Data Modeling and Visualisation

CCT490H5F - Social Data Analytics

Professor Alex Hanna

October 20, 2016

FiveThirtyEight

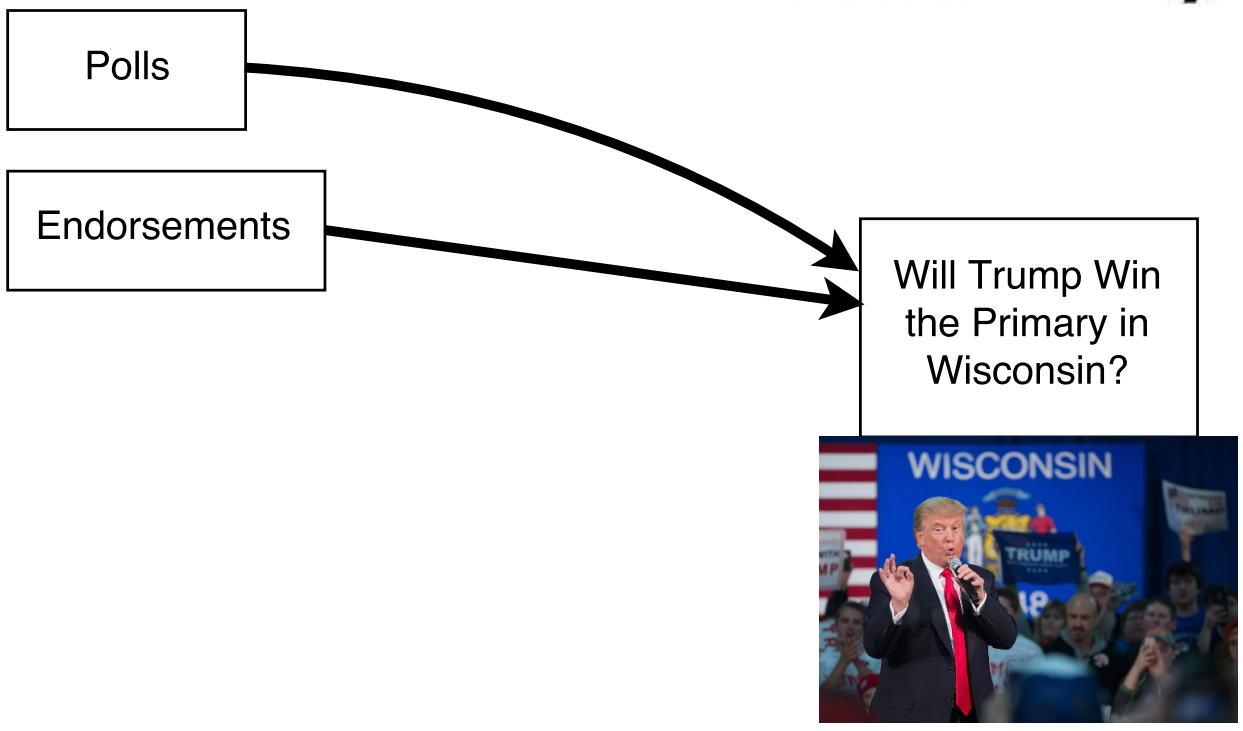
Will Trump Win the Primary in Wisconsin?

FiveThirtyEight

Polls

Will Trump Win the Primary in Wisconsin?

FiveThirtyEight



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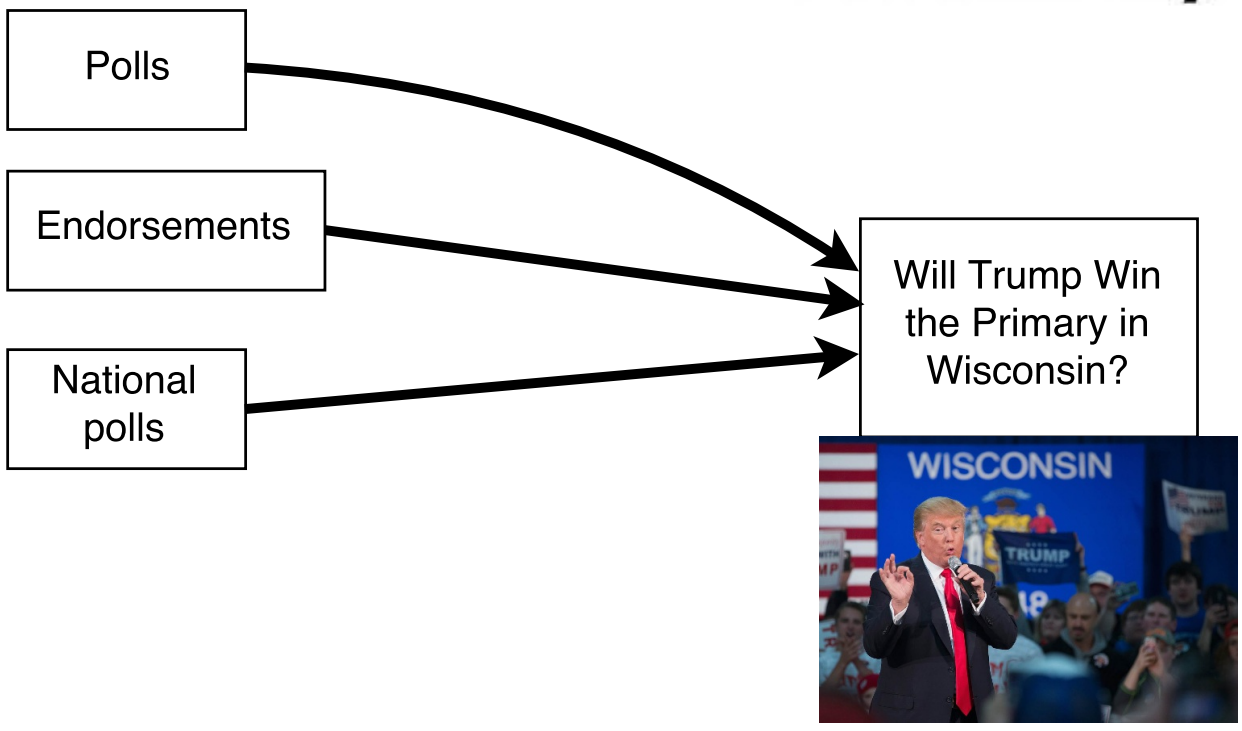

