



Application of Artificial Intelligence Natural Language Understanding in Nuclear Energy and Environmental Policy

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The United States Nuclear Regulatory Commission (NRC) is designated by Congress as an independent agency tasked with the purpose of ensuring the safe use of radioactive materials for beneficial civilian purposes while protecting people and the environment (NRC, 2024). During my internship, I worked in the Environmental License Renewal Branch (ELRB) within the Division of Rulemaking, Environmental, and Financial Support which is subordinate to the Office of Nuclear Material Safety and Safeguards. My role as an Energy Policy Analyst Student Trainee included exposure to draft work on Generic Environmental Impact Statements (GEIS) and Supplemental Environmental Impact Statements (SEIS) in support of the 2013 Commission

findings on the environmental impacts on nuclear power plant operations license renewals (NRC, 2023). I was specifically tasked with updating the 2006 Environmental Frequently Asked Questions (FAQs) from NUREG-1850 to reflect the current Commission rule change regarding the subsequent license renewals (SLRs) of nuclear power plants and updated 2024 License Renewal (LR) GEIS (NRC, 2023). This document provides the public with greater insight to the environmental uncertainty of nuclear re-licensing.

The main goal of this internship was to identify, quantify, and translate key SLR and LR GEIS public comments into a living FAQ document for improving communication between the NRC staff and the public. The American public has historically shown to be subjective regarding nuclear energy policy, therefore careful attention to public approval or disapproval of rulemaking changes is an important aspect of nuclear energy policymaking and decision-making (Arumugam et. al., 2021) IBM Watson Natural Language Understanding Artificial Intelligence (AI) provides a method in which public comments may be parsed for keywords, sentiment, and emotion (IBM, 2024). Key and emotional environmental nuclear re-licensing issues were discovered through IBM

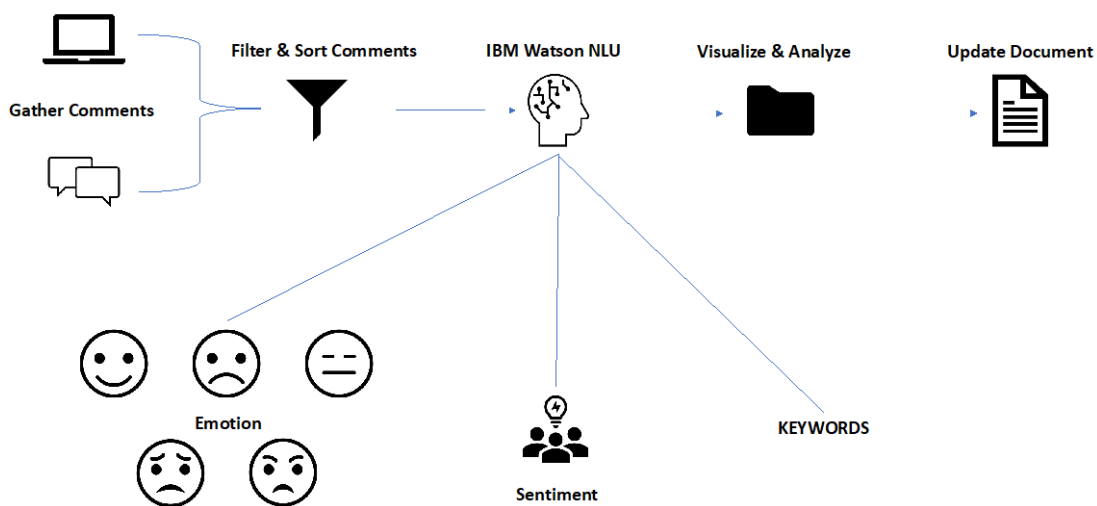


Figure X. Brief Methodology

Watson. The findings from the SLR and LR GEIS public comments provided a means to accurately address the concerns of the American public. The findings were used to update NUREG-1850 for the NRC public website and public meeting distribution.

Utilizing AI to analyze public comments for emotion, keywords, and sentiment is relatively novel and limited in scientific research. The results from this experiment not only apply to the NRC, but also provide key insights into a new application of science. The success of this experiment gained the attention of NRC management and therefore an AI Use Case Proposal was submitted for Commission review. The work conducted in this experiment provides proof of concept and allows not only better communication between the NRC and the



public, but also increases licensing efficiencies. It is evident from the work of this internship project that there is a long way to go before the public truly has an increase in nuclear risk acceptability, but this project showcased the potential for a novel form of science that has proven potential to bridge the gap between science and policy.

