Analyzing a location to open a new fitness center in Manhattan, New York

Introduction: Business Problem

Typically, the age of an abalone is determined by cutting the shell through the cone, staining it, and counting the number of rings through a microscope.

This process is tedious and time-consuming. I want to create a machine learning algorithm that could predict the age to a viable degree of accuracy to save time and money.

Data

Link: http://archive.ics.uci.edu/ml/datasets/Abalone

8 attributes
4177 instances

Sex: nominal - M (male), F (female), I (infant)

`Length`: continuous - longest shell measurement (in mm)

`Diameter`: continuous - measurement perpendicular to legnth (in mm)

`Height`: continuous - with meat in shell (in mm)

`Whole weight`: continuous - the whole abalone (in grams)

`Shucked weight`: continuous - weight of the meat (in grams)

`Viscera weight`: continuous - gut weight after bleeding (in grams)

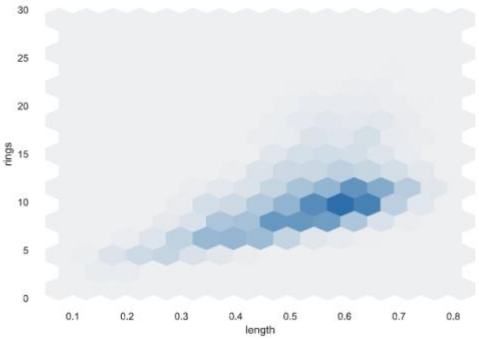
`Shell weight`: continuous - after being dried (in grams)

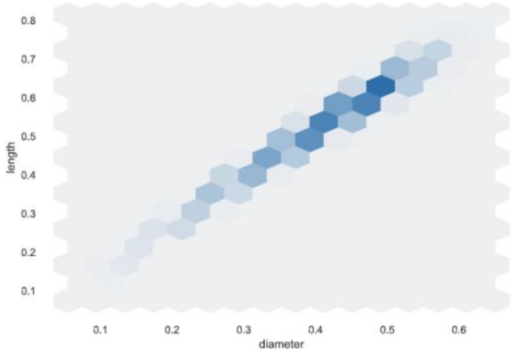
`Rings`: integer - +1.5 gives the age in years

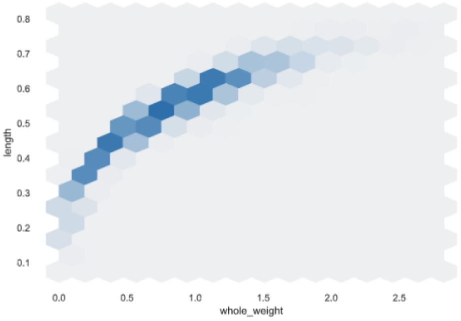
Methodology

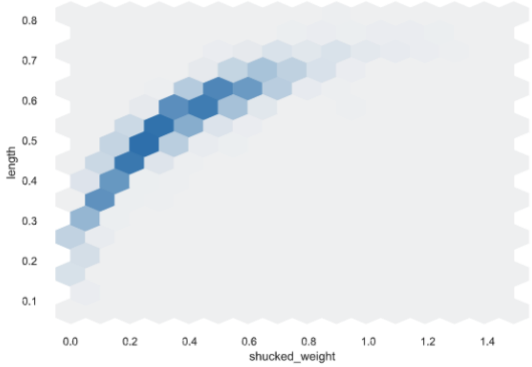
I started off by loading the **abalone_data.data** file into a data set. I organized the data set into nine columns – ***sex***, ***length***, ***diameter***, ***height, whole_weight***, ***shucked_weight***, ***viscera_weight***, ***shell_weight*** and ***rings***.

I then explored and analyzed the features. I've shown some of the analysis below:



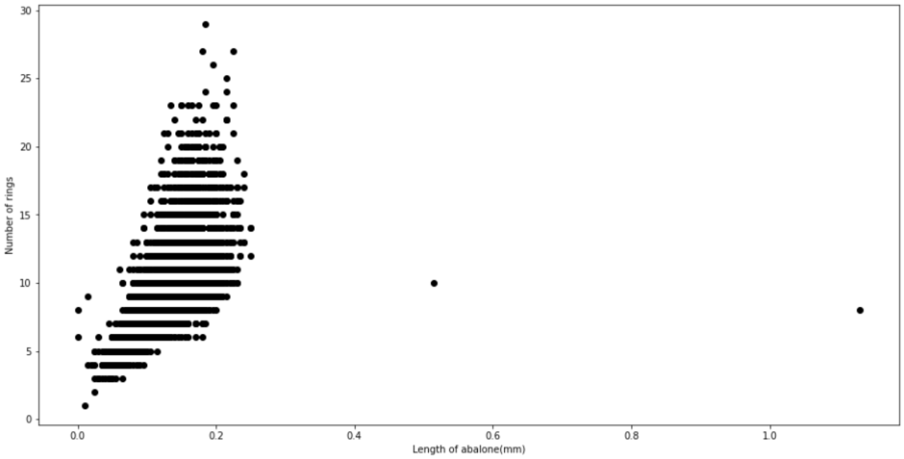


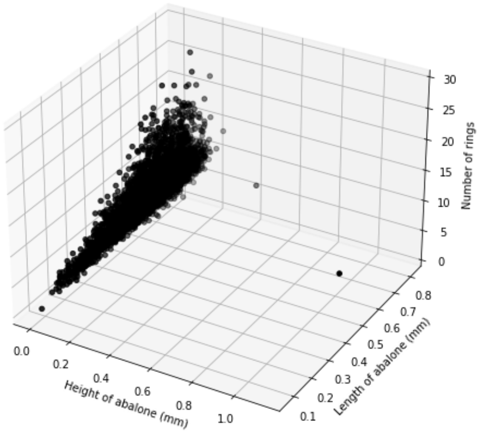




Analysis

I wanted to explore the correlation between the size of the abalone (length and height) and their age (number of rings).





Feature Engineering

I then used One-Hot encoding to split the ***sex*** column into three separate columns – ***sex_F*** (Female), ***sex_I*** (Infant) and ***sex_M*** (Male)

Modeling

I then modeled the prediction algorithm using Scikit-Learn. I wanted to use multiple methods of regression and determine the accuracy of each one. I chose to compare the accuracy using the *Root mean squared error*.

I compared the following models: ***LightGBM***, ***Ridge Regressor, Linear Regressor, Bagging Regressor, Lasso Regressor*** and ***Random Forest Regressor***.

Results and Discussion

The prediction model varied between each regression model chosen, however they were all able to predict the age to a certain degree of accuracy. Below is a table of how each model performed, in order of lowest error to highest error:

Model	**RMSE**
LightGBM	1.509731
Ridge Regression	1.564081
Linear Regression	1.564081
Bagging	1.746120
Lasso	1.889234
Random Forest	2.242457

Conclusion

In predicting the age of abalone using data on its physical attributes, it seems that the LightGBM model performed the best in with the lowest RMSE, while the random forest model performed with the highest RMSE, therefore being the least accurate.

However, it is important to note that RMSE isn't the only type of error that could be used to judge accuracy. In the future I will try to compare the regression models with R Squared score as well.