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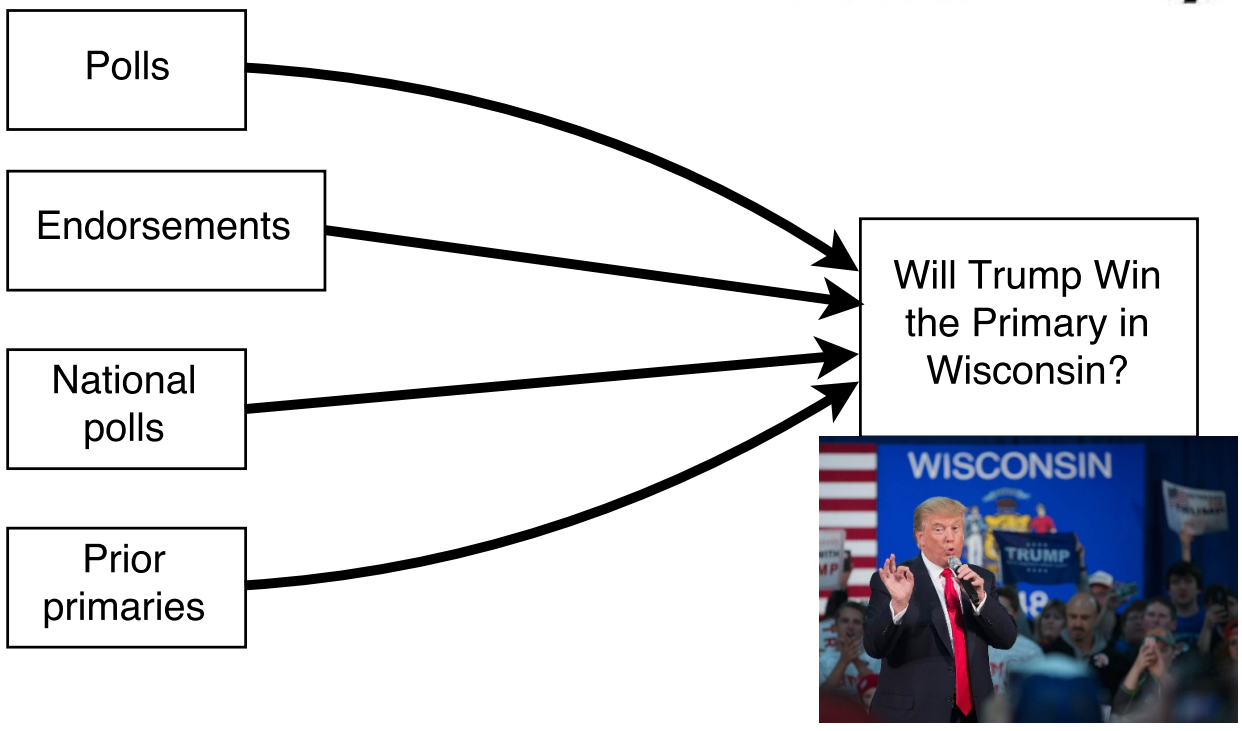

Data Modeling

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A *mathematical model* is a representation of reality using numbers.

Why have a model?

- *Description*: You want to summarise data.
- *Explanation*: You want replicate the working of the world with existing data.
- *Prediction*: You want to forecast the future from past data.

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“All models are wrong but some are useful.” - George Box, statistician

Example: More Tweets, More Votes

DiGrazia et al. 2013. “More Tweets, More Votes: Social Media as a Quantitative Indicator of Political Behavior”

The more times a 2010 US House candidate was mentioned, the more likely it is they will be elected.

