ECE4873 Project Summary

Project Title	**Prince William Sound Profiler**
Team Members (names and majors)	Seungju Jason Lee, EE
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Course & Section **Primary Advisor**	ECE4873A Dr. Mick West
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Web Site URL	PENDING

Project Abstract **(250-300 words)**	The Exxon Valdez oil spill of 1989 is generally considered to have the largest environmental impact of any oil spill to date. Ocean Scientists at Prince William Sound have been using an underwater profiler to monitor environmental factors. The platform has an anchor that holds it at a specified depth. The platform goes to the surface of the water once a day to transmit a signal that it is still alive. The data collected on ocean life and ocean currents is not transmitted and must be retrieved by scientists. The collected data gives scientists information on how the location and its inhabitants are recovering. There are multiple ways this platform can be improved and updated. Currently, someone must retrieve the platform every few weeks in order to charge the battery and extract data. Over time the battery life has decreased, further increasing the maintenance required. If this maintenance could be decreased that would be a great improvement for the platform. Currently, it is very difficult and expensive to replace the battery. A battery that can be serviced by the scientists themselves would be ideal. The platform has many sensors on board to detect ocean life such as plankton. The current solution to classifying plankton is through the use of machine learning. However, there is room for improvement in this component. There is a weather buoy nearby that could potentially be used to install components on for communication with the platform. Our team is identifying which features/issues to focus our project on.

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List codes and standards that significantly affect your project. Briefly describe how they influenced your design.	If we pursue working on a communication component, we will need to adhere to IEEE 802.11: for wireless communications from profiler to shore. Since we are creating a submersible electric component, we will need to adhere to electronic waterproofing standards
List at least two significant realistic design constraints that applied to your project. Briefly describe how they affected your design.	Two constraints are water and pressure. Everything we design that must go underwater needs to be able to withstand water and the corresponding pressure at the given depth. This is especially important for electronic components. Other constraints are water temperature and water current. All components on the profiler will need to be able to operate in low temperatures. All parts of the profiler will also need to be able to reach the surface despite the strength of the current.
Briefly explain two significant trade-offs considered in your design, including options considered and the solution chosen.	One tradeoff we have to consider is that adding any additional module will increase the power consumed. Since the battery at this point must be changed frequently, we have to consider efficiency of added components. One solution to the issue could be that we develop an improved power system that will allow the profiler to operate for a longer period of time compared to the current iteration despite having additional modules. Another tradeoff is that the longer our profiler or any component stays at the surface, the higher the risk of damage is. This is caused by high boat traffic in the area. A possible solution is optimization of any task that needs to be performed at surface as well as limiting any component that needs to stay at surface level.

Briefly describe the computing aspects of your projects, specifically identifying hardware-software tradeoffs, interfaces, and/or interactions. ***Complete if applicable; required if team includes CmpE majors.***	While the current system already uses machine learning to gather data on plankton ecosystems, our task is to improve upon what is already in place. The originally created neural network algorithm has not been updated since 2019, so there is a possibility that there are new libraries available to upgrade the current system. If we are given the original source code, we will be able to look for any sections of the program(s) that can be optimized, as well. The current profiler also makes use of a fairly primitive communication system, only sending a short signal to indicate that it's still in operation once every 24 hours. We would like to implement a new communication system that can better send stronger signals without a large drain on power. We will need to create a module that can collect pertinent information from both the camera and water tester, create one or more data packets, and transmit these messages either to a relay point on shore or find a way to create reliable communication otherwise.