DSC 680 – Applied Data Science

Waste and Pollution

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Abstract

Waste of all kinds has been an ongoing challenge for this world over many years. The amount has had an impact in both water and on land. This project aims to provide knowledge around the amount of waste that has built up over the years and how we can make it better. The project additionally examines what the most common material(s) that are polluting the oceans and landfills. The result of the project will give a better understanding of how waste and pollution have affected the world around us and how much it could potentially cost us overall if there is no action.

With the materials and waste data provided, I asked questions surrounding the idea of how much waste had been generated over years, whether it had gotten worse or better, and what materials contributed the most.

In my review of the data, it was determined that the biggest contributor was paper and paperboard. This was a surprise to me as plastics was my first guess going into it. There are a lot of resources available for how to better reduce, reuse, and recycle. Following along with guidelines and using proper waste 'etiquette' we can reduce the amount of threat to our people and planet.

Waste and Pollution

Background

Over multiple decades, waste has become a significant problem. This includes everything from food waste to material waste such as paper, wood, metal, and of course, plastic. The United States alone produced more waste than other countries, about 12%, compared to what it recycled. Solid waste has been increasing over the years starting from about 88 million tons in the 60's to over 268 million tons in 2017. There are over 1,000 hazardous waste sites in the United States alone and with the amount of waste in the areas, it contaminates the air, soil, and water. When recycling happens, it can decrease the amount of waste going to landfills which in turn, saves the contamination from all around us. Recycling can save money as well. When materials are re-used, it eliminates the reason to buy new items. In addition, cutting back on your waste, saves money on pickups. Like everything else, waste requires measurement, time, and money. When we know what is out there and identify the problem, a solution can be implemented. Data science techniques are available to present the problem and the solution.

Methods

Data cleaning, exploratory data analysis, and visualization methods were created and analyzed using Python, specifically Jupyter Notebook. In addition, research has taken place for domain knowledge. The data sources for the project were from https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/studies-summary-tables-and-data-related and https://www.statista.com/statistics/186256/us-municipal-solid-waste-generation-since-1960/ . The target variable was the waste generated and then this was broken down into different materials individually. The additional variables include year, paper, glass, metals, plastics, rubber and leather, textiles,

wood, and other. A chart including this information can be found in Appendix A. The materials data is notated as the materials in which are generated in the municipal waste stream in the United States.

During the cleaning phase, the columns were renamed, unneeded columns of data were dropped, the variables were changed from objects to integers in both datasets, and visuals were created to compare data. Additionally, it was determined there were no missing values. I chose to show a correlation chart (appendix B) as well as bar charts for the waste amount in millions (appendix C) and the materials amounts by year (appendix D). Looking at the correlation in appendix B, we can see that paper and glass are the least related to the other materials. With the additional two charts, it was determined that waste had risen above over 250 million within the final year recorded and paper was the primary material found in landfills over the years.

Results

The amount of waste in millions is shown as rapidly increasing as the years go on. In 2017, 26.8 million tons of plastic were sent to landfills. It was determined that the amount of waste has been increasing over the years and the primary material found is paper and paperboard. Throughout the years, there has been an increase in plastic waste; however, a decrease in glass. With the decrease in glass, it tells me that this is due to recycling. A lot of glass is also repurposed to serve other needs for people.

Discussion/Conclusion

Being an advocate around my friends and family for 'plastic free' living as much as possible, a lot more knowledge was gained during my research around this subject. This includes all other materials that are just as harmful as plastic can be. Plastics can take up to

400 years to break down and a lot can happen within that time. A lot of our daily lives

contain elements of plastic, paper, etc. that can be re-used and/or recycled. While the

amount of waste keeps piling up, the data also has been evolving in ways to identify certain

waste products to pull from landfill. The more we can identify, the more machines can pull.