Other things which affect votes

- Incumbency
- Ideological leaning
- Age
- Education
- Gender
- Race
- Media markets

Major variables in MTMV

Critical variables for this analysis

- *Dependent variable*: Republican percent of the vote share (`vote_share`)
- *Independent variables*
  - Republican percent of Twitter mention share (`mshare`)
  - Republican incumbency (`rep_inc`)

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Description of MTMV Data: Crosstabs

In [71]:
```
import pandas as pd
import numpy as np
df_mtmv = pd.read_csv("data/mtmv_data_10_12.csv", index_col = 0)
```

In [59]:
```
## vote share and mention share mean
## by Republican incumbency
gr_mtmv = df_mtmv.groupby('rep_inc')
gr_mtmv[['vote_share', 'mshare']].mean()
```

Out[59]:

	vote_share	mshare
rep_inc		
0	42.119264	39.360672
1	67.516408	72.170127

In [60]:
```
## vote share and mention share standard deviation
## by Republican incumbency
gr_mtmv[['vote_share', 'mshare']].std()
```

Out[60]:

	vote_share	mshare
rep_inc		
0	13.850496	27.930878
1	7.005758	28.911278

Explanation of MTMV Data: Correlation

```
In [8]: from scipy.stats.stats import pearsonr

        print(pearsonr(df_mtmv['mshare'], df_mtmv['vote_share'])[0])

        0.508867322507
```

Pearson correlation: measure of the linear dependence between two variables X and Y. Ranges from [-1, 1].

Explanation of MTMV Data: Linear Regression

```
In [9]: from statsmodels.formula.api import ols

model = ols("vote_share ~ rep_inc + mshare + pct_white + \
             pct_college + med_hhinc + pct_female", df_mtmv).fit()
model.summary()
```

	coef	std err	t	P>|t|	[95.0% Conf. Int.]
Intercept	8.2099	24.490	0.335	0.738	-39.936 56.356
rep_inc	18.3989	1.008	18.257	0.000	16.418 20.380
mshare	0.0543	0.015	3.639	0.000	0.025 0.084
pct_white	0.4735	0.026	18.028	0.000	0.422 0.525
pct_college	-0.3384	0.073	-4.619	0.000	-0.482 -0.194
med_hhinc	0.1132	0.051	2.211	0.028	0.013 0.214
pct_female	0.0418	0.464	0.090	0.928	-0.870 0.953

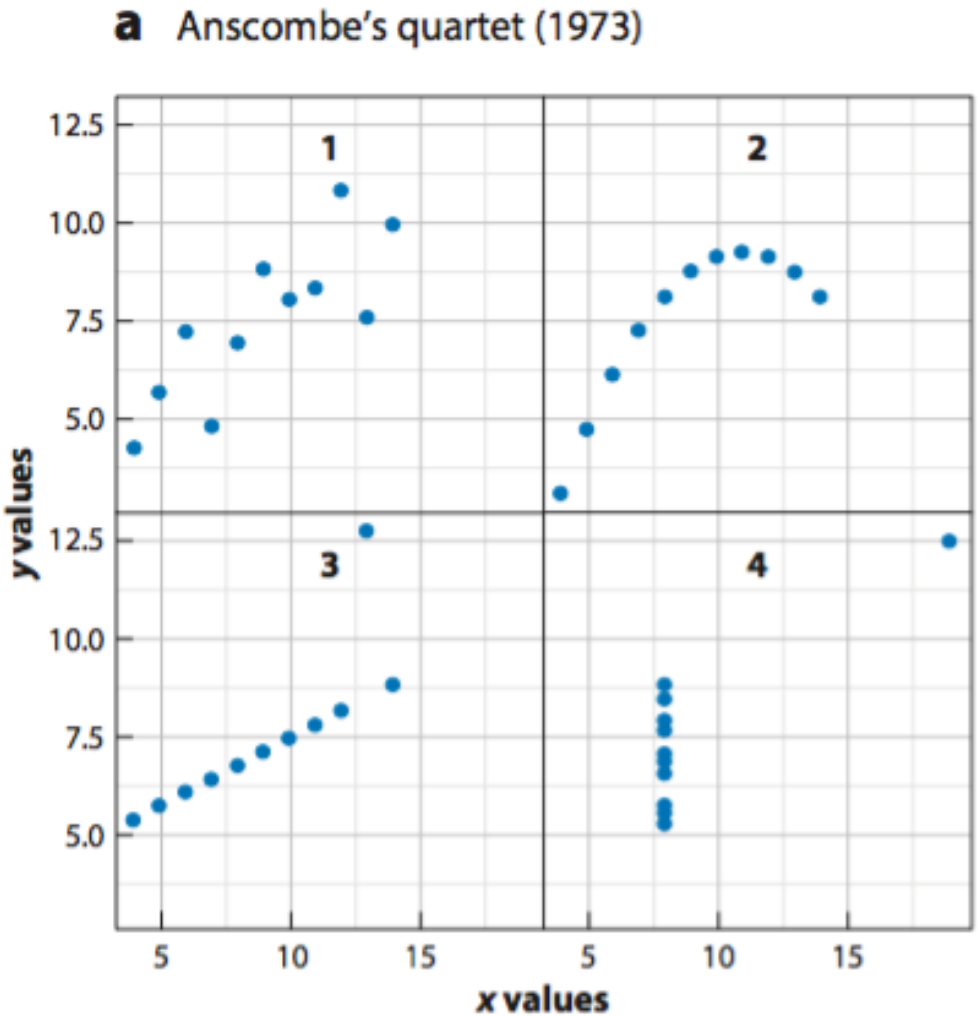
Regression: statistical technique which models the relationship between multiple variables.

Exercise: Build your own model!

