Studying the relationship between system usability (SUS) and cognitive overload (RTLX) scores while using voice interfaces

The field of voice interface design exhibits a noteworthy correlation between System Usability and Cognitive Overload. Previously thought to be independent, our research reveals an unexpected twist: a significant relationship exists between cognitive burden and ease of use. Such connections are uncommon across web interfaces, therefore this revelation challenges the standard. In this research, we break down assumptions and investigate the field of speech user experience design as we examine voice interface data.

Unpacking the data

The dataset consists of System Usability (SUS) and Cognitive Overload (RTLX) scores obtained from 100 participants. Our examination of the data revealed that it adheres to a **normal distribution pattern,** and both variables, SUS and RTLX, are **linear and continuous.** This dataset's characteristics make it conducive for a **correlation analysis**, allowing us to explore the intricate relationship between SUS and RTLX scores in the context of our study

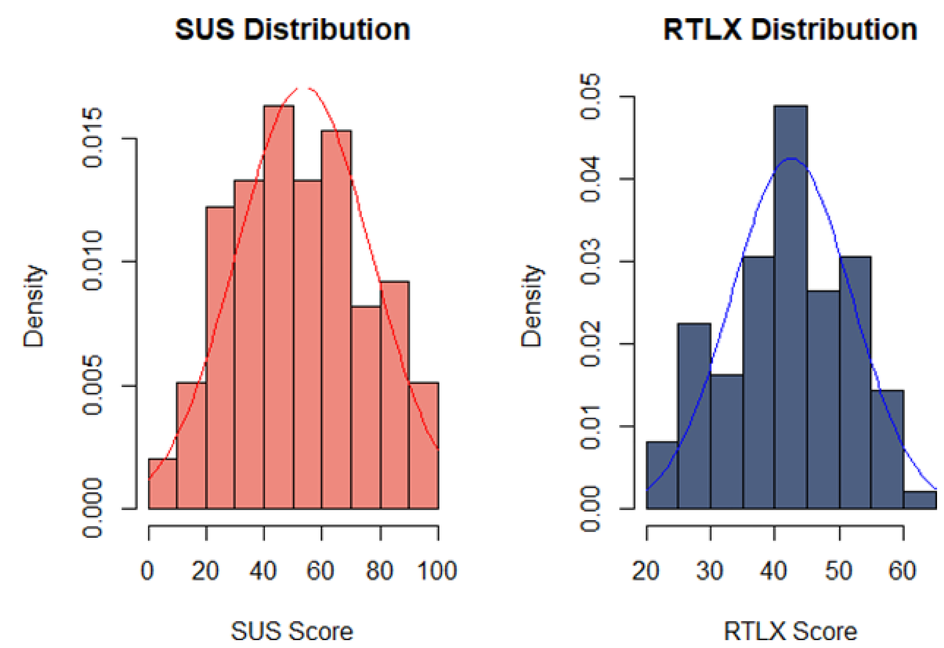

Fig. 1, Comparison of normal distribution curves for SUS and RTLX scores.

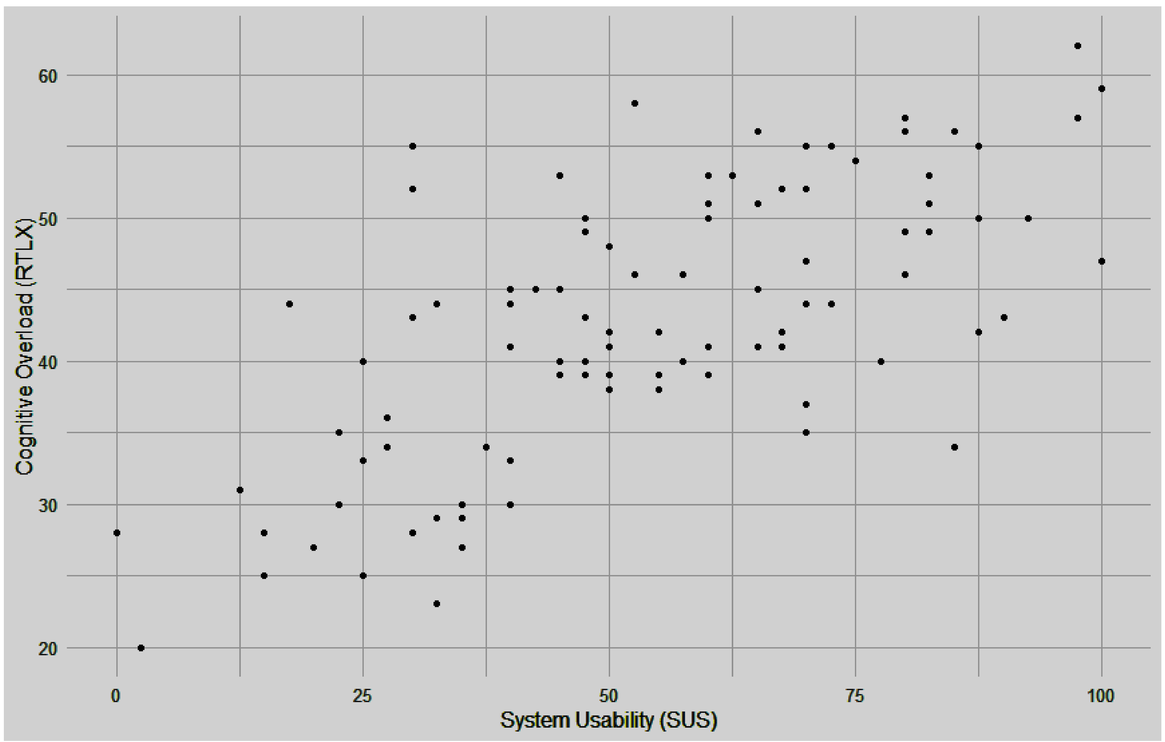

Fig. 2, Scatter plot for SUS and RTLX scores

Relationship analysis

Continuing, our analysis revealed a strong, statistically significant **positive correlation** between System Usability (SUS) and Cognitive Overload (RTLX) with a correlation coefficient of **$r(98) = 0.68$ ($p < .1$)**.

Limitations

The study primarily draws from Alexa data but aims to address usability in voice-based systems more broadly, recognizing that findings are specific to Alexa due to data constraints. Additionally, the suitability of the System Usability Scale (SUS) in voice interfaces, as compared to web interfaces, is an area of potential variation worth considering.

Future work

In the future, we should look at many different voice assistants, not just focusing on specific platforms. We need to see if the System Usability Scale (SUS) works well for voice interfaces and use new tools like the Voice Usability Scale (VUS) for this purpose. By studying various voice interfaces, we can better understand how users experience them.

Conclusion

The research uncovers a noteworthy relationship between System Usability (SUS) and Cognitive Overload (RTLX) in voice interfaces, challenging prior assumptions. The results reveal a strong, statistically significant positive correlation ($r(98) = 0.68$, $p < .1$), emphasizing the interplay between usability and cognitive load. However, it's important to note the study's limitations, including data constraints and the need for further research in diverse voice assistant contexts.

- Longo, L., & Dondio, P. (2015). On the Relationship Between Perception of Usability and Subjective Mental Workload of Web Interfaces. Technological University Dublin.
- Zwakman, D. S., Pal, D., & Arpnikanondt, C. (2021). Usability Evaluation of Artificial Intelligence-Based Voice Assistants: The Case of Amazon Alexa. SN Comput Sci, 2(1), 28. doi: 10.1007/s42979-020-00424-4