

## December 2023-February 2024 Northern Michigan Search Interest Forecast

Author: Dan Shaffer

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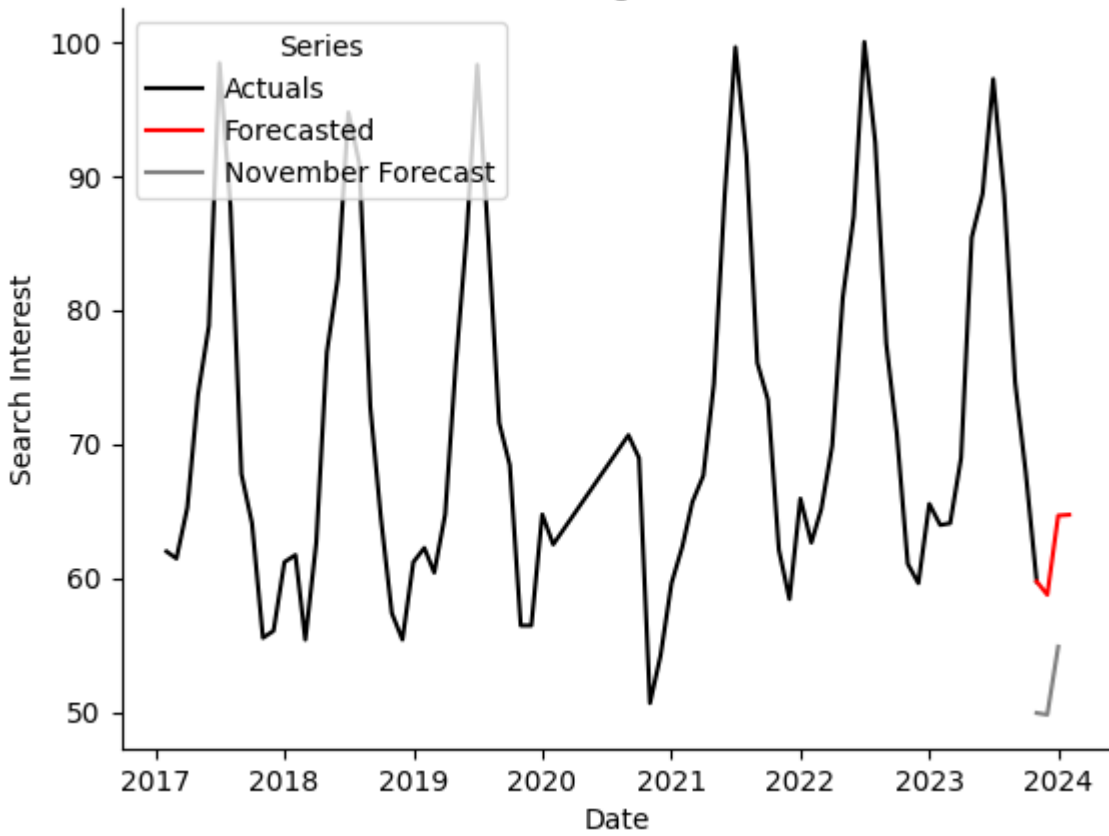
Below are the search interest forecasts for the combined Northern Lower and combined Upper Pensinsula places for December, January, and February 2024. Note that the possible range for historical search interest is normalized to a maximum of 100, but forecasts outside this range are permissible as these values are forecasted to be outside the historical range.

Also provided are barcharts comparing the average search interest for the forecast months (December, January, February) to the same months in previous years.