Visualisation

Purposes of visualisation

- Exploring data
- Confirming model
- Presenting results



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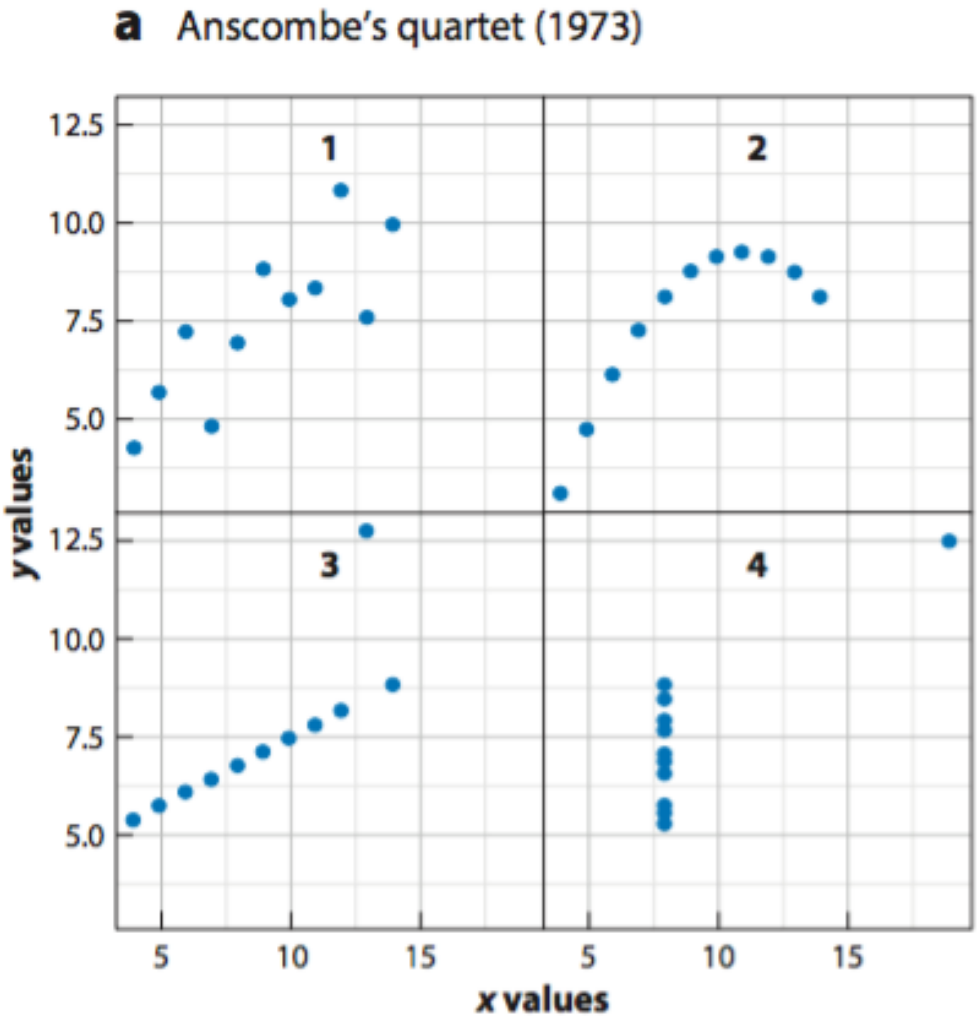

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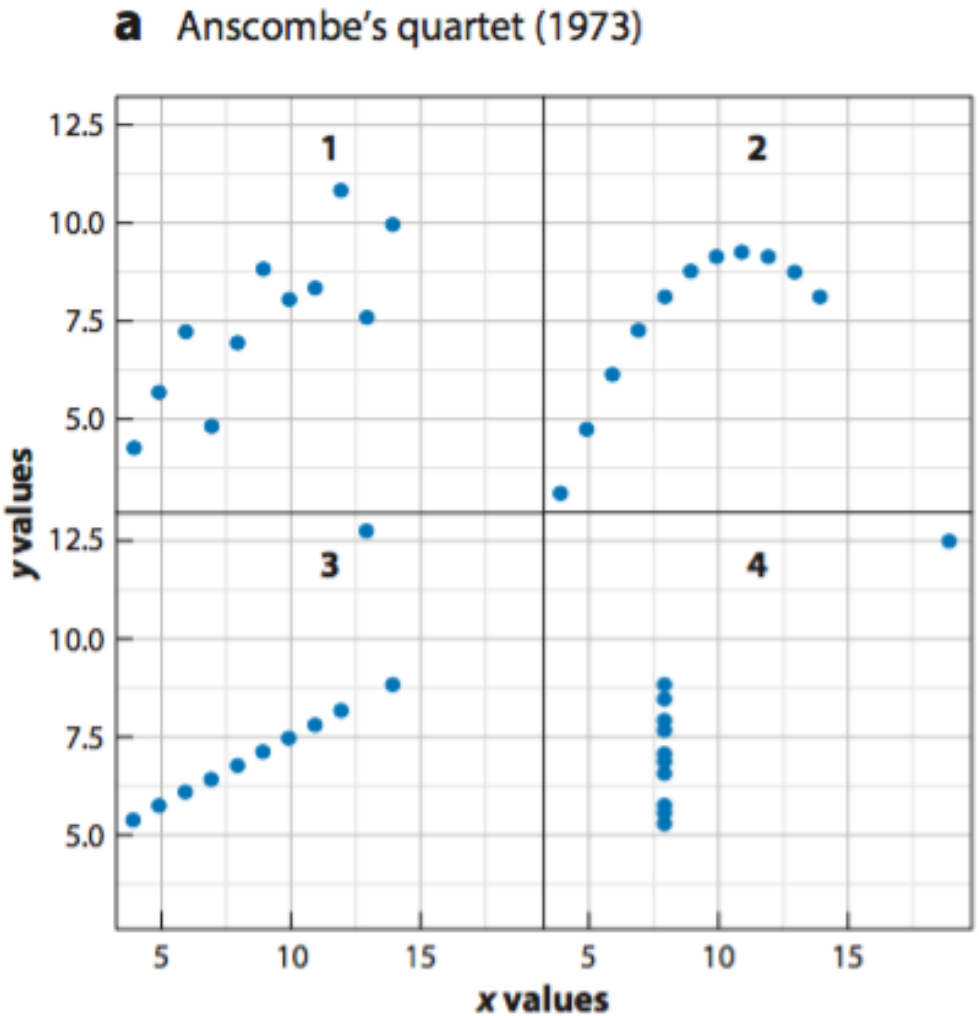

