Predicting densities of microplastics in rivers and oceans

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Metis Passion Project
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Ocean gyres

THE OCEAN CLEANUP

CONCENTRATE THE PLASTIC AND **TAKE IT OUT**

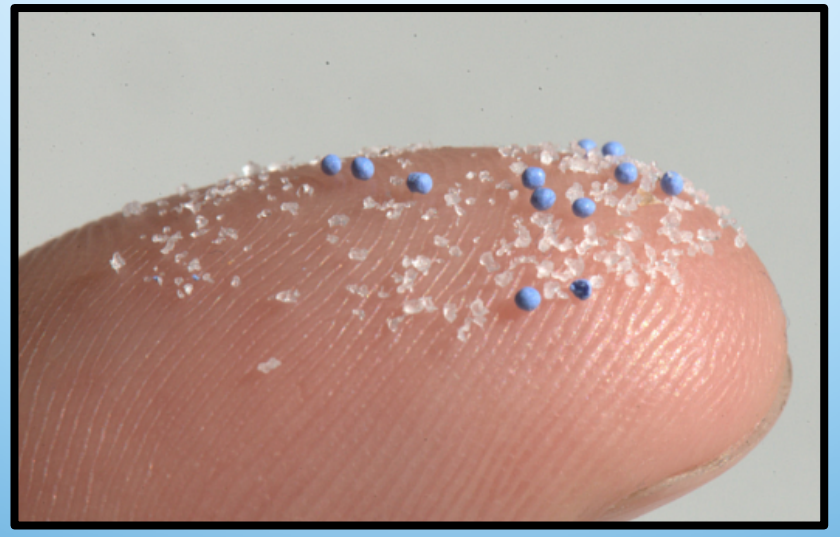
A vessel acting as a garbage truck of the seas will remove the collected plastic every few months.

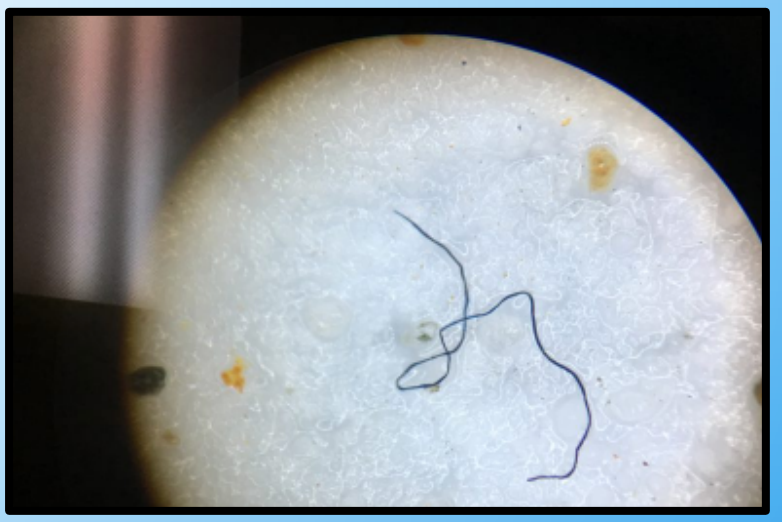
Considerations

Some estimate that only around 3 - 5 % of total plastic pollution actually end up in gyres

The Ocean Cleanup’s systems don’t capture microplastics

Microplastics – plastics < 0.5 cm





The problem – not enough data

Available locations < 2500 samples
Possible locations = $4.60 * 10^{12}$

How do we clean up microplastics if we don't know where to look?

