MACHINE LEARNING I REGRESSION ANALYSIS OF STUDENT GRADE DATA

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SCOPE

✓ Description of Dataset

✓EDA with plots

✓Feature selection

✓Models

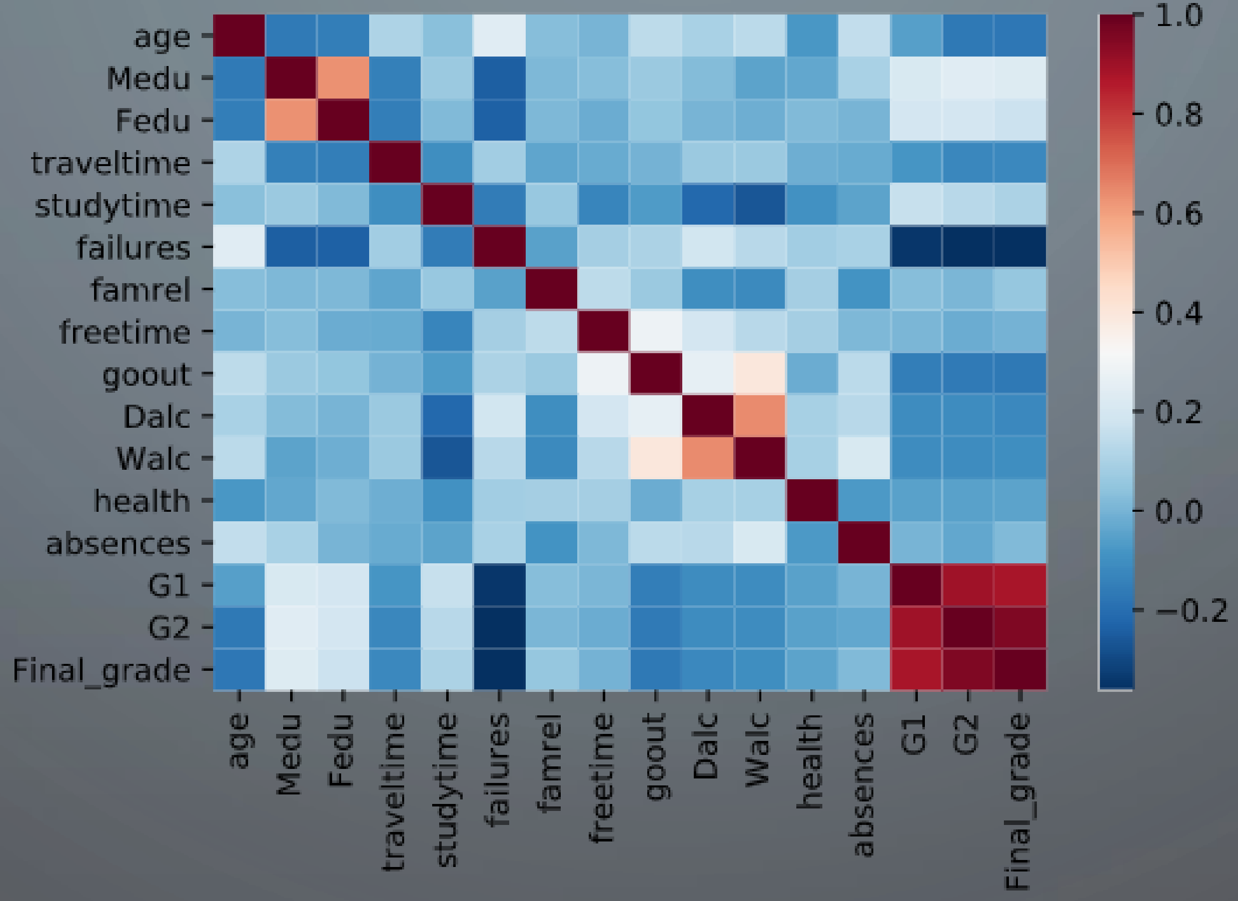
(Linear,SVM,KNN,Ridge,Lasso)

