BUILDING ETHICAL AI THROUGH COLLECTIVE INTELLIGENCE: ADDRESSING THE TROLLEY PROBLEM IN SELF-DRIVING CAR

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DEEP LEARNING INDABA

Introduction

The introduction of Artificial Intelligence (AI) in self driving cars (SDCs) presents significant ethical challenges, particularly in scenarios that resemble the Trolley Problem; a thought experiment that questions the morality of decision-making in life-and-death situations. Traditional ethical frameworks struggle to address these unique challenges. This study examines the application of collective intelligence (CI) principles as a novel approach to resolving these ethical concerns. This underscores the potential of CI to create universally acceptable ethical frameworks, to enhance public trust in AI and facilitate the development of AI systems that are socially responsible.

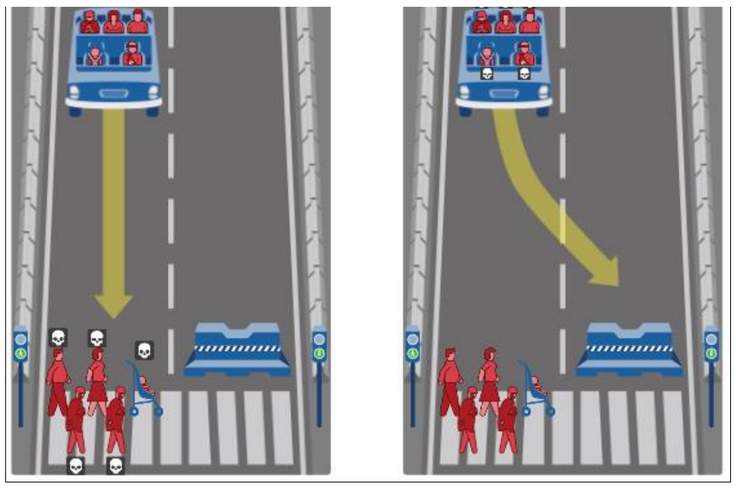

Figure 1. The Trolley Problem revisited for SDC

Methods and Materials

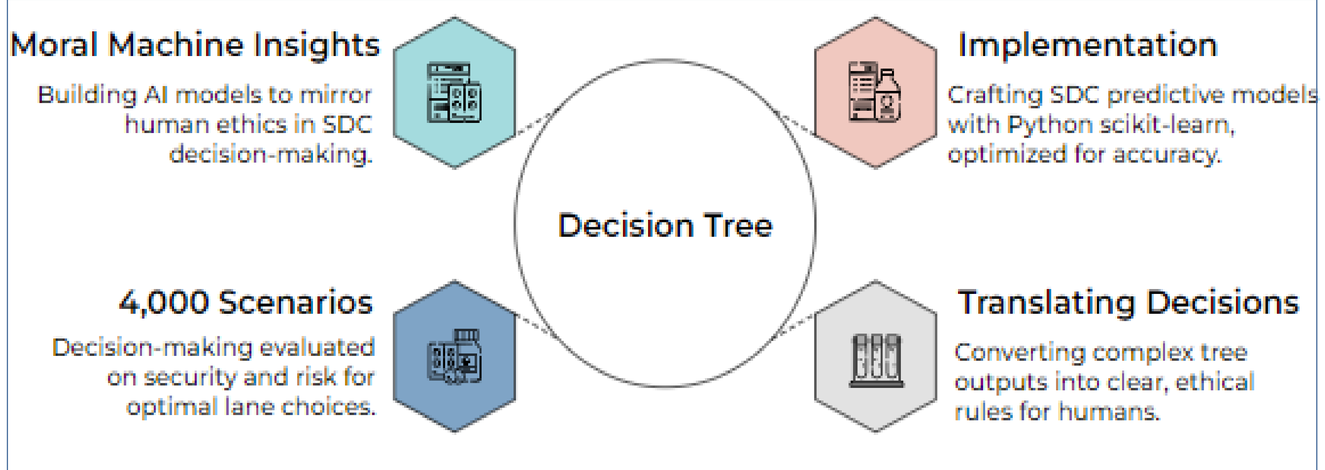

Table 1. Features (Variables) used for the Decision Tree

Feature ID	Feature Description
f1	Security on the right lane: High values suggest a clear and secure lane.
f2	Pedestrian risk on the right lane: Lower values indicate a higher risk of pedestrians.
f3	Security on the left lane: High values indicate a safer path if swerving left.
f4	Pedestrian risk in the left lane: Lower values denote significant risk.
Decision	The decision made (stay or swerve) for each scenario.