There are solutions that we can take now to reduce the amount of waste we are

producing. Some of those solutions include buying in bulk, choosing to reuse a water bottle,

using utensils from home, using a reusable bag, and simple things like cutting the strings off

of disposable masks can help with sea life. A lot of waste comes with mindfulness. If we do

not take care of our planet, the amount that will be available to us in the future is

diminishing minute by minute.

Acknowledgements

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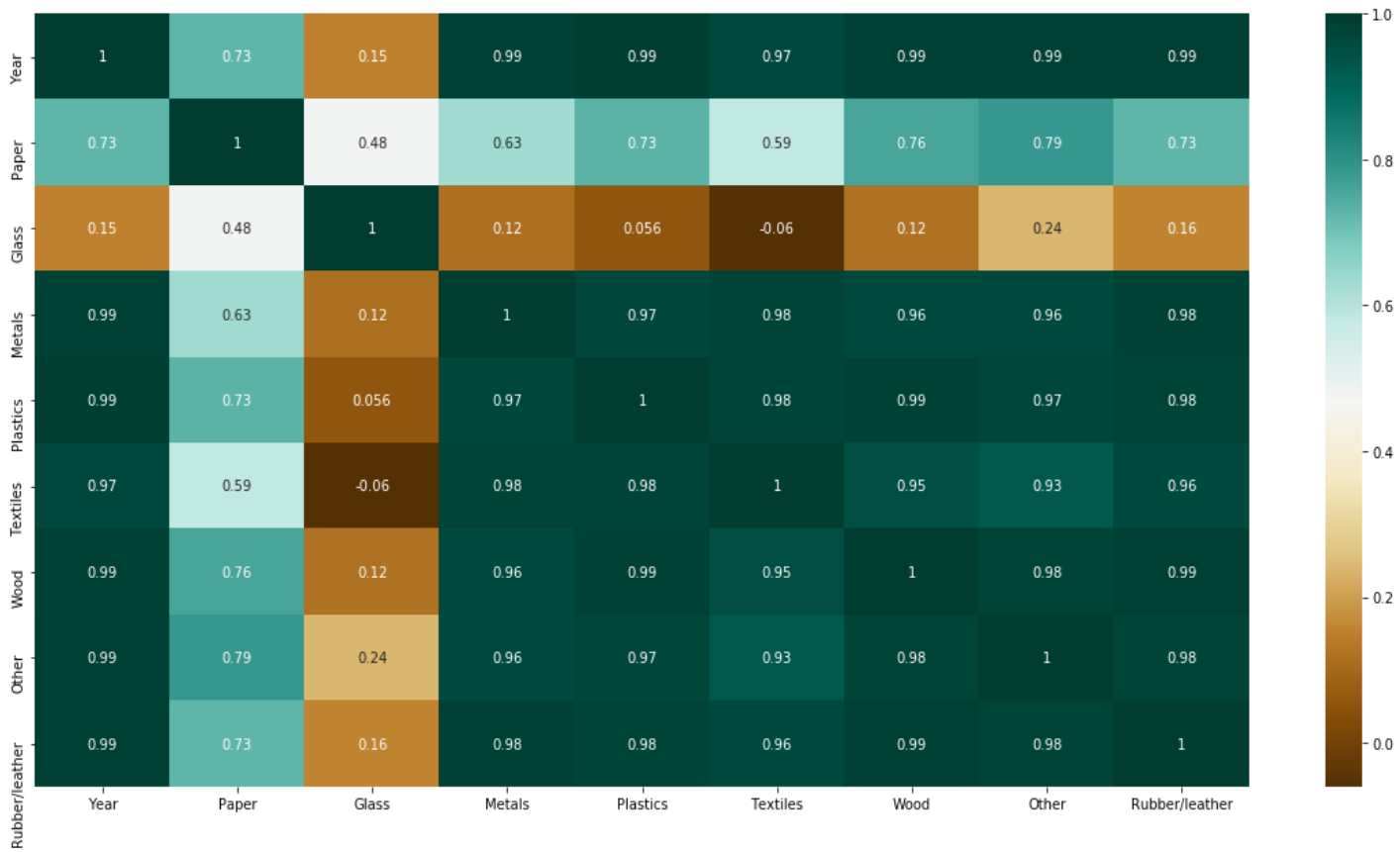