Univariate visualisations

- Understand the variable beyond mean, median, standard deviation, etc.
- Should be first part of exploring data
- Types
  - Histogram
  - Density

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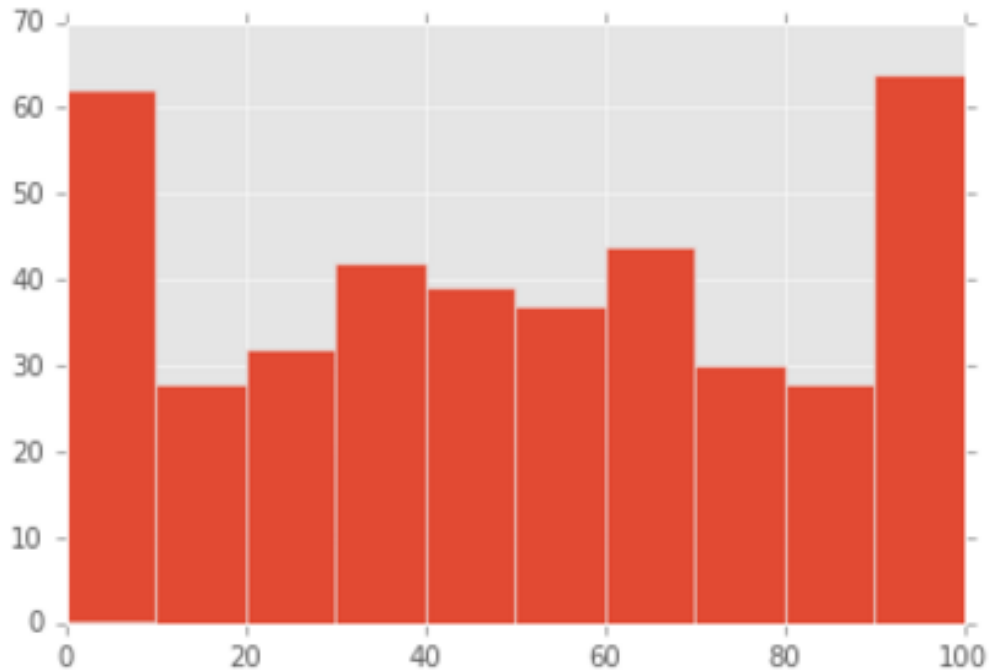