FEATURES

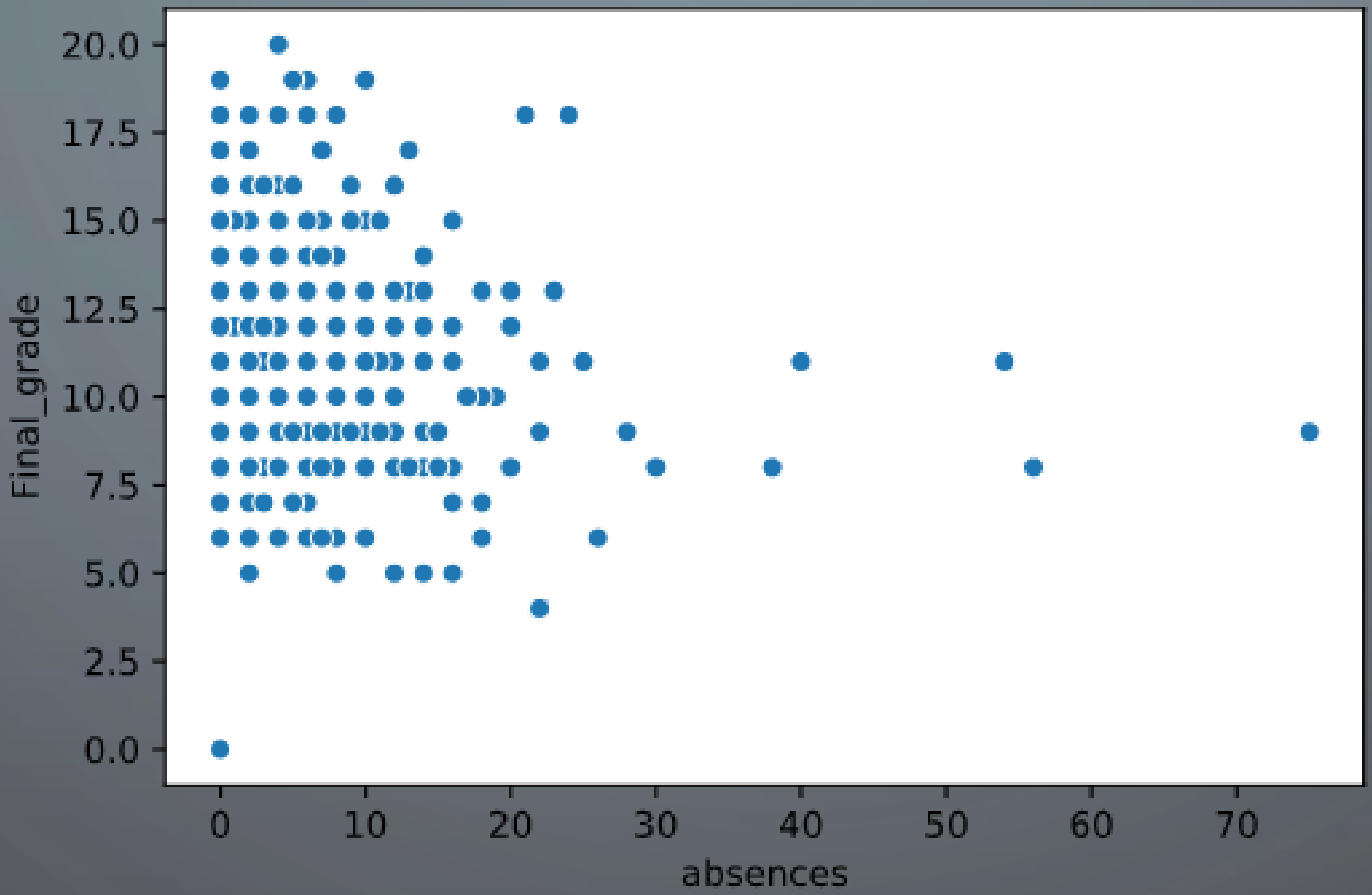
- **MATH FINAL GRADE**
- Father Education
- Failures
- Traveltime
- Studytime
- Weekday Alcohol consumption
- Weekend Alcohol consumption
- Parent Status
- Romantic
- Absences
- Final Grade
- Go out
- Family relation
- Guardion
- Mother Job
- Father Job
- Sex
- Age

