Competitor Package

The year is 2030.

Over the past decade the world has faced disease, social injustices, and economic hardships, all while the threat of climate change and environmental degradation loom in the horizon. However, humans are an ever-adapting species, and are slowly acclimating to their new world. As a result, there have been global shifts in the way the world operates.

Closer to home, Ontario is looking towards city growth to help spur the local economy and build resiliency. The Ontario Government has recently created an action plan to restart urban development on Toronto's Quayside. On May 7th, 2020 Sidewalk Labs ended their project to develop a Smart City on this 4.8-acre parcel of waterfront property. Since then, this piece of government-owned land has been left unattended to. But as the city of Toronto continues to rapidly grow, so does the need for a new city centre.

Ontario's new action plan is all about developing the downtown quayside and Toronto Islands area into a new urban centre that supports the growth of the Greater Toronto Area. The government has introduced a set of key strategic pillars to define the project's trajectory:

- ***Environmental Sustainability***: Reducing carbon emissions, and city waste.
- ***Healthcare Accessibility***: Build systems and infrastructure that improves access to health and medical services.
- ***Flexible Transportation***: To support the culture shift towards a predominantly "work from home" society.
- ***Privacy Safeguarding***: Using technology in ethical ways, to not infringe on citizens' privacy.

With this plan in place, the government has been looking to local Scientists and Engineers to help develop this new city. Afterall, who knows Toronto better than its own citizens? This project is an expensive one, and the government is working on getting additional stakeholders to invest in this new city model. You and your team have been brought on as the first round of researchers and developers. You will develop prototypes to entice current stakeholders and pitch new ideas to attract more investors to this project.

The goal of the "Smart City" is to leverage advances in technology to build a new city centre, while keeping focus on their four strategic goals so that the city better reflects the world of 2030. Your team has the next 30 hours to develop, prototype, and innovate the future of Project Waterfront.

Welcome to Lassonde Games 2021!

LASSONDE GAMES

Project Waterfront will include commercial, residential, and tourism-based sections, and will include the development of the land formerly occupied by Ontario Place, as well as redeveloping portions of Centre Island. The project site is an impressive 26 km^2 region, including multiple islands, tourism hotspots, an airport, and many natural spaces. This region will also be home to Toronto's thriving technology industry, as a place for innovative growth. Below is a map of the defined site, along with some key points of interest, and land divisions. It is important to understand the context of the project site, which may help motivate decisions you make within the three problems.

Please explore Project Waterfront to view the 7 planned regions and uses. The link includes boundaries, and information about various locations. Please use this information as guidance towards developing your solutions when necessary.

View Project Waterfront

Your team will be given a Google Drive link where all file submissions should be placed by **February 6th, 2021 at 11:59 PM**!

PROTOTYPING CHALLENGE
SPONSORED BY:

One of the major goals of Project Waterfront is to use the site as a catalyst for positive environmental change, with new innovative solutions for issues involved in urban development. Over the years, Lake Ontario has become increasingly polluted with plastic bottles, bags, and many other pieces of debris. In 2018, the Ocean Conservatory estimated an annual 650 kg of litter enter Lake Ontario every year and now 12 years later, that number has since doubled.

With this shocking statistic in mind, the Ontario government has made it a priority for Project Waterfront to not only limit its production of litter, but to be actively involved in the cleanup of one of the world's largest freshwater reserves. Top researchers from the highly acclaimed Lassonde School of Engineering have recommended the use of an autonomous robotic collection system. Your team has been tasked with developing a proof-of-concept system to better control the rampant growth of litter within Lake Ontario. This is a critical aspect of Project Waterfront and will be a key facet of projects vision to have a sustainable, technology-driven city.

Mission Statement:

Your task is to design a prototype schematic of your team's novel aquatic cleanup system. Though the researchers at Lassonde have recommended an aquatic system, the details of implementation have been left to the discretion of your team's robotics division. Systems can be docked on land or allowed into the lake. These systems can be actively driven, or passive floaters, it can be one combined system or multiple parallel ones, there are no constraints on the type of system created. It is important to mention that as the robotics team, it is your job to only develop the catching mechanism and design the algorithms for movement. The waste disposal is a worry for a different team!

Though the solution is open-ended, there are many factors that should be considered when developing the system. Some notable factors to consider are how this system will be powered (remember this is a green city), amount of maintenance or level of human interaction which could result in large costs in the future. How the system handles Toronto weather, and the scalability of this system could also be significant factors. The system will be deployed from Cherry Beach, which will be a business location within the new development, so making sure the system is not obtrusive could also be something to consider. These aforementioned factors are not all equally important and do not represent all the possible factors that could be considered. They are simply starting points for how your team should think about this problem. It is up to your team to think about as many design factors as you can when building your prototype.

