

## Capstone checklist for standards, sustainability, health & safety and legal.

**Absence, or insufficient completion, of this checklist will result in the rejection of the proposal or report.**

Please use this checklist as a guide to help you express these topics in your reports, and to summarize them.

*This checklist must be completed in full by each capstone team member and submitted with the final project proposal (Capstone I) and final project report (Capstone II). Where appropriate, responses should relate to your sub-system and area of responsibility. Write full sentences; simply answering “yes” or “no” will not be accepted.*

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Project Title: Prediction of Concrete Compressive Strength Using Machine Learning	Project code: 1010091	Date: 29/05/2022

Provide a brief overview of your project

Our aim is the predicting the cement strength by it's mixture materials without making and destroying it physically.

### Part A - Overview

1. What are the main functional and performance requirements of your product or sub-system?

There are two important criteria. The first is the accuracy of the dataset that will train the machine learning, and the second is the algorithmic efficiency/consistency/accuracy of the machine learning.

2. What are the dominant design constraints for your product or sub-system?

The only point that we can assume as the constraint of the product is the data type that the algorithm to be trained needs to evaluate. In our project, it calculates over 7 parameters.

3. Who will be the users of your product?

People who want to work on machine learning, people interested in Civil Engineering and Artificial Intelligence, Industrial Engineers, Computer or Software Engineers/Scientists.

4. What realistic operating conditions have you assumed your product will be exposed to?

It may be expose wrong data set and power outage.

5. Other.

No additions.

## Part B - Standards

1. What safety standards apply to your product or sub-system? For example, ISO.

This project does not need any safety standards.

2. Are there any basic standards (legal metrology) that apply to your product or sub-system?

No, there is no basic standard/standards.

3. Are there any performance standards that apply to your product or sub-system?

When the result/results of our product are compared with real results, it should have at least 80% accuracy.

4. Are there any codes (government laws) that apply to your product or sub-system?

No, there isn't any codes or government laws that applied our product.

5. Other.

The standard of this project is not bound by any legal situation. The standard of this project is that its performance and result are near to other machine learning projects.

## Part C - Economic impacts

1. Explain how you minimized the cost of your prototype, and how production costs could be reduced if the prototype were to be mass produced?

It is not a product that can be reproduced by mass production. It does not constitute any economic situation, since it does not have a physical component and can be found as an open-source code.

2. Compared to other similar products that are on the market, how does your design lead to cost savings for the user?

If we consider the scenario where the accuracy of the project is very high, the structure can withstand strongly for years without the need to re-build or strengthen it.

3. Would there be any *tax incentives* to be considered towards final product cost. For example, renewable energy and energy-efficient products tax incentives, carbon footprint reduction, etc.

Thanks to the project, the most optimal level of concrete can be produced without material consumption, and thus, the emission of carbon dioxide gas along with environmental pollution is reduced.

4. Are there any environmental aspects, such as availability of resources that may affect the product cost and therefore price and market vulnerability?

Since optimal concrete is produced, raw materials will not be consumed to test the durability of the concrete.

5. Other.

There is nothing else that needs to be added from an economic point of view.

## Part D - Environmental impact

1. Are there any greenhouse gas emissions related to the production or use of your product, what aspects of your design attempts to reduce those emissions?

As mentioned it in Part C that it reduces raw material consumption and prevents carbon dioxide emissions.

2. Does your product require usage of environmentally sensitive resources such as water, energy, wood, etc. and how does your design encourage efficient use of such resources?

Various materials such as water, aggregate, mineral mixtures are needed in cement making, and concrete is wasted when tests are made to measure the durability of the resulting concrete. Therefore, it prevents this consumption.

3. Does your product rely on materials or resources that scarce (such as rare elements)? Has your design been adapted to make use of materials that are more abundant?

Since the material in project is concrete and its raw material is easy to access, there is no use of rare materials and has not adapted to make use of materials that are more abundant.

4. Does your product introduce or encourage different usage or behaviors that are more environmentally friendly?

As mentioned in the Part C and above that it contributes to nature as it prevents material waste.

5. Other

No other addition.

## Part E - Social impact

1. In what way can your product impact people's lives (positively and negatively)? What design decisions have you made to maximize positive impact and minimize negative impact.

If our project is successful, we can easily access the most optimal strength level of concrete and enable people to live in more durable buildings. In order to further increase this, we can continue our research in this area and expand our research on different materials and obtain results that will increase the durability of cement and reduce the wear life.

2. Does your product address any social needs?

No, there is no social need required in this project.

3. Who will benefit from this product?

There are two parts that will benefit from this product directly and indirectly. One will be Civil Engineers who want to reach optimal concrete, and the other will be people living in a building with optimal concrete.

4. If your product were to be mass-produced, would it create new jobs, or destroy jobs?

It certainly does not destroy any profession or create any new jobs.

5. Other

No addition on this section.

## Part F - Health and safety

1. What relevant health and safety laws or standards does your product or sub-system comply with?

It is not subject to any health standards or laws.

2. What practices did you adopt during the development of your prototype to protect your own health and safety and the health and safety of those around you?

There is no need to take any health safety in using this software or using optimal concrete.

3. What design decisions did you make to increase the safety of your product or sub-system?

There is no need to take any health safety in using this software or using optimal concrete.

4. Can your product be used in any way that can impact the health and safety of the user or others?

Thanks to our project, building solid structures can save a lot of people's lives.

5. Other

No addition on this section.

## Part G - Legal

1. What laws or regulations apply to your product?

It is not subject to any legal regulation regarding the optimal concrete reached as a result of the software or the software.

2. The manufacturer of a product is liable for any damage or harm that results because of a defect. What harmful defects could occur during mass production of your product, and how could they be minimized?

The product is not subject to mass production, and one of the two ways that the product can be faulty is using an incorrect data set and the other is not algorithmically successful.

3. Have you violated any licenses or patents in the development of your prototype? Would there be any such violations if the product were mass produced? How have you mitigated such issues?

There are no license or patent violation in our product.

4. What security and privacy laws are relevant to your product or sub-system, and what aspects of your design ensure that these laws are adhered to?

Our project is not subject to any security law.

5. Other

No addition on this section.

## Part H - Others

Do you have any other relevant information to share related to your design experience regarding *standards*, *sustainability*, *health & safety* and *legal* aspects of your capstone project?

Our project will contribute to human health and nature, aiming to minimize raw material consumption by enabling people to use solid structures. It also has no legal requirements.