PLOTS

Correlation matrix based on Spearman

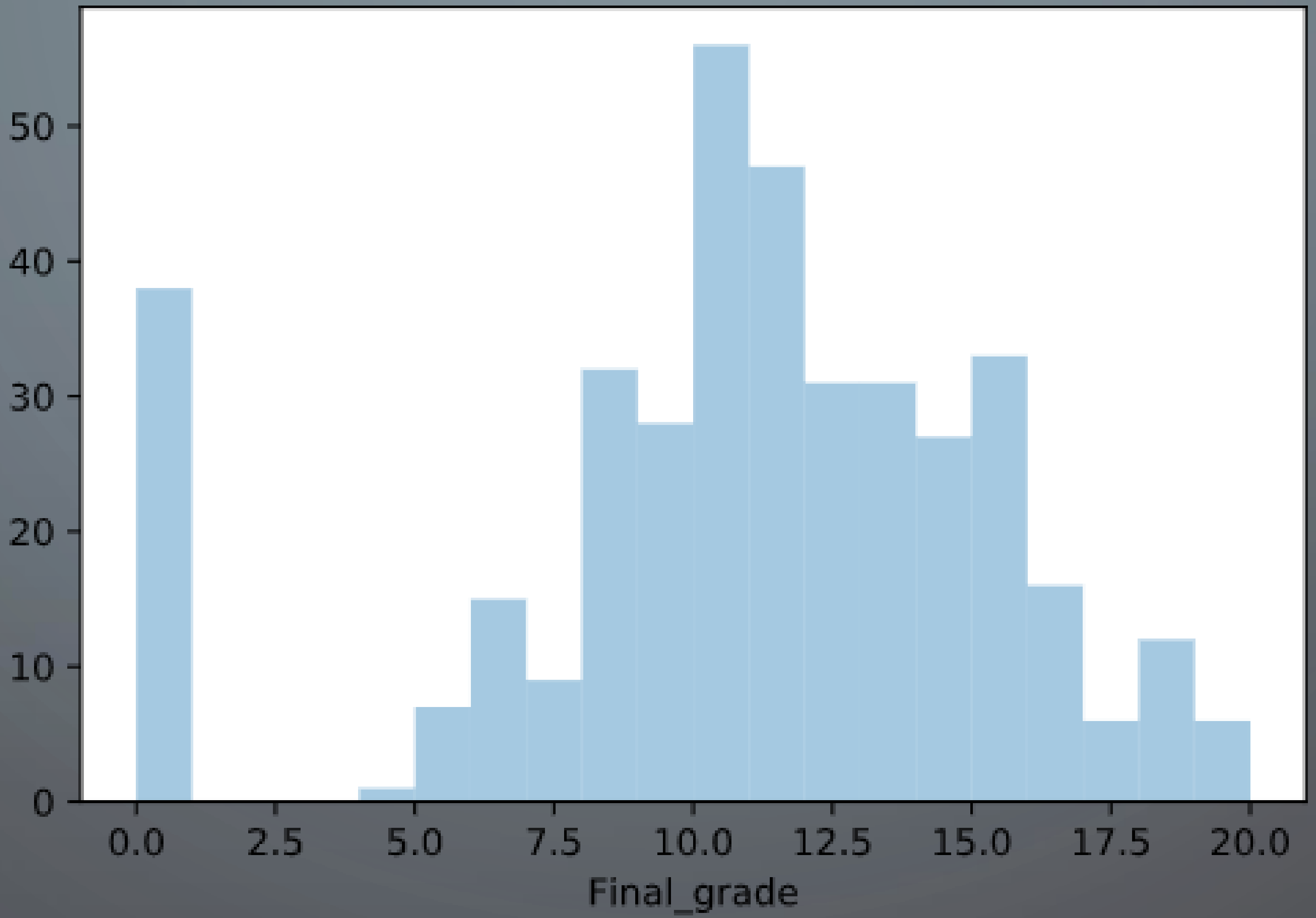


PLOTS

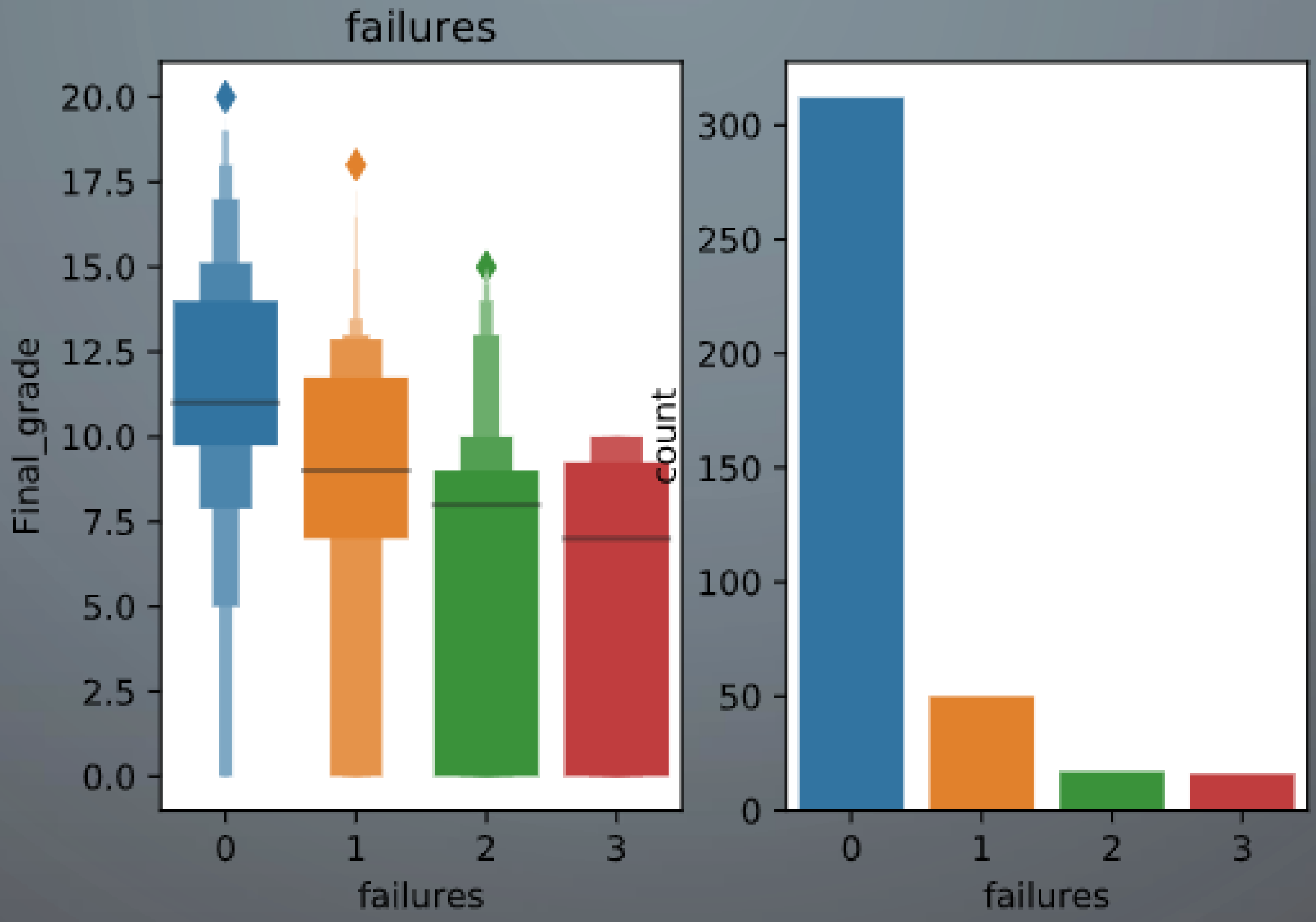


Final_grade
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
0
10
20
30
40
50
60
70
absences