Deliverables:

For this challenge, your team is expected to design a CAD Model of your aquatic litter retrieval system. Your team may wish to include other information within their submission and all files should be maintained in a Google Drive directory named *Prototyping* which will be shared for judging. During the judging period, your team will have **8 minutes of demo, and 5 minutes of Q&A**. This is an informal presentation, but a set of PowerPoint slides is recommended. These slides should be used to show the main aspects of the design, and various points of interest within it. Treat the presentation as a replacement for a physical model, rather than a formally structured presentation. Your team may also want to consider multiple schematics depicting different angles, or parts of the design that you wish to highlight. In addition, students should also be prepared to answer questions from the judges.

Tools:

Your team can use any piece of software you would like. There are many great free CAD programs available including TinkerCAD (for groups who are new to CAD), FreeCAD or AutoCAD for people with more experience. As a team you may also wish to design a hardware schematic if you have more skills in those areas rather then focusing solely on a CAD design (but there still must be some schematic of the physical device).

You can use opensource projects, but they must be referenced within your design/presentation. Opensource projects must not be the entirety of the project, but used for smaller subcomponents, or as a springboard for your unique design.

RUBRIC CRITERIA:

Prototype:	**/60**
Does the proposed design sufficiently solve the problem statement?	/15
Was the prototype detailed enough for fabrication?	/10
Does the prototype accurately model their described design?	/10
Did the team use appropriate modelling software to build their prototype?	/5
Does the team directly address other considerations within the physical design? (Such as but not limited to environmental conditions, low maintenance, simplicity of design, power consumption, scalability, pollution, etc.)?	/20
Design:	**/30**
Can the team explain the benefits and drawbacks of their design?	/15
Can the team explain changes they would make to further improve their design, and why these were not included in the original design?	/15
Demo:	**/10**
Are all team members knowledgeable about their design?	/5
Does the team appear to work well together?	/5

PROGRAMMING CHALLENGE
SPONSORED BY:

Developing a future city is not only about integrating technology into infrastructure, but it is also about connecting the citizens to that infrastructure. Over the years, Toronto's population has not only been growing, but it has also been aging. The senior population alone has increased to 19%, which accounts for approximately 678,000 citizens. This demographic is considered to be one of the most at-risk when it comes to healthcare.

Since the global pandemic of 2020, accessible healthcare has become a growing concern for people all over the world. For this reason, the Ontario Government has made this a key focus for Project Waterfront. Innovators from the Lighthouse Discovery District have enlisted the help of you and your team to develop healthcare solutions with a high regard for senior citizens in this future city development.

Many facilities around the world have already been relying more on technology to help them connect with patients, manage daily operations, and even transport medical samples and supplies. As an example, Ruby Hall Hospital in Pune adopted a software-based solution capable of handling the billing and reporting requirements associated with corporate health check-ups, while improving patient experience. In addition, UPS conducted a trial program called Flight Forward to utilize autonomous drones for delivering blood and tissue samples between different branches of a hospital. At a more individual level, applications such as GreatCall have been developed as an emergency response system for seniors.

Mission Statement:

Your task is to design and develop a software system to improve the autonomy and accessibility of healthcare among the senior population in Toronto's Quayside. Healthcare in this context spans a multitude of areas including nursing/house calls, hospital visits, clinic appointments, emergency response, and even routine at-home medications.

Your focus will be on user experience and overall lifestyle benefit. The system should make some healthcare-related aspect of the user's life easier or more accessible. You can develop your solution in any programming language and use any libraries/APIs/third-party services as you see fit (with proper crediting and acknowledgements).

You must justify all design choices made throughout the development process including your target audience. You can target the senior population as a whole or make your solution niche to a more specific subset of that demographic. You can choose to solve one major problem or multiple smaller ones. Your system can be interactive or completely automated (i.e. a UI is not a *requirement* for user experience). If you choose to develop a system that is meant to integrate with some hardware component, focus on the software and simulate the intended real-world usage during your demo.

You can assume your target users have a basic understanding of technology and have access to a device that can use your system.

