

# Assignment 2

## Advanced Computational Methods for Data Science - CS/STAT 6301.012

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### Part 1: Practice Test Effectiveness

#### Summary of the model

The below is the summary for the linear model that is built to predict the Real Exam Scores (response variable) with the Practice Exam Scores (predictor variable) using the training data. The “In Progress” and scores below 30 in the practice test records were eliminated.

```
Call: lm(formula = trainData$RealExam ~ trainData$PracticeExam)
```

Residuals:

Min	1Q	Median	3Q	Max
-33.088	-7.919	0.493	8.146	22.605

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	64.34296	4.03816	15.934	< 2e-16	***
trainData\$PracticeExam	0.14343	0.05113	2.805	0.00564	**

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Residual standard error: 11.36 on 164 degrees of freedom

Multiple R-squared: 0.04578, Adjusted R-squared: 0.03997

F-statistic: 7.869 on 1 and 164 DF, p-value: 0.005637

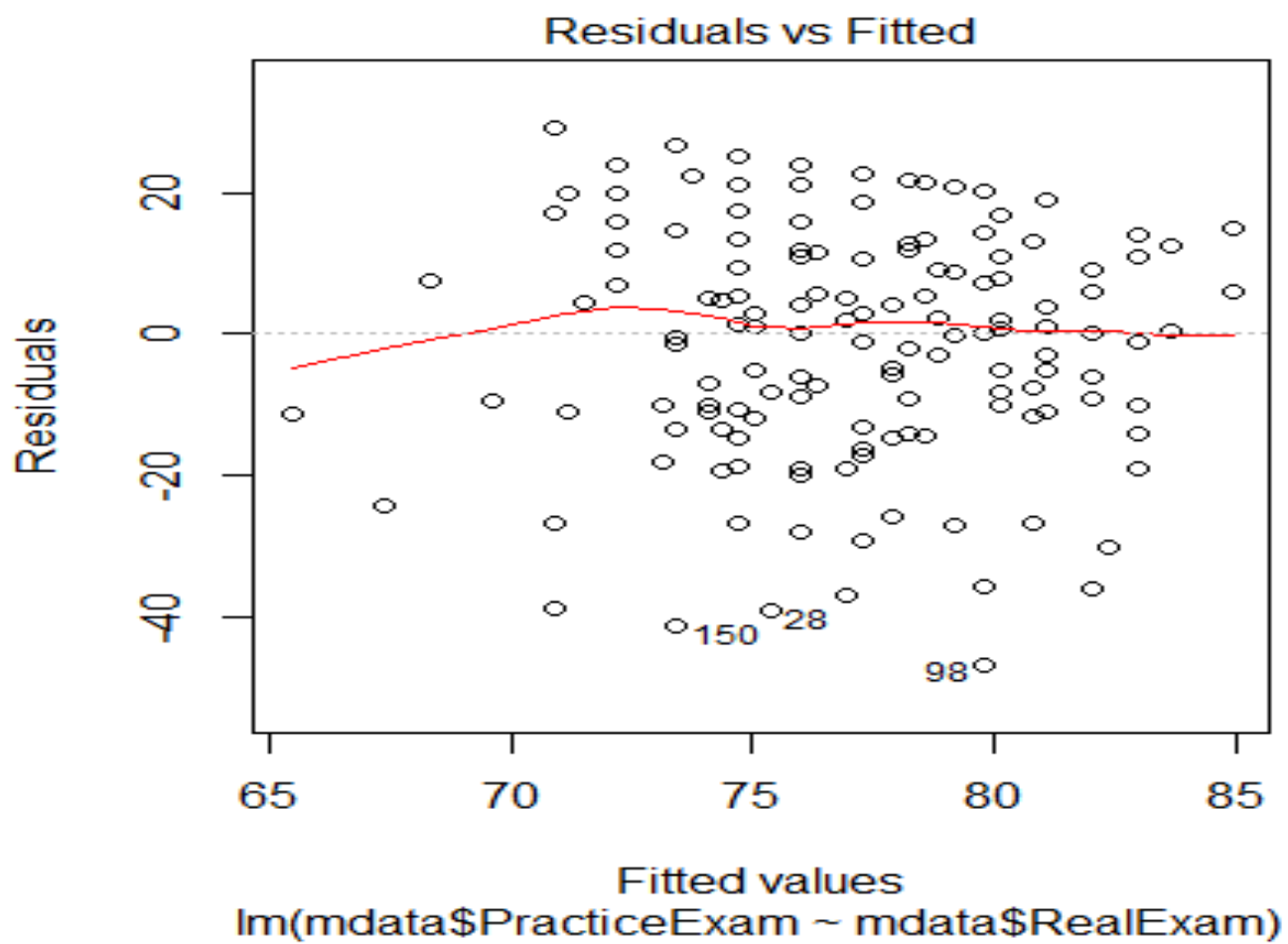
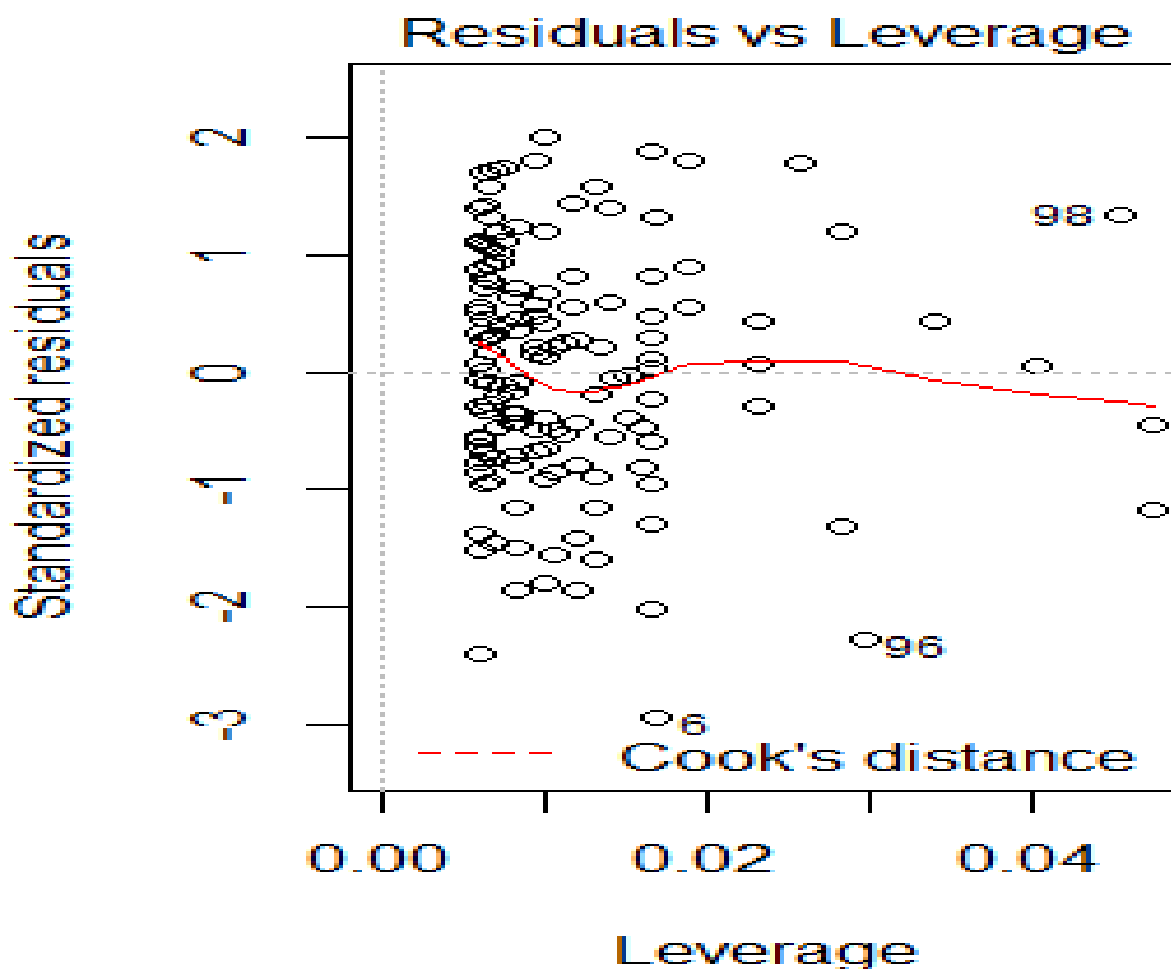