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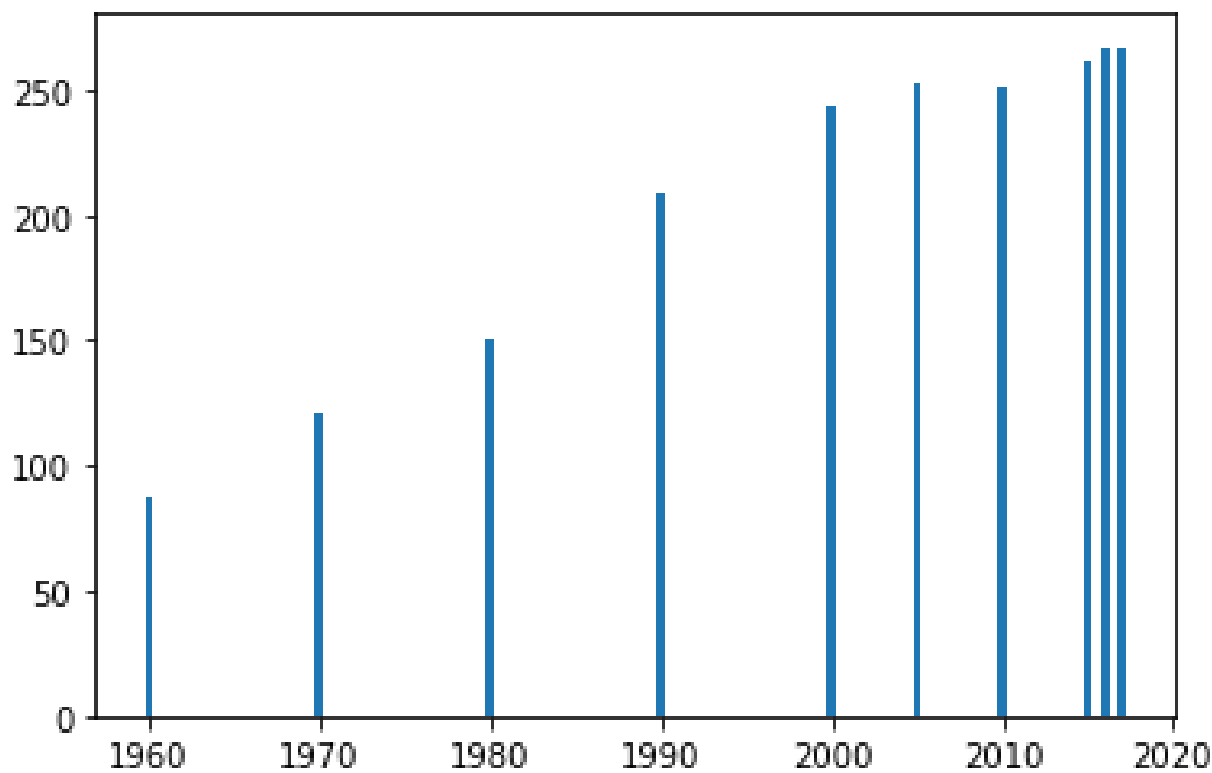   since-1960/

Appendix A

Waste and Materials Datasets columns and descriptions

Column Name	Data Type	Description
Year	integer	Year of recorded data
Paper	integer	Paper and paperboard in 1,000 tons
Glass	integer	Glass in 1,000 tons
Metals	integer	Metals in 1,000 tons
Plastics	integer	Plastics in 1,000 tons
RubberLeather	integer	Rubber and Leather in 1,000 tons
Textiles	integer	Textiles in 1,000 tons
Wood	integer	Wood in 1,000 tons
Other	integer	Uncategorized materials in 1,000 tons
Generated Waste	integer	Amount of generated waste in millions per year

Appendix B

Appendix C

Appendix D