Team Green Flash Project Report

INTRODUCTION

1.1 Overview

- Want to reduce the Kms driven and minimize CO2 Emission?
- Want to optimize your daily delivery routes and lessen the cost of **Last Mile Delivery**?
- Want to solve real world Environment issues through gamification?
- Want to avoid last minute obstacles in between your journey?
- Want to increase your job efficiency and improve customer service?

In India millions of deliveries take place every day. Ever wondered what impact it leads to our environment?The effects of a changing climate are visible: droughts, reduced harvests, and increase in the consumption of fossil fuels, Since non-renewable energy takes millions of years to form. Moreover, we burn petroleum, coal, and natural gas. Our air fills up with dangerous pollutants, which leads to rise in earth's temperature. Keeping all this in mind we thought about a solution that can help overcome these issues.

Green Flash is a product based solution which comes with a Green Flash web app and a Flash board admin panel. **When we went through the solutions of the industry and studying all their pros and cons brainstorming ideas on the white board, doing our part of "Operations research" we went down the life cycle of "Supply chain" and got to a point where we realized how "Last Mile Delivery" (which is delivery of the parcel of customer from city warehouse to doorstep) this took up maximum of time cost and increased carbon emission more than in any other step of supply chain, so we shaped our vision on Last Mile Delivery.**

As a local living in a particular area for a long time, we know all the shortcuts, all the downfalls of a particular route. So why not use this superpower to challenge machine learning intelligence to earn some rewards.Does coming up with our tagline "Google se phele Local".

So basically our idea is to build an application that collects local people's data as their normal day to day travel routine and if we found any shorter path as compared to already existing solutions , the locals would receive points and further we can use this data in delivery optimization.

Here we have defined a few entities gamers, bikers and admin -

Gamers - Locals (One who provide us the DATA)

Bikers - delivery person

Admin - The manager of software (Flash Board Admin)

How this entities will progress and fulfill their tasks will be defined in Novelty/Uniqueness

So to very clearly define this terms -

- Gamers - Locals using the app will be called gamers as we have decided to gamify this application to make it more fun for the users.
- Bikers - The delivery person who will be using the optimized routes for delivery will be called bikers.
- Admin - The one to manage the gamer's data and track the bikers will be called the admin.

The working of Bikers(Delivery Person),Gamers(Locals) and Admin will be clearly defined in Ahead.

So Basically our data is vast and more of quality which makes our ML model more efficient and reliable.

We had a though is google maps not doing it and here is what we found -
It's possible to use Google Maps to optimize routes if you only have one or two deliveries,but beyond that Google Maps is a poor tool for route optimization because to truly optimize your routes you'd have to manually enter each possible variation of stops to see which one is shortest.

A brief description about your project

1.2 Purpose

The use of this project. What can be achieved using this.

Highlights Of Our Project :

- To ensure the drivers spend less time on the road.
- To reduce fuel costs and other vehicle maintenance charges.
- To increase the number of stops in a day.
- Solving real world Environment issues through gamification.
- Identifies Most effective routes.
- Logistics companies can buy data from us
- **Locals doing something Productive** while doing their work simultaneously

More number of jobs per day

This software helps identify the most cost effective routes.

2 LITERATURE SURVEY

2.1 Existing problem
Existing approaches or method to solve this problem
2.2 Proposed solution
What is the method or solution suggested by you?

As we think of navigating apps, Google maps is the first to get in our mind.The navigation app is used by both people and some services like Uber, flipkart, zomato that use Google's mapping solution. There are some services that offer navigation, like MapMyIndia and a few more, but none refined enough to guide you on a daily basis on your mobile device.
No doubt, it’s a great application, but still it has some drawbacks:

Google Maps does not have up-to-the-minute information on unusual conditions, such

as roads damaged by weather, blocked by street fairs or altered by recent construction work

A recent experience was my road trip, wherein Google Maps kept diverting us through small villages and bad road patches when there were better roads with no reported jams whatsoever. In one instance, Google Maps almost re-routed us to take a 7-kilometer longer route to one of our destinations until we decided **to stop and check with a local**.

While researching about the problems "**to stop and check with a local**" this line hit us and we thought why not build an application that integrates locals into an app that can be with us throughout our journey to guide us.

