

# Sense of Belongingness of a student on-campus

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## ABSTRACT

To know the sense of belongingness of a student in the university, we are designing an app to gather data of how they are feeling at different locations. The app collects the location data of the student when he/she is in the premises of university. The App shoots the relevant questions to find out the belongingness of the student.

Previous studies suggest that students who feel they are participating tend to find and use campus resources more broadly, driving their success. Attribution also protects students from stress and thereby improves their mental health.

While we agree that the characteristics of the environment influence the way people think, feel, and behave, we disagree about which aspects of the environment have psychological consequences. Physical environment, including location, is often one of the objective characteristics associated with a situation. The places people visit regularly can be consistently associated with a set of factors, thus representing a type of situation that has psychological consequences and has a clear connection with the individual location.

In addition, it was found that four-year college students with a high sense of belonging use campus services such as student counseling and student financial aid more than two-year college students.

## KEYWORDS

Outlier detection, Sense of belongingness, Community sensing.

## ACM Reference format:

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## INTRODUCTION:

**PROOF OF CONCEPT :** The project focuses on retrieving the location of the user based on the GPS. We are thinking to use GPS(GPS positioning system) which can be used to get the accurate location of the user. The App will shoot the questions to the user based on the user's location. The questions are asked to infer whether the student feels that he/she belongs to the community. The data collected is sent to the Database and is analyzed using Grafana, a data visualization tool. The user might get questions in between 2 to 5 questions.

Belonging is an important aspect of college success, whether it's among classmates, in the classroom, or on campus. It can have an impact on a student's academic adjustment, achievement, goals, and even whether or not they continue in school. We know that belonging is a fundamental human motivation, and that everyone has a strong need to belong . There are numerous definitions of belonging. A sense of belonging relates to a sense of togetherness, of being important or important to others . The lack of a sense of belonging is commonly referred to as "alienation," "rejection," "social isolation," "loneliness," or "marginality," and it has been connected to negative proximal and long-term consequences like discontent, low self-esteem, depression.

In this paper we explain how important 'sense of belongingness' is and what methods have been used to know the students state of mind. The react-native application collects the coordinates of location of the user once a day at 11:00 AM. The coordinates are stored in the database and the notifications are sent at later time in the day. The questions are shoot based on the location the student visited when the location was taken from the user. The future scope of the project would be to analyze individuals data and display those results to the user.

The surveys are not efficient these days. For example, if the survey is sent out to 100 people and only 10 % of them would return with the answers. Due to this very less data points, It is inefficient to know the problems and how the students are connected with the campus. We have tried different methods to motivate students to fill the survey by giving free student cash and give aways. Even after this marketing strategy we failed to bring the students for filling the survey. We have analyzed on why students are not responding to the surveys and had agreed on terms that students are receiving bulk emails in which our survey can be missed out. Even though the student opens the survey, he is not answering all the questions due the size of the questionnaire as it contains 20 to 25 questions and few questions might not relate to them. So, In this project we were trying to figure out what would be the best time to send the survey, how many questions to send in the survey and what questions to send in the survey. To collect more data points, we have designed an application to improve the user experience and sending personalized notification and location related questions.

### EXPLICIT CONTRIBUTIONS:

Back- End: Neerab, Front- End: Neerab, Anuhya.

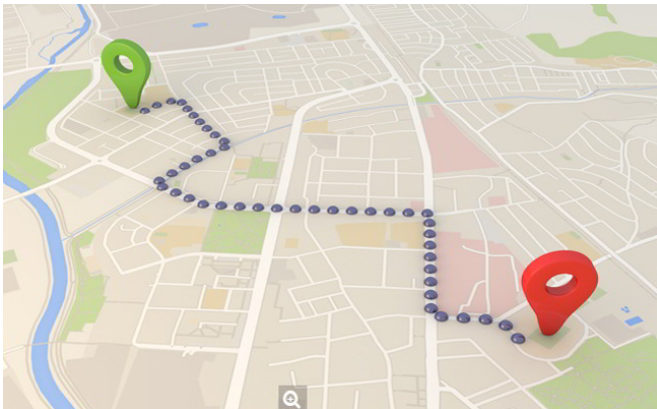


Figure 1:- GPS Location sensing.