Deliverables:

Your team is expected to submit all code files to a Google Drive directory named *Programming* which will be shared for judging. During the judging period, your team will have **8 minutes of demo, and 5 minutes of Q&A**. This is an informal presentation, so a set of PowerPoint slides is optional. Your presentation should be used to explain a high-level overview of your solution, your major design choices, and a demo of your functional code in practice. In addition, students should also be prepared to answer questions from the judges.

RUBRIC CRITERIA:

Code:	**/50**
Is the code executable without errors? Does the system handle edge cases?	/5
Is the system easy to set up and run?	/10
Is the system intuitive and easy to use?	/20
Does the system fulfill the requirements proposed by the team?	/15
Design:	**/40**
Does the team have a clear idea of their target users and the specific problem they are trying to solve?	/5
Can the team explain the benefits and drawbacks of their design?	/10
Are the team's design choices logical and feasible for the scope of this task? Can the team justify their design choices in terms of feasibility and real-world usage of their system?	/15
Can the team explain any future applications or implementations of their design, or anything missing from their original design?	/10
Demo:	**/10**
Are all team members knowledgeable about their design?	/5
Does the team appear to work well together?	/5

INNOVATIVE DESIGN CHALLENGE
SPONSORED BY:

Transportation systems are the backbone of urban living, and yet innovation within this field has been slow over the past decades. For example, had the transportation industry kept pace with the computing industry, today we would be able to travel from New York to London in a second for a penny. Imagine how different our lives would be if that statement were true.

Here at Project Waterfront, we do not shy away from innovation, and transportation is no exception. Creating a ubiquitous transportation system for a growing city is no easy task, but one that is essential to the success of the project.

Transportation in and around Toronto has changed drastically over the past 10 years. Many institutions have adopted hybrid work from home policies, and when/where people travel has shifted tremendously.

Mission Statement:

Your team must design the transportation infrastructure for the waterfront area. This plan should mainly focus on public transit, and/or transit systems to support supply chain. Transportation systems are not one-size fits all, and many cities have adopted unique ways to solve their transportation needs. Whether it be the Hyperloop in San Francisco, Norway's submerged floating tunnel system, or Shanghai's elevated cycle path, the way in which city dwellers move is changing.

Your focus will be on the infrastructure of the system, what technologies to use, and the physical design/layout. The system should not be just one type of transportation, but rather a fully connected system for many types of users. There are many factors that your team may wish to consider when designing, such as the speed of transportation and the speed of development (we do not want to wait 10 years for this to be operational). Other factors to consider are cost, extendibility, environmental impact, connectivity to major hubs in the GTA, weather, etc. The geomorphology of the region could also be considered.

Finally, this system is meant to be a major point of interest that will be used as a selling point for Project Waterfront to acquire more investors. Designing something cutting edge and pushing the boundaries of innovation is key.

***Assumptions*:**

You are developing this system to support the traffic within the bounds of Project Waterfront, but you should consider connection points to surrounding regions. You may assume that there will be approximately 50,000 people using some aspect of the infrastructure daily, with heavier tourism traffic during the summer. These users will be travelling from the GTA, to offices, tourism locations and the airport. Please consult the Google Earth project outline for regional information that you can use to help create your system.

***Deliverables*:**

Your team is expected to submit all code files to a Google Drive directory named *Innovative Design* which will be shared for judging. During the judging period, your team will have **8 minutes of presentation, and 5 minutes of Q&A**. This is a formal presentation, so a set of PowerPoint slides is necessary. Your presentation should be used to explain the details of your solution, major design choices, and research that you did. You may also wish to include graphics, and maps to better detail your solution. In addition, students should be prepared to answer questions from the judges.

RUBRIC CRITERIA:

Design:	**/65**
Project Plan	
Has the team included a feasible and organized timeline?	/5
Has the team considered resource and monetary needs of their solution?	/5
Has the team designed a system to support 50,000 passengers?	/10
Innovation of Design	
Has the team design a creative solution to spark the interest of investors?	/10
Has the team considered the project site, and the customers requirements?	/5
Has the team created a solution that will improve transit within Toronto?	/5
Did the team discuss the environmental impact associated with their design?	/5
Additional Design Considerations	
Did the team consider and justify the inclusion/exclusion of other design considerations (e.g. weather, extendibility, maintenance, connectivity, accessibility, efficiency, etc.)	/20
Presentation:	**/25**
Are concepts/ideas explained thoroughly?	/15
Presentation style (e.g. ppt aesthetic, voice projection, eye contact, flow etc.)	/10
Teamwork:	**/10**
Does each group member contribute to the presentation?	/5
Is each group member knowledgeable about the solution?	/5