Exploring the Relationship Between Color and Genre in Film Poster Design Throughout the Golden Age of Hollywood

1. Introduction

Whether one looks up a film online or goes to a theater, a poster is what leaves the first impression. As a medium, a film poster is unique in the way it serves both as an art piece and a promotional material. Thus, the primary function of a poster is to capture the viewer's attention using a variety of visual elements. A poster can be informative or entertaining by showing a scene from the film or by putting the actors' faces in the foreground. At the same time, the poster can communicate a message through more implicit terms, among which is color psychology. In this paper, I will focus on the relation between color and genre, as the latter is another convention that studios utilize to set the expectations for a film and attract an audience. By combining prior research with my own data-driven analysis of select film posters from the Golden Age of Hollywood, I hope to provide more insight into the ways genre and color are intertwined.

2. Data Collection

All films discussed in this paper were released between 1930 and 1969 and are entirely or at least primarily in the English language. To create a comprehensive dataset, I collected information about films from three sources: highest worldwide grossing films, Academy Award Best Picture nominated films, and the Movie Memory Project database. Details about official title, year of release, and genre are based on IMDb's records. In particular, the first type of data is retrieved from lists created by lauri-f on IMDb while the second one is based on the official Academy Awards database and cristiano702003's IMDb list. The Movie Memory Project database can be found here, while the clean dataset will be attached separately. It should be noted that each film in IMDb is labeled with at least one and

up to three genre categories. In this project, I consider all genre categories of a film equally, as IMDb lists them in alphabetical order rather than in order of importance or relevance. Finally, the poster images are also retrieved from IMDb, as IMDb uses the theatrical release poster as each film's thumbnail. In total, my combined data contains 888 unique titles and 23 genres. Among these genres, I will specifically examine the following seven: drama, romance, comedy, musical, film-noir, horror, and sci-fi.

3. Methods

For each image, I extracted its RGB (red, green, blue) encoding, meaning that each image was encoded into a 256x256x3 array where the first two dimensions (256 and 256) indicate the height and width of the image and the last dimension is related to the idea that in the RGB color model each pixel is expressed via three values, all ranging from 0 to 255, that determine the presence of red, green, and blue. For example, in the RGB model, red, green, blue, black, and white can be expressed by the values [255, 0, 0], [0, 255, 0], [0, 0, 255], [0, 0, 0], and [255, 255, 255], respectively (Joblove & Greenberg, 1978). Because film posters contain multiple colors, I am only going to focus on the most prominent color, which tends to be the poster's background color. Previous research has demonstrated that the background color has significant effects on the perception of the poster (Yu & Zhou, 2018). Hence, studying background color can offer important insight into existing genre conventions, while reducing the computational complexity of image processing tasks.

To determine the most dominant color of each film poster, I am using k-means clustering with k = 5 whereby the pixels are partitioned into 5 groups based on Euclidean distance proximity and the cluster center (i.e., the average value of all points in the cluster) is chosen from the group with the most pixels. This method uniquely selects the most representative color from each poster and returns the result in RGB coordinates.

Since the main colors from all posters have a wide variability in terms of their coordinates, it would be helpful to classify them via a system that is more intuitive and easier to discuss. A standard way of describing colors in the English language is by using 11 color terms: black, white, red, yellow, green, blue, brown, orange, purple, pink, and gray (Berlin & Kay, 1969). How can each color from each poster be then assigned to one of these colors? Given that color perception is inconsistent across individuals, there is no unique system for such color assignment. Even so, studies have shown that logistic models perform relatively well at separating colors in the HSL (hue, saturation, lightness) model (Mangine, Jakes & Noel, 2005). To clarify, hue is a wavelength which can take values ranging from 0 to 360 degrees based on its position in the color wheel (see Figure 1 for reference); saturation is the intensity of the color; and lightness is the white-to-black property of a color. Both saturation and lightness can take values from 0 to 100 percent (Elliot & Maier, 2014).

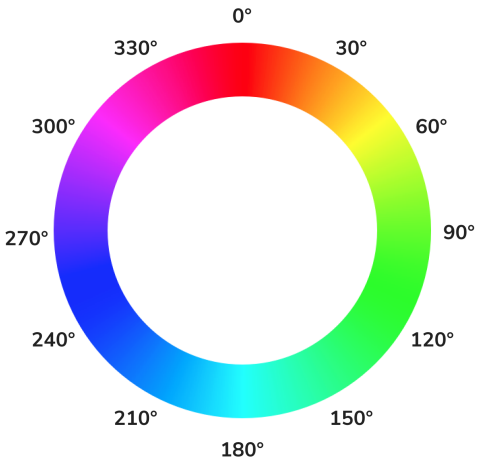

Figure 1: Color wheel

Note that black, white, gray, and brown are not part of the color wheel; their values are influenced by saturation and lightness as well as by hue. Additionally, green and blue are traditionally thought to have hues of around 120 and 240, respectively, meaning that 180 is a reasonable cutoff point between those two colors. Finally, given that the goal is to divide the

color wheel into 7 segments, the following function is suggested (here, h, s, and l denote hue, saturation, and lightness, respectively):

- If $l \geq 95$, return "white";
- If $l \leq 5$, return "black";
- If none of the above conditions is true and $s \leq 10$, return "gray";
- If none of the above conditions is true, and if $h \geq 20$ and $h \leq 40$ and $s \leq 70$, return "brown" (these values were chosen by sorting the colors in ascending order by hue and observing that most colors that appear brown have similar hues to colors that appear red or orange);
- Finally, if none of the above conditions holds true, round down to the nearest integer the result of the formula

$$\frac{7}{1+e^{-1.1(x-3)}}$$

where $x = \frac{h}{60} + 3$ if $h \leq 180$ and $x = \frac{h}{60} - 3$ if $h > 180$. When a value is obtained (which can be an integer between 0 and 6 since the logit function is bounded by 0 and 7, exclusively), I assign the color based on the mapping {0 : "blue," 1 : "purple," 2 : "pink," 3 : "red," 4 : "orange," 5 : "yellow," 6 : "green"}.