MIT Moral Machine

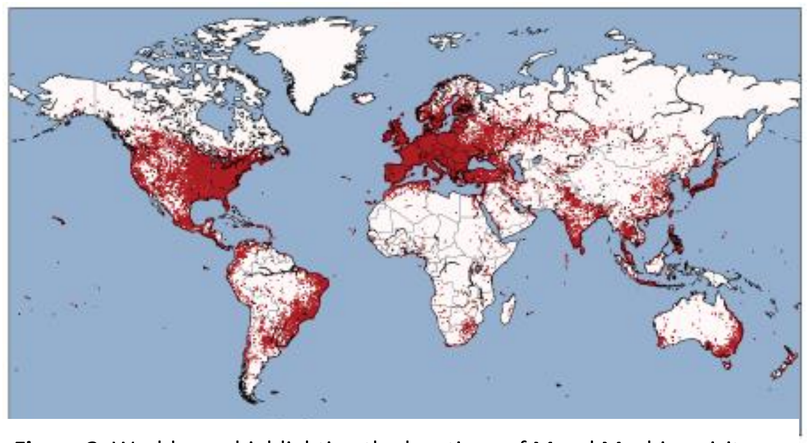

Figure 2. World map highlighting the locations of Moral Machine visitors. (n = 39.6 million). [1]

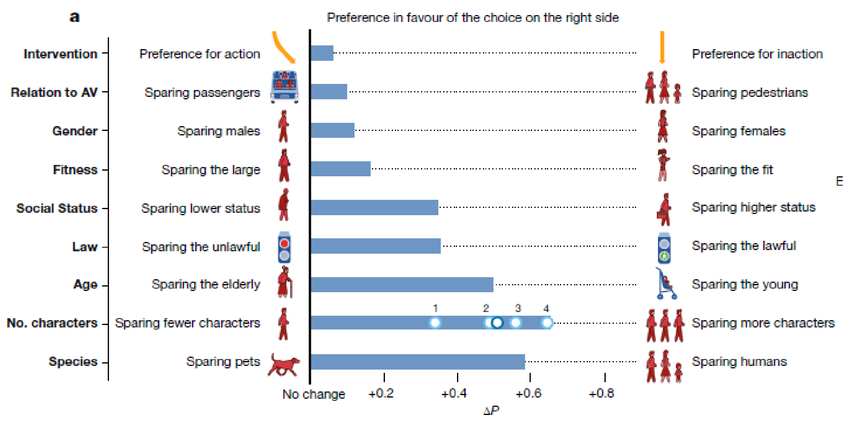

Figure 3. Global preferences. [1] *A. Gröschel Jr, E. Awad, and J. Schulz, "2018 article the moral machine," Nature, 01 2018*

Conclusion

The integration of CI into AI ethics, as illustrated by the Moral Machine and its application in developing a decision tree for SDCs represents a significant step towards the development of morally aware autonomous vehicles. SDCs can be equipped to make ethically informed decisions in critical situations. This reflects a more universally acceptable standard of morality. This approach enhances the safety and reliability of autonomous vehicles, paving the way for more socially responsible AI technologies. As we continue to explore this new frontier, the collective wisdom of humanity remains our most valuable guide.