## 1.1 LOCATION

1. The location coordinates are fetched from the network provider using the below sample code.

```
import { StatusBar } from 'expo-status-bar';
import React from 'react';
import { StyleSheet, Text, View } from 'react-native';
import * as Location from 'expo-location';
```

```
export default function App() {
```

```
  const checkPermission = async () => {
    const hasPermission = await
Location.requestPermissionsAsync();
    if (hasPermission.status === 'granted') {
      const permission = await askPermission();
      return permission;
    }
    return true;
  };

  const askPermission = async () => {
    const permission = await Location.getPermissionsAsync();
    return permission.status === 'granted';
  };

  const getUserLocation = async () => {
    const userLocation = await
Location.getCurrentPositionAsync();
    console.log(userLocation.coords);
    return userLocation.coords;
  };

  return (
    <View style={styles.container}>
      <Text>Open up App.js to start working on your app!
{ checkPermission()} </Text>
      askPermission()
      getUserLocation()

      <StatusBar style="auto" />
    </View>

  );
}

const styles = StyleSheet.create({
  container: {
    flex: 1,
    backgroundColor: '#fff',
    alignItems: 'center',
    justifyContent: 'center',
  },
});
```

2. If the user is present in a particular location within the campus, we retrieve the coordinates else the location data will be ignored.
3. We can also find out the congestion in the study areas based on the location and people connected to the network.
4. The App shoots the questions if it finds any anomaly in the location data.

### Below are steps to find the anomaly in location data:

1. In order to run anomaly detection job, we must have the latitude and longitude.

2. A data visualizer is used like Grafana.
3. An Anomaly detection job should be created to monitor the anomalies in data

## 2.1 GPS Vs Wi-Fi LOCATION:

The way of acquiring location data is the fundamental distinction between GPS and Wifi locating systems. To calculate a user's location, GPS uses satellites orbiting the Earth, whereas Wifi locating technology uses relative network signal strength acquired from network access points. Each technology has its own set of advantages and disadvantages. Let's take a look at a few of them right now.

The Global Positioning System (GPS) is a radio-based navigation system controlled by the United States government. You must have a clear line of sight with at least four GPS satellites in order to use GPS properly. Mountains, clouds, buildings, and trees all diminish the likelihood of establishing a successful GPS connection.

Although GPS can locate you everywhere on the earth, regardless of how far away you are, it is not the most precise locating technology available. The accuracy of location can only be as close as 4 meters, or around 13 feet, depending on the equipment utilized.

When the user is inside a building, surrounded by buildings, clouds, or trees, however, GPS accuracy is further limited. As a result, GPS works best in wide places with a clear view of the terrain.

Cellular location technology is an umbrella word that encompasses a number of different locating technologies, such as Wifi and SIM-based approaches.

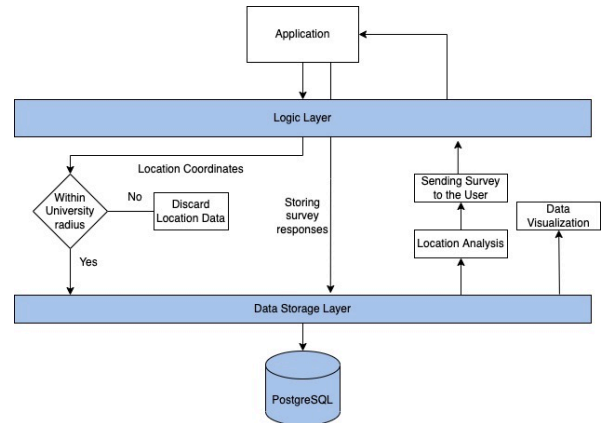
Cellular appears to fill in the gaps where GPS fails. Its powers shine in densely populated areas with a high density of cell towers. Because of how it employs crowdsourced Wi-Fi data, cellular methods thrive in buildings, cities, and heavily inhabited locations. It can determine the location of a device based on its distance from a group of network access points.

The cellular model's accuracy in locating a user's location within buildings and places with network coverage is another advantage. This technology can pinpoint a user's location to within a few feet, allowing emergency responders to take more effective action.

## 2.2 PRIVACY:

We will ask the user's permission to access the location of the user when he or she is in the campus. Location data outside of the university is not tracked and discarded.

## 2.3 EMPIRICAL METHODOLOGY:



### Procedure:

- Data : We are using the location data generated by the application.
1. The application collects the coordinates of location from the user.
  2. The data will be formatted and sent through a messaging queue to the back end.
  3. Back end stores the data in database and process that data to identify if it is an outlier.
  4. If there is a pattern change the application sends a survey to the user.

## 2.3 METHODS

### I. USER'S MOST VISITED PLACE:

1. User's most visited place place is determined by taking the location data of the user and the data is undergone through cluster analysis. The cluster with most points is taken as the location that is spent most of the time on that particular day.

### II. GENERATING QUESTIONS:

1. Once we get the user's most visited location, the questionnaire is prepared based on the location. The number of questions will be decided based on the previous answers he/she provided.

### III. STORING ANSWERS:

1. Answers are stored in the database with the timestamp of when the user submitted the survey.

### 3. RELATED WORK:

In the paper 'Putting mood into context' the user was sent a notification during the day. The location is self reported by the user using the app, whereas in our application we infer the location based on the location coordinates and compare it to the near by university buildings. so that user doesn't have to go through the hassle of reporting the location. In our application we are detailed questions unlike in the above mentioned article which only knows how the person is feeling at that place. we send out personalized questionnaire with questions ranging from 2 to 5.