In other words, after converting the colors from RGB to HSL (which I do using the `rgb_to_hsl` function from the `webcolors` library in Python), I use a simple mathematical model to reduce my system of colors to just 11 types.

4. Results

Figure 2 and Figure 3 show the spatial positions of all 888 film posters in the HSL coordinate system and the distribution of colors.

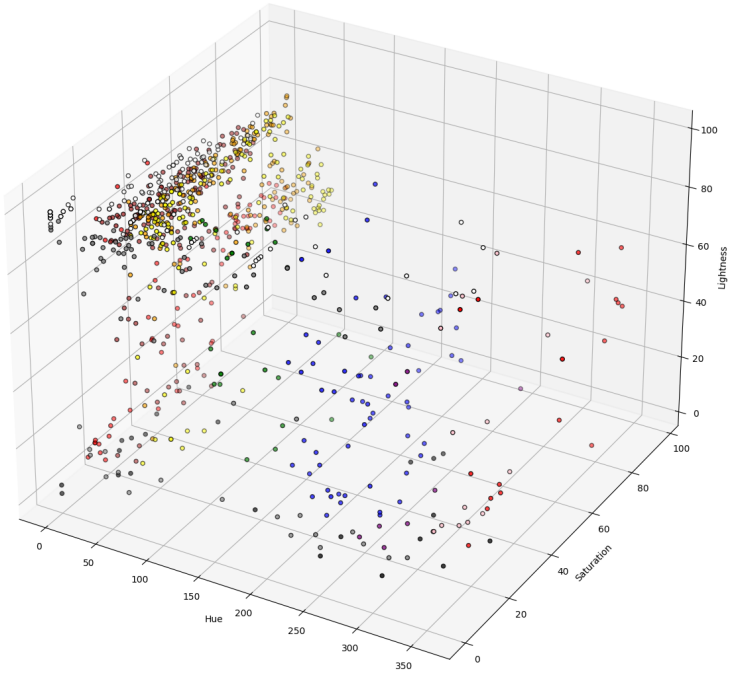

Figure 2: Color distribution by hue, saturation, and lightness values

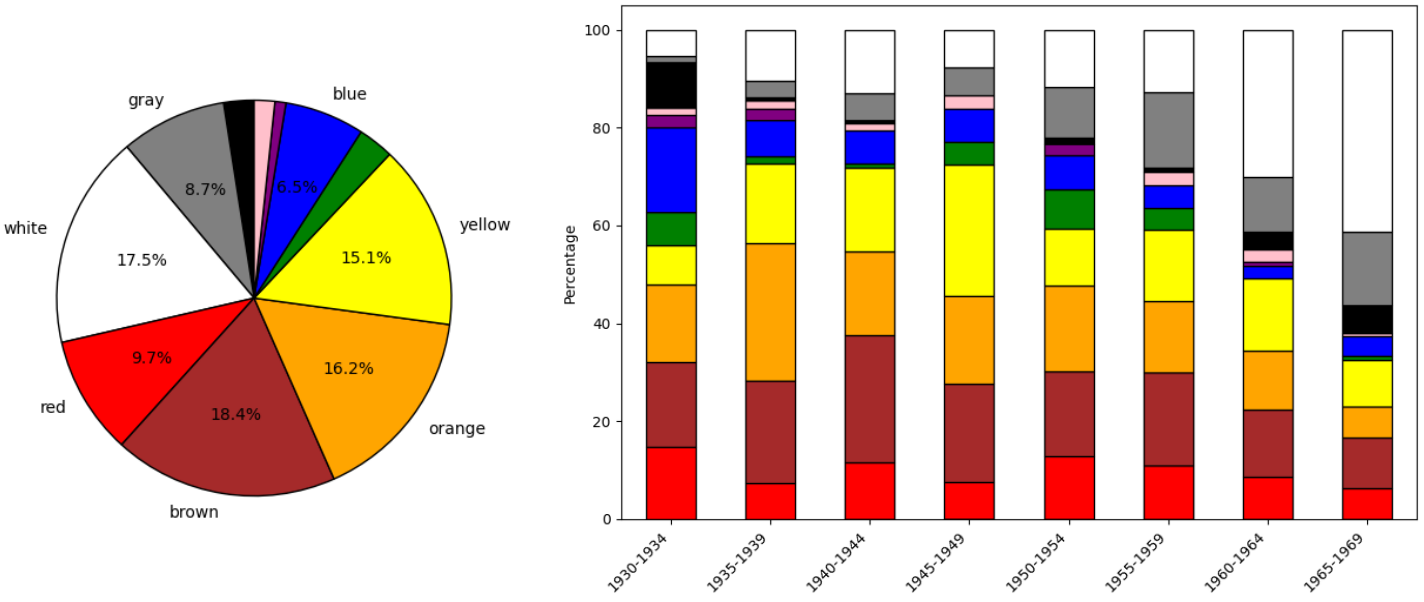

Figure 3: Color distribution of all films by percentage (left) and five-year period (right)

