Do Androids Dream of Electric Billboards: Algorithmic Corrections to Research Posters for Accessibility Measures

Dani Paul Hove, Class of 2020

Within academia, it's often a difficult task to create concise, accessible summaries of one's work, especially when forced to crunch it onto a single page poster. Problems often include readability issues, inconsistent structuring, and excessive visual clutter, all of which make absorbing the already dense material more difficult, or even impossible for those with accessibility needs. While templates and write-up guides can be helpful, a well-designed poster often needs a hint of experience with the design discipline, which many don't have the time nor interest to invest in. As such, an automation of many of the more standardized tasks would prove helpful.

The program I produced this summer aimed to provide a solution to this, through a combination of neural networks, means-shift clustering and an application of design fundamentals and accessibility standards.

The initial analysis is conducted by processing all text elements on the document, recording characteristics such as size, position, formatting, and punctuation. This data is then put through a neural network trained on a batch of diverse research posters curated and labeled according to whether each text element is a part of one of five categories: headings, subheadings, subsection headings, body text or captions. Current training has been able create weighting models with upwards of 95% accuracy when testing their ability to correctly identify elements in the labeled set.

Following this, using the "average" color of text found during the initial data analysis, a monochromatic color scheme is established for the text elements, with each category receiving a varying shade, while the heading category is recolored the color-wheel complimentary color of the subheading category. Following this, a standard set of fonts are applied across the categories: Georgia for body and subsection areas, and an Arial pairing for every other category. Categories are given uniform formatting, while underlining is removed. Additional background elements are also stripped for the sake of maximizing clarity/minimizing possible clutter and color clashes.

Next, a means-shifting algorithm is used to categorize groups of elements visually, finding sections of the poster (e.g. grouping elements under "Methods" in a separate cluster to elements under "Citations"). These groups are then used when rearranging the layout of the poster. Overlap between groups is first accounted for, with the degree of overlap affecting how the sizing across the data set is adjusted. After tweaks from that, some minor alignment corrections are made, making sure the edges and widths of each group is consistent with one another.

The next steps in refining the program would involve a more sophisticated layout rearrangement step, involving a grading system and a series of loose templates for generating ideal positioning. An additional layer for accessibility would involve chart editing, primarily in reducing data clutter, and generating color-blind friendly palettes. Another feature awaiting implementation is using the clustered groups to refine the accuracy of the neural network's initial analysis, due to the difficulty in manually annotating the incredible amount of posters required to obtain a near perfect neural step.

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