In the paper protecting privacy in community sensing. As we know privacy is a major concern in location based services such as traffic monitoring, maps , etc. How can we overcome this privacy concern so that user is not concerted about his location to the third party users. One approach they came up with defeat device type algorithms where they reveal the location updates to the third party application if it follows few rules. They have implemented algorithms such as bounding box, k- block. The motivation of this paper is not protect the users location all the times but how many times they can reveal so that any third party user cannot infer their location by using any prediction algorithms.

In the paper, driving towards the community sensing, they have tackled the privacy concern in a different way. As we know utilizing the private sensors such as camera, wifi, GPS location services where it takes into the concern of battery power and users dis-interest of not using this real time applications. In this real time location based applications, How can get the required data without accessing location continuously. In other words, can we optimize the calls to the user private device sensors to optimize the battery power and users increase usage of this applications. They came up with demand analysis, different predictive algorithms, which makes the final decision on when to access the private sensors.

In many papers authors are researching the sense of belongingness in a psychological aspect rather than analyzing it in a multi disciplinary way including mathematical and computer science point of views. In our project we came up questions that are shotted to the users with the help of psychology department at our university. This way our work stands out the rest.

### 4. RESULTS:

The response rate was higher when we shooted three questions rather than five questions. Most of the surveys are filled at 3:00 PM which we retrieved from the backend.

The figure displays four screenshots of a mobile application interface for a survey. The top-left screenshot shows the 'Main' screen with a title bar and a text box containing: 'This is a POC deployed to 10 to 15 students to study the student belongingness. This survey is anonymous.' Below this is a purple button labeled 'FILL THE SURVEY'. The top-right screenshot shows the 'Home' screen with a title bar and two survey questions. The first question is 'I feel valued.' with response options: 'strongly disagree', 'disagree', 'somewhat disagree', 'somewhat agree', 'agree', and 'strongly agree'. The second question is 'I am proud to be a student at CU.' with the same response options. A purple 'SUBMIT' button is at the bottom. The bottom-left screenshot shows the 'Home' screen with a title bar and three survey questions. The first question is 'I feel a connection with the CU Boulder community.' with response options: 'strongly disagree', 'disagree', 'somewhat disagree', 'somewhat agree', 'agree', and 'strongly agree'. The second question is 'Did you go to library to study with friends' with response options: 'Yes', 'Looking for study space', 'Checking library', and 'Other'. The third question is 'I feel that I belong at CU Boulder.' with response options: 'strongly disagree', 'disagree', 'somewhat disagree', 'somewhat agree', 'agree', and 'strongly agree'. A purple 'SUBMIT' button is at the bottom. The bottom-right screenshot shows the 'Home' screen with a title bar and three survey questions. The first question is 'I feel a connection with the CU Boulder community.' with response options: 'strongly disagree', 'disagree', 'somewhat disagree', 'somewhat agree', 'agree', and 'strongly agree'. The second question is 'Did you go to library to study with friends' with response options: 'Yes', 'Looking for study space', 'Checking library', and 'Other'. The third question is 'I feel that I belong at CU Boulder.' with response options: 'strongly disagree', 'disagree', and 'somewhat disagree'. A purple 'SUBMIT' button is at the bottom.



## **7. LESSONS LEARNED:**

### **I.WHAT WENT WELL?**

1. Designing the survey in the front end went well.
2. Identifying the location was also easy.
3. In the backend everything went well.

### **II. WHAT DIDN'T GO WELL?**

1. Sending push notifications daily was challenging as there are lack of proper tutorials.
2. Retrieving the location daily in a recurring fashion.
3. Explored the cumulosity platform but in turn found out that its paid

### **III. WHAT WAS CONFUSING?**

1. Deciding on a data visualization tool.
2. Deciding on a database that can go well with react-native.

## **REFERENCES**

- [1] <https://www.sciencedirect.com/science/article/pii/S0092656616300526>
- [2] <https://www.tandfonline.com/doi/abs/10.1080/0309877X.2021.1955844?journalCode=cjfh20>
- [3] <https://journalofbigdata.springeropen.com/articles/10.1186/s40537-020-00320-x>
- [4] <https://knowledge.wharton.upenn.edu/article/belonging-at-work/>
- [5] [https://www.researchgate.net/publication/328109869\\_College\\_Students'\\_Sense\\_of\\_Belonging](https://www.researchgate.net/publication/328109869_College_Students'_Sense_of_Belonging)
- [6] <https://www.winlab.rutgers.edu/~gruteser/papers/Marco04.pdf>
- [7] <https://www.sciencedirect.com/science/article/pii/S0092656616300526>
- [8] <https://ieeexplore.ieee.org/abstract/document/4505497>
- [9] <https://files.eric.ed.gov/fulltext/EJ1156289.pdf>
- [10] <https://www.tandfonline.com/doi/full/10.1080/02671522.2019.1615116>