



1890-2016  
TIME PERIOD

# HOUGHTON COUNTY

Data Source: <https://www.mtu.edu/alumni/favorites/snowfall/>

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Winter of 2015-2016



WINTER MONTHS  
DEC - MAR



MAX. SNOWFALL (Inches)  
71.50 (Jan)



MIN. SNOWFALL (Inches)  
1.50 (May)

## HOUGHTON, MICHIGAN - HISTORY

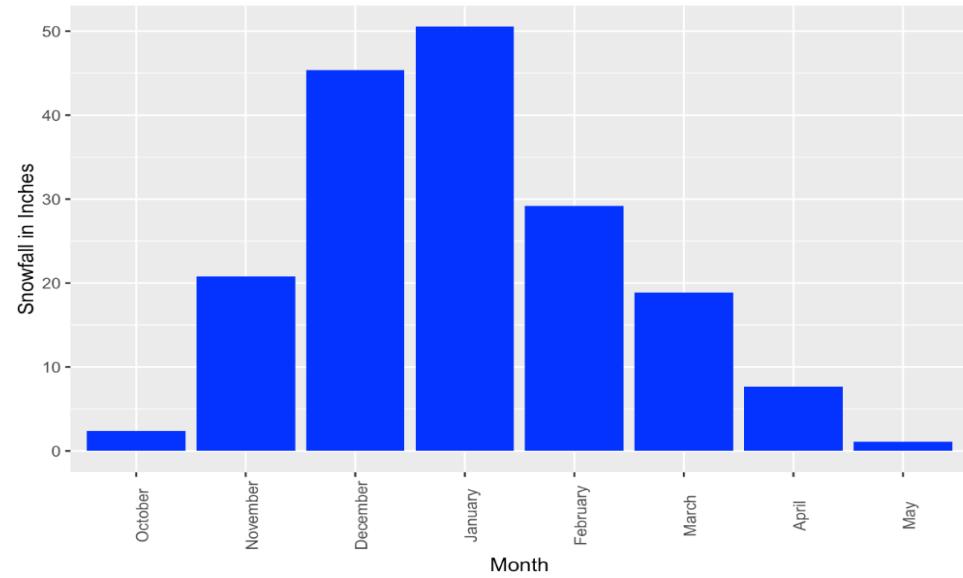


Houghton has been listed as one of the "**100 best small towns in America**". Population of the town is around 7.8k people. It was the birthplace of professional ice hokey in the United States when the Portage Lakers were formed in 1903.

Houghton is also a home to Michigan Tech, a public research university founded in 1885. Snowfall is measured near Houghton County Memorial Airport by Michigan Tech's **Keweenaw Research Center**. According to Michigan Tech's snowfall record, the record-high seasonal total—a whopping 355.90 inches—came in the winter of 1978–79. The least amount of snowfall, in the winter of 1930–31, is 81.30 inches. Last year during the winter of 2014-2015, total inches of snowfall recorded was 181.5 inches.

