LISES: Legislative Information Simplification and Enhancement System for Mitigating Information Asymmetry in Governmental Policies

Vemula, Maruthi (School: North Carolina School of Science and Mathematics)

The goal of this study was to create an enhanced yet accessible system to generate simplified summaries of governmental policies, thus enhancing public understanding and mitigating information asymmetry through cognitive psychology. L.I.S.E.S. (Legislative Information Simplification and Enhancement System), a novel pipeline integrating GPT-4, a Large Language Model (LLM), achieves this goal. The system leverages the Gunning Fog Index (GFI) and Flesch-Kincaid Score (FKS) for readability assessment, with results indicating a 121.5% FKS increase from full bills and a 52.3% enhancement over provided summaries. GFI metrics reveal a 61.8% and 44.5% decrease from full and provided texts, respectively. Consistently high ROUGE-L scores across six Legislative Congresses reflect robust information retention. To augment summaries below the 0.5 ROUGE-L benchmark, L.I.S.E.S. employs a feedback loop utilizing a Genetic Algorithm, refined by a novel fitness function integrating FKS, GFI, and ROUGE-L, yielding a 29.89% average improvement in ROUGE-L scores. Additionally, to evaluate the cognitive load of the created summaries, a specialized Psycholinguistic Cognitive Load Neural Network (PCL-NN) model was developed. This model exhibits superior performance in calculating the cognitive load of AI-generated summaries, with a correlation coefficient of 0.93, which outclasses standard LSTM and CNN models. The PCL-NN validates the quality of the summaries and their cognitive accessibility by demonstrating a 15.7% improvement in accuracy and a 21.5% error reduction relative to other models. L.I.S.E.S. not only streamlines the conveyance of legislative information but also embodies the transformative potential of AI in fostering informed civic engagement.

Awards Won:
Fourth Award of $500