The goal

Predict densities of microplastics in rivers and oceans

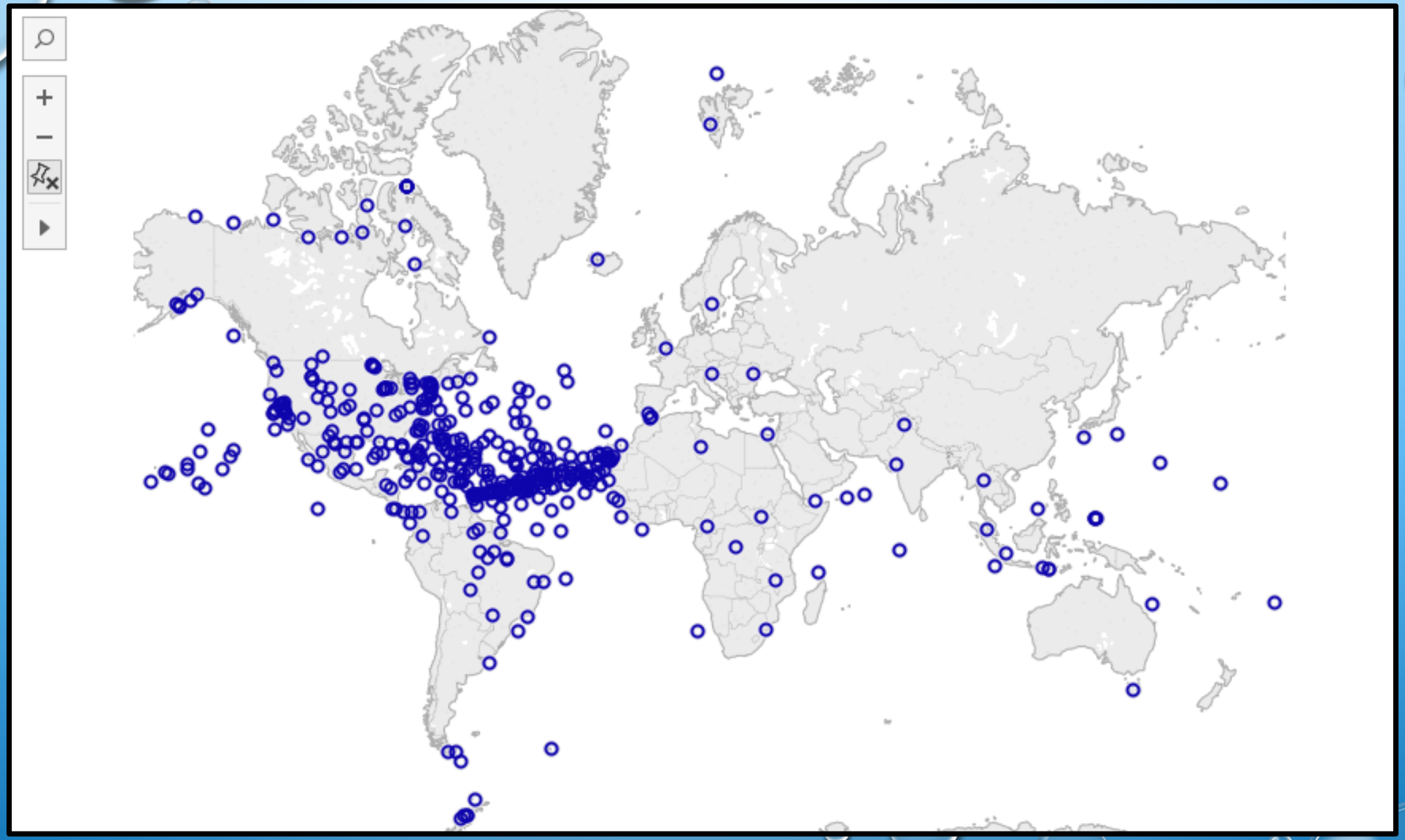
- use available (and imperfect) data to predict locations where microplastics are likely to be found
- emphasis on minimizing model error

