Identify impact of project on ethical, IP, environment, and sustainability of lit reviews

# Ethical

* Our project approach involves using artificial intelligence and machine learning techniques to determine whether the dataset we have can differentiate between iron, copper, rock etc.
* Current techniques to identify objects on the seafloor include people monitoring data on a computer screen, relying on intuition to find objects. People are switched out every 20 minutes in order to reduce tiredness, which over the long term (couple days), can result in a decrease in quality of human work. Our approach aims to get rid of this human component and rely solely on AI and machine learning techniques. This introduces a common ethical issue involving AI and machine learning since this will result in the loss of jobs for people.
* Thousands of shipwrecks on the ocean floor are under threat by illegal metal salvagers. These shipwrecks usually contain the graves of sailors and are considered war graves. Our software used incorrectly can possibly help contribute to this. Currently, this is mainly happening in the waters around Indonesia. HMS Prince of Wales and HMS Repulse (both sunk by Japanese aircraft) were found in 2014 to have been damaged by scavengers. They contain the graves of 840 sailors.
* In contrast, the approach can also be used to quickly locate wrecks to search for any possible survivors of an incident (involving submarines).

# Intellectual Property

* Currently, you are not able to differentiate between different materials e.g., rock, aluminium, iron, etc.
* We will be using software from Teledyne CARIS called GAM which is an AI tool that removes noise from deep water sonar data
* With this software we plan to make our own AI that will be able to take existing datasets and recognise man-made seabed objects
* Possible IP implications when working with and adapting this software. However since we are working with the business that own it, it should not be a problem
* Since we are not working with any staff from the university and have not discussed any technical details with our project supervisor, any IP that we generate will belong to us and not the university
* If we are to generate IP, then we have briefly discussed working with our external partners to expand upon this and to also try and get funding

# Environment

* Our approach to identifying man-made objects on the seabed can have possible negative effects on the environment depending on who the software is used by. Drilling for oil and natural gas on the ocean floor requires extensive data collection on the surrounding environment. The use of our software could assist in this industry which overall is devastating for the environment.
* Hopefully our approach can help the environment by saving much time which can reduce the duration of a ship at sea, thus reducing fuel and various costs. The search for the ARA San Juan lasted over a year and it had been considered that the probability of locating the wreck in the area where it was eventually found was 90%, but previous searches failed to find it due to insufficient technology and presence of numerous submarine canyons. The submarine was present in the data collected by the search teams, however the insufficient technology meant it was not found. Assuming our approach to the project succeeds, this should greatly reduce the time ships spend in the ocean, therefore producing less carbon emissions and having a smaller effect on the environment.

# Sustainability

* Since our approach is based entirely upon software, this makes it very sustainable
* Possible bugs in software could affect the sustainability
* The goals of this project are to:
  + Review the relevant literature and current classification methods​ to assess areas for improvement
  + Rule out certain paths that the team wouldn’t be able to ​have an impact in
  + Identify areas than can be innovated and innovate in one or more of those areas by the end of the year
  + To learn the existing Teledyne software and its filtering algorithms and to investigate their performance and potential flaws
  + To study the seabed survey data and write necessary programs to pre-process the data​
  + To learn and apply some appropriate artificial intelligence methods/algorithms to classify the seabed survey sonar data with an aim of automating the process​ and potentially using machine learning techniques if feasible by the end of the year
  + To evaluate the effectiveness of the methods developed
* Since the goals listed above are quite open-ended it means that these goals can be passed onto future groups who are also working on this project, making this project very sustainable in the longer-term. Also, since the goals are quite ambitious it will be very easy for this project to be completed over a much longer period of time
* With our approach to this project, we can also increase sustainability of the oceans by more easily identifying marine habitats and other important aspects that are critical to the health of our oceans. This is a type of environmental sustainability that our project will have an effect on.
* This project will also test the sustainability of the code that we write and test. Since we will have access to large datasets, we will have to write lots of code that will be able to process, handle and classify the data. The sustainability of our code will then be based upon how well it is able to complete these tasks. Since we also aim to incorporate aspects of AI and machine learning, the efficiency of these algorithms will also have a great effect on the sustainability of our code
* The sustainability of this project will be affected by how well we write our project plan and other team management documents. As mentioned above, this project is very open-ended so it is very likely that this project will be passed down to future teams. Therefore, the sustainability will be partly determined by how well we communicate this information to the future teams so that they can carry on the progress we have already made.