It is clear that colors with low hues (red, brown, orange, and yellow) dominate over colors with high hue values (green, blue, purple, and pink). In particular, nearly eighty-five percent of the posters use a warm tone (a color whose hue is between 0 and 180 degrees) as

opposed to cool tones (a color whose hue is between 180 and 360 degrees). I will explore this pattern in more detail in further sections where I conduct color analysis based on genre. Additionally, most colors have saturation of over 40 percent, indicating that most posters use relatively intense colors for background; these colors also tend to be bright, since most of them have lightness values of over 60 percent. In particular, nearly a fifth of the colors are classified as "white," meaning that their lightness values are close to 100 percent. Over the course of the period, the use of white in poster backgrounds increased considerably, reaching nearly 50 percent in the late 1960s. According to James Verdesoto, the film poster artist behind iconic works, such as *Pulp Fiction*, *Ocean's Eleven*, *Girl*, *Interrupted*, and *Training Day*, the white background is a popular choice, especially for genres like comedies, because it allows the viewer to focus on the action occurring in the center of the poster and not be distracted by the surrounding environment (Verdesoto, 2019).

Now I will turn my attention to each of the genres, mentioned above, and I will explore their color distribution as a whole and as a five-year period sequence (that is, from 1930 to 1934; from 1935 to 1939; from 1940 to 1944; from 1945 to 1949; from 1950 to 1954; from 1955 to 1959; from 1960 to 1964; and from 1965 to 1969).

4a. Drama, Romance, Comedy

The three most popular genres are drama, romance, and comedy, with 563, 311, and 302 films, respectively. Below are their color distributions:

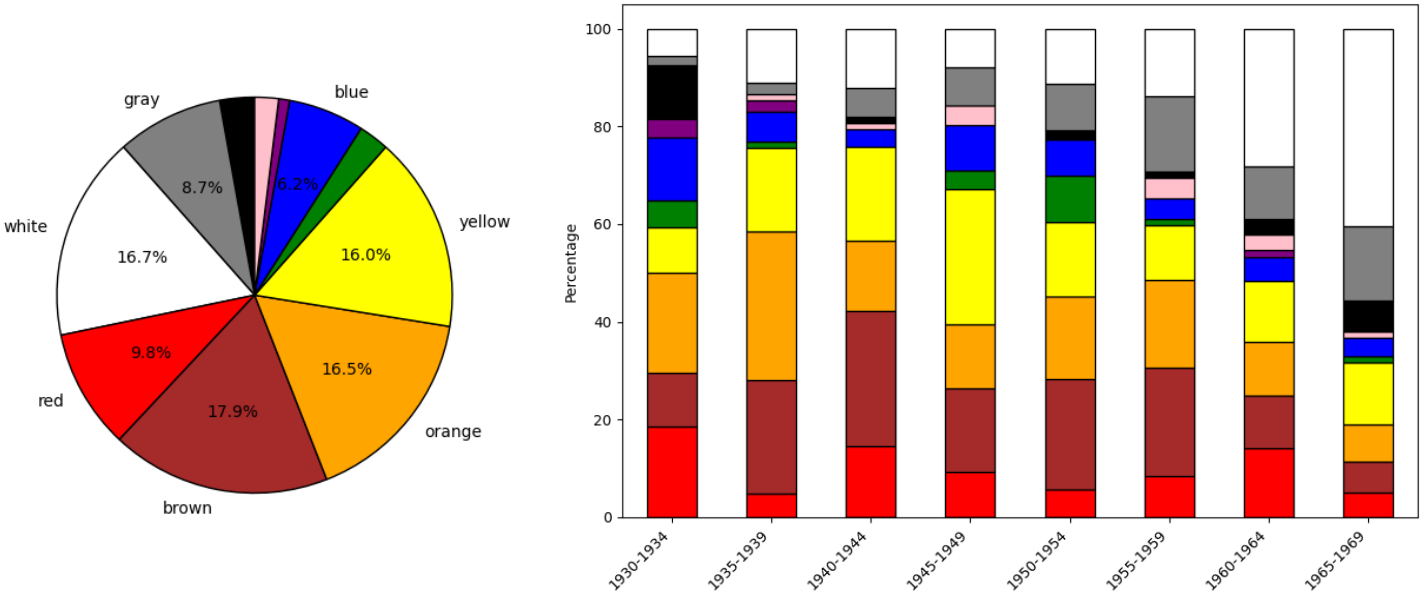

Figure 4: Color distribution of drama films by percentage (left) and five-year period (right)