The PSM Environmental Science Degree has provided me with an abundance of opportunity. Not only has it allowed me to earn a summer internship at the U.S. Nuclear Regulatory Commission, but it further advanced my career. Following completion of my summer internship, I transitioned to a part-time Co-op where I further expanded my knowledge and experience at the

NRC. In October of 2023, I was offered a non-competitive duty position at the NRC as an Environmental Scientist where I will be conducting Endangered Species Act Section 7 Consultation with other Federal agencies in support of nuclear licensing activities. An additional benefit of the NRC is their scientific and engineering pay scale – meaning I am guaranteed to promote to GG-13 in three years of Federal service. Without the knowledge gained from the ESGP program, there would be no way that I could be where I am today. I am forever grateful for all the opportunity that Oregon State University has provided me, and I hope the findings of this internship project provide evidence on the successful application of Artificial Intelligence Natural Language Understanding to further bridge the gap between communicating science to the American public.

Emotion Overview

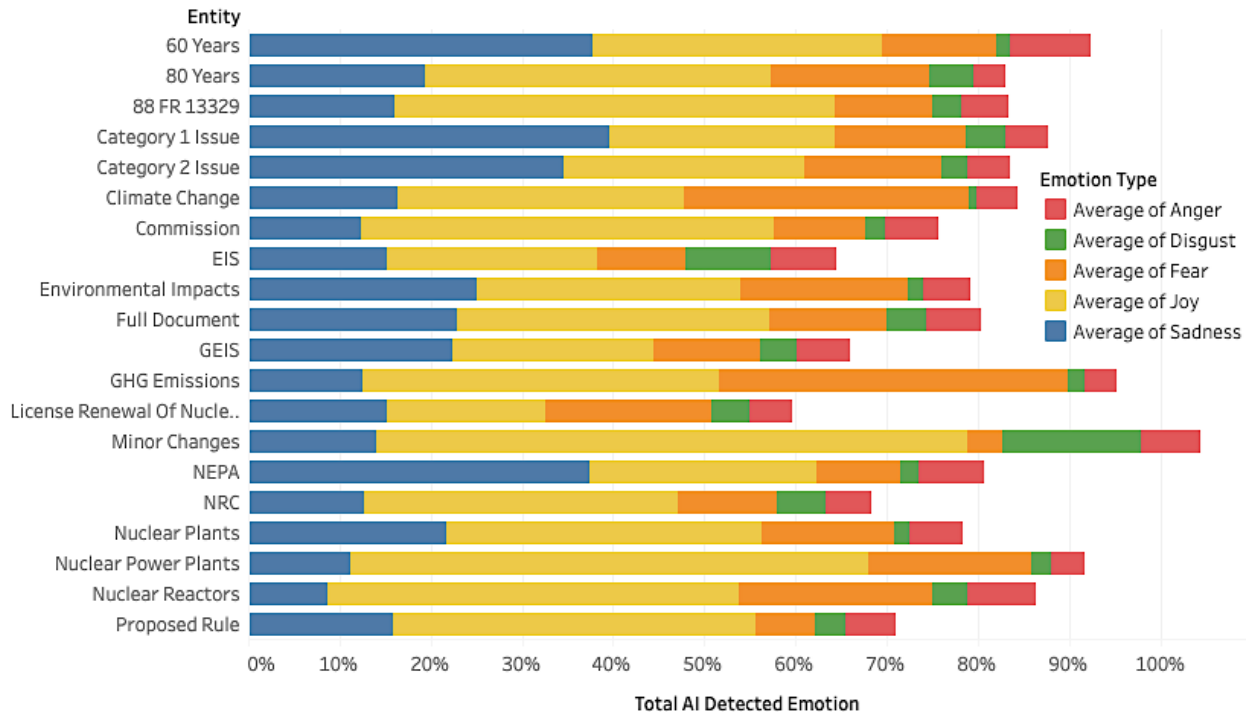


Figure X. Emotion Analysis from IBM Watson NLU presented through Tableau

Keyword Relevance

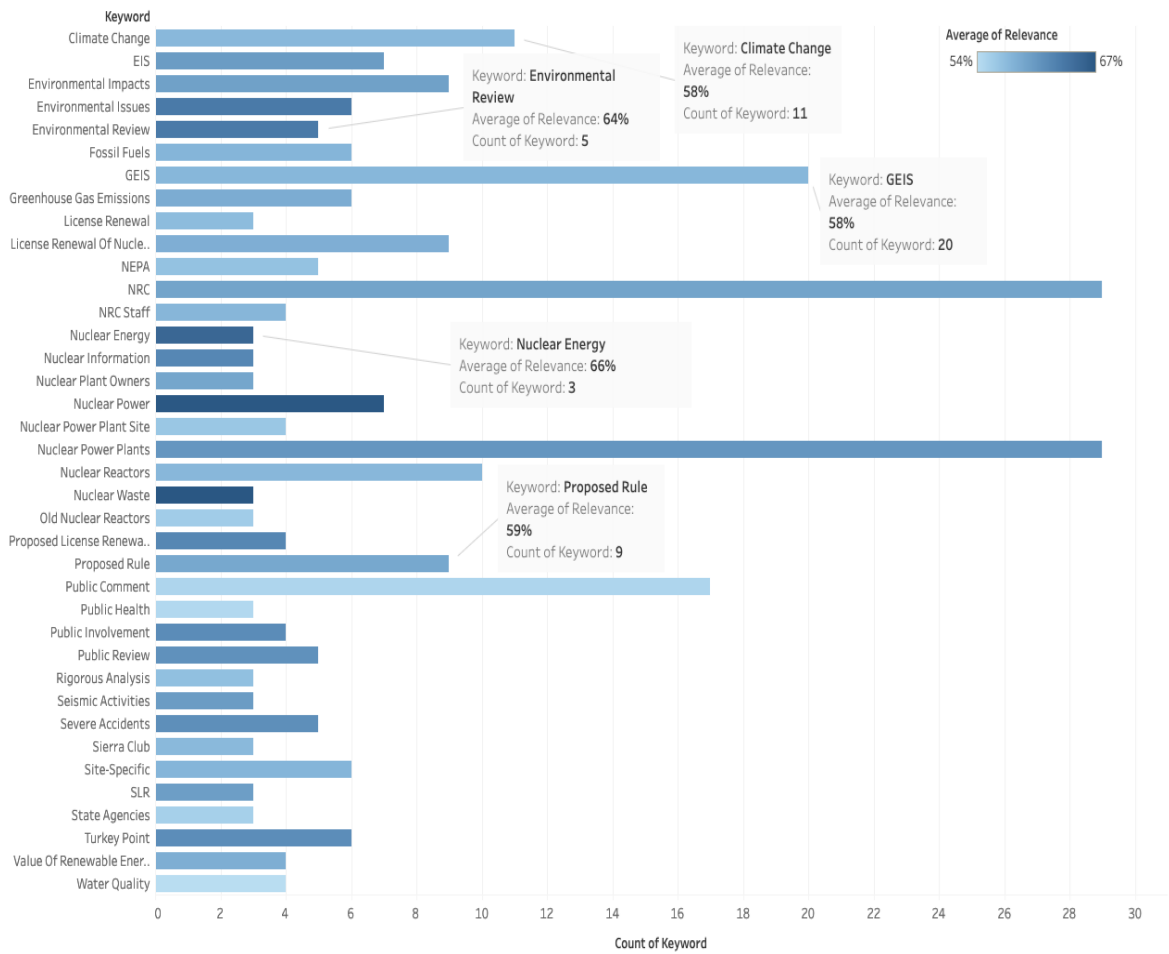


Figure X. Keyword Relevance from IBM Watson NLU presented through Tableau

Sentiment Overview

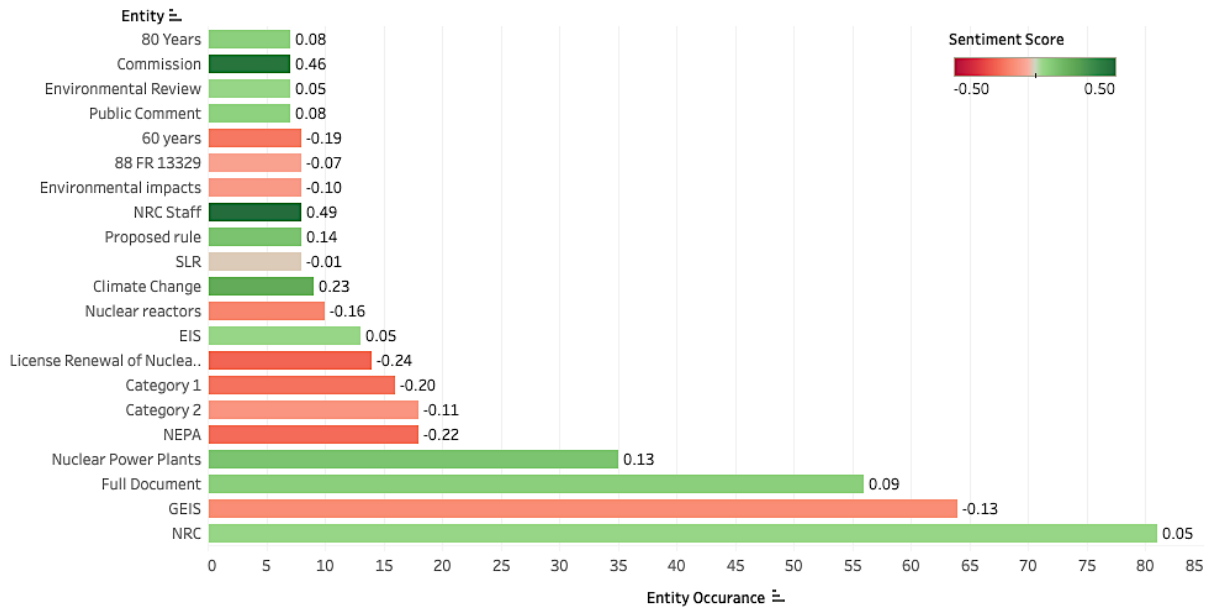


Figure X. Sentiment Analysis from IBM Watson NLU presented with Tableau

References

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