## A LOOK BACK AT WEATHER HISTORY (OVER 129 YEARS)

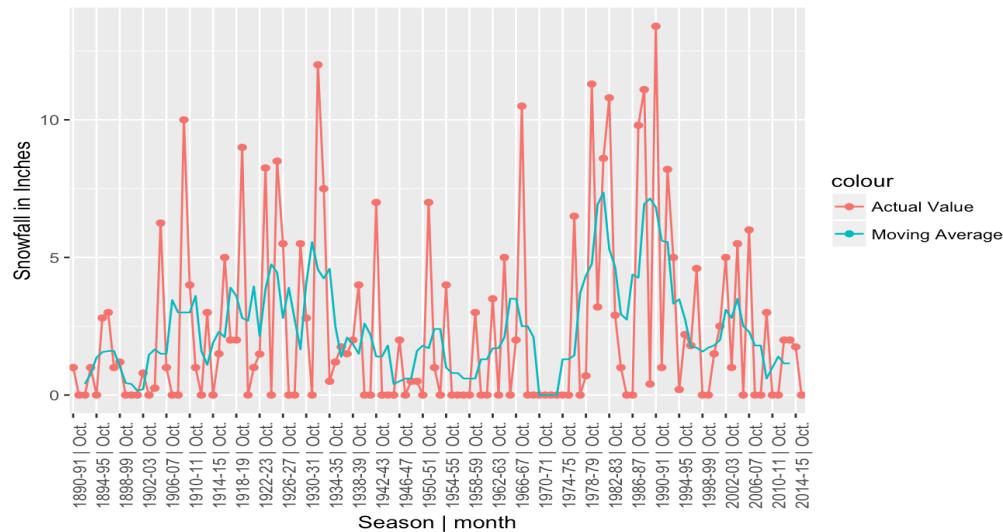
- ▶ This chart represents average snow fall in Houghton for little over the past century. Length of the blue bar indicates the total inches of snowfall. On x-axis, we have 8 months ranging from October to May.
- ▶ Over the years maximum snowfall was recorded in the month of January with an average of 50 inches, followed by December with an average of 45 inches.
- ▶ It's not unusual to snow during the month of May but it is also not as rare as you may think. Over the past 129 years; May had an average of 2 inches of snowfall.



## LET'S LOOK AT THE MOVING AVERAGE TO ESTIMATE THE TREND-CYCLE

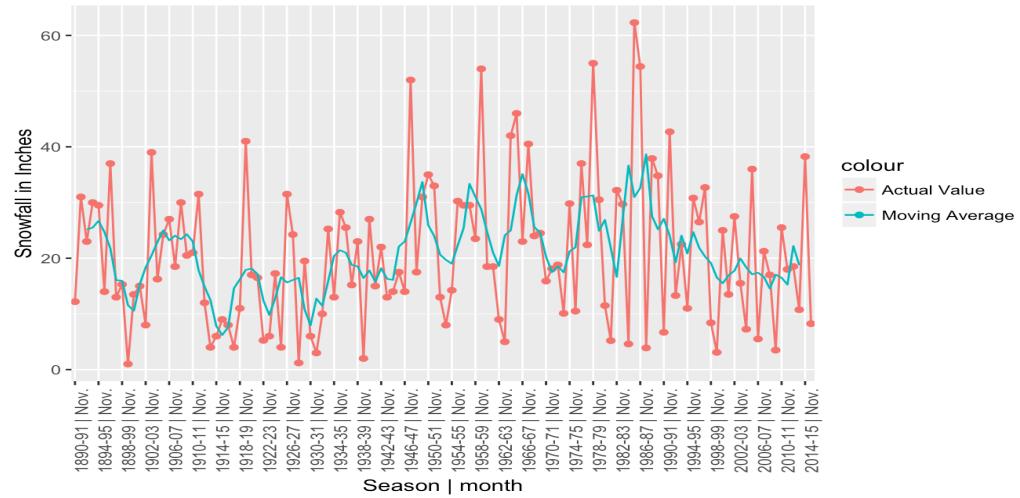
OCT

- To smooth out snowfall data and to estimate the trend cycle, moving average has been calculated.
- It sums up the data points over a specific time period and divides the total by the number of data points. It is called a "moving" average because it is continually recalculated based on the latest price data.
- Moving Average for October months is about 2.37 inches.