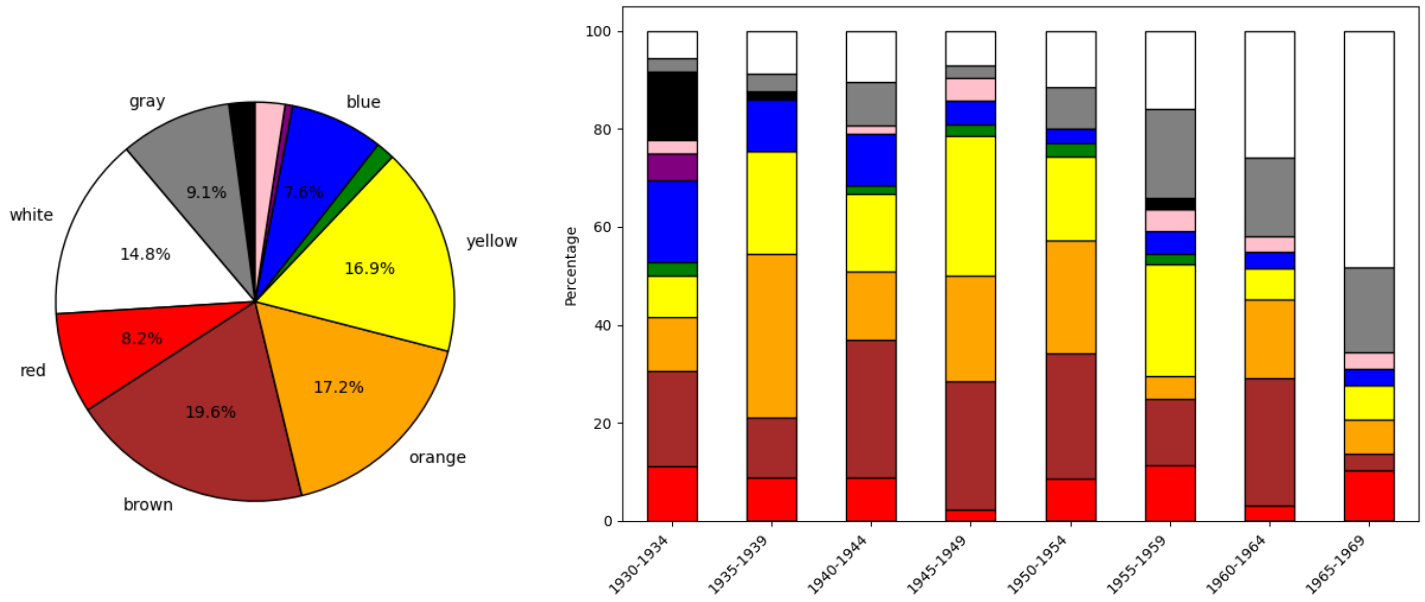

Figure 5: Color distribution of romance films by percentage (left) and five-year period (right)

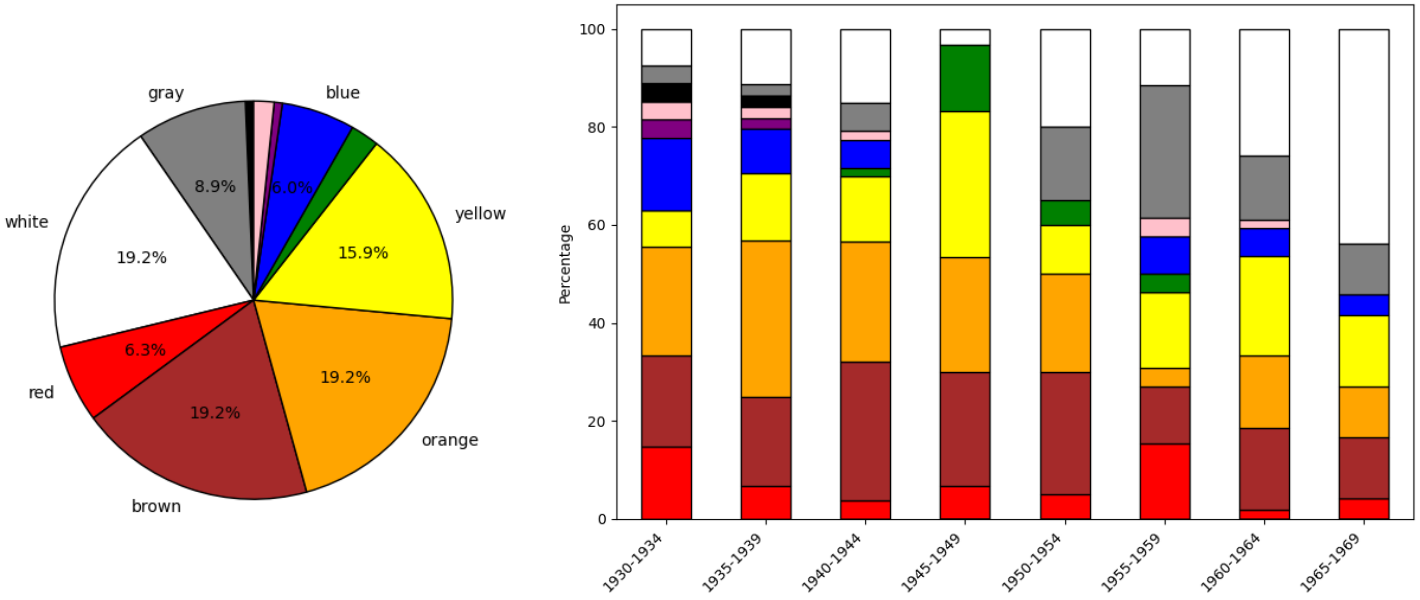

Figure 6: Color distribution of comedy films by percentage (left) and five-year period (right)

