Group Report Eco Oracle

Submitted:

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To Helene von Schwichow & Charlotte Böhm

In SustAInability

Introduction

Imagine a world where every product you use, from your morning coffee cup to T-Shirt you are wearing, comes with a hidden story – its impact on our planet, told in terms of its carbon footprint. This invisible mark that every item leaves on the environment is crucial, yet often overlooked in our daily hustle. But what if we had a way to uncover and understand this story, making it a part of our decision-making?

This is precisely where the SINE Foundation's challenge is trying to gain a foothold. The use of artificial intelligence is part of the solution to this enormous task.

Challenge

In the context of more regulations (e.g, Corporate Sustainability Reporting Directive) increasingly demanding companies to disclose their environmental data and impacts, the traditional methods of assurance and reporting practices prove insufficient in ensuring the honesty and reliability of such information. It is essential for us to explore innovative methods for data verification, guaranteeing that companies disclose their environmental impact.

The primary goal of this challenge is to authenticate the carbon emission claims of products, aiming to counteract green-washing. This involves delving into the entire production cycle — from the sourcing of raw materials, through the processes of manufacture, to transportation and final delivery to the consumer.

Team

Our team, Jamasaca, is a dynamic blend of students from TUM and HM, each bringing diverse perspectives from our varied degree programs. Guided by our commitment to enhancing transparency in CO2 emissions, we've adopted a fitting slogan: "Transparency Counts."

Our Team Members are:

- Carl Frederic - Roles: Presenter
- Jiachen Wang - Roles: Lead Research
- Markus Ertl - Roles: Lead Developer
- Sarah Gruber - Roles: Scrum Master

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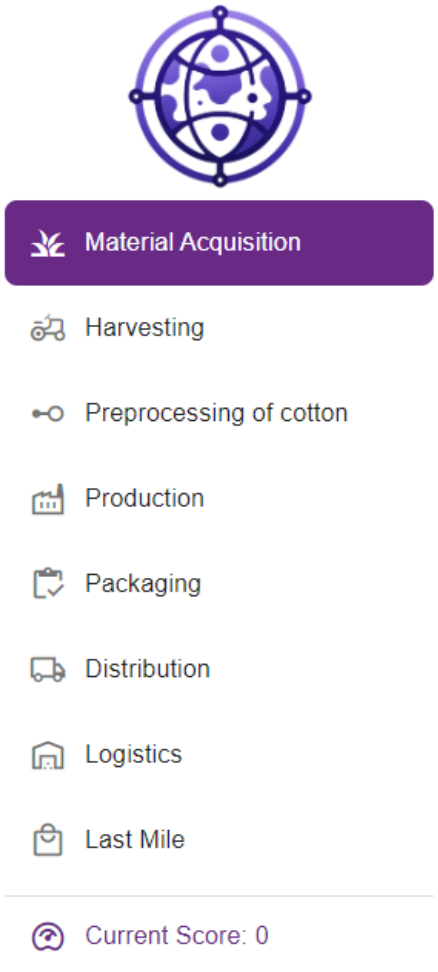
After careful consideration of the different strengths and weaknesses of each team member, we decided on these roles to maximize the output during the workshop.

Our Solution

EcoOracle



We created a prototype version of a tool called the EcoOracle that is meant to quantify the CO2 emissions of a product by examining every facet of its production chain. Recognizing the myriad factors that influence a product's carbon footprint, our goal was to develop and implement an innovative scoring system capable of capturing these complexities. Ideally, this system would leverage artificial intelligence (AI) to gather comprehensive information and continuously refine its accuracy through machine learning.

On the one hand, we have conducted research on the production chain, particularly focusing on the production chain of clothing and its carbon footprint. Several research studies have explored the processes involved in the life cycle of cotton textiles and their carbon footprint (PACT, 2022; Payet, 2021; Wang et al., 2015;). By referencing these literature and information sources, we

have summarized the following processes (as shown in the left diagram): Material Acquisition, Harvesting, Preprocessing of cotton, Production, Packaging, Distribution, Logistics, and Last Mile. The scoring system also draws inspiration from these literature sources.

On the other hand, the aspiration to fully integrate AI was met with a significant hurdle: the prevalent lack of transparency in data related to production chains. In addition to that also the amount of data about the production chains was insufficient. This opacity in the supply chain data made it challenging to train the AI with the necessary, detailed information it would require to operate at its full potential.

Consequently, we adapted our approach. Instead of relying on AI, we implemented a simplified mathematical model to serve as a showcase. This version, while less complex than the envisioned AI-driven system, still provides a valuable foundation. It demonstrates the tool's potential in assessing CO2 emissions and sets the stage for future enhancements. As transparency in production data improves and becomes more accessible, we anticipate evolving the Eco Oracle to include the originally intended AI capabilities, thereby increasing its precision and utility in assessing environmental impacts of the production process that is used by a company.

Interpretation of EcoOracle Output

The tool EcoOracle provides the user a score for the Co^2 emissions of any given production process. This score can be compared to other production processes and their Co^2 emissions. In case the scores and the emissions matching the given data for the production process can be trusted. However if there is a discrepancy in the table of scores and emissions the production process has to be inspected to find the reason for the discrepancy. It could be an improvement in production techniques or the data is not correct.

If the production has improved in terms of Co^2 emissions the scoring system should be updated by training an updated AI model with the new data. This process will keep the tool up to date by always including the most recent data and techniques in the database.

Outlook

The next step to further develop the EcoOracle tool is to create a database which includes many different production processes and their Co^2 emissions. The database can be built by calculating the real Co^2 emissions of the production process of many different products by different companies. The values of the database will build the ground truth and are used to train an AI which develops a scoring system. Furthermore the AI developed scoring system will be included in the EcoOracle tool.

Another step is to increase the number of companies willing to use EcoOracle, which is important to get easier data for the database and expand it to get a more accurate scoring system. Moreover the more companies are using EcoOracle the more other companies will get to know the tool and also start using it. This results in overall greater use of the Tool and therefore increases the impact of EcoOracle in improving transparency of Co^2 emissions, which helps to reduce the emissions.

Conclusion

The concept behind our prototype was centered on simplicity and adaptability, aimed at providing a versatile solution that could be seamlessly integrated into various products. Recognizing the current gap in the regulations regarding transparency in Co^2 emissions throughout production chains of companies, we were compelled to employ a straightforward calculation method for our scoring system. This approach, while elementary, was essential in navigating the existing limitations and ensuring that our prototype remained practical and effective in its application. The core objective was to create a foundational tool that could evolve and expand its capabilities as regulations and industry standards become more defined in the future.The usage of a neural network into the validation process of our tool represents a significant step forward in enhancing its accuracy and efficiency. Neural networks, with their advanced learning capabilities, are adept at analyzing complex patterns and large datasets, making them particularly suitable for validating tools that deal with. By employing a neural network, we can ensure a more robust and thorough validation process. This approach allows the tool to adapt and improve over time, learning from real-world data and applications and improving the transparency of production processes a lot.

References

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