

「The Road Less Traveled」

Black Ice

1. Social Background & Motivation

COVID-19 is the ongoing pandemic that is infecting millions around the world. Families have been separated and workers have been stranded in danger. In such devastating occurrences, the subway and bus stations in Japan are still in frequent use. ¹Approximately 6.4 million people ride the Tokyo metro each day. Furthermore, the city of Tokyo has many rush hours ranging throughout each day which creates great concentrations of people, a highly vulnerable situation that can lead to mass infection. ²The social distancing policy also has heavy impacts on human mental health, with 47% of US adults reporting feelings of depression. In response to this large scale pandemic we've established our product, "The Road Less Travelled" (RLT).

2. Description of Business

RLT is a mobile application that serves two purposes: determining optimal travel routes for commuters and suggesting optimal gathering locations with less population concentration. Both of these purposes stem from our machine learning algorithm, which utilizes security camera footage from local restaurants, malls, and other public locations to provide an estimate of population data in a given area, all of which is done with and through close cooperation with the local government. In the modern world, there exists an expansive network of security cameras providing constant surveillance around cities worldwide, whose data hold high utility potential. For example, ³Tokyo plans on installing an additional 22,000 security cameras on metros in 2020. Using this footage, RLT is able to generate an estimate of real-time population concentration in public areas through object detection algorithms, namely ⁴Convolutional Neural Network (CNN), which ensures speed by only requiring one forward propagation pass through the network to make a prediction, making it optimal for real-time detection. The object detection algorithm is perfected through deep machine learning through stimulation using sample data imagery.

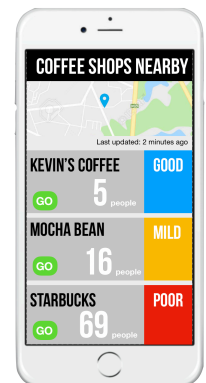
When logging onto our app, users will be able to find a list of recommended gathering locations, determined based on the user's current location and the population concentration levels in nearby gathering areas through the use of our machine-learning algorithm. This allows families and friends to find suitable spots for social gatherings without heavily exposing themselves to the risk

of contracting COVID-19, addressing the issue of loneliness due to the lack of social interaction by highly reducing risk. Currently, many people are opting to lock themselves at home due to hysteria regarding the danger of contracting the virus.

⁵While this does keep them safe from COVID-19, it leads them to sacrifice social interaction with their family and friends, which is crucial towards wellbeing and mental health. Our app makes users feel more comfortable and safe going outside,

allowing them to achieve a more optimal lifestyle balance by improving mental health. Secondly, commuters are able to input their desired destination, and our algorithm will generate the optimal travel route for them that limits social interaction and prevents crowding. The navigation system will borrow the Google Maps pathfinding algorithms with an additional Deep Reinforcement Learning model. The machine learning model will have higher reward values for paths with less people and lower reward values for paths that are crowded. The algorithm incorporates this to achieve the best balance between efficiency and safety, aiming to bring the user to their destination as fast as possible, and as safe as possible. RLT aids the combat against the fears that COVID-19 has shed upon our society and gifts users with a sense of reassurance through reunification with their loved ones, in addition to an added level of physical safety.

RLT earns revenue in a variety of different ways. Since we are a social organization that aims to benefit society, we would likely receive government subsidies in order to fund our operation. ⁶To add on, since 90% of iOS Apps are free, we believe that RLT should also be free to download in order to increase usage. However, we would still be able to earn revenue by running advertisements within the



RLT's User Interface

¹<https://www.tripsavvy.com/the-worlds-busiest-subway-systems-4146031>

²<https://www.kff.org/coronavirus-covid-19/issue-brief/the-implications-of-covid-19-for-mental-health-and-substance-use/>

³<https://securitytoday.com/articles/2019/03/12/tokyo-to-install-22000-security-cameras-on-metro-in-advance-of-2020-olympics.aspx?admgarea=ht.networkcentric&m=1>

⁴<https://medium.com/@akash29/real-time-object-detection-for-a-specific-objects-on-tensorflow-apps-7a60fd39e1e>

⁵<https://www.nytimes.com/2017/06/12/well/live/having-friends-is-good-for-you.html>

app. Our large potential user base would mean that advertisements on our app would receive high viewership; this would lead to us being able to charge higher prices and thus would increase our revenue.

Sustainability and Social Development:

RLT benefits local small restaurant or shop owners who typically do not receive much foot traffic; these small business owners are the ones who are being harmed most by COVID-19. Our app is able to recommend these lesser known meetup locations over popular locations such as Starbucks and McDonalds, granting these smaller businesses more publicity and promotion during this time of crisis. This would drastically improve local economies and the wellbeing of disadvantaged small business owners and employees. In terms of sustainability, the collection of the data that RLT analyzes does not require the construction of any additional infrastructure, as it is already being collected by preexisting security cameras. Furthermore, RLT makes public transportation safer by preventing crowding, which encourages the use of public transportation and reduces carbon emissions. All in all, RLT makes cities cleaner, greener, and healthier.

3. Marketing:

During the COVID-19 pandemic, our target customers are commuters who require the use of public transportation, such as workers and students and also that are separated from their families and friends since they cannot find a safe space to meet up. RLT will attract its first level of consumers by approaching the Japanese government in order to gain access to security cameras in public areas. At the same time, it will attend restaurant/plaza industry conferences in order to spread awareness of RLT's existence and also initiate potential partnerships. After the cornerstones of the business are established, RLT will make their product known to the public by running social media advertisements. Apps and websites such as Instagram, Facebook, and YouTube are known for their appeal to a variety of generations.⁷ These social media advertisements will be especially effective during times of pandemics as the average time spent on social media has greatly increased. Our competitors, navigation applications such as Google Maps and Baidu Maps operate in a way that is similar to RLT in that they process traffic data in real time and suggest potential paths to a given destination. However, RLT's unique selling point is that RLT offers optimal paths based on real time *human traffic* rather than car traffic a groundbreaking service that competitors have failed to dissect. RLT can also recommend gathering locations through machine learning, while competitors are solely limited to navigation.

4. Financial Plan:

As a social organization, RLT will rely on the government for financial support, especially in the first two years when the company is still in debt. The reliance on the government will root from either of two forms: from government subsidies or from forming a PPP (private public partnership) with the government. The reason for the negative profits in the early years is due to the high amounts of R&D, a large part of which is market research. Brand awareness is also very critical for an app like RLT's, and therefore, RLT will require high amounts of promotion for the first years. Profit will start to materialize in Year 3, due to the exponential increase in sales as the app becomes more popular and begins to generate more revenue from selling advertisement spots on the app.

Amount in JPY (<u>per 1,000 JPY</u>)	Year 1	Year 2	Year 3
Revenue	7,534	34,723	153,129
Costs of Goods Sold	11,200	13,539	19,831
Gross Profit	-3666	21,184	133,298
Less Expenses	134,756 (1,2)	100,431 (1,2)	98,237 (1,2)
EBIT	-138,422	-79,247	35,061
Net Profit after Interest and Tax	-138,574	-79,384	30,492

⁶<https://techcrunch.com/2013/07/18/paid-apps-on-the-decline-90-of-ios-apps-are-free-up-from-80-84-during-2010-2012-says-flurry/>

⁷<https://www.nytimes.com/interactive/2020/04/07/technology/coronavirus-internet-use.html>