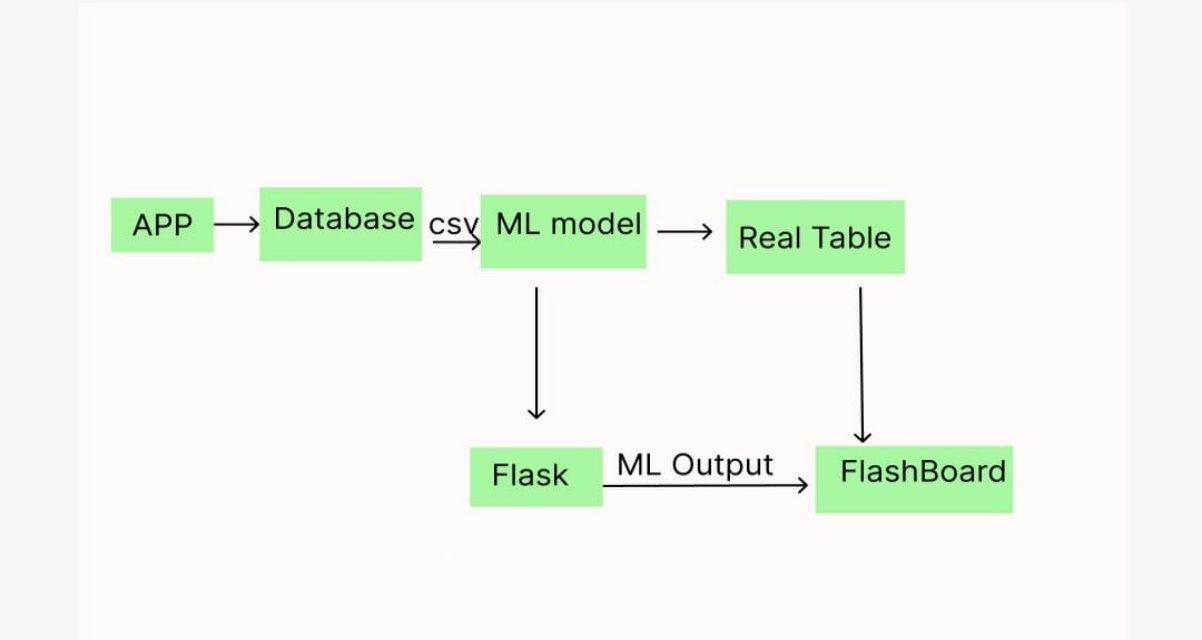
Here are the four basic steps happening in our project which we will explain further in depth along with the flowchart:

1. Track
2. Routes saved in db and export csv
3. Comparison of routes through ml
4. Results on dashboard

3 THEORETICAL ANALYSIS

3.1 Block diagram

Diagrammatic overview of the project.



3.2 Hardware / Software designing

Hardware and software requirements of the project

Software requirement specification :

The minimum software requirement specifications for developing this software are as follows :

- Operating System
- Presentation layer
- Database
- Presentation
- Documentation Tools

Hardware requirement specification :

- Processor
- RAM
- Hard Disk
- Monitor

ALGORITHMS:

1. RANSAC

Technologies & tools:

Front - End ,UI/UX

- Figma
- Canva
- Flask
- HTML,CSS,Javascript, python

Back - End

- Php MySql
- Table plus
- Filezilla

Cloud Service

- AWS
- Watson Assistant

For Data Analytics

- Excel
- Google Maps
- Php,MySql

For Machine learning

- Python
- Google colab

Deployment

- Flask
- Graph Theory

4 EXPERIMENTAL INVESTIGATIONS

Analysis or the investigation made while working on the solution.

1. RANSAC - (Random Sample Consensus) is an iterative method to estimate parameters of a mathematical model from a set of observed data that contains outliers algorithm takes linear regression algorithm to the next level by excluding the outliers in the training dataset. We have used this algorithm in order to exclude all the routes given by local which are same as the route given in pre-existing solution

2. Polyline encoding - Polyline encoding is **a lossy compression algorithm that allows you to store a series of coordinates as a single string**. Point coordinates are encoded using signed values.This was done in order to compress our coordinates data into a string.

3. Regression -Regression is a method to determine the statistical relationship between a dependent variables.We carried out some regressions in order to determine time and distance correlation for each map.