Data and tools

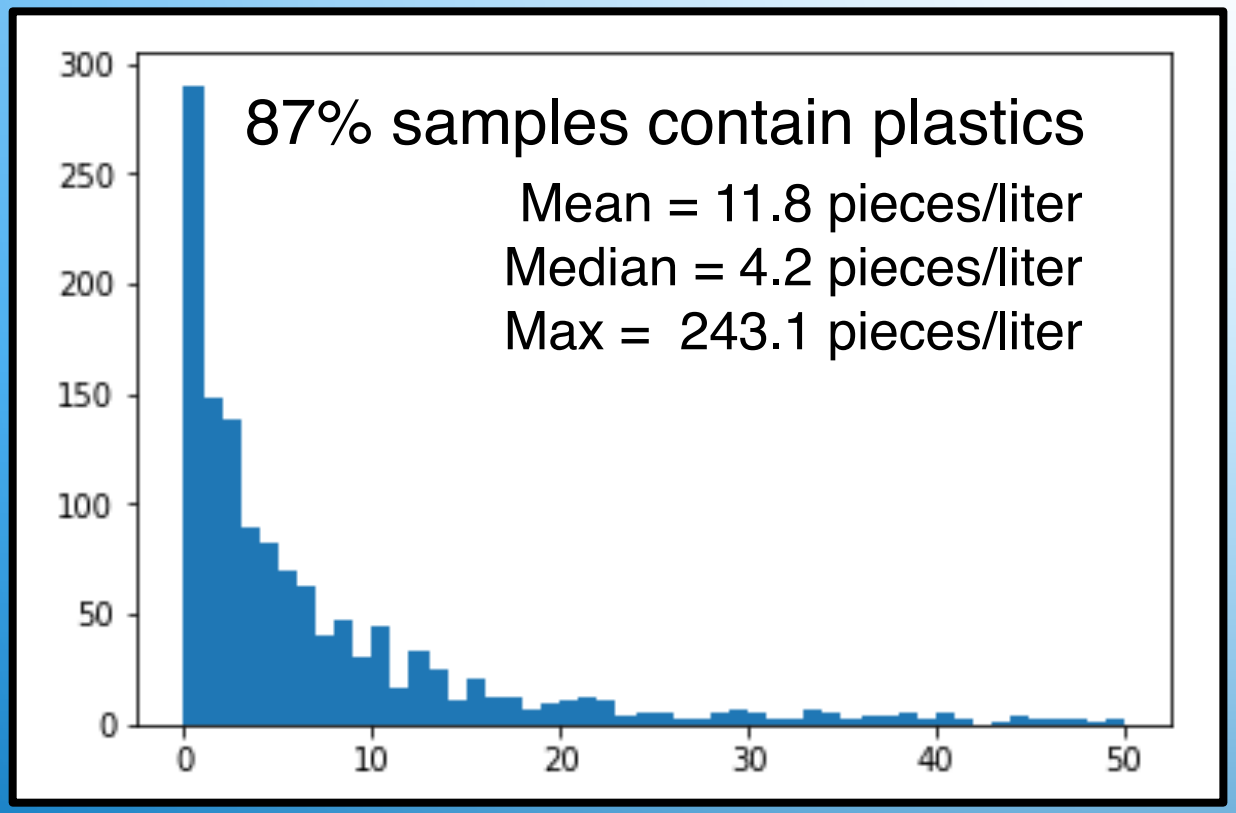
kaggle

scikit learn

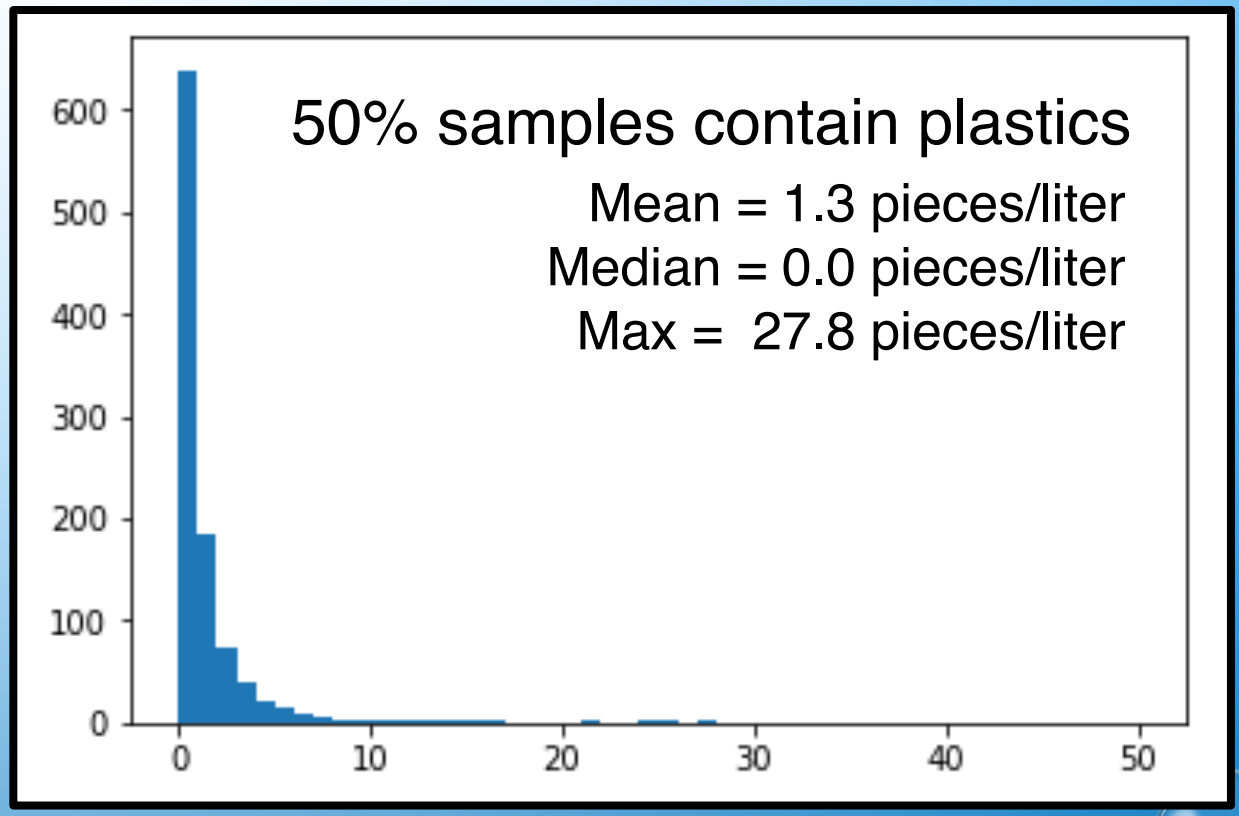
Dai, A., 2016: "Historical and future changes in streamflow and continental runoff: A review", in Terrestrial Water Cycle and Climate Change: Natural and Human-Induced Impacts, Geophysical Monograph 221. Ed. Qiuhong Tang and Taikan Oki, AGU, John Wiley & Sons, 17-37 (DOI: 10.1002/9781118971772).



More plastic in oceans than in rivers



Ocean Samples



River Samples

Models

Regressions:

linear

poisson

random forest

gradient boosted

Features:

sample location

salt or fresh water

distance to cities

city population

distance to river mouths

river annual water discharge

Error metric:

root mean squared error

rmse

Results – gradient boosted regressor

On average, highest performing model is off by about 19 pieces of microplastic per liter.

Making predictions for locations with no data

Thank you

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