Interestingly, all three genres display similar patterns not only in terms of their color distributions as a whole but also throughout the whole period. Overall, there is a clear preference for warmer tones and white-gray tones. Additionally, all time-series diagrams illustrate that during the first half of the Golden Age of Hollywood, a wider variety of colors were used, with brown-orange at the lead, except for the 1945-1949 period when yellow was the most popular color. In the later periods, however, white became more dominant, eventually overtaking the warm tones in the 1965-1969 period. The similarities between genres are in part due to the fact that many of the films in the list fall into two or even all three genre categories. Moreover, colors with longer wavelengths, such as red, orange, and yellow, have been shown to be "physically and emotionally arousing, exciting and distracting," so they seem appropriate for genres that are linked to heightened emotions (Berens, 2014). Red, in particular, can be associated with "energy, war, danger, strength, power, determination as well as passion, desire, and love." Yellow is the color of sunshine and symbolizes "joy, happiness, intellect, and energy." Orange, the combination of red and

yellow, is reminiscent of "joy, sunshine, and tropics." Brown can mean "reliability, friendship, and wellness" as well as "stability". White, apart from fulfilling the purpose of being a minimalistic color, can also denote "light, goodness, innocence, and purity" (Cerrato, 2012). Thus, all of these colors are, in one way or another, enhancing the mood and messaging of the genres that the films are related to.

4b. Musical

Even though the musical genre follows similar trends as the above genres, I want to consider it separately, as it reveals interesting information about poster design for musicals. Although warm tones and white-gray tones are still predominant, it can be observed that red, brown, and yellow are more popular than orange and white is used even more frequently. It also is not too surprising that during the 1960s the number of different colors used decreased, and white became the standard color that was used in the majority of the posters. These results suggest that posters for musicals emphasize even more the positive themes of goodness, friendship, and love.

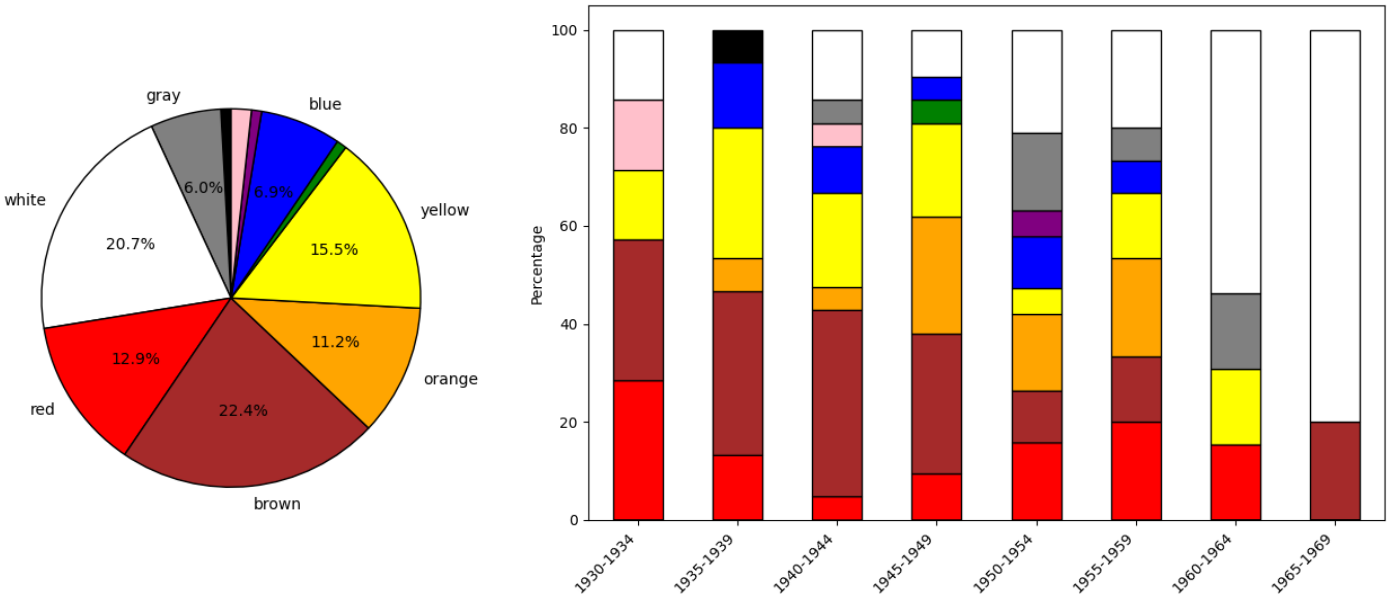

Figure 7: Color distribution of musicals by percentage (left) and five-year period (right)

4c. Film-Noir

In film-noir, yellow is clearly the most used color, followed by red and brown. White, in contrast to the previous genres, takes up only about ten percent of the color distribution. Interestingly, the palette of colors used for this genre is more limited and during the 1940s and the 1950s it was clear that red and yellow were the two most prominent colors. Why were these two colors so prominent in film-noir posters? Apart from creating a strong contrast when combined together, red and yellow both have associations with the topics of crime, danger, and intrigue that the genre explores through its recurring themes, elements, and situations of "a left-handed form of human endeavor," racket-busters, private dicks, Red Scare as well as"hot money, heists, and masterminds" (Muller, 2014). In this context, red can be perceived as a color of passion, danger, and aggression (as well as communism), while yellow evokes a sense of mystery and often serves as a warning sign to indicate a potential danger (Fagerholm, 2009).