Figure 1: Above is the residual vs fitted plot for the model obtained



`lm(trainData$RealExam ~ trainData$Practice)`

Figure 2: Above is the residual plot for the final model obtained

correlation\_accuracy

	actuals	predicted
actuals	1.0000000	0.2139737
predicted	0.2139737	1.0000000

Conclusion:

For the given data set, the created linear regression model resulted in a 21% accuracy in prediction. The MSE obtained was 128.9457

## Part 2: Predicting Car Trade In Value

### Summary of the model

```
Call:
lm(formula = trainData$Price ~ ., data = trainData)
```

Residuals:

Min	1Q	Median	3Q	Max
-5129.9	-440.9	0.0	517.8	3467.4

Coefficients: (24 not defined because of singularities)

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	2.771e+04	1.561e+03	17.752	< 2e-16	***
Mileage	-2.412e-01	1.021e-02	-23.615	< 2e-16	***
MakeCadillac	3.972e+04	1.596e+03	24.882	< 2e-16	***
MakeChevrolet	-7.715e+02	1.635e+03	-0.472	0.637591	
MakePontiac	-6.973e+03	1.726e+03	-4.039	8.19e-05	***
MakeSAAB	3.450e+03	1.725e+03	2.000	0.047132	*
MakeSaturn	-7.741e+03	1.735e+03	-4.462	1.49e-05	***
Model9_3 HO	6.298e+03	9.523e+02	6.614	4.92e-10	***
Model9_5	7.795e+03	1.522e+03	5.121	8.35e-07	***
Model9_5 HO	8.383e+03	1.324e+03	6.331	2.19e-09	***
ModelAVEO	-1.267e+04	1.232e+03	-10.279	< 2e-16	***
ModelBonneville	4.304e+03	1.004e+03	4.285	3.08e-05	***
ModelCavalier	-1.014e+04	1.502e+03	-6.751	2.34e-10	***
ModelCentury	-7.293e+03	1.006e+03	-7.252	1.49e-11	***
ModelClassic	-7.924e+03	1.635e+03	-4.847	2.86e-06	***
ModelCobalt	-9.593e+03	1.501e+03	-6.391	1.60e-09	***
ModelCorvette	1.351e+04	1.642e+03	8.227	5.33e-14	***
ModelCST-V	-1.786e+04	1.543e+03	-11.573	< 2e-16	***
ModelCTS	-3.310e+04	1.530e+03	-21.632	< 2e-16	***
ModelDeville	-2.979e+04	1.543e+03	-19.304	< 2e-16	***
ModelG6	4.906e+03	1.960e+03	2.503	0.013284	*
ModelGrand Am	-3.141e+03	1.436e+03	-2.188	0.030077	*
ModelGrand Prix	2.391e+03	2.319e+03	1.031	0.304118	
ModelGTO	1.268e+04	1.683e+03	7.532	3.04e-12	***
ModelImpala	-4.085e+03	1.542e+03	-2.650	0.008838	**
ModelIon	-3.282e+03	1.946e+03	-1.686	0.093618	.
ModelL Series	NA	NA	NA	NA	
ModelLacrosse	-8.869e+01	1.665e+03	-0.053	0.957591	
ModelLesabre	-1.114e+03	1.665e+03	-0.669	0.504543	
ModelMalibu	-6.485e+03	1.496e+03	-4.334	2.53e-05	***
ModelMonte Carlo	NA	NA	NA	NA	
ModelPark Avenue	NA	NA	NA	NA	
ModelSTS-V6	-2.592e+04	1.531e+03	-16.933	< 2e-16	***
ModelSTS-V8	-2.000e+04	1.563e+03	-12.797	< 2e-16	***
ModelSunfire	-4.048e+03	1.721e+03	-2.351	0.019878	*
ModelVibe	NA	NA	NA	NA	
ModelXLR-V8	NA	NA	NA	NA	
TrimAero Sedan 4D	-6.834e+03	9.525e+02	-7.175	2.28e-11	***
TrimAero wagon 4D	-4.814e+03	1.246e+03	-3.864	0.000160	***
TrimArc Conv 2D	3.135e+03	1.261e+03	2.487	0.013889	*
TrimArc Sedan 4D	-3.823e+03	1.231e+03	-3.106	0.002233	**
TrimArc wagon 4D	-2.994e+03	1.400e+03	-2.140	0.033855	*
TrimConv 2D	5.641e+03	1.596e+03	3.535	0.000529	***
TrimCoupe 2D	9.314e+02	1.435e+03	0.649	0.517236	
TrimCustom Sedan 4D	-2.239e+03	1.269e+03	-1.764	0.079517	.
TrimCX Sedan 4D	-2.103e+03	8.983e+02	-2.341	0.020441	*
TrimCXL Sedan 4D	-1.060e+03	9.011e+02	-1.177	0.240972	
TrimCXS Sedan 4D	NA	NA	NA	NA	
TrimDHS Sedan 4D	4.376e+03	1.679e+03	2.607	0.009970	**
TrimDTS Sedan 4D	5.414e+03	1.619e+03	3.344	0.001020	**

