
PROPOSAL FOR PROJECT ON MARINE MICROPLASTICS DATASET RELATIONSHIP ANALYSIS IN R

YASSY BARDALLIS DOPPLER BARDALLIS¹

DATA

For this project, we have chosen to work with a dataset on the density of marine microplastics in samples drawn from seawater around the world. These datasets contain information quantifying the presence of microplastics at specific points in the world on specific dates. This dataset is termed the “SEA_MICRO” dataset and was acquired from kaggle.com[1] but seems to have been drawn from data relating to a project done by scientists supported by the NOAA Marine Debris Program[2].

BACKGROUND

Marine microplastics, which are defined as plastic particles under 5mm, pervade our ecosystem. They have been found in everything from fish[3] to human placentae[4]; while we are still exploring the impact they have on our world, they are already known to be detrimental to the health and life of coral[5], and other species have been and are being investigated, including us[6]. As the marine world is intricately intertwined with our own, research into their movements is imperative.

QUESTIONS

In this project, we wish to investigate the distribution of microplastics and whether there is any statistical significance to this evidence that would support a relationship between the time of year, the geographical region in question, and concentration levels. Specifically, we want to investigate how statistically plausible it is for a model to be created using this data that can predict whether there will be more or less than a particular concentration of microplastics in a given geographical region given a particular time window.

The members of this project team have personal interests in this project. Y. Bardallis has had a deep interest in the ocean since a young age that only has grown stronger over the years. D. Bardallis, as a cat, has a vested interest in the future of marine life as it directly and immediately relates to his food supply. Both Y. Bardallis and D. Bardallis are also members of the population on this planet and, therefore, will live with the consequences of this microplastic and its presence for as long as they live; they do not want future generations of cats and humans to have the same immediate impact from these microplastics that they will.

¹ Doppler Bardallis, mentioned throughout the work, is Yassy’s cat.

MODEL

This project will begin with partitioning the data into a small number of bounded geographical regions, then further into training and test sets within each region. These bounded regions will replace the latitudinal and longitudinal data into a form that is simpler to analyze using the authors' current levels of knowledge. This form will consist of a classification variable. Further research into marine research standards will factor into how many regions we will be using. Our estimate is 6-10.

We intend to train the data using QDA within each region and use the lasso method along with cross-validation to shrink the tuning parameter and each model's coefficients. Finally, we will use the still untouched test set within each region to evaluate our final models for the project's presentation and paper.

BIBLIOGRAPHY

- [1] "MARINE MICRO-PLASTIC / ON WORLD / DENSITY / NOAA."
<https://www.kaggle.com/datasets/brsdincer/marine-microplastic-on-world-density-noaa> (accessed Feb. 24, 2023).
- [2] dianna.parker, "Detecting Microplastics in the Marine Environment | OR&R's Marine Debris Program," Jul. 18, 2013. <https://marinedebris.noaa.gov/research/detecting-microplastics-marine-environment>, <https://marinedebris.noaa.gov/research/detecting-microplastics-marine-environment> (accessed Feb. 24, 2023).
- [3] M. Constant, M. Reynaud, L. Weiss, W. Ludwig, and P. Kerhervé, "Ingested Microplastics in 18 Local Fish Species from the Northwestern Mediterranean Sea," *Microplastics*, vol. 1, no. 1, pp. 186–197, Mar. 2022, doi: 10.3390/microplastics1010012.
- [4] H. M. Duszka *et al.*, "Uptake, Transport, and Toxicity of Pristine and Weathered Micro- and Nanoplastics in Human Placenta Cells," *Environ. Health Perspect.*, vol. 130, no. 9, p. 097006, Sep. 2022, doi: 10.1289/EHP10873.
- [5] C. Corinaldesi *et al.*, "Multiple impacts of microplastics can threaten marine habitat-forming species," *Commun. Biol.*, vol. 4, no. 1, p. 431, Mar. 2021, doi: 10.1038/s42003-021-01961-1.
- [6] C. L. Dybas, "Silent Scourge: Microplastics in Water, Food, and Air: Scientists focus on the human health effects of ubiquitous plastics," *BioScience*, vol. 70, no. 12, pp. 1048–1055, Dec. 2020, doi: 10.1093/biosci/biaa119.