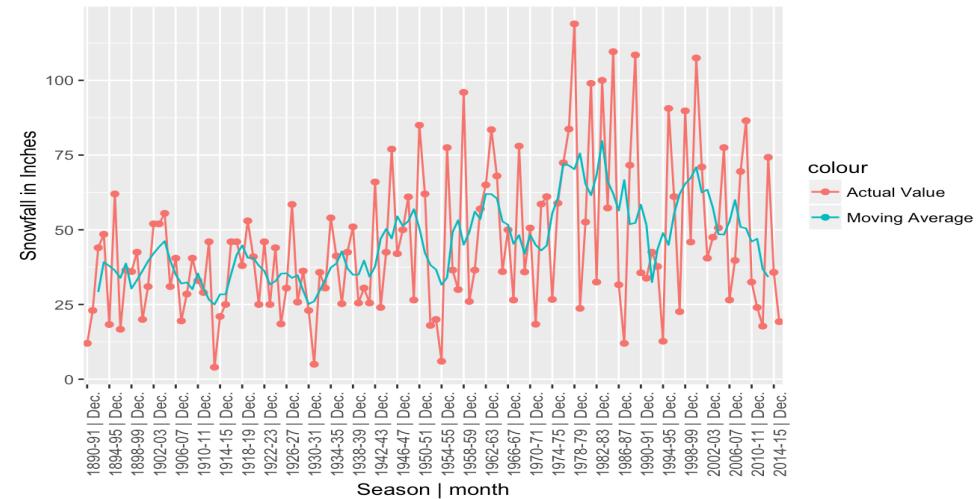
NOV

- To smooth out snowfall data and to estimate the trend cycle, moving average has been calculated.
- It sums up the data points over a specific time period and divides the total by the number of data points. It is called a "moving" average because it is continually recalculated based on the latest price data.
- Moving Average for November months over



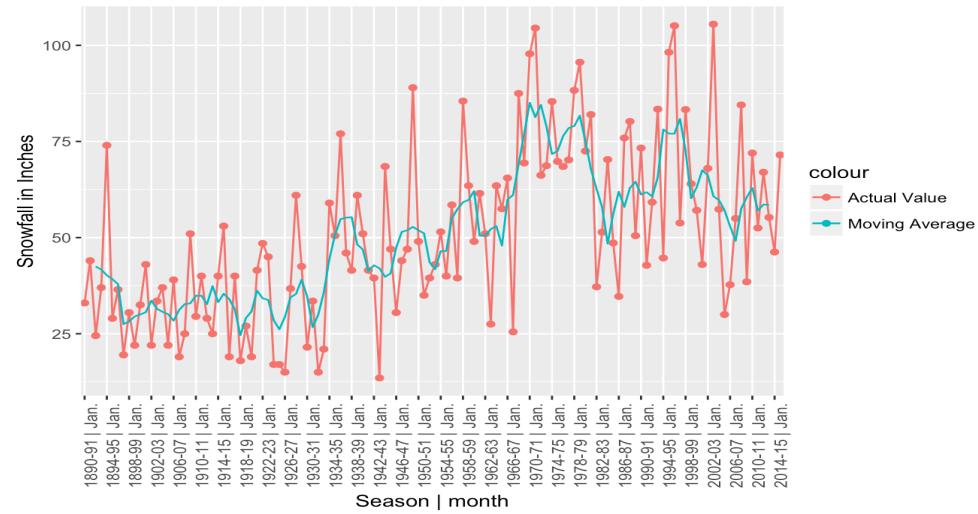
**DEC**

- ▶ To smooth out snowfall data and to estimate the trend cycle, moving average has been calculated.
- ▶ It sums up the data points over a specific time period and divides the total by the number of data points. It is called a “moving” average because it is continually recalculated based on the latest price data.
- ▶ Moving Average for December months over