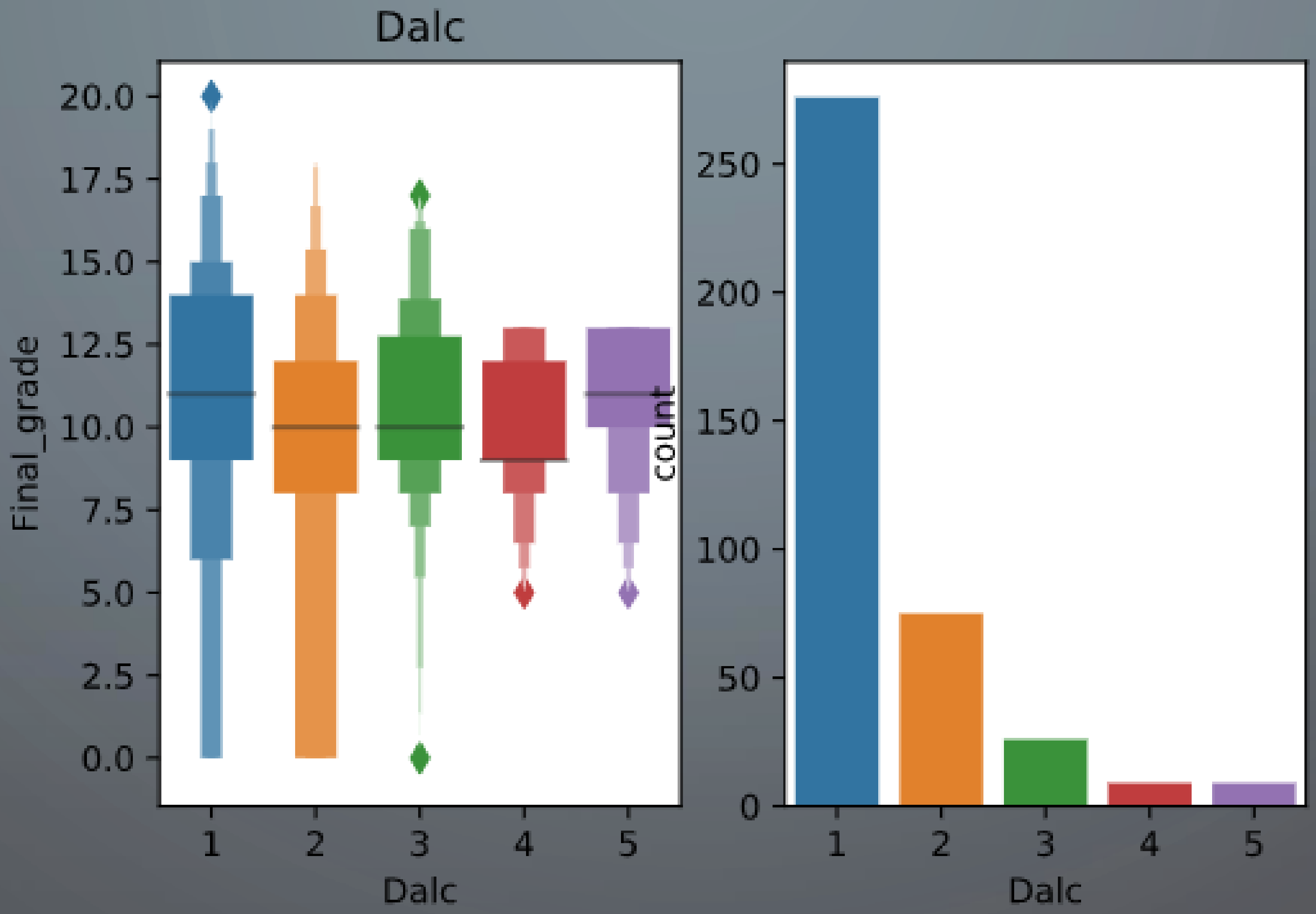
PLOTS



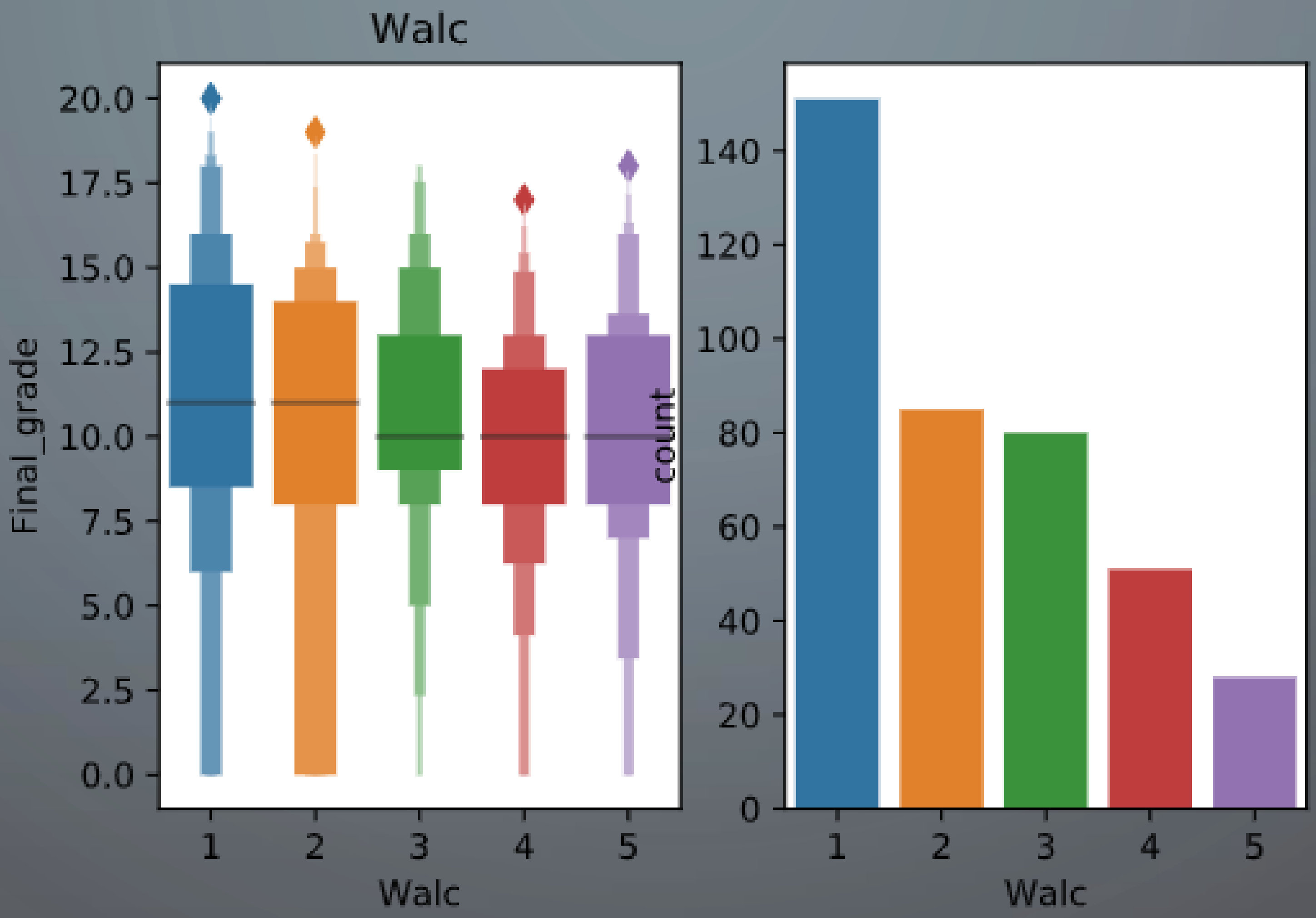
PLOTS


failures
Final_grade
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
0
1
2
3
failures
count
300
250
200
150
100
50
0
0
1
2
3
failures

PLOTS


Dalc
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
Final_grade
1
2
3
4
5
Dalc
count
250
200
150
100
50
0
1
2
3
4
5
Dalc

PLOTS


Walc
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17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
Final_grade
1
2
3
4
5
Walc
140
120
100
80
60
40
20
0
count
1
2
3
4
5
Walc