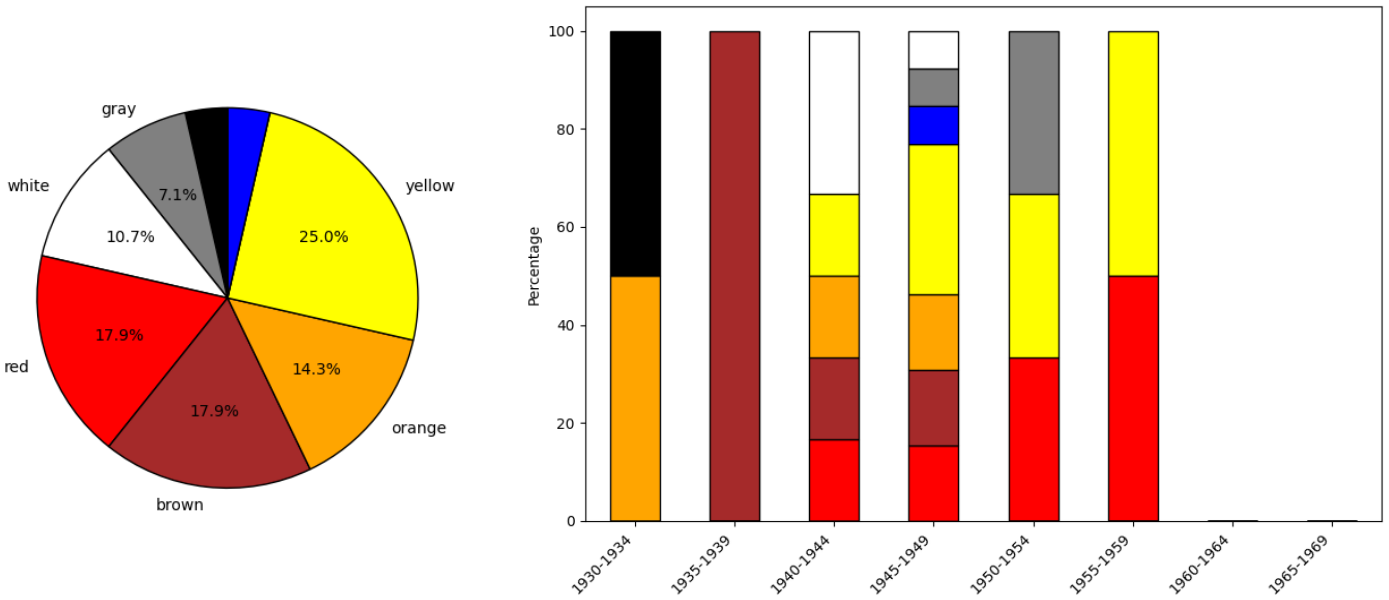

Figure 8: Color distribution of film-noir by percentage (left) and five-year period (right)

4d. Horror

The horror genre reveals a very even distribution of colors, including blue, white, red, brown, yellow, green, and black. The fact that blue, green, and black collectively make up nearly forty percent of the color distribution is significant since these colors are otherwise underrepresented in poster design. In popular culture, blue is traditionally associated with "depression and sadness" and is often used for night scenes. Green has negative connotations with "nausea and envy" along with disgust. Black, on the other hand, symbolizes "mourning and death." According to Cecilia Fagerholm, the color black "is used a lot in movies with horror or gothic themes, using our fear of the unknown and unexplored— the dark spaces we know nothing about— to promote their themes." White and yellow, despite their positive associations, can be used to provide a contrast to strong colors, such as black and blue (Fagerholm, 2009). The prominent use of red is also not surprising, given that red is "the color of blood and, therefore, the color of life and (when spilled) death" (Elliot & Maier, 2014). In other words, all of the various colors that horror posters use help underscore the themes of the genre.