Results

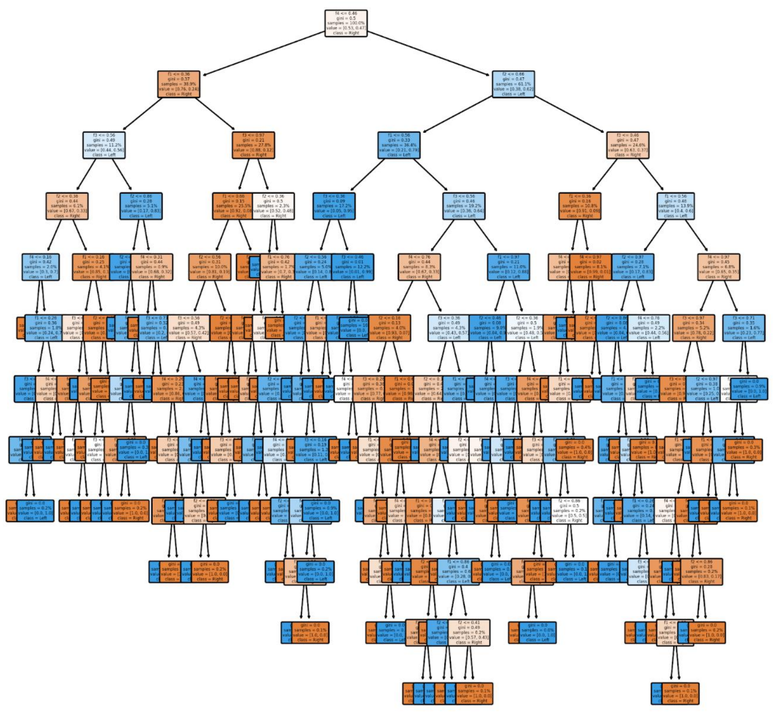

Figure 4. Decision Tree generated. 128 leaf nodes (ethical rules). The feature importances —f1 (22.42%), f2 (23.57%), f3 (27.74%), and f4 (26.27%). The range of rule depths is clustered between depths 6 and 9 . At rank 1, feature f4 holds total importance, suggesting initial decisions heavily weigh the pedestrian risk in the left lane.

Table 2. Examples of ethical rules generated

Rule num.	Conditions	Decision
1	f4 <= 0.46, f1 <= 0.36, f3 <= 0.56, f2 <= 0.36, f4 <= 0.16	Stay in the right lane
40	f4 <= 0.46, f1 > 0.36, f3 > 0.97, f2 <= 0.36	Swerve to the left lane
99	f4 > 0.46, f2 > 0.66, f3 <= 0.46, f1 > 0.36, f4 > 0.97	Swerve to the left lane
100	f4 > 0.46, f2 > 0.66, f3 <= 0.46, f1 > 0.36, f4 <= 0.97	Stay in the right lane
128	f4 > 0.46, f2 > 0.66, f3 > 0.46, f1 > 0.5, f4 > 0.97, f3 > 0.71	Swerve to the left lane

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Acknowledgements

MORAL MACHINE

USAII® UNITED STATES ARTIFICIAL INTELLIGENCE INSTITUTE

Integration of Collective Intelligence and Artificial Intelligence in the Development of Recommendation System

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Introduction

The integration of Collective Intelligence (CI) and Artificial Intelligence (AI) has emerged as a better approach in addressing complex challenges across various disciplines especially in problem discovery and problem solving. This synergy holds an immense promise in improving AI algorithms and its accuracy by leveraging the enormous human intelligence in the development of innovative ideas for problem solving.

Methods

This project utilized two mathematical concepts; cosine similarity and pareto front analysis. It shows the role of human centered computing in collective intelligence and how it can be integrated with artificial intelligence systems in developing platforms and designing products. The platform design leveraged several collective intelligence techniques for problem solving e.g feedback mechanism, user rating, many eyes, iterative improvement etc.