TrimGT Coupe 2D	2.226e+03	1.323e+03	1.683	0.094234	.
TrimGT Sedan 4D	-8.822e+02	1.891e+03	-0.467	0.641460	
TrimGT Sportwagon	9.150e+02	1.100e+03	0.832	0.406702	
TrimGTP Sedan 4D	2.353e+03	2.447e+03	0.962	0.337645	
TrimGXP Sedan 4D	2.783e+03	9.041e+02	3.079	0.002433	**
TrimHardtop Conv 2D	NA	NA	NA	NA	
TrimL300 Sedan 4D	NA	NA	NA	NA	
TrimLimited Sedan 4D	NA	NA	NA	NA	
TrimLinear Conv 2D	6.186e+03	1.347e+03	4.592	8.65e-06	***
TrimLinear Sedan 4D	NA	NA	NA	NA	
TrimLinear Wagon 4D	-3.999e+03	1.398e+03	-2.861	0.004763	**
TrimLS Coupe 2D	1.659e+03	1.429e+03	1.161	0.247197	
TrimLS MAXX Hback 4D	1.713e+03	1.528e+03	1.121	0.263881	
TrimLS Sedan 4D	1.259e+03	1.369e+03	0.920	0.359105	
TrimLS Sport Coupe 2D	5.612e+02	1.467e+03	0.383	0.702573	
TrimLS Sport Sedan 4D	1.805e+03	1.534e+03	1.177	0.240995	
TrimLT Coupe 2D	-1.141e+03	9.538e+02	-1.196	0.233208	
TrimLT Hatchback 4D	3.117e+03	1.350e+03	2.310	0.022122	*
TrimLT MAXX Hback 4D	2.346e+03	1.529e+03	1.535	0.126800	
TrimLT Sedan 4D	1.368e+03	1.369e+03	0.999	0.319146	
TrimMAXX Hback 4D	7.836e+02	1.592e+03	0.492	0.623310	
TrimQuad Coupe 2D	3.607e+03	2.099e+03	1.718	0.087626	.
TrimSE Sedan 4D	-4.909e+02	1.007e+03	-0.488	0.626500	
TrimSedan 4D	1.732e+02	1.403e+03	0.123	0.901875	
TrimSLE Sedan 4D	NA	NA	NA	NA	
TrimSpecial Ed Ultra 4D	2.780e+03	1.896e+03	1.467	0.144377	
TrimSportwagon 4D	NA	NA	NA	NA	
TrimSS Coupe 2D	NA	NA	NA	NA	
TrimSS Sedan 4D	5.912e+03	1.542e+03	3.835	0.000178	***
TrimSVM Hatchback 4D	NA	NA	NA	NA	
TypeCoupe	NA	NA	NA	NA	
TypeHatchback	NA	NA	NA	NA	
TypeSedan	NA	NA	NA	NA	
TypeWagon	NA	NA	NA	NA	
Cylinder	NA	NA	NA	NA	
Liter	NA	NA	NA	NA	
Doors	NA	NA	NA	NA	
Cruise	NA	NA	NA	NA	
Sound	NA	NA	NA	NA	
Leather	NA	NA	NA	NA	