4. Watson Assistant - Watson Assistant is a highly effective way to create your own chatbot ,it will help us retrieve information from the gamers about the obstacles which came in between their journey which will further help us to choose a better route.

5. AWS - We used AWS cloud to store our web application and also the database. AWS - We used AWS cloud to store our web application and also the database.

6. Filezilla - To access our files deployed on cloud server

7. Table plus- To connect DBMS with app deployed on cloud

8. VS code - VS code editor for editing our front end for Dashboard.

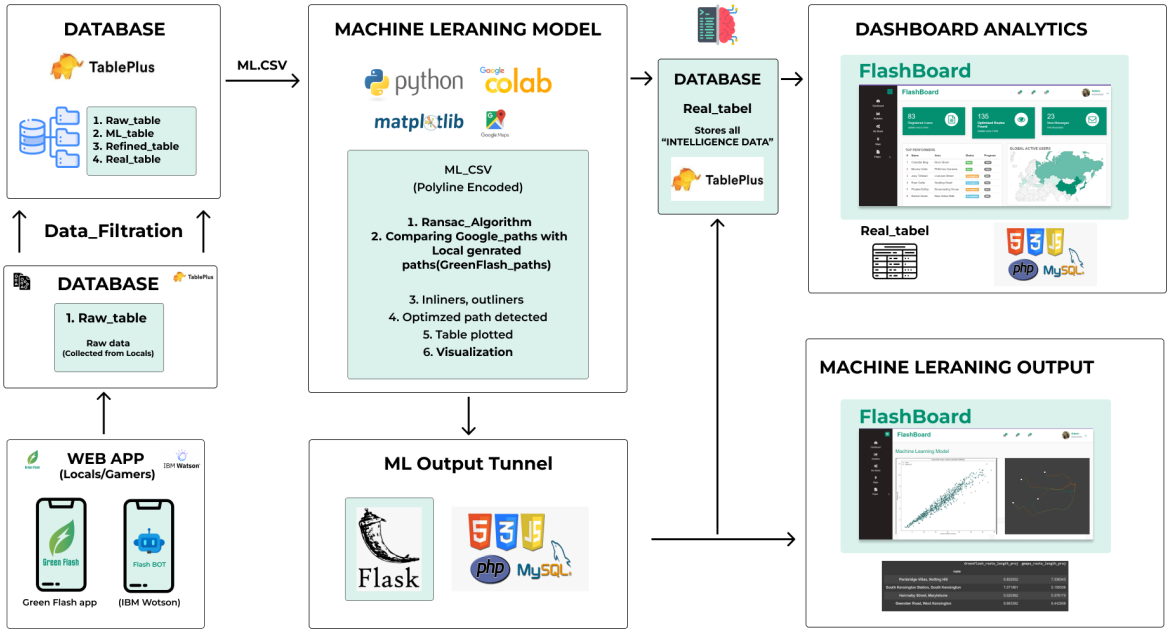
9. Google colab - To run our ML model

10. Important Libraries used in Python

- Basemap
- Fiona
- Pandas
- Geojson
- Matplotlib
- Sklearn
- Shapely
- Numpy
- Lxml
- Requests
- itertoolsmpl_toolkits

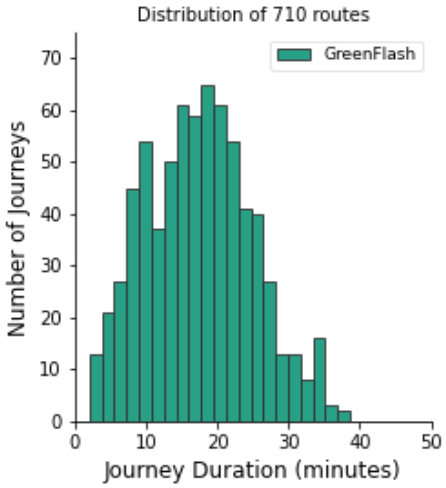
5 FLOWCHART

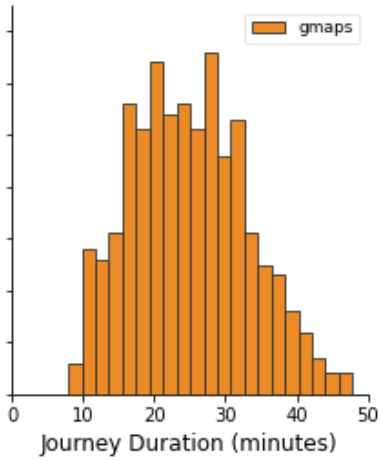
Diagram showing the control flow of the solution

