DA3 Exercise1

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```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --

## v ggplot2 3.3.5     v purrr   0.3.4
## v tibble  3.1.5     v dplyr   1.0.7
## v tidyr   1.1.4     v stringr 1.4.0
## v readr   2.0.2     v forcats 0.5.1

## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()

## Loading required package: lattice

##
## Attaching package: 'caret'

## The following object is masked from 'package:purrr':
##
##     lift

## New names:
## * `` -> ...1

## Rows: 149316 Columns: 23

## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr  (9): intmonth, stfips, prcitshp, state, ind02, class, unionmme, unionco...
## dbl (14): ...1, hhid, weight, earnwke, uhours, grade92, race, ethnic, age, s...

##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

- Target Variable (Y): Hourly wage
- Predictor variables (X): Education (High school graduate as base), Race (White as base), Age, Sex (Male as base), Marital Status (Married as base), Union Status (Not in union as base)

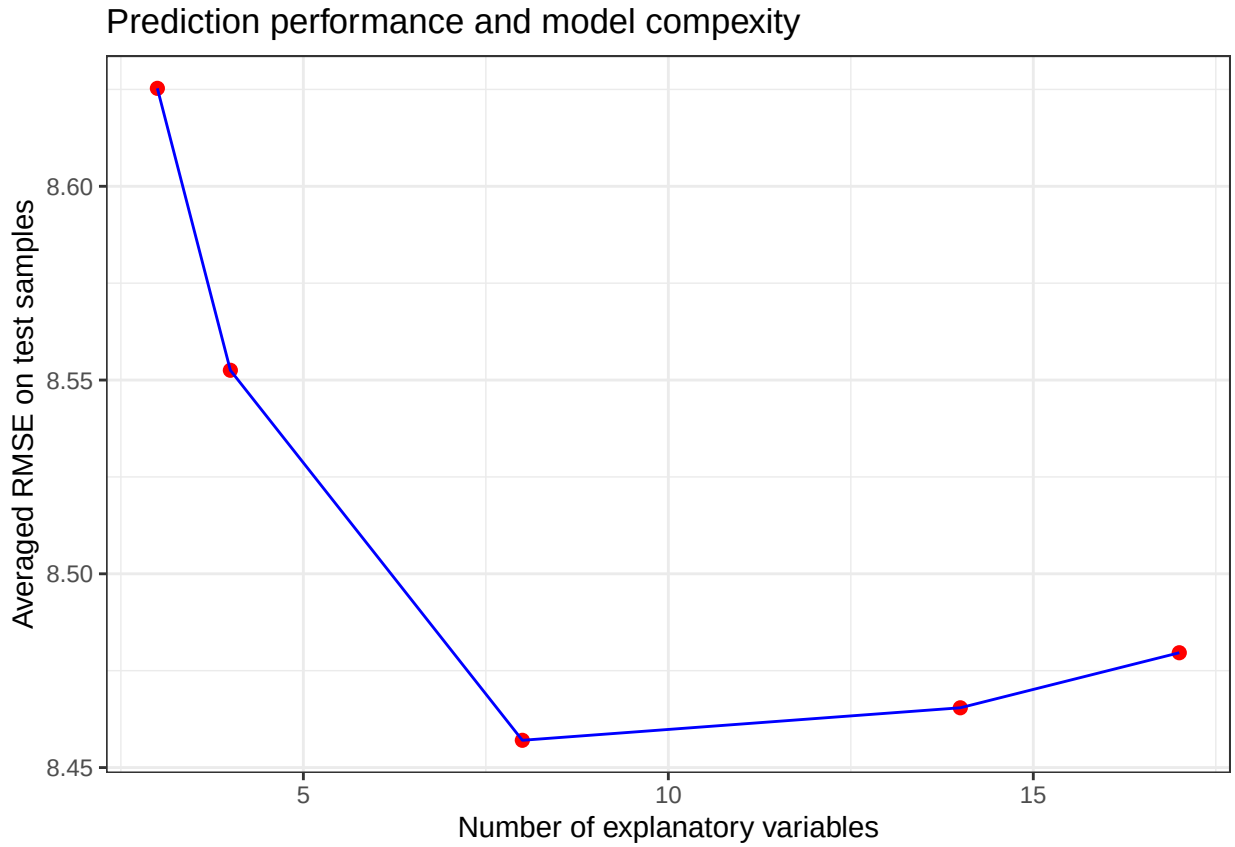
```
## Linear Regression
##
## 2980 samples
##    2 predictor
##
## No pre-processing
## Resampling: Cross-Validated (4 fold)
## Summary of sample sizes: 2235, 2235, 2236, 2234
## Resampling results:
##
##   RMSE      Rsquared    MAE
##   8.622476  0.01786559  6.10027
##
## Tuning parameter 'intercept' was held constant at a value of TRUE
```

```
##
## Call:
## lm(formula = .outcome ~ ., data = dat)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -18.358  -5.487  -1.565   3.620  55.254
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.915498   2.599660   0.737    0.461
## age          0.687602   0.121813   5.645 1.81e-08 ***
## agesq       -0.006892   0.001368  -5.038 4.98e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 8.619 on 2977 degrees of freedom
## Multiple R-squared:  0.01795,    Adjusted R-squared:  0.01729
## F-statistic:  27.2 on 2 and 2977 DF,  p-value: 1.964e-12
```