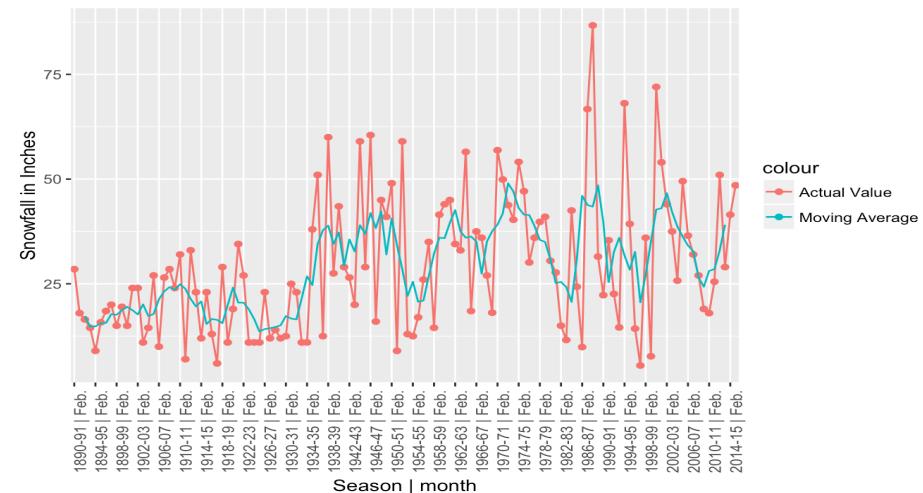
**JAN**

- ▶ To smooth out snowfall data and to estimate the trend cycle, moving average has been calculated.
- ▶ It sums up the data points over a specific time period and divides the total by the number of data points. It is called a “moving” average because it is continually recalculated based on the latest price data.
- ▶ Moving Average for January months over the

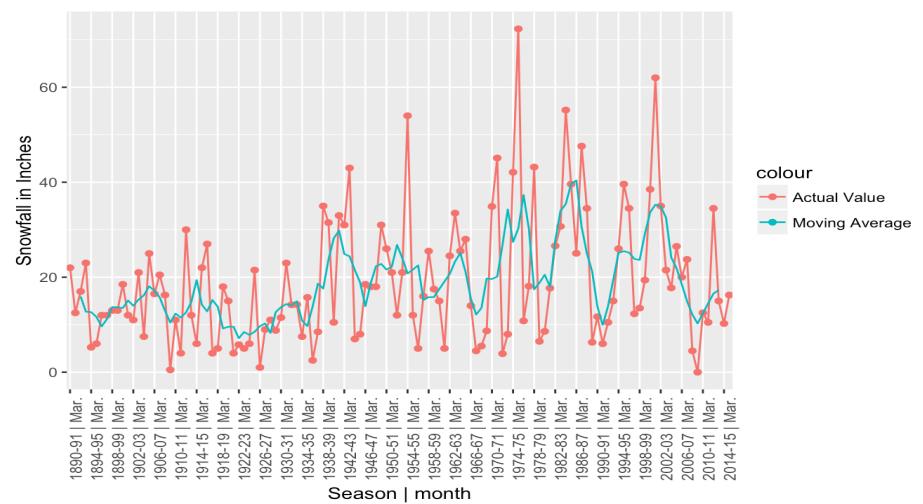


**FEB**

- ▶ To smooth out snowfall data and to estimate the trend cycle, moving average has been calculated.
- ▶ It sums up the data points over a specific time period and divides the total by the number of data points. It is called a “moving” average because it is continually recalculated based on the latest price data.
- ▶ Moving Average for February months over the

