

Lab 1 – Smart City

Team Gold

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CS410

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1 Introduction

Cities are getting bigger and more crowded every year. The United Nations says that by 2050, around 6.5 billion people will be living in cities. Because of this, people deal with more traffic, less space, and slower communication between city systems. The way most cities are built can't handle this kind of growth, so things like traffic, pollution, and poor resource management keep getting worse.

Smart City is our solution to this problem. It's a community-based app that helps people move around the city faster and stay informed. The app uses AI and real-time data from users to make smarter route suggestions and share useful updates. The main goal is to reduce congestion and make it easier for residents, commuters, and city officials to stay connected. Smart City helps people and technology work together so cities can be more organized, efficient, and enjoyable to live in.

2 Product Description

Smart City is an app that gives people live updates about what's happening around them. It shows real-time traffic, crowd levels, and route suggestions based on data from users and sensors. The app doesn't just guide you—it learns and updates itself to make sure everyone gets where they need to go without all the stress of congestion.

One of the main things that makes Smart City different is its **Alternative Destination system**. If too many people are going to the same place, the app uses live data to suggest other nearby spots that aren't as crowded. It connects with the Google Maps API and works with a **dynamic queue system** that spreads users out evenly. This helps fix the *Braess Paradox*, which is when rerouting people accidentally creates new traffic jams.

Overall, Smart City makes city life smoother by combining AI, user data, and smart design. It's helpful for anyone—whether you're driving, managing a business, or planning for a city because it uses information from the people who live there to make daily life a little easier.

2.1 Key Product Features and Capabilities

- Key product features include an engaging user interface with community dashboard and navigation, efficient data handling by processing and storing collected data, providing insights based on the data collected with the assistance of AI.
- Smart City is significant and unique as we aim to eliminate the barriers to data collection while providing a one-stop solution that enables citizens to navigate their communities in a simpler manner.
- Smart City looks to solve the problem of rapid urbanization and overcrowding that has been trending globally.
- By implementing a software-based solution, we aim to provide citizens with the tools they need to navigate their community without any hassle. By providing a user engaging experience, our application will be able to gather user data in a secure and private

manner. City officials and planners can then use this data to make plans for the city. For example, analyzing user traffic data to implement changes regarding roadways and highways

2.2 Major Components (Hardware/Software)

- Hardware needed to support the solution includes a computer to access the web application in charge of handling the data, a smartphone (iOS or Android) for users to access the application for navigation and community hub and Internet connectivity is needed to engage with the application.
- The Major Functional Components Diagram is split into three different sections. We first have the presentation layer which allows users and city officials to engage with the application. Then we have the application layer which provides the logical components that make up the application. This includes the core data handling logic. Lastly, we have the data layer which houses the database we will use for data storage.
- The user application and data platform modules will be developed using the React Native Framework. The user application will interact with APIs such as Heat Maps Google API, Google Places API, and Google Maps with the react-native-maps framework. We will be using JavaScript for front end and Java for backend development along. We will use the Firebase library to implement our database.

3 Identification of Case Study

3.1 Who It's For

- Local city residents and commuters who want real time traffic, event, and safety updates
- Community members who share or check local updates
- City officials using data insights to improve their decision making

3.2 Why

- Make commuting easier and reduce traffic issues
- Help people stay informed about what's happening around them
- Combines navigation, community input, and APIs/AI all into 1 app

3.3 Case Study Group

- Small group of ODU students (5-10) and nearby residents that commute around campus and surrounding area
- They'll use the prototype and give feedback

3.4 Potential Future Uses

- Broader city population (Norfolk, Hampton Roads)
- Local businesses that want to share events or receive data insights
- City planners using our data
- Visitors or tourists using the app for navigation and local updates

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4 Glossary

Internet of Things (IoT): systems that combine sensing, computing, communication, and actuation to connect physical/cyber objects

Application Programming Interface (API): a set of features and rules that lets software interact with other software (a “contract” between programs)

Crowdsourced Reporting: gathering information by soliciting contributions from a large group of people, typically via the internet

Privacy-by-Design (“Privacy-First Design”): building systems so that, by design and by default, only the personal data necessary for a purpose are processed

Open Data (Open Data Access): data anyone can freely use, re-use, and redistribute, with at most attribution/share-alike requirements

Predictive AI / AI-Powered Forecasting: using data, statistical algorithms, and ML to estimate the likelihood of future outcomes

Anomaly Detection: identifying data patterns that deviate from expected behavior

Access Control: controls that enforce authorized access to information and system resources in line with policy

Citizen Feedback Loop: a two-way process where institutions act on and report back about citizen input to sustain engagement and trust

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