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Project 3 Writeup

Surgeries can be a deeply sensitive topic for many people as it's something you'd never want to happen yet is something that is usually medically necessary if not life-saving. For most surgeries, the patient undergoes some form of anesthesia in order to sedate the patient and aid the surgeon resulting in a wide range of effects and surgery outcomes. Our project, therefore, set out to analyze these outcomes, particularly the patterns of post-operative recovery and any correlations that exist between certain demographics and anesthesia types and amounts via an interactive visualization. The dataset we used is titled *Korean Surgery Dataset (Demographics, Clinical, and Waveform of physiology from surgeries)* hosted on vitaldb.net. This dataset is a comprehensive, free-to-use collection of 6,388 surgical patients' high-resolution intraoperative biosignals (including 500 Hz waveform data and numeric values recorded every 1–7 seconds) and over 60 related clinical variables serves as an unparalleled resource for advancing medical AI research. We cleaned the data so that only relevant columns were kept with most pertaining to surgical approaches used, departments, mortality, and patient demographics. Understanding the relationship between surgery outcomes and anesthesia effects with an in-depth and interactive visualization is not only an interesting data science project but also a real-world tool that can potentially be used in official medical reports.

In the creation of our interactive D3 visualization, we decided that our interactive visualization should toggle between a scatterplot and a barplot based on the user's chosen parameters. For instance, if the parameters chosen by the user are categorical a bar plot is shown, otherwise, a scatterplot is shown showing any correlations that exist between the two quantitative variables. The color palette we chose was relatively standard with green dots representing successful surgeries and red ones representing surgeries that resulted in the patient's death. In order to visualize these relationships properly, we transformed the data several times via normalization, grouping, and filtering so that relevant variables could be used and analyzed properly. Finally, to further enhance the interactivity of our visualization, we added a hover effect to each data point so that that patient's demographics and surgery information would be displayed in a small popup near the cursor.

Throughout the course of this project, our team had a strong and organized workflow. We first discussed everyone's strengths and assigned tasks accordingly including data acquisition, the creation of the checkpoint visualizations, prototyping in D3, and user testing. We then each focused on our assigned areas while still ensuring we understood every aspect of this project and helping other group members when needed. The overall development of this project was a cohesive, communicative, and well-thought-out approach highlighting the importance of team collaboration. With our visualization, we are confident that it displays critical information regarding surgery outcomes and anesthesia effects deeming it worthy enough to be cited as a source in a future official medical/scientific report.