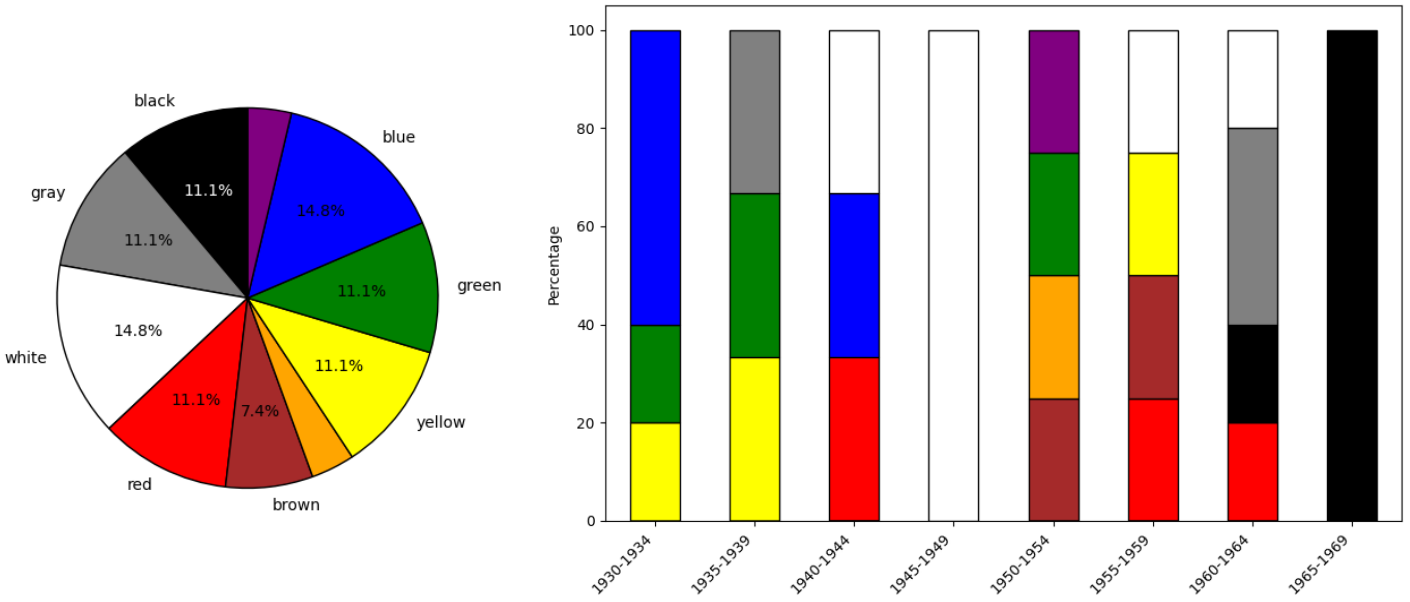

Figure 9: Color distribution of horror films by percentage (left) and five-year period (right)

4e. Sci-Fi

Finally, in the context of sci-fi, it appears that green as well as red, orange, white, and gray are the most prominent colors. Once again, I put emphasis on the color green, as it tends to be an unpopular color among more common genres. Along with the associations described in the horror film genre section, the color green is often used to depict the skin of monsters and aliens. Teal, a combination of green and blue, is additionally used to signify "poison and pollution" which can be related to the topics of foreignness and invasion in the context of sci-fi (Fagerholm, 2009). In fact, sci-fi films, despite often depicting imaginary creatures, were largely based on real-life events that were perceived as "threats to humanity," including the Hiroshima-Nagasaki bombings in 1945 and the Red Scare throughout the 1950s (Elliot & Maier, 2014). It is, thus, no surprise that green has become the quintessential color of the genre. The connotations of red, orange, yellow, white, and gray can be attributed to a combination of factors listed in the sections above, such as the associations with alertness, as described in the film-noir section, and the idea of contrast to colder colors like green, blue, teal, and purple.

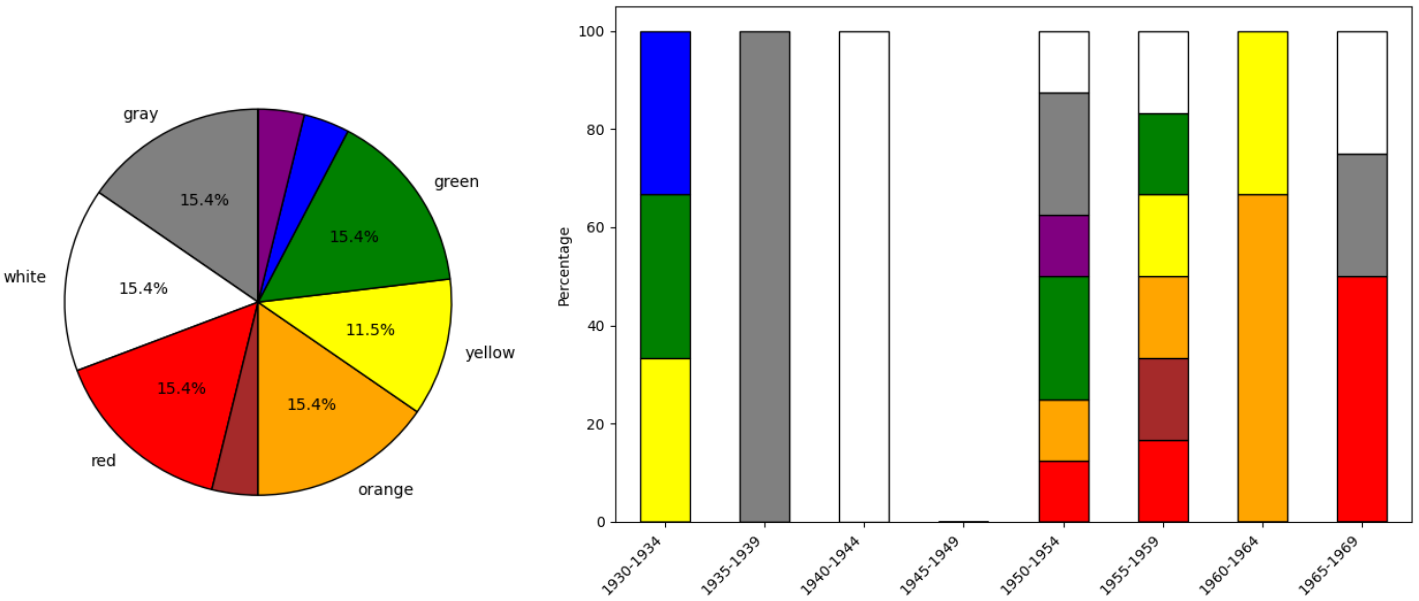

Figure 10: Color distribution of sci-films by percentage (left) and five-year period (right)

To develop a better understanding of the colors that different genres utilize, we need to take into account the other two coordinates (saturation and lightness) as well.