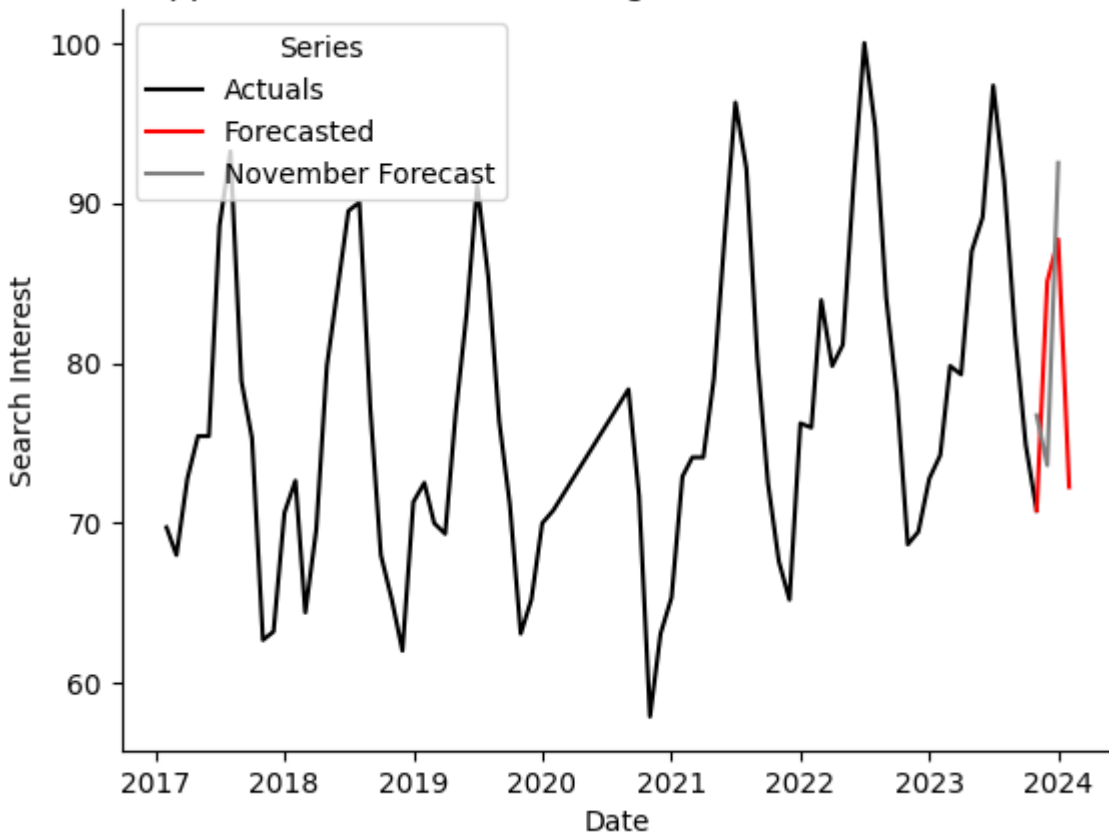
The forecast for the Upper Pensinsula is higher relative to past years while the Lower Peninsula is slightly lower.

Also shown is the previous forecast from November. For the Lower Peninsula, this forecast was lower than the current forecast. The current forecast is actually more consistent with the September forecast. I'm currently planning changes that should reduce this forecast to forecast volatility. For the Upper Peninsula, the December forecast is higher for December (85 vs 74) and similar for January (88 vs 92). The Upper Peninsula forecast for February shows a drop to typical historical levels for February (72).