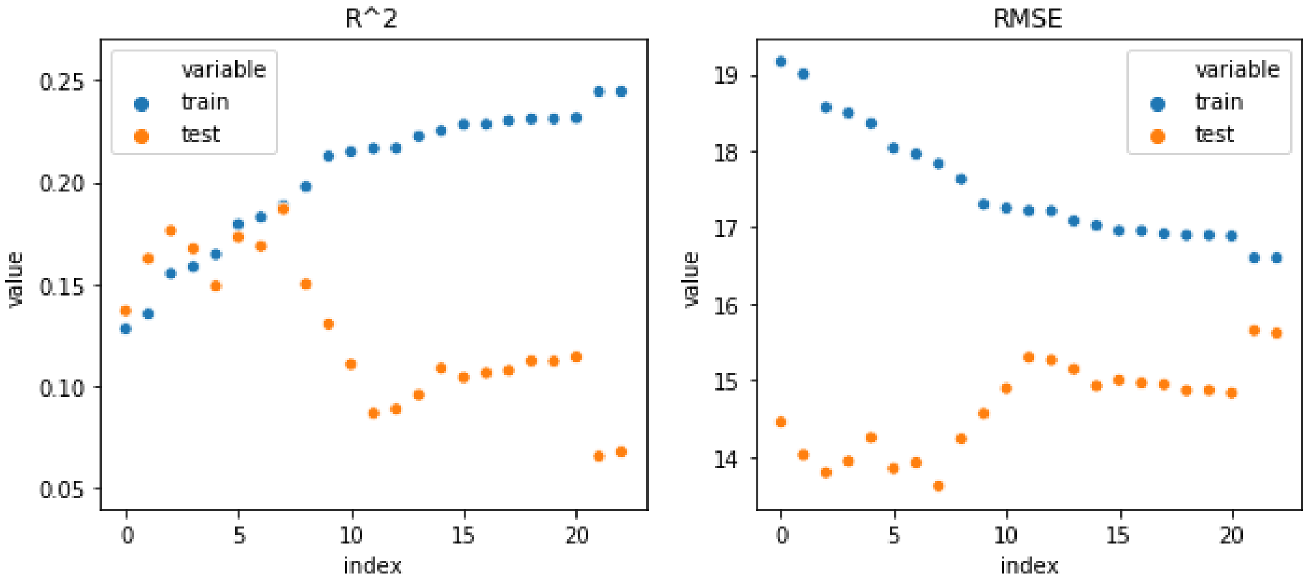
METHODS

- Linear model
- SVM
- KNN
- Ridge and Lasso
- Hurdle

LINEAR MODEL

WITH ALL FEATURES

- R2 train: 0.24
- R2 test: 0.06
- Overfitting

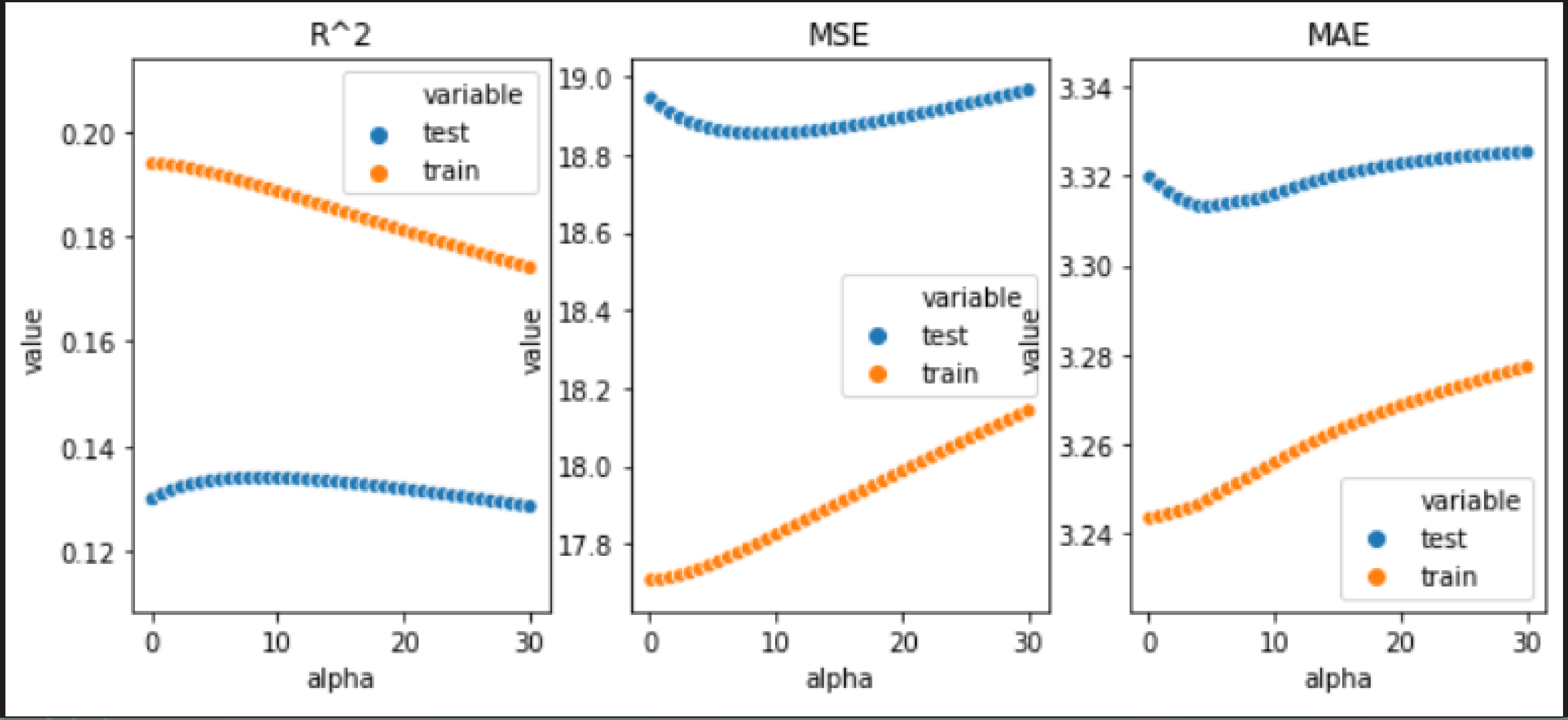


FIGHTING WITH OVERFITTING – RFE

R2 TRAIN: 0.1886

R2 TEST: 0.1868

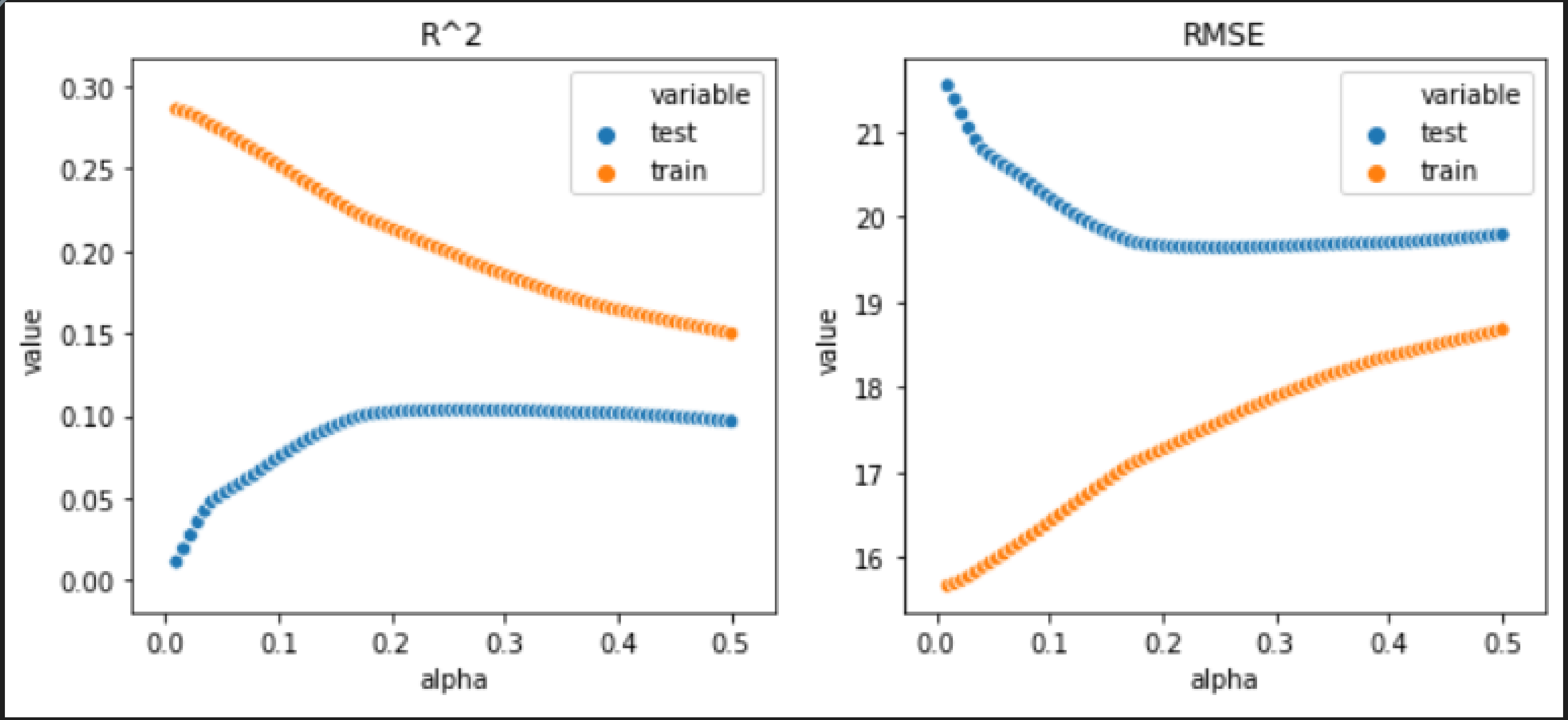
FIGHTING WITH OVERFITTING -RIDGE