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

Residual standard error: 1099 on 166 degrees of freedom  
Multiple R-squared: 0.9936, Adjusted R-squared: 0.9911  
F-statistic: 396.6 on 65 and 166 DF, p-value: < 2.2e-16

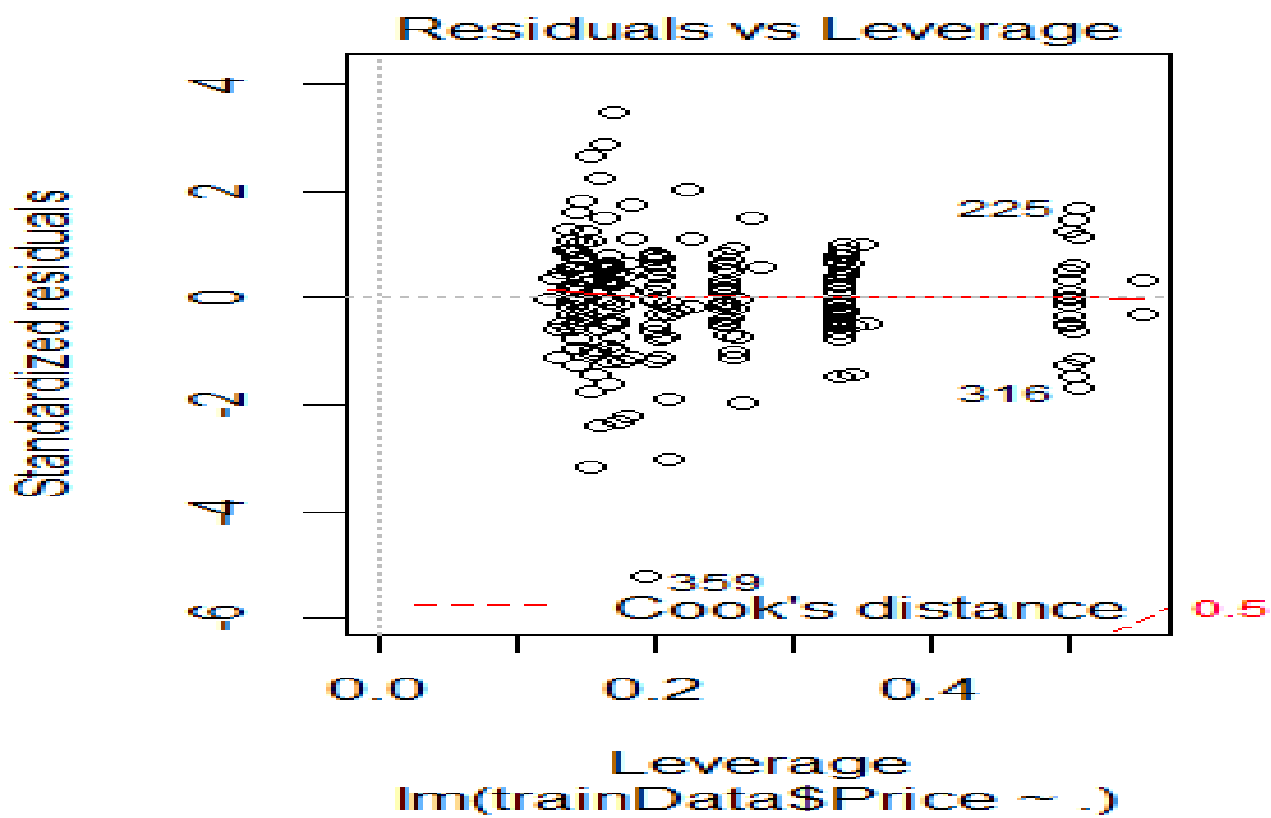


Figure 3: Above is the residual plot for the final model obtained

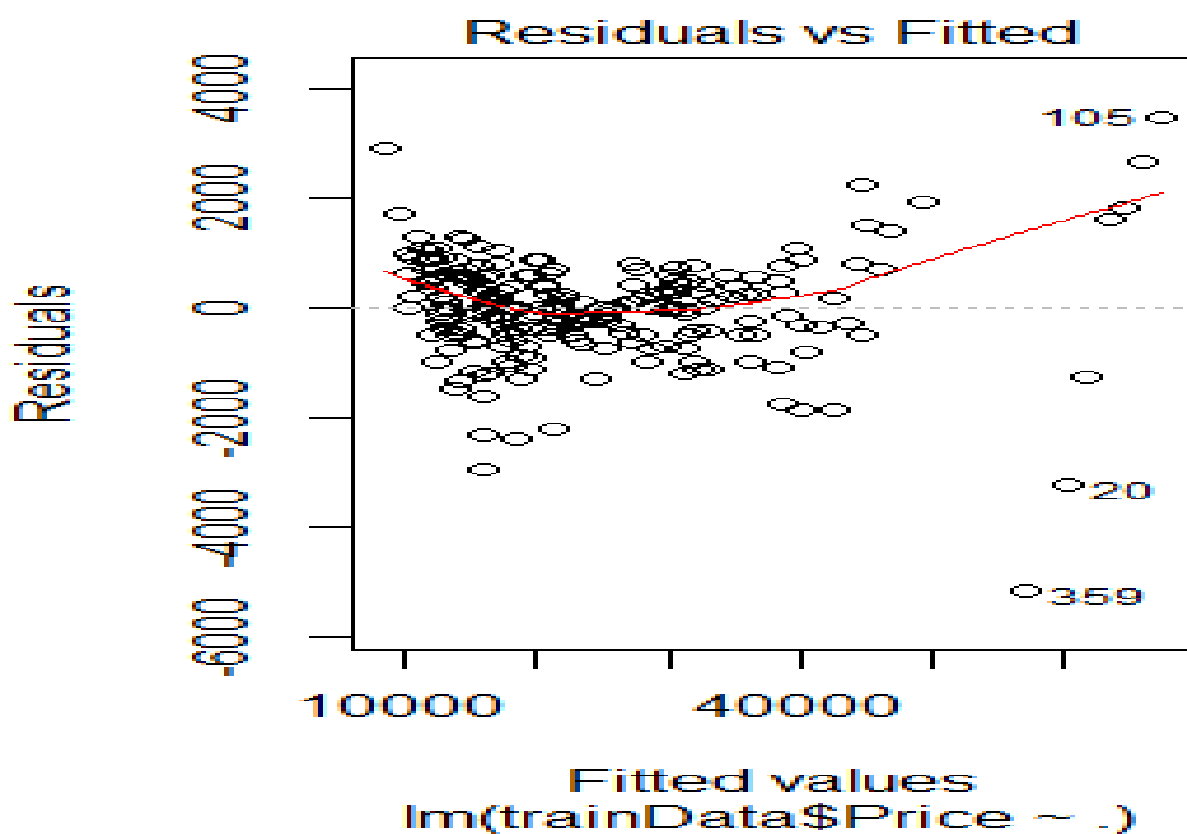


Figure 4: Above is the residual vs fitted values plot for the model obtained

## correlation\_accuracy

	actuals	predicted
actuals	1.00000000	0.02014075
predicted	0.02014075	1.00000000

## Conclusion

A linear regression model was created with all the factors into consideration for price. For the given data set, the created linear regression model resulted in a 2.01% accuracy in prediction. The MSE obtained was 1208277.