Platform Architecture

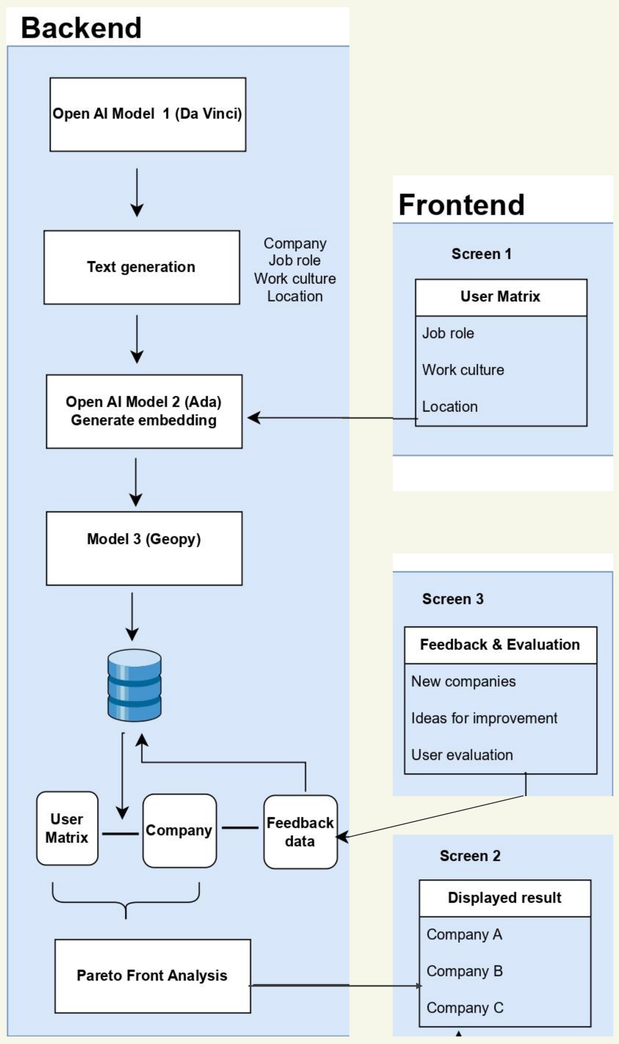

Figure 2: InternMatch Platform Architecture

Pareto Front Visualization for a User

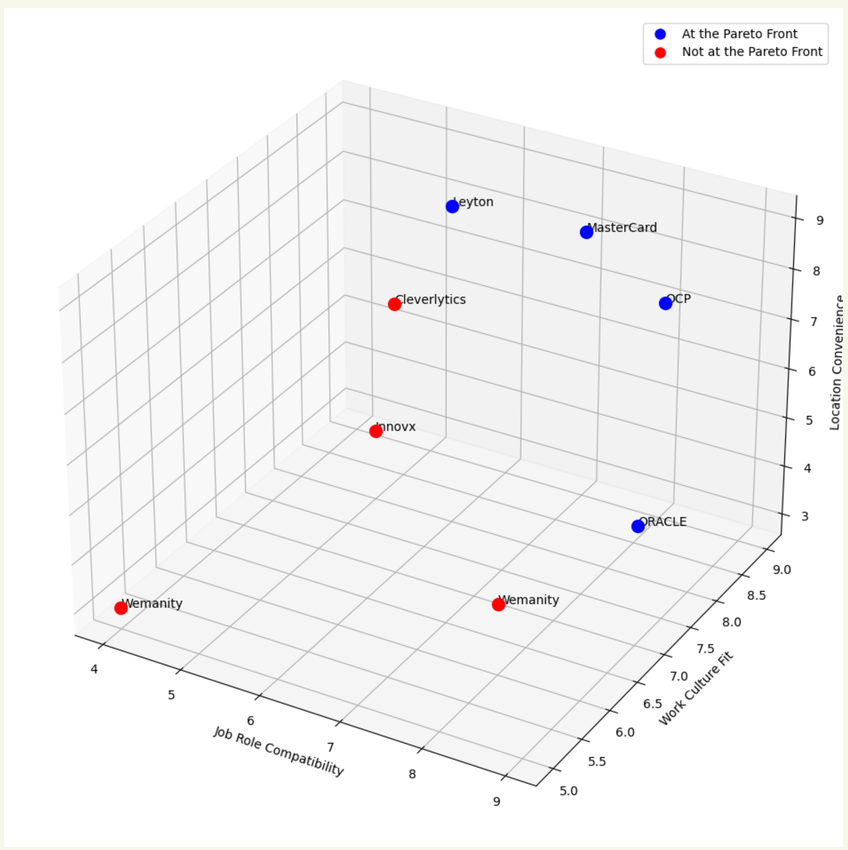

Figure 3: 3D Visualization of Companies after the Pareto Front Analysis for a specific user's preferences, based on three criteria (axes): 'Job Role Compatibility', 'Work Culture Fit', and 'Location Convenience' .

