Behavioral Insurance and Sustainable Claims: An Experimental Study with LLM-Based Simulations

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Abstract

This study investigates how Large Language Models (LLMs) can be used to simulate behavioral responses in insurance decision-making involving sustainability trade-offs. We focus on the acceptance of recycled car parts (PIEC) in auto claims as part of a broader circular economy approach.

Using a series of carefully constructed scenarios, we prompt the LLM to make choices between a brand-new part and a recycled part of equal quality and warranty, under conditions where the insured pays no additional cost. Each scenario varies key behavioral stimuli, such as moral versus rational framing, social influence cues (e.g., "75% of customers choose this option"), and symbolic or informational nudges.

We simulate decisions through four behavioral profiles—economic-pragmatic, ecological-conscious, technical-rational, and passive-indifferent—allowing us to examine how different reasoning patterns emerge based on framing and persona calibration. This method provides a controlled environment to analyze how value signaling and sustainability cues affect choice architecture in insurance contexts.

Our findings demonstrate the potential of LLMs for behavioral simulation and ethical reasoning in insurance innovation, especially when empirical testing with human participants is constrained. The approach also provides insights into how insurers can align claim processes with environmental goals by anticipating customer reactions through AI-based modeling.

Keywords: Behavioral Insurance; Large Language Models (LLMs); Circular Economy; Sustainable Claims; Recycled Auto Parts.

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