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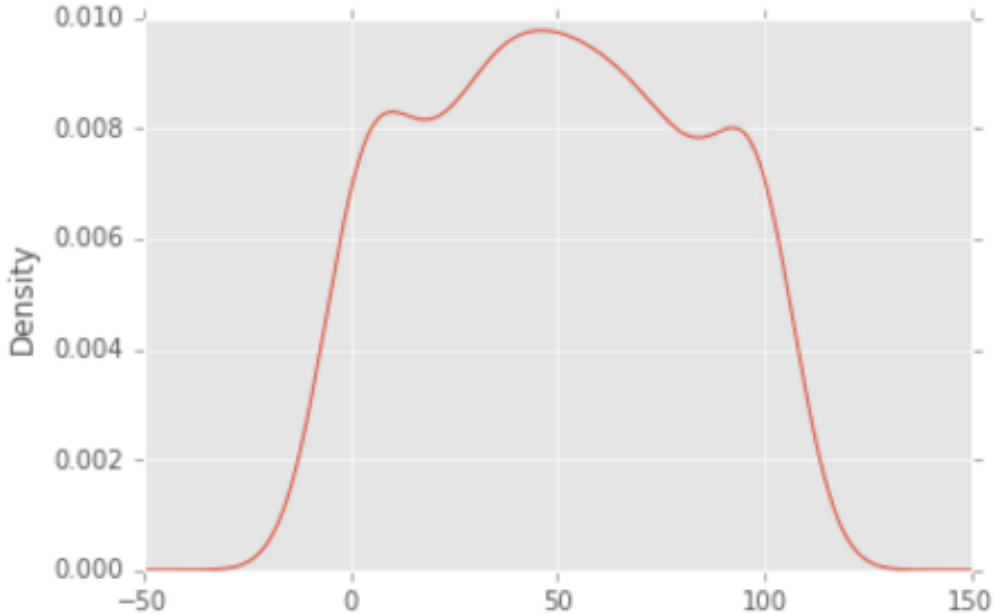
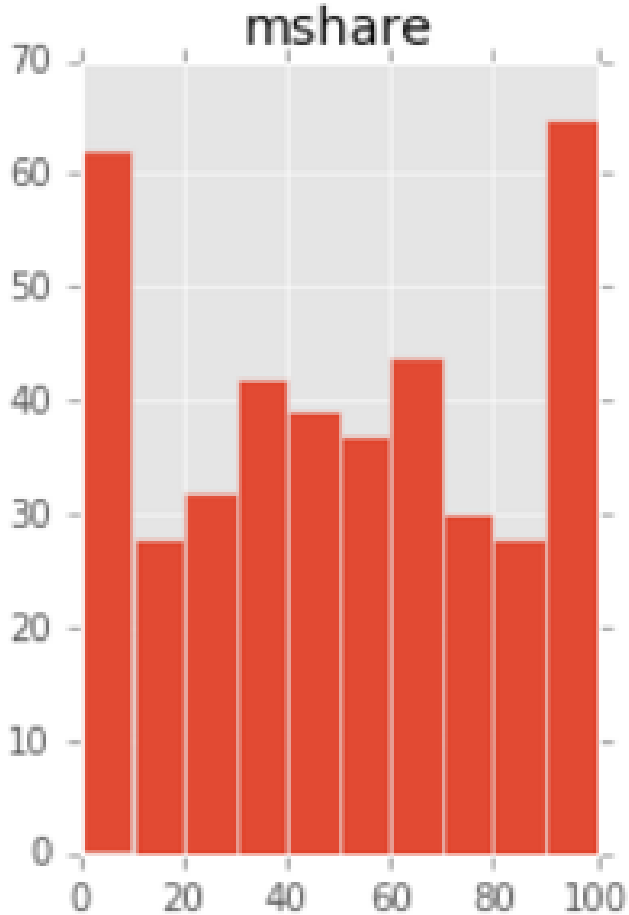
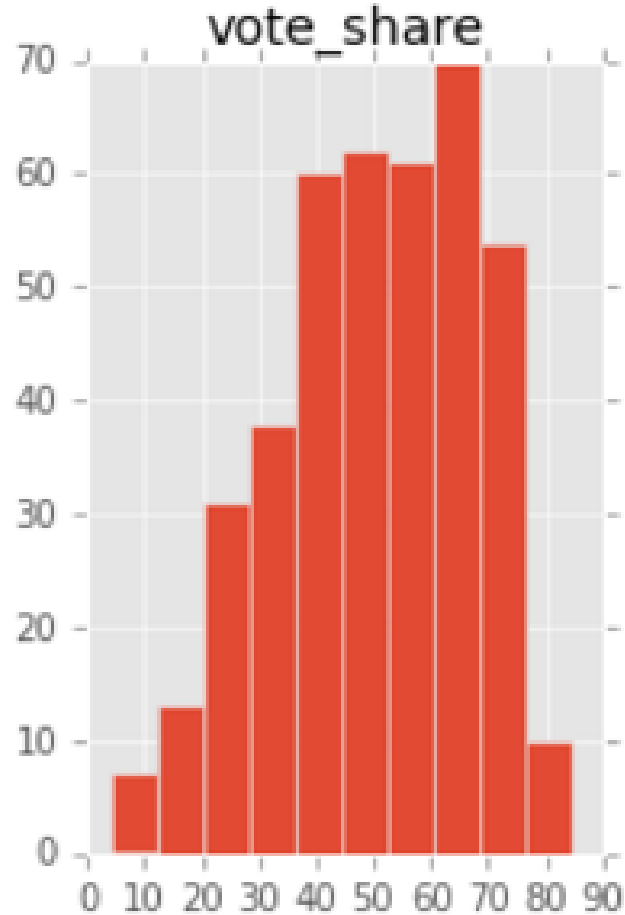


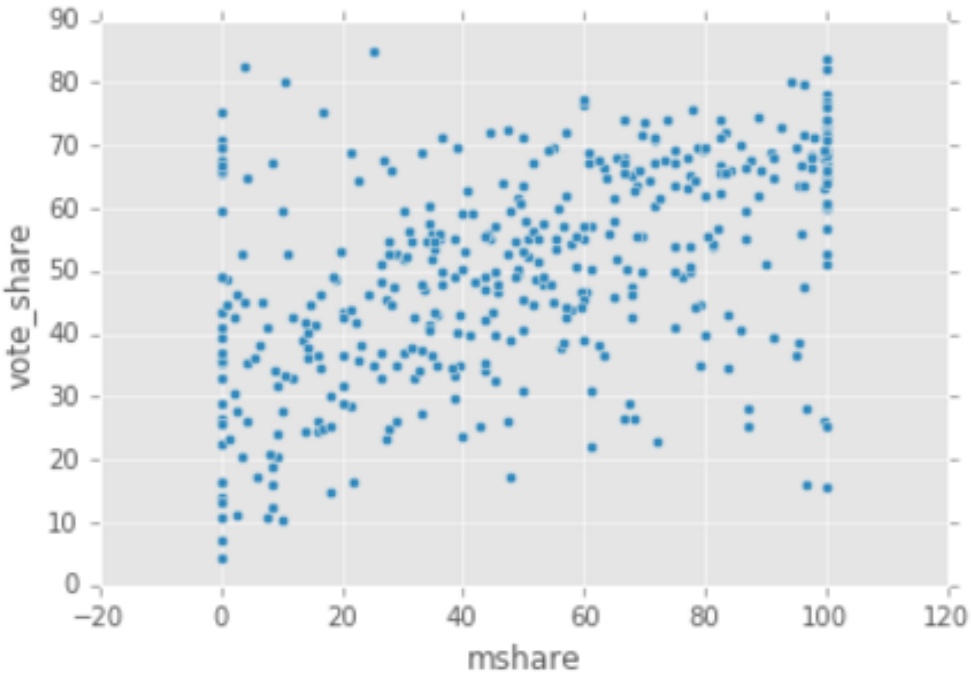
Univariate visualisations: Comparing variables





