Prime Time Birds

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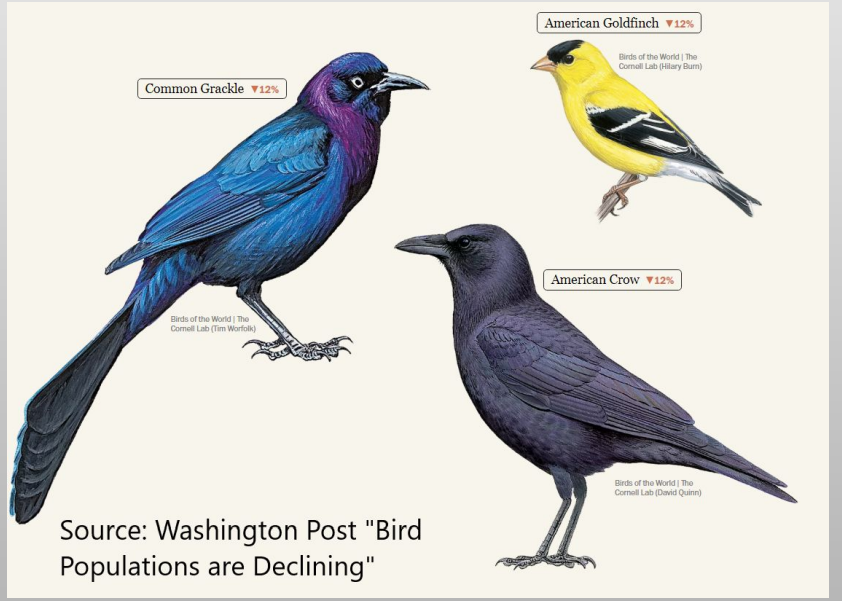
Overview

- A study in 2019 showed the loss of around 3 billion birds in the U.S. and Canada since 1970.
- The 2022 State of the Birds Report identifies 70 birds that have lost half or more of their populations in the last 50 years and stand to lose another half in the next 50
- 90% of the birds lost come from 12 different families of birds that include sparrows, blackbirds, warblers, and finches.



Our Project, trained on 7 years of both bird sighting data (EBird) and weather data (NOAA), predicts future bird migration patterns and sighting.

Stakeholders

- Conservationists
- Local Government
- Farmers (birds kill pests)
- Birders or Bird Enthusiasts
- General population (birds eat mosquitos and other disease carrying insects))

The U.S. is home to 600+ species of birds.

Birds are a “bellwether” species and represent ecological issues that affect other species populations.

Steep bird population decline signals the grave effects of climate change, habitat loss, and pollution on the habitats and populations of other species,

Datasets

Our datasets consist of

- Weather data from NOAA (Precipitation, Snow, Max Temperature based on Latitude and Longitude)
- The Bird data from Cornell Lab of Ornithology (EBird) is submitted by birders based on sightings and includes metrics such as time of day and Location.
    - Location data was categorized by whether it was a Conservatory, U.S. Fish and Wildlife Service Land Holding, Important (Prime) Bird Area.
- The species that we tracked were American Goldfinch, Tufted Titmouse, Dark-Eyed Juncos, and Mallards.

Dataset Processing

Set up grid data based on Long and Lat.

Weather Data:

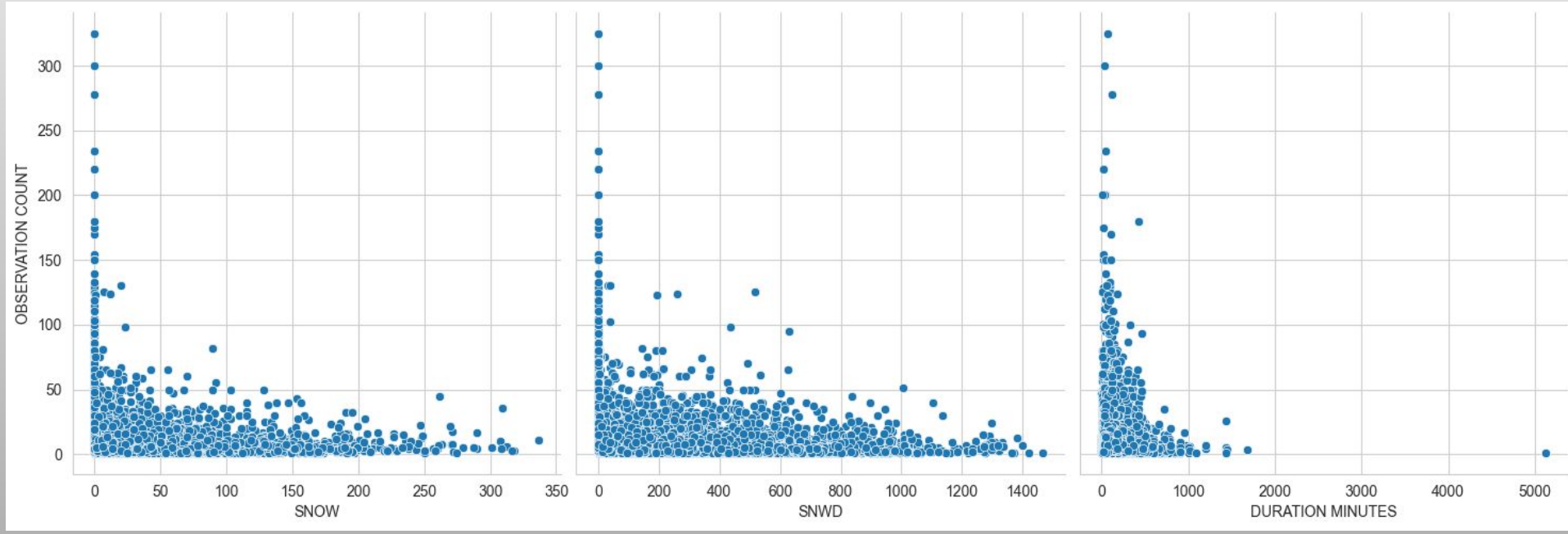
- Dropped Extraneous data such as snow depth, etc.
- Aggregated/Averaged information by region

Bird Data:

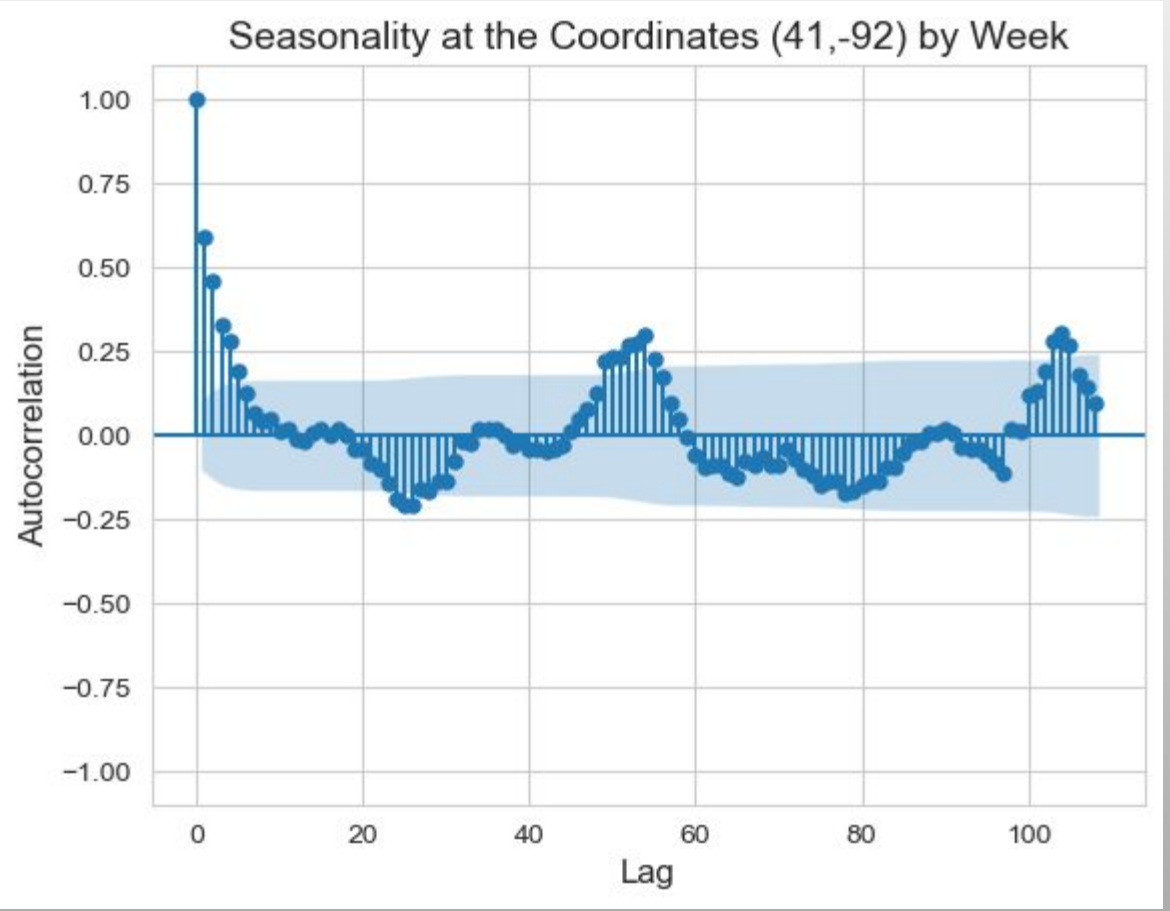
- Averaged Observation count by day.
- Cleaned Group or duplicate submitted sightings.
- Dropped data and columns with too few values or not enough information, irrelevant to the project (Breeding+Behavior codes, Effort Distance, etc)