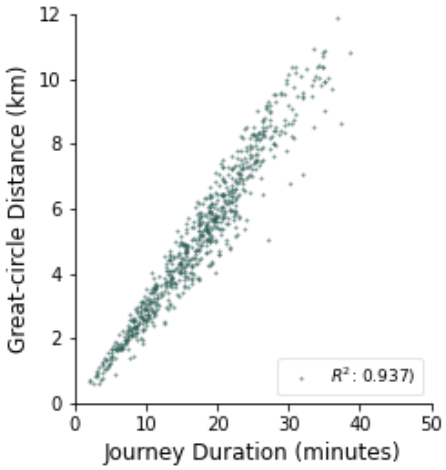


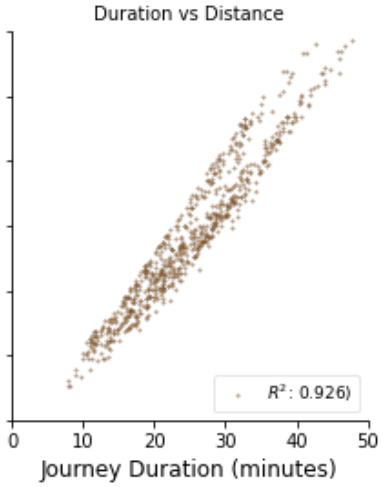
6 RESULT

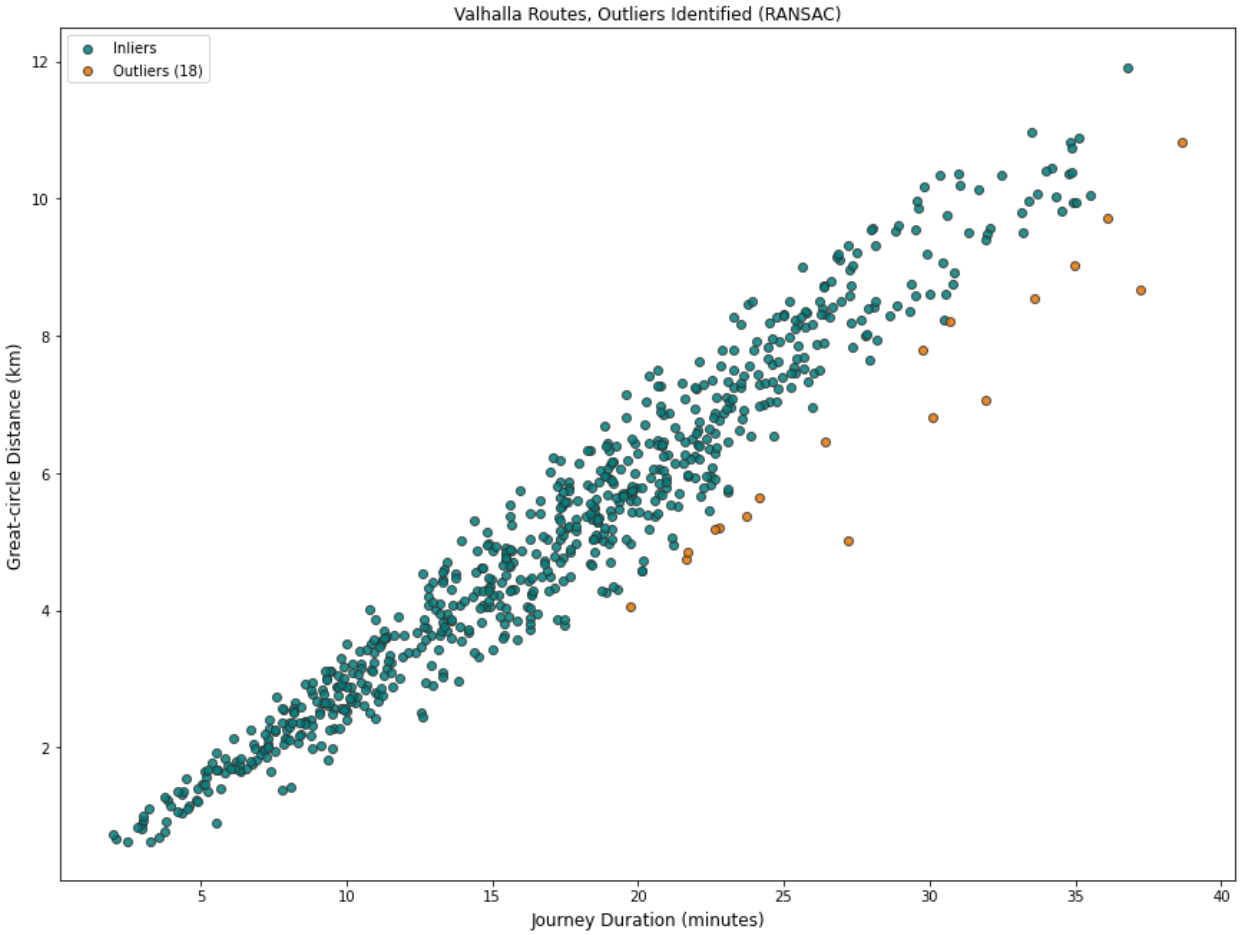
Final findings (Output) of the project along with screenshots.