Bivariate and multivariate visualisations

- Understanding variable relationships
- First part of model exploration



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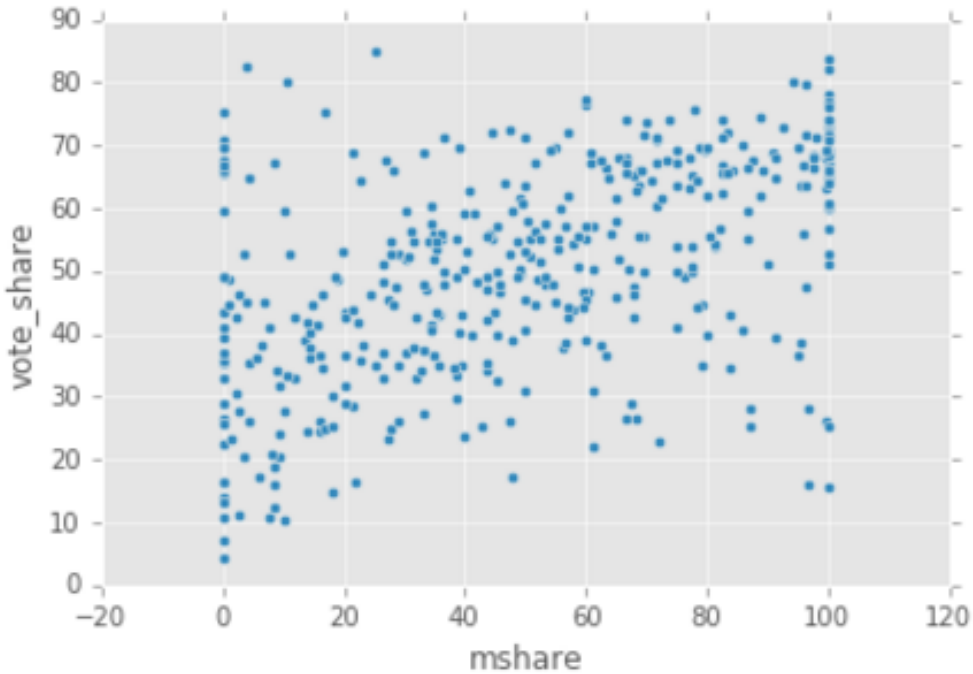