Models

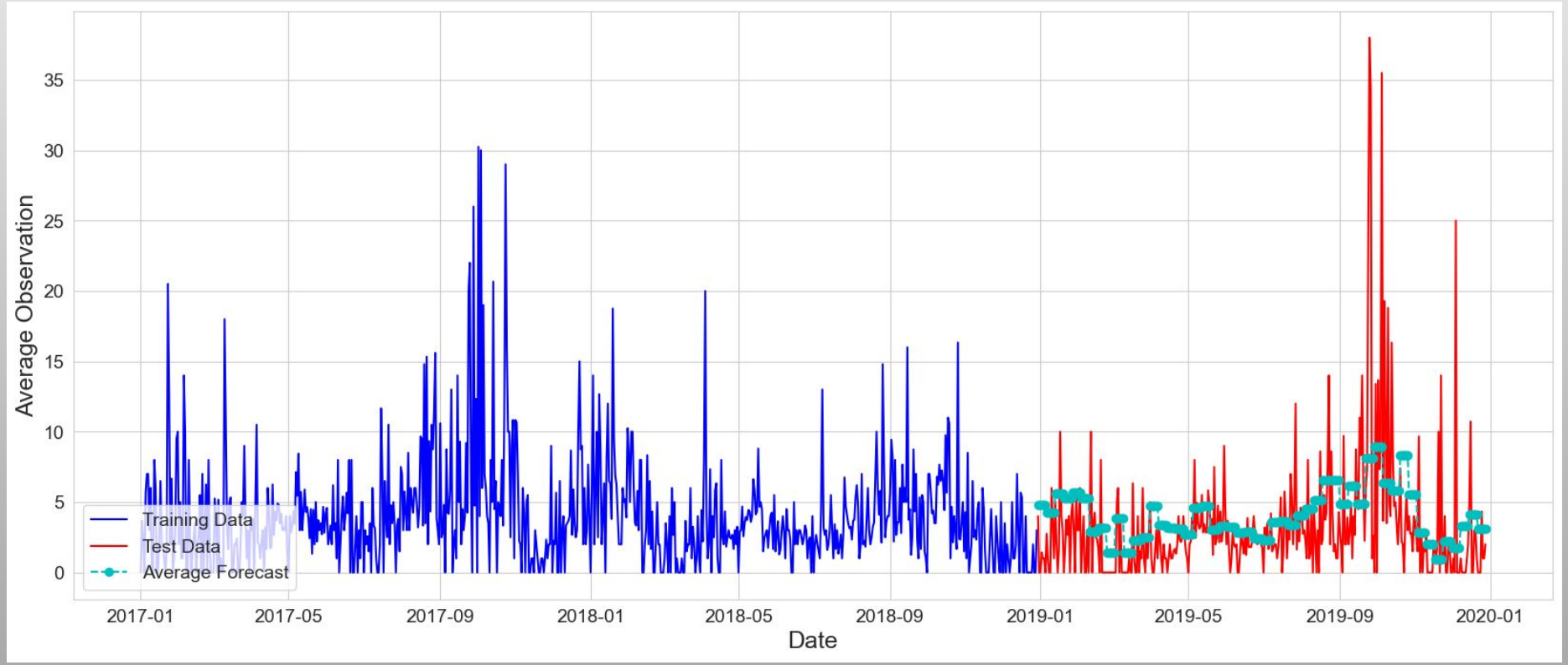
Basic Regression



Time Series Pt1



Time Series Pt2



MSE (Mean Squared Errors) on test sets

Basic Regression MSE: 22.8

Average Model MSE: 19.6
Naive Model MSE: 16.6

RNN MSE: 11.7

Based on these results we decided to go with RNN.

Results: Because it outperformed Average and Naive Models, this RNN generated useful predictions in regards to bird migration patterns.

Future work?

- Gather weather forecasts from online to automatically predict locations and density by location and species
- Use cross-species and cross-location information for prediction (currently, our time series and RNN models consider information one location and species at a time)

Acknowledgement(s)

Mentor: Kshitij Aggarwal
Thank you Erdős people.
(And EBird for giving us access and NOAA for just doing it for free <3 :))