Distribution of 710 routes
GreenFlash
Number of Journeys
Journey Duration (minutes)


gmaps
Journey Duration (minutes)


Great-circle Distance (km)
R^2: 0.937)
Journey Duration (minutes)


Duration vs Distance
R^2: 0.926)
Journey Duration (minutes)



name	GreenFlash_route_length_proj	gmaps_route_length_proj
Pembridge Villas, Notting Hill	6.802932	7.336343
South Kensington Station, South Kensington	7.071861	5.199306
Harrowby Street, Marylebone	5.020362	5.376170
Gwendwr Road, West Kensington	8.663382	8.442908

```
name
Pembridge Villas, Notting Hill                    True
South Kensington Station, South Kensington       False
Harrowby Street, Marylebone                       True
Gwendwr Road, West Kensington                    False
dtype: bool
```

name	
Pembridge Villas, Notting Hill	6.802932
South Kensington Station, South Kensington	5.199306
Harrowby Street, Marylebone	5.020362
Gwendwr Road, West Kensington	8.442908

Shorter-than-expected Routes, GreenFlash(4 Routes)

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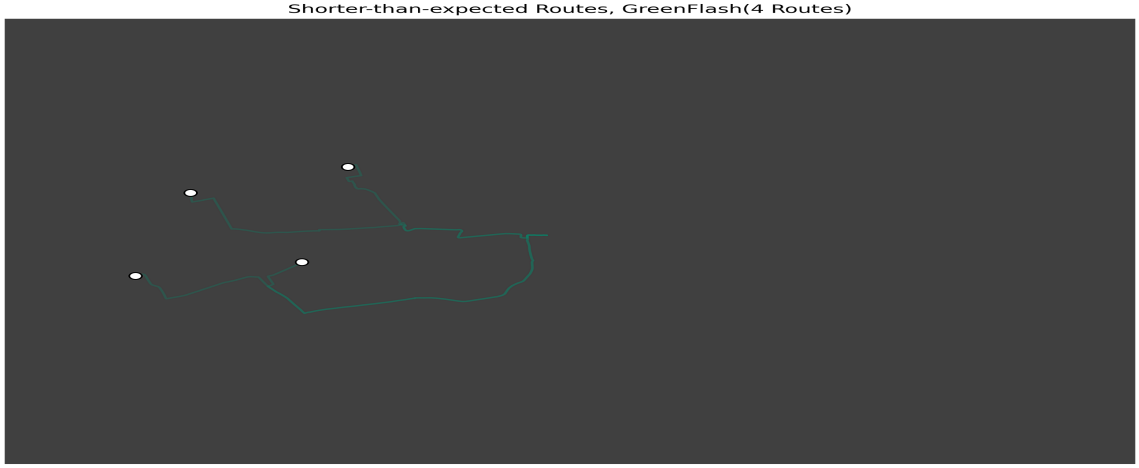

7 ADVANTAGES & DISADVANTAGES

List of advantages and disadvantages of the proposed solution

Advantages:

1. Based on a reliable source ei locals.
2. Goodwill through an interactive way.
3. Improve cosumer’s experience
4. Less hectic for drivers.
5. Increase vehicle utilization
6. Is cheaper, more efficient and more scalable.
7. Is more up-to-date, performant and has customisable algorithms and iteration logic.
8. Foreign countries are using v2v (Vehicle to Vehicle) technology which is not possible in India right now, our app can be a great alternative for that.