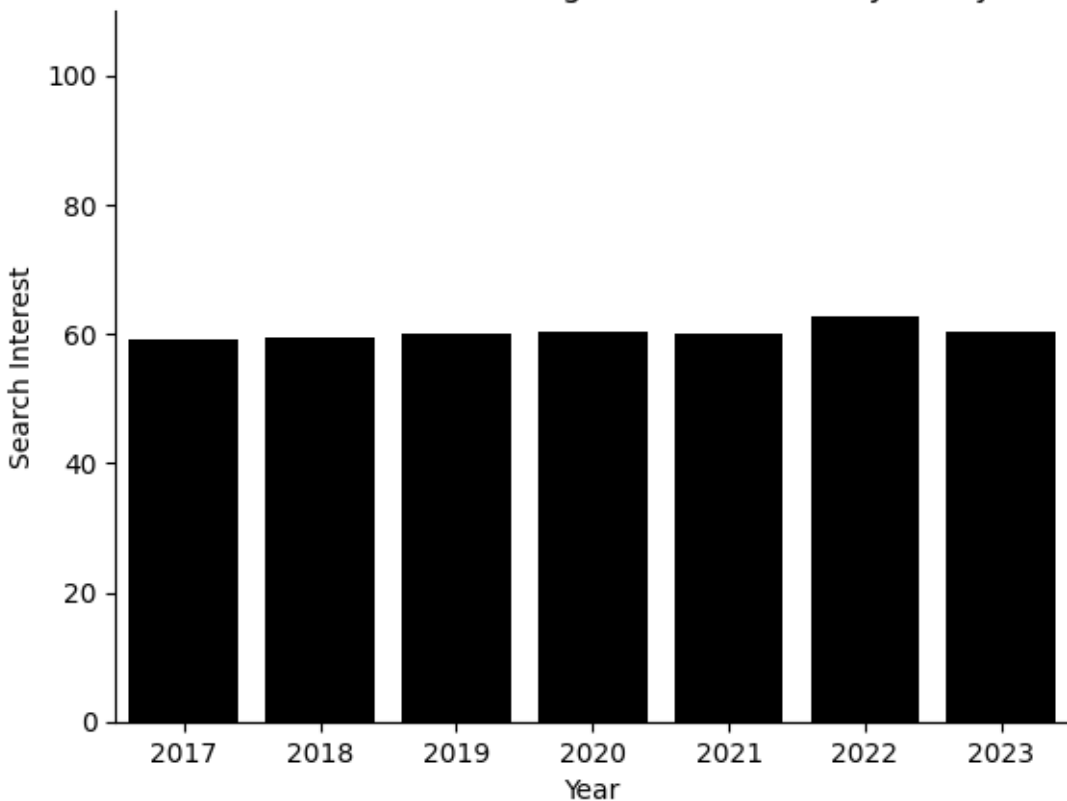
### Northern Lower Places Google Search Interest Forecast



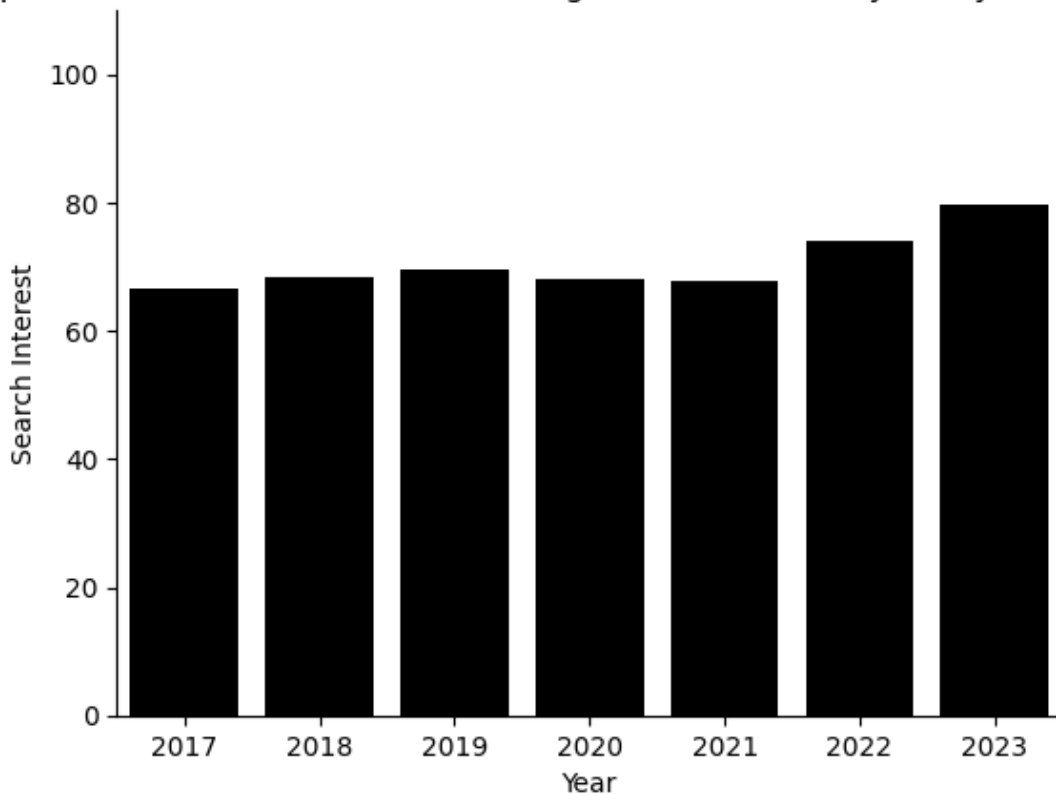
### Upper Pensinsula Places Google Search Interest Forecast