AI-Driven Company Generation

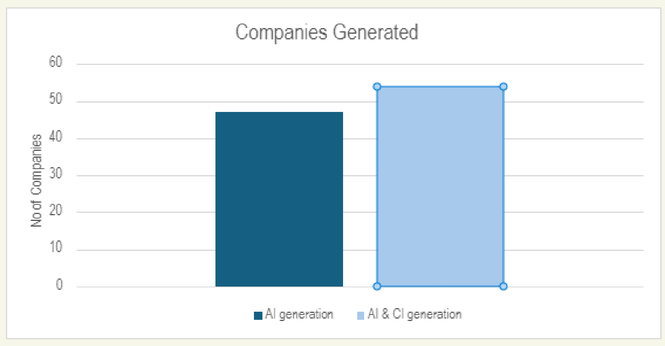

Figure 1: Impact of Collective Intelligence on AI-Driven Company Generation.

Users' Feedback Mechanism

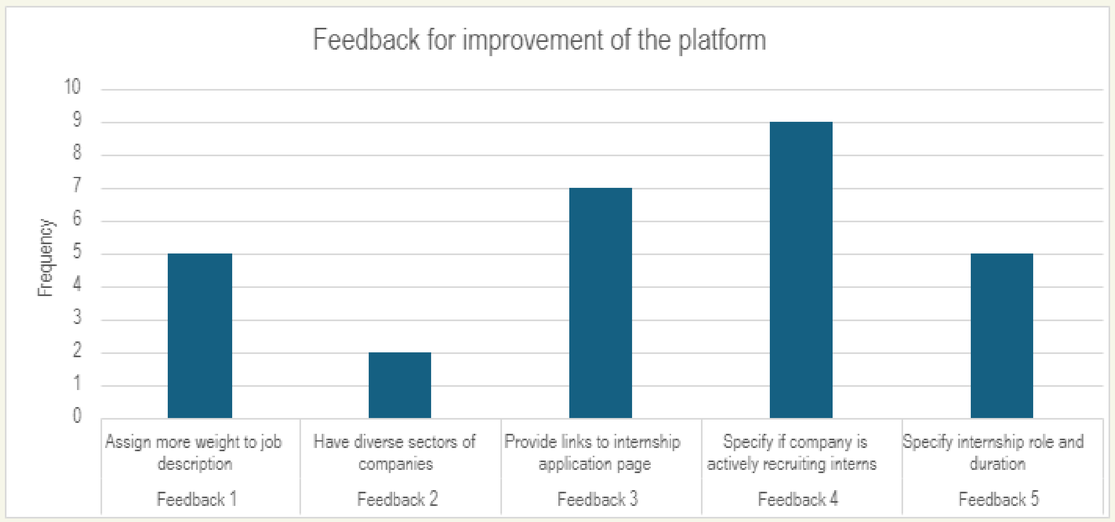

Figure 4: Users' Feedback for Improvement of the Platform. These key suggestions could potentially enhance user experience as the functionality of the platform could be more effective at meeting user needs. Ultimately, this would likely increase user satisfaction, retention, and the overall effectiveness of the platform in facilitating successful matches between interns and companies.

Future Perspectives

We will:

- Implement the feedback given by the users during the testing phase of the prototype.
- Implement seamless integration of new companies in real time given by users as feedback after validation.
- Integrate channels to help companies leverage the collective intelligence of the university community in solving their problems.

Platform Rating

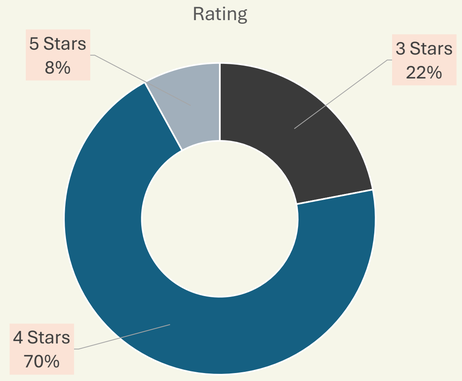

Figure 5: Platform Rating by Users

Conclusion

The integration of collective intelligence and artificial intelligence has indicated the possibility of generating superior result in problem discovery and solution development when both domains work synchronously. In this era of generative AI it has become paramount to integrate both in the development of products that contextualizes the inherent environment where the solution is to be utilized.

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