Disadvantages:

1. Real time traffic updates
2. Does not predict differences in fuel consumption on regular route vs optimized route.
3. Assistant at the end of journey, due to this local might forget the location of the obstacle.
4. Google maps comes pre installed in almost every phone, adapting to a new application

might take time.

5. There might be a gap between theory and practicality.
6. Might not be applicable for foreign countries where google is more authorized.

8 APPLICATIONS

The areas where this solution can be applied

Increasing Adoption of Route Optimization Software by Logistics Companies

- ecommerce business

Globally, online shopping is on the boom. The world's booming e-Commerce business is due to increasing digitization and smartphone usage. The rise of e-Commerce in Asia-Pacific has boosted online delivery. E-commerce enterprises are increasingly implementing route optimization technologies to optimize delivery efficiency and consumer satisfaction. Customers nowadays demand next-day delivery, and businesses struggle to meet deadlines.

Ecommerce retailers need quick and reliable delivery route optimization software for that last mile delivery.

- Medical use

Route optimization makes your last mile delivery operations streamlined, flexible, and fast. It helps you to deliver pharma supplies at your customer's convenience by planning delivery schedules automatically. Moreover, it also ensures that you cover a maximum number of stops by covering the minimum possible distance.

Gamers(locals) Application:

☆ Gamification for Gamers(locals)

Rewards - The gamers can earn rewards in the form of points.

Feature of rewards:

☆ Exchange points with coupons.

☆ Prefering bicycle over bike will provide some increment in points.

☆ Gamers can suggest best parking spots in an area - walk / cycle / bike.

☆ People's health will eventually improve (Reward of plant trees).

☆ Concentrating on ecological concept with optimized delivery.

Admin(dashboard) Application:

☆ Can review all the backend activities and analytics through FlashBoard.

9 CONCLUSION

Conclusion summarizing the entire work and findings.

The project building work brought alot of experience and skills along. We learnt alot from IBM, the bootcamps were of great knowledge and also helped in making of this project.As a first ptoject for our team, it will be a lifetime memory. Thank you IBM for giving us this opportunity.

10 FUTURE SCOPE

Route Optimization is a very scalable,flexible and productive field, as the IBM Hackathon tagline says "Code for a better future" the intention of choosing this problem statement was that Optimization is the future. There are endless possible enhancements that can be made in the future,here are few that we thought about:

- Real time GPS tracking
- After receiving wide range of data we can launch the same service for locals
- Interegrate voice assistant so that user can inform us about the obstacle at the right time.
- Istead of being data oriented service we can build an application for drivers and become product based.

11 BIBLIOGRAPHY

- References of previous works or websites visited/ books referred for analysis about the project, solution previous findings etc.
- Optimo Route -https://optimoroute.com/
- ibm drone - https://www.ibm.com/case-studies/c848309d42496w67

https://flytzip.com/

https://flytbase.com/drone-delivery/

https://www.upperinc.com/

- Last mile delivery

https://www.wipro.com/business-process/the-future-of-delivery-with-drones-contactless-accurate-and-high-speed/

- Github

https://github.com/LaurentVeysseir/Route-planner-algorithm

IMPORTANT LINKS:

- My Maps - https://www.google.com/maps/d/u/0/
- GPS Tracker - https://try.locate2u.com/global-gps-tracking-2/?utm_campaign=GPS%20Tracking%20-%20Global&utm_source=ppc&utm_medium=capterra&utm_term=gps%20tracking&utm_content=destination%20url%20capterra

- DA Code

https://www.geeksforgeeks.org/python-program-for-dijkstras-shortest-path-algorithm-greedy-algo-7/

- ACO towardsDS

https://towardsdatascience.com/the-inspiration-of-an-ant-colony-optimization-f377568ea03f

https://towardsdatascience.com/using-ant-colony-and-genetic-evolution-to-optimize-ride-sharing-trip-duration-56194215923f

APPENDIX

1. SOURCE CODE
   Attach the code for the solution built