Northern Lower Search Interest Averaged for December, January, and February



Upper Peninsula Search Interest Averaged for December, January, and February



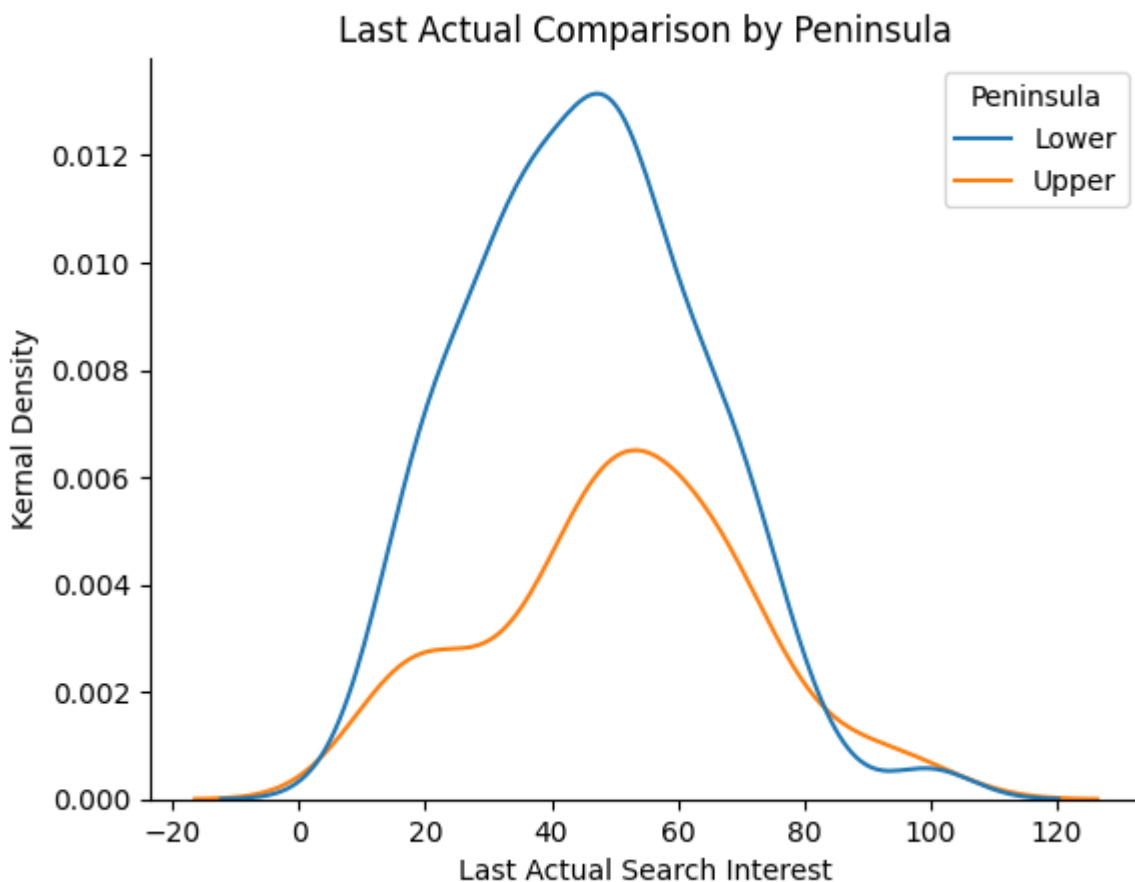
The following table shows the top five places that are forecasted to have the highest search interest compared to the same time period in 2022/2023. It's likely that 'Pilgrim' having a high search interest is actually due to search interest in the 'pilgrims' associated with Thanksgiving in the last actual month (November). Three of the other places listed here are in the Upper Peninsula with Menominee near lake Michigan and Kingsford and Ramsay near the Wisconsin border. Kingsley is near Traverse City.

|   | Place     | Peninsula | Difference |
|---|-----------|-----------|------------|
| 0 | Pilgrim   | Lower     | 80.3       |
| 1 | Menominee | Upper     | 48.0       |
| 2 | Kingsley  | Lower     | 28.3       |
| 3 | Kingsford | Upper     | 25.2       |
| 4 | Ramsay    | Upper     | 25.1       |

Three things impact the value of the search interest forecasts for each place.

1. The last available monthly value: since models are differenced, it matters how high the last month's value is
2. Seasonality: if search interest is typically high during a month, it will be forecasted to be high again
3. Model difference: based on forecasted atypical weather and gas price changes, the model will predict the deviation from historical and seasonal values.

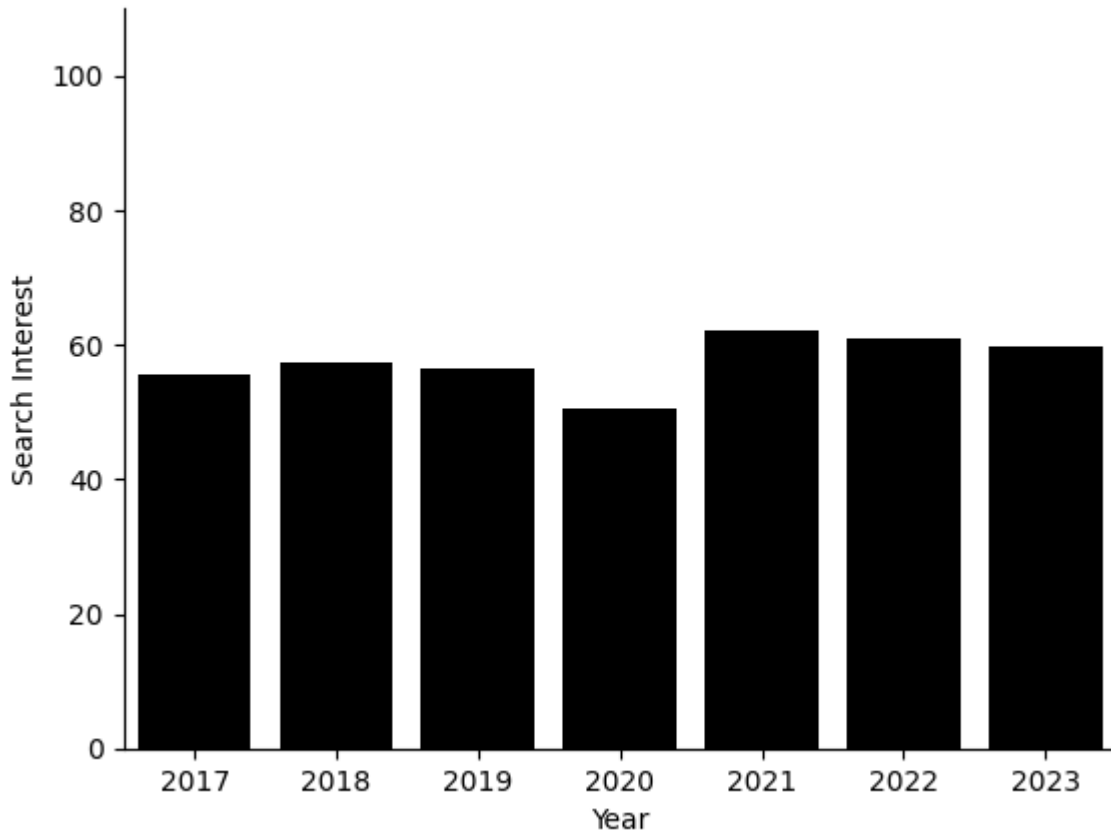
The following shows last actual values for November 2023 for search interest in the Lower and Upper Peninsula. The distribution of last actuals is higher for the Upper than the Lower Peninsula. Note that due to kernel smoothing the plot shows values outside of 0-100 which are the possible values.



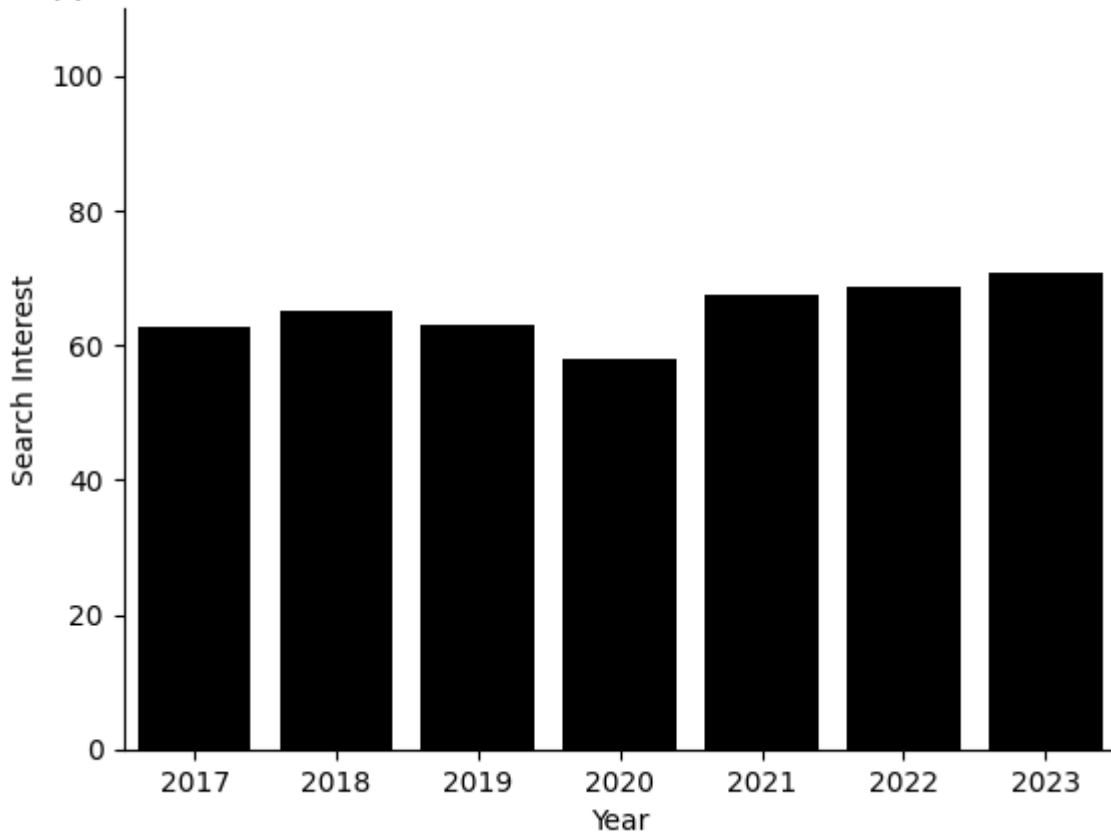
The last actuals used in the aggregate forecast are from the aggregate series. These charts compare the aggregate last actual for both peninsulas to previous values in November. For the Lower

Pensinsula, the last actual is relatively low compared to the last several years. For the Upper Peninsula, it is relatively high.

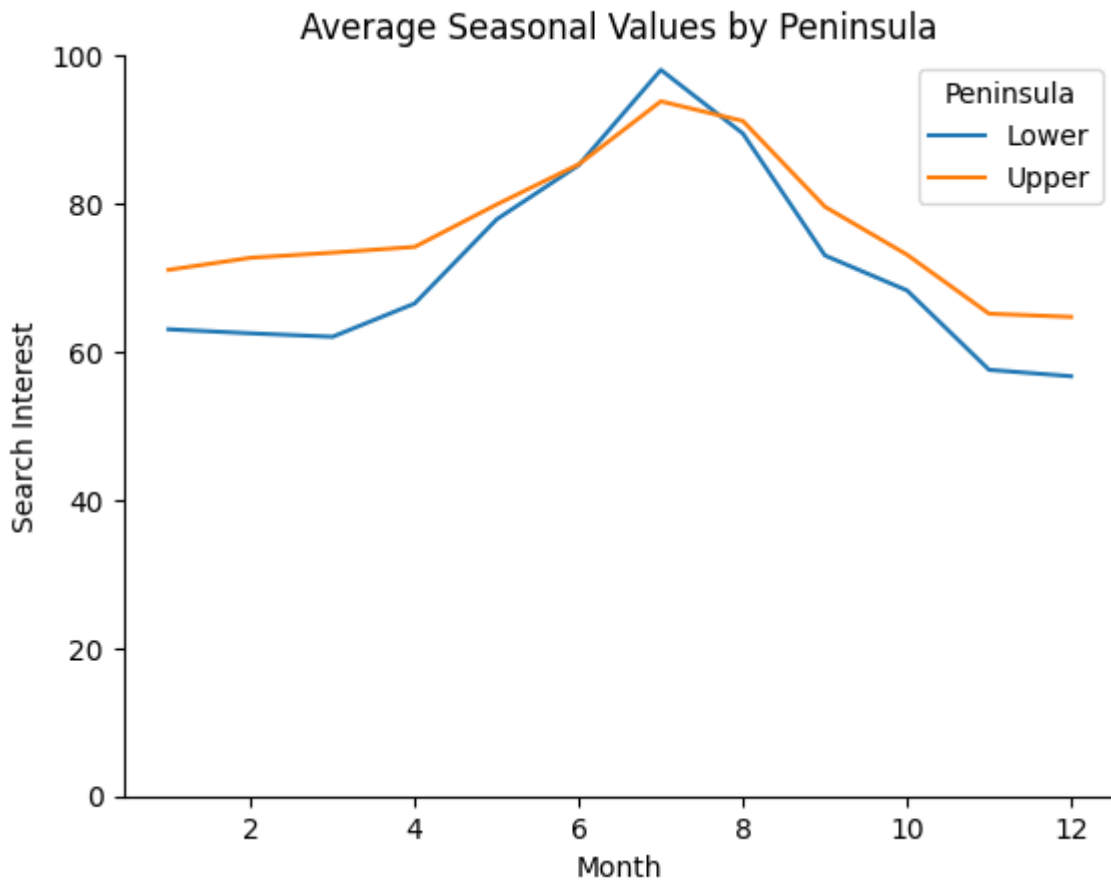
Northern Lower Last Actual Search Interest versus Previous Novembers