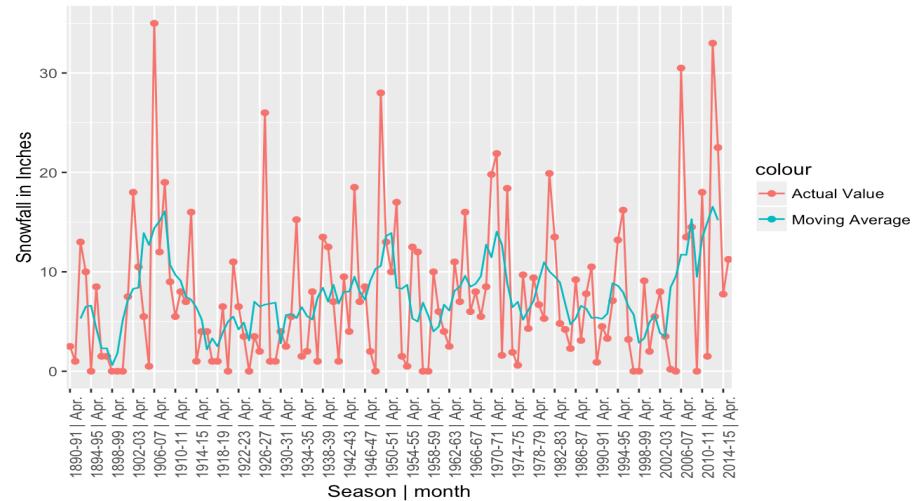
**MAR**

- ▶ To smooth out snowfall data and to estimate the trend cycle, moving average has been calculated.
- ▶ It sums up the data points over a specific time period and divides the total by the number of data points. It is called a “moving” average because it is continually recalculated based on the latest price data.
- ▶ Moving Average for March months over the



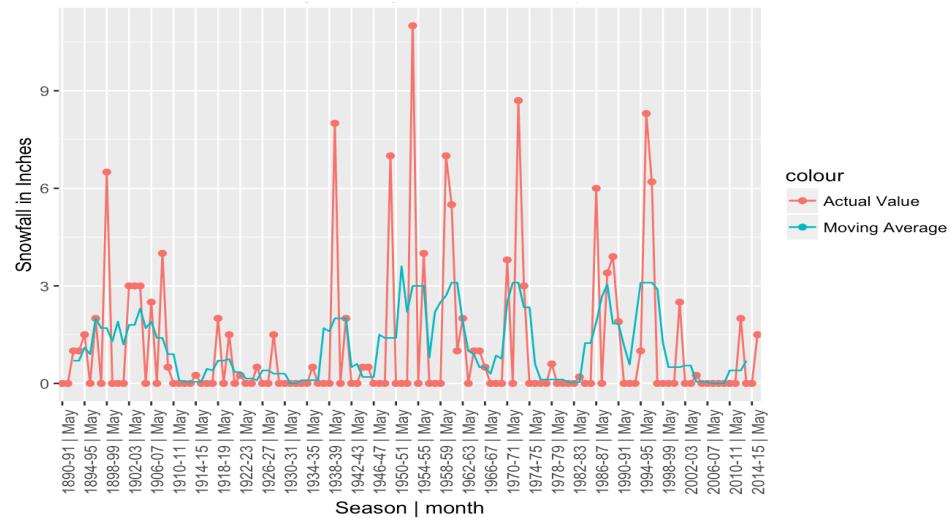
APR

- ▶ To smooth out snowfall data and to estimate the trend cycle, moving average has been calculated.
- ▶ It sums up the data points over a specific time period and divides the total by the number of data points. It is called a “moving” average because it is continually recalculated based on the latest price data.
- ▶ Moving Average for April months over the