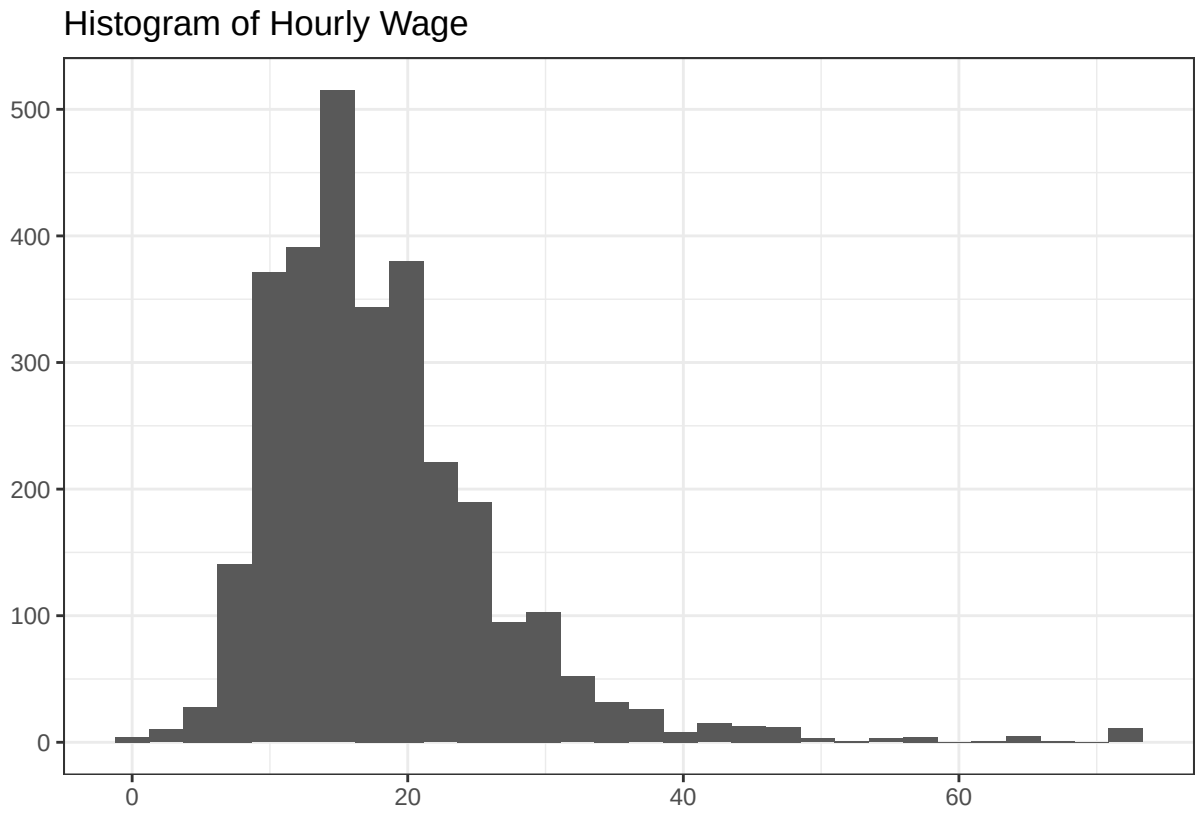
```
##   intercept     RMSE   Rsquared     MