed devices: categorized by signals that ranged within an Euclidean distance < 45 meters, frequency in days > 5 days, and signals created within weekends.
   - Mobile devices: the rest of the mac addresses that is not qualify the above characteristics were defined as "mobile devices"
3. Divide the area into zones and identify its security level

We are using the metrics to implement **e-permitting** and **virtual geofencing** and solve the problems that mentioned above.

E-permitting:

It used to enable or block access to certain places (such as laboratories) or use certain machines (such as vehicles). The purpose of e-permitting is to make sure unauthorized people will not enter a place that is in a high security level, as this can prevent accidents. For example, a visitor without any protective gear entered the manufacturing area and operating the machine could cause injury easily to his/herself and also the employees.

Virtual geofencing:

It can be used to notify a certain technician if they are nearest to the machine that is broken. The company may suffer a loss due to the broken machine. A quick response to fixing the machine can minimize the money loss and bring the company back on track.

Also, if there are people in restricted locations in the building, they will be alerted that the danger zone is around them. Since the visitors have no idea about the layout of the facility, it could prevent them from getting close to those dangerous areas where the accident happened.