R2 TRAIN: 0.184

R2 TEST: 0.195

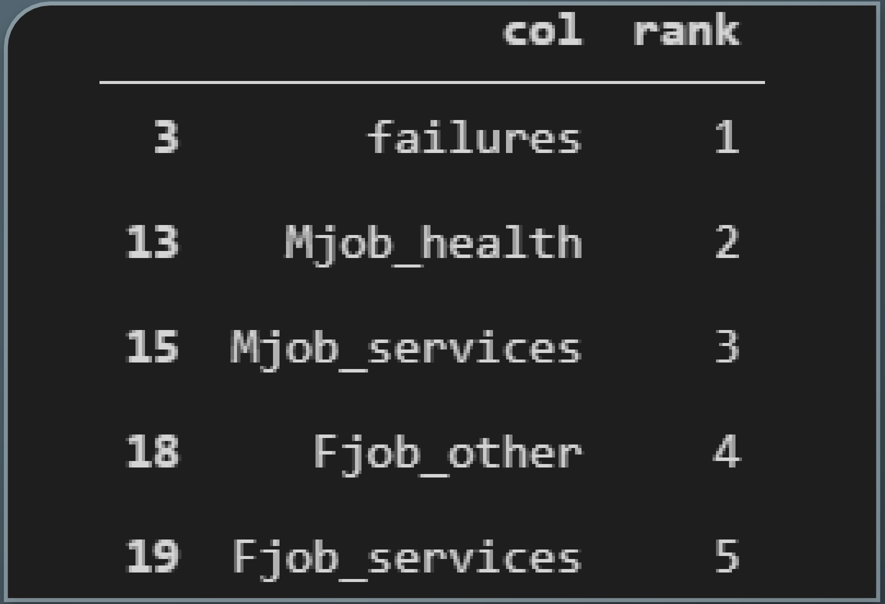
FIGHTING WITH OVERFITTING -LASSO



- R2 train: 0.182
- R2 test: 0.100

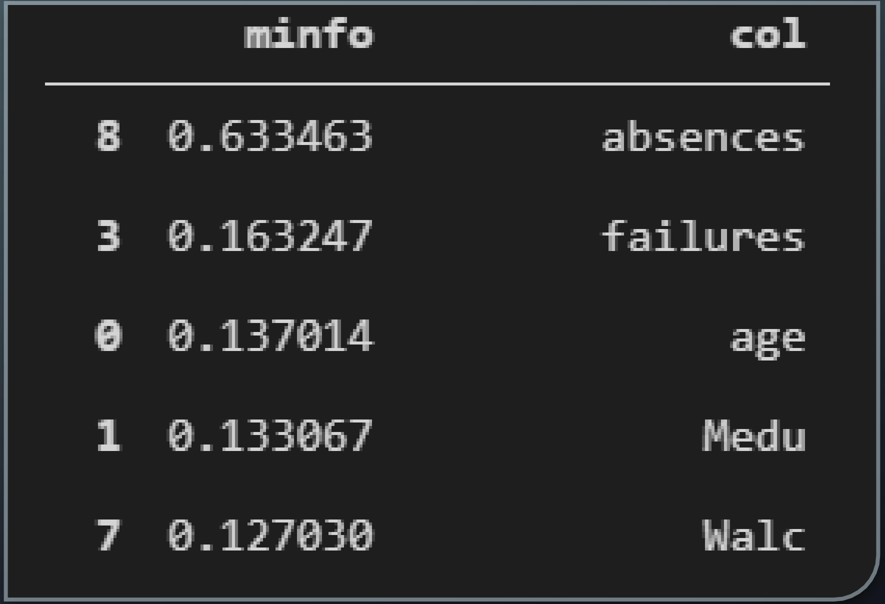
FEATURE SELECTION

- RFE

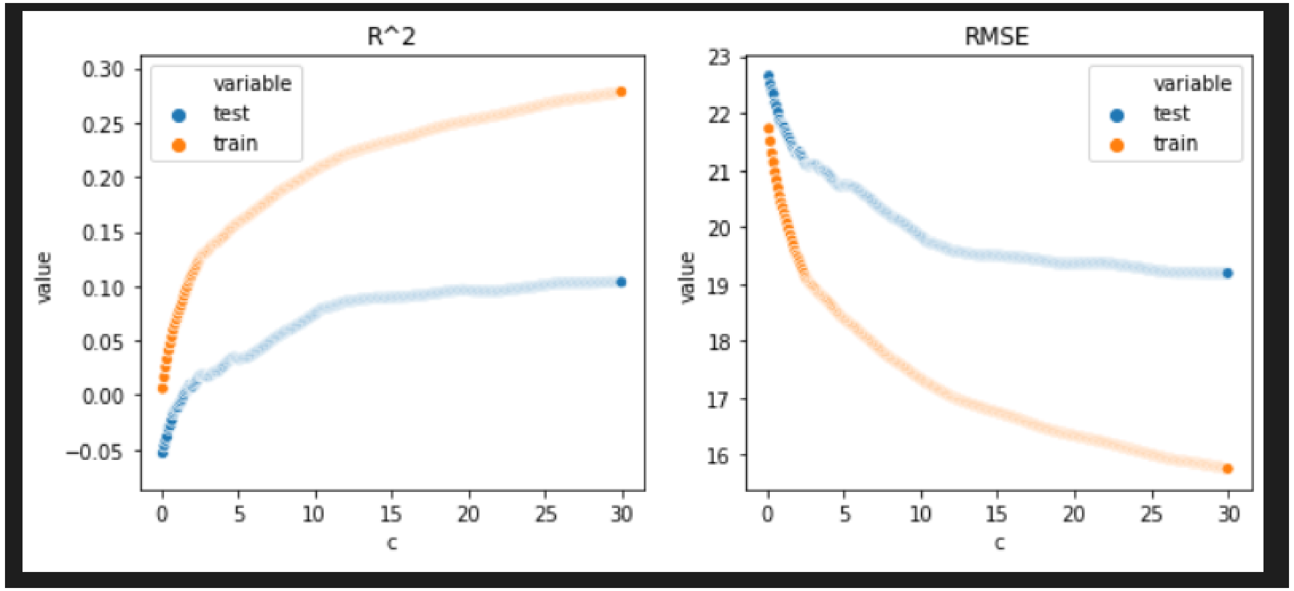


	col	rank
3	failures	1
13	Mjob_health	2
15	Mjob_services	3
18	Fjob_other	4
19	Fjob_services	5

- Mutual Info



	minfo	col
8	0.633463	absences
3	0.163247	failures
0	0.137014	age
1	0.133067	Medu
7	0.127030	Walc



SVM

- R2 train: 0.2270
- R2 test: 0.1984

CONCLUSIONS

- Our Fails
  - KNN
  - SVM with features from linear model
  - Linear model with mutual information features
- General take-aways
  - R^2 around 20% is very poor
  - SVM was the best model, with Ridge being almost as good