**Final Project Summary**

Data analysis was conducted on a Jupyter Notebook using the following python packages:

* pandas package was used for data manipulation and analysis and [Numpy](https://numpy.org/) package was used for numerical computations.
* From the Matplotlib package pyplot was used for data visualization and colors for mapping utilities and Seaborn was also used for statistical data visualization

**Questions**

1. What are the 5 most common chemicals in beauty products?

2. What is the distribution for the primary category (class?

3. Which product category (class) contains the 5 most common chemicals?

4. What is the distribution of the top 5 chemicals in the top 10 brands (by count)?

**Insights:** The 5 chemicals that are under observation in this study are found in majority of the products in this dataset (89%).

**Titanium oxide** used in sunscreen and foundation is considered safe in many countries and is U.S. FDA approved as a color additive in cosmetics. However, there is inhalation risk when used in aerosolized or powdered form (loose powders or sprays) which may be classified as a possible carcinogen when inhaled. **Retinol and retinyl esters** found in anti-aging serums, creams and acne treatments poses chronic toxicity with long-term high doses and the most at risk individuals are pregnant people, children and people with liver disease. **Amorphous silica** used in makeup, powders and toothpaste is not the same as respirable crystalline silica. However, loose powders may pose some risk if heavily inhaled over time. **Mica** is approved globally for cosmetic use. Found in highlighters, eye shadows, foundations, bronzers, body lotions to add shimmer/shine. However, ethical concerns exist over its mining which include child labor and unsafe working conditions particularly in India and Madagascar. There is safety controversy on **Butylated Hydroxyanisole**, an antioxidant preservative that prevents spoilage of oils in lipsticks, moisturizers, sunscreens and deodorants. It is a potential endocrine disruptor and carcinogen in high doses thus banned/restricted in some countries including the U.S. Classified as "reasonably anticipated to be a human carcinogen" by the U.S. National Toxicology Program.

**Recommendations:** Manufacturers should look for healthier alternatives (some brands use synthetic mica). Everyday users should take care to look at what is in the products that they use.

**Future Study:** Research into the other chemicals that are found in the fewer products and regulations around ingredients in cosmetics and beauty products.