Upper Peninsula Last Actual Search Interest versus Previous November

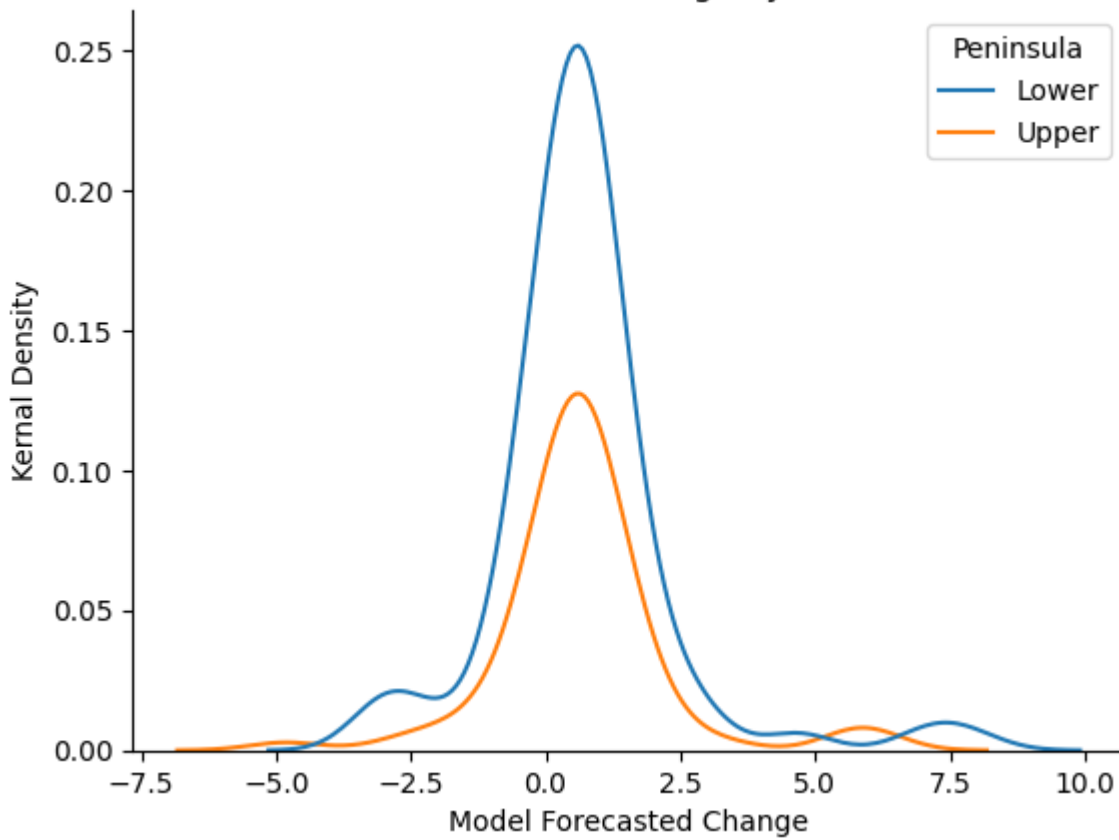


The following figure shows the aggregate average search interest for each month. Both the Upper and Lower Peninsulas have a seasonal peak in July/August with the Lower Peninsula peak solidly in July. The Upper Peninsula values have higher values for January-March likely due to winter snow sports like snowmobiling. For the December-February forecast period, we should expect some of the lowest search interest values.



Finally, forecasts are determined by the forecasted place level change based on weather and gasoline prices. For both peninsulas, the most likely forecasted change is near zero but slightly positive.

Model Forecasted Change by Peninsula



The following chart shows the average of the changes over the forecast period for places in each peninsula. The average change for the Lower Peninsula is higher than the Upper Peninsula. However, in the next chart, these changes are weighted by their contribution to the aggregated peninsula forecasts. In this case, the Upper Peninsula is much more positive than the Lower Peninsula.

Average Place Change During Forecast Period



Average Place Change Weighted by Contribution to Peninsula Aggregate