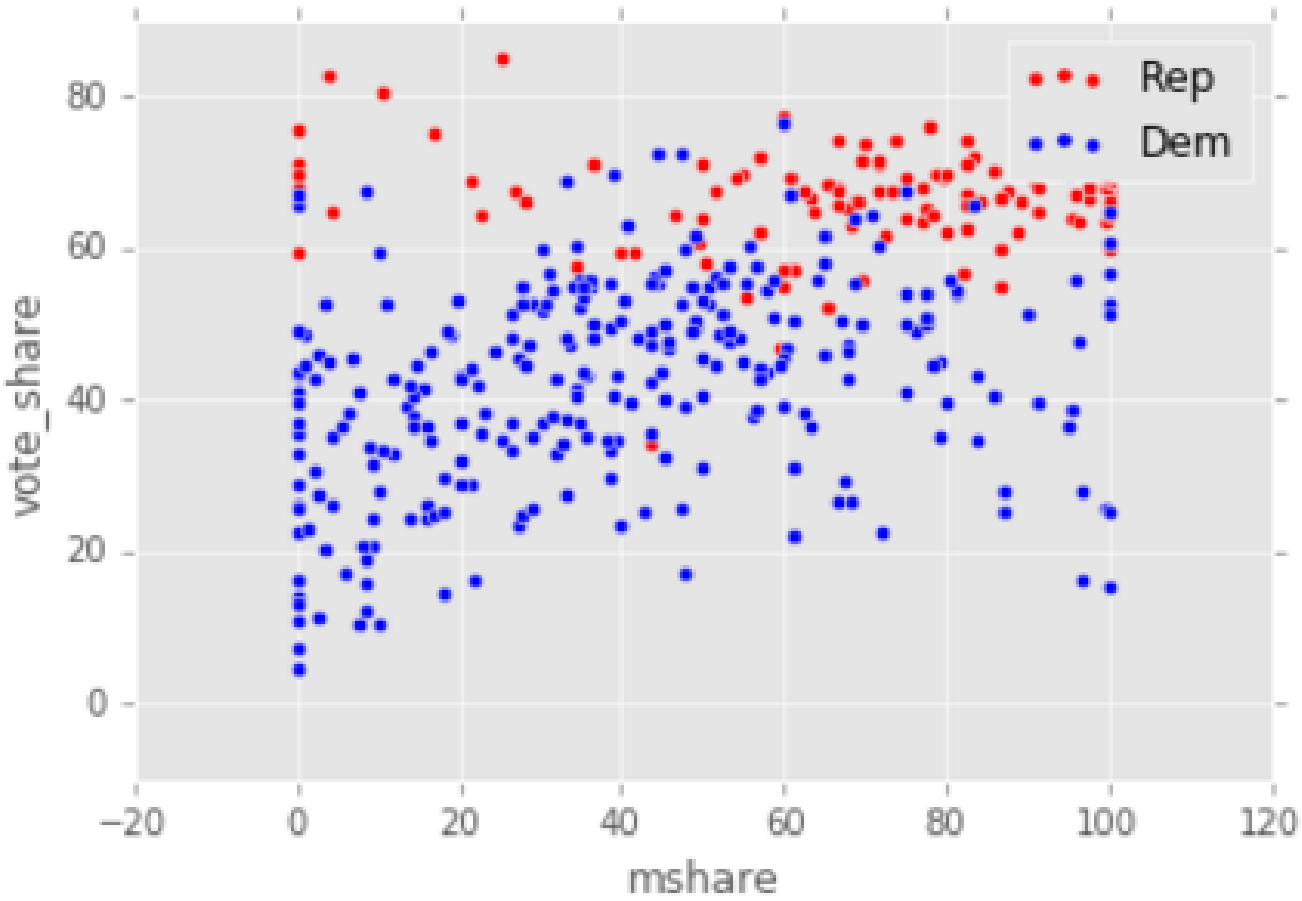
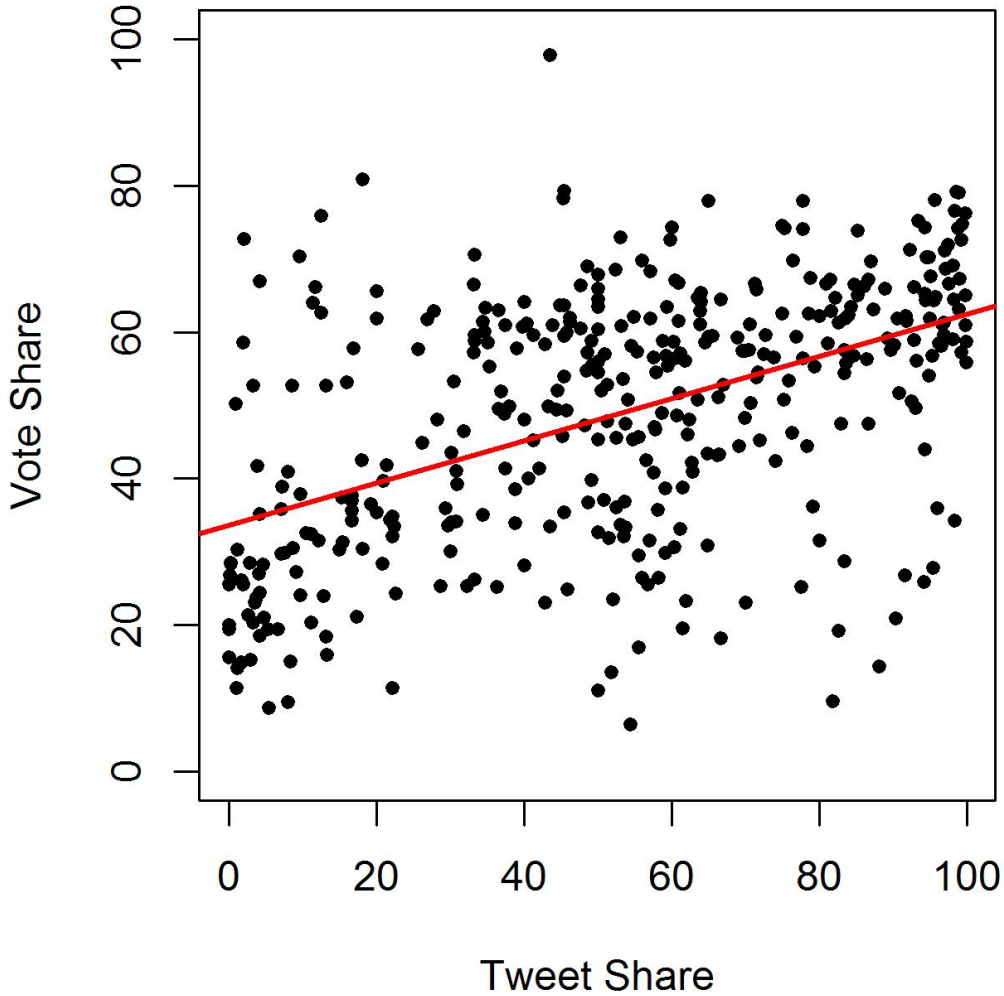


Multivariate visualisation: Adding color



Model confirmation



guessthecorrelation.com