**Visualizing Uncertainty with Chromatic Aberration**

**Abstract:** In recent years an increasing array of research are being conducted by researchers in the field of uncertainty visualization that attempt to determine the impact of representations on users’ perception and evaluate its effectiveness in decision making. Uncertainties are often an integral part of data and by nature model predictions also contain significant amounts of uncertain information. A prominent example of uncertainty, COVID-19 is a respiratory infectious disease caused by novel coronavirus. Due to its unprecedented challenges over time and frequent changes of strains, scientists and researchers are investigating the available data to discover the patterns in different demographic areas and examine the effect of vaccinations against different variants. In this study, we explore a novel idea for a visualization to present predictive model uncertainties using Chromatic Aberration (CA). We first utilized existing machine learning models to obtain predictive results using Covid-19 pandemic data and calculated the corresponding model uncertainties for the most impacted countries with respect to number of new-cases, new-deaths, and new-vaccination for different countries. We then visualized the data itself and its associated uncertainties with an artificially spatially separated channels of red, green, and blue color components. This chromatic aberration representation has been evaluated in a comparative user study. From quantitative analysis it is observed that user can identify targets in CA method more accurately than VSUP [35] method. In addition, their speed of target identification was significantly faster in CA to VSUP method. But their preference between the two does not vary significantly.

**1 Introduction:**Uncertainty visualization is an ongoing area of research but a topic that many people avoid due to the additional complexity that it introduces. There are various studies conducted for uncertainty representations, for example: textual representation such as captions or tooltips [51], graphical representations such as glyphs [21, 54], custom color palettes such as VSUP [35], bivariate choropleth maps [43], texture patterns [29] and so on. But as far we know, no uncertainty representation has used Chromatic Aberration. We introduce machine learning model uncertainties as chromatic aberration in visual interfaces. To accomplish the purpose, we have categorized the scope of the research with several core components: firstly, collect relevant data from some reputable sources. Secondly, generate uncertainty information from predictions based on the data (accomplished by feeding collected data into machine learning models and calculated from the resultant forecasts [6]). Thirdly, visualize the uncertainty and data using chromatic aberration, as well as competing existing methods. Fourthly, conduct a controlled human-computer interaction experiment to evaluate the effectiveness of the new visual representation. Fifthly, explain experimental results with numerical analysis and draw conclusions.