EAS506 - Statistical Data Mining I

Homework 1 – Question 2

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09/17/21

Abstract

This report summaries the steps taken to perform linear regression on a clean and transformed cereal dataset.

Content

1 Introduction

The Cereal data frame has 73 rows and 14 columns. The data come from the 1993 ASA Statistical Graphics Exposition and are taken from the mandatory F&DA food label. The data have been normalized here to a portion of one American cup.

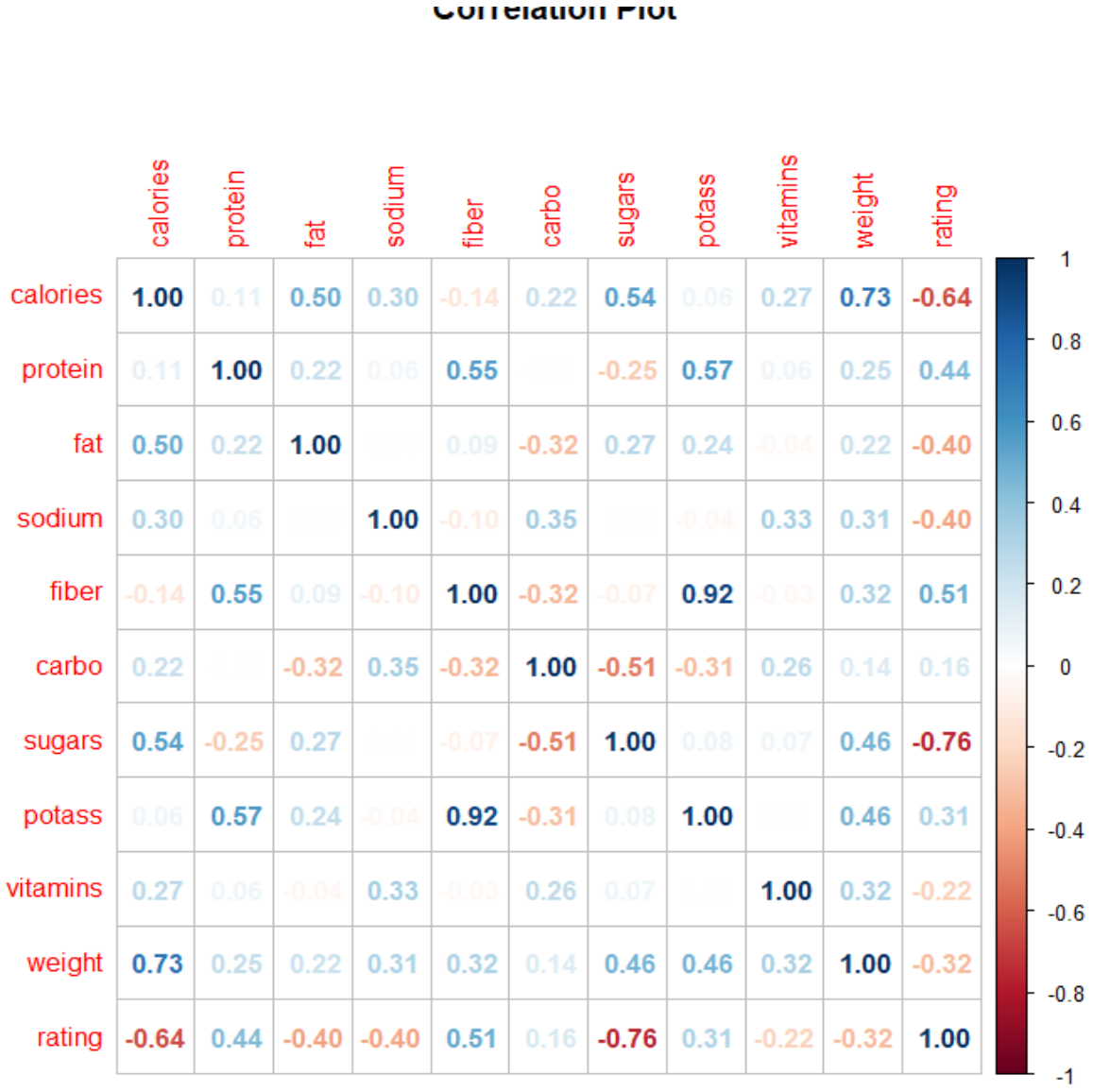
This report summarizes the process undertaken to build a linear regression model on cereal dataset that was cleaned previously.

2 Method

2.1 Initialization Steps

- Clear the memory
- Install and load all required libraries.
- Analyze the dataset.

2.2 Plotting a Co-relation plot



Q.1) Which predictors appear to have a significant relationship to the response 'rating'?

Ans 1) ~ 'calories' and 'sugars' are highly negatively co-related to our response 'rating' feature.
~ 'protein', 'fiber' and 'potass' are positively co-related to our response 'rating' feature.

2.3 Create Linear Regression Models

- A number of Multiple-Linear-Regression Models were created to predict the rating.

  ~ Fitting a linear regression model with all the features.

  ~ Fitting linear regression model with updated features.

  ~ Fitting linear regression model with features that are negatively correlated to 'rating' (our response)

  ~ Fitting linear regression model with features that are positively correlated to 'rating' (our response)

  ~ Interactions with all features.

  ~ using ":" with most significantly impacting features to our response.

2.3.1 Fitting a linear regression model with all the features.

- Used all the numeric and integer features in the data frame to fit a model.

- Residual standard error: 3.058e-07 on 62 degrees of freedom.

- I noted that that 'weight' feature is not important, so we'll fit next model without that feature.

2.3.2 Fitting a linear regression model with all the features.

- Used all features except the weight feature.

- Residual standard error: 3.064e-07 on 63 degrees of freedom

2.3.3 Fitting linear regression model with features that are positively correlated to 'rating' (our response)

- Used only features that are co-related to ‘ratings’ feature negatively.

- features used were calories + sugars + fat +sodium

- Residual standard error: 6.25 on 68 degrees of freedom

- This model suggests that calories and fat is not important feature which is surprising because in co-relation plot 'calories' had -0.64 co relation with 'rating' feature.

2.3.4 Fitting linear regression model with features that are negatively correlated to 'rating' (our response)

- Used only features that are co-related to ‘ratings’ feature positively.

- features used were : protein + fiber + potass

- Residual standard error: 9.358 on 69 degrees of freedom

Q.2) What does the coefficient variable for “sugar” suggest?

Ans 2) Co-efficient variable for “sugar” were:

Eastimate	Std. Error	t-value	Pr(>|t|)
-7.249e-01	3.397e-08	-2.134e+07	<2e-16 ***

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Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

This suggests that sugar is an important feature and is highly co-related to our response feature ‘rating’.

Q.3) Use the * and : symbols to fit models with interactions. Are there any interactions that are significant?

Ans 3)

2.3.5 Interactions with all features.

- Used all the features.

- Residual standard error: 1.347 on 9 degrees of freedom

- Significant relations:

a) fat:sodium:carbo:sugars : 0.000666 ***

b) calories:protein:fat:sodium:sugars : 0.000997 ***

c) calories:fat:sodium:carbo:sugars : 0.000665 ***

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Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

2.3.6 using ":" with most significantly impacting features to our response.

- Used ":" with all positively and negatively impacting features with co-relation to our target feature.

- positive features were: calories:sugars

- negative features were: protein:carbo:potass

- Residual standard error: 6.671 on 70 degrees of freedom

- Significant relations:

a) calories:sugars : < 2e-16

b) protein:carbo:potass : < 2e-16

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