As seen from the bar chart below, saturation across all genres is relatively similar, with film-noir posters having the highest average saturation and horror film posters having the lowest. In *The Art of Noir*, Eddie Muller describes noir as "the dream turned nightmare, from which we all wake up screaming" (Muller, 2014). Muller further states that the attraction of the film-noir genre "must be the imagery— simultaneously innocent and incendiary, naive and nasty— featuring a blatant commingling of sex and violence" (Muller, 2014). Hence, the use of vivid colors for film-noir posters seems to complement the profound yet controversial and emotionally charged nature of the genre. The idea that horror posters use colors with lower saturation (that is, colors with gray tones) may be attributed to the association of gray with the notions of "confusion, loss of distinction, age, intelligence, technology, shadows, and work," many of which have been and continue to be incorporated in horror films (Fagerholm, 2009).

As for lightness, it is clear that comedies and musicals have the highest lightness values, followed by drama, romance, and film-noir. Horror and sci-fi, however, seem to use darker colors. These differences between genres with positive themes (e.g., comedy and musical) and negative themes (e.g., horror and sci-fi) can be again linked to color psychology, as various studies of color-emotion relations among children and adults demonstrate that brighter colors elicit positive reactions while darker colors provoke negative emotional associations (Boyatzis & Varghese, 1994; Hemphill, 1996).

Interestingly, a related study conducted by I-Ping Chen, Fang-Yi Wu, and Chih-Hsiang Lin on the differences of colors across frames taken from comedy, musical, horror, and sci-fi films also yielded, despite using different films and methods to convert colors from RGB to HSL, that comedies and musicals have higher saturation and contrast

than horror and sci-fi (Chen, Wu, & Lin, 2012). Therefore, it could be speculated whether or not poster colors are representative of the colors that the corresponding films use, in order to be as informative as possible about the visual approaches, themes, and tones of those films.

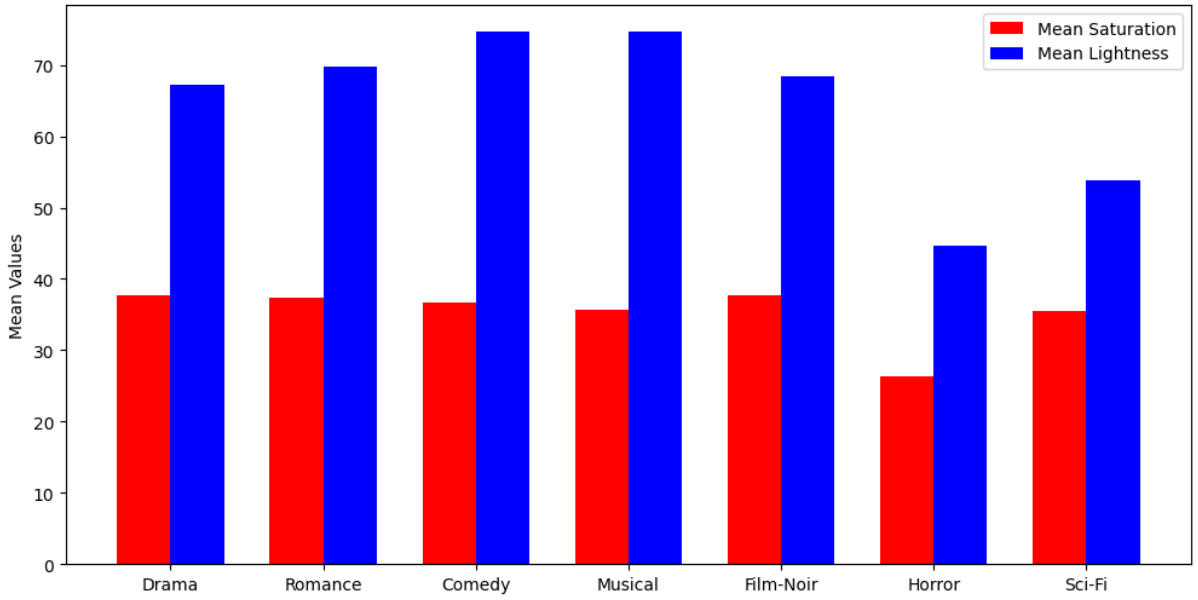

Figure 10: Mean saturation and lightness values by genre

5. Conclusion

The empirical analysis concurs with assessments from previous research, while also contributing to a greater insight of the relationship between genre and color in film poster design. In general, warm, vivid, and bright colors seem to be associated with genres that provoke strong (normally positive or arousing) responses (e.g., drama, romance, comedy, musical, and film-noir) while cold, muted, and darker colors were more frequently used in genres that are known for evoking negative or subdued emotions (e.g., horror and sci-fi). Further work would require improving the accuracy of color classification and analysis as well as including more studies on the topics of color psychology and Hollywood film poster design principles.

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