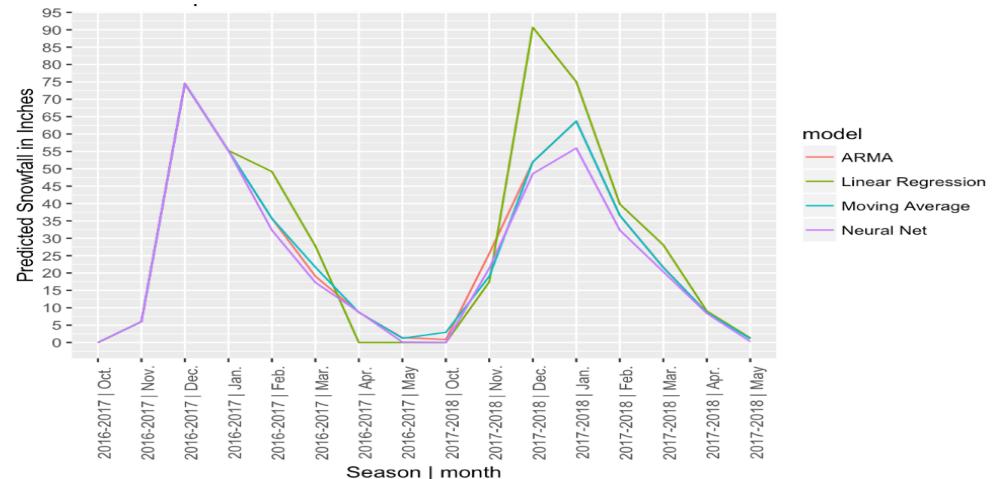
MAY

- ▶ To smooth out snowfall data and to estimate the trend cycle, moving average has been calculated.
- ▶ It sums up the data points over a specific time period and divides the total by the number of data points. It is called a “moving” average because it is continually recalculated based on the latest price data.
- ▶ Moving Average for May months over the



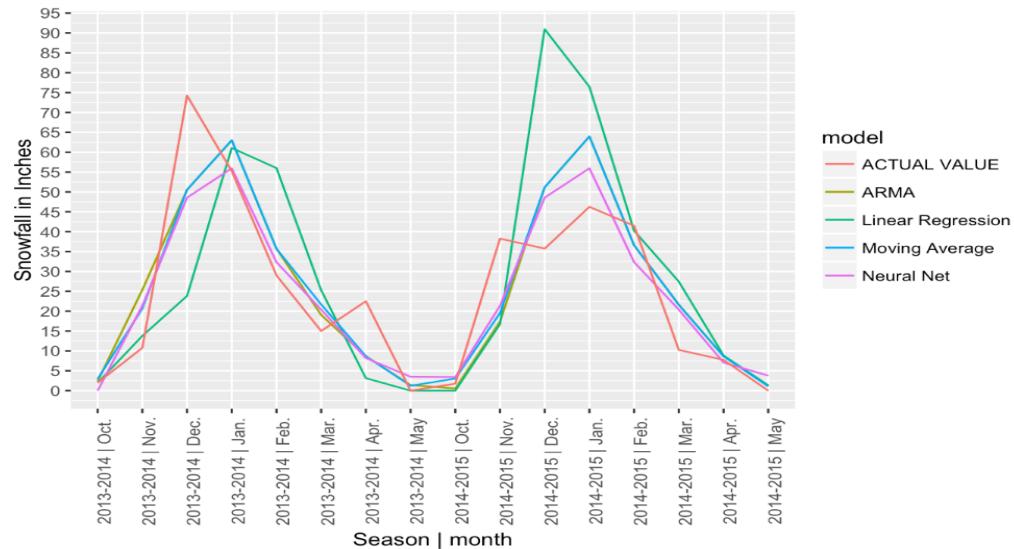
## LETS FORECAST SNOWFALL FOR NEXT TWO YEARS

- ▶ **Forecasting** is a process of predicting or estimating future events based on historic data. Very popular and widely used forecasting models such as ARIMA, Linear Regression, Moving Average and Neural Net are used to forecast snowfall for next two years.
- ▶ As per the graph; 3 out of 4 models are suggesting that maximum snowfall will be in the month of january between 50 inches to 55 inches for year 2016-2017 and average of 70 inches in 2017-2018. However, linear regression model is suggesting that



## ARE MY RESULTS RELIABLE ?? LETS CROSS VALIDATE

- ▶ Learning the parameters of a prediction function and testing it on the same data is a technique called "cross validation".
- ▶ To ensure if above mentioned models are robust, they were deployed on the data from years 2013-2014 and 2014-2015. (*We already have data for above periods and we can compare forecasting results on our existing data.*)
- ▶ Based on the graph, max snowfall was observed in January about 55 inches during the year 2013-2014 and 45-47 inches during the year 2014-2015 which matches with our existing data. That being said;



**Note:** A **drawback** of using prediction models could be - As we predict far away in the future, our training data will start containing instances of our own predictions, which will lead to erroneous predictions and degrade model accuracy over time.

**Thank you** very much for your time and patience 'ゞ

Here is a picture of myself enjoying the snowiest day of the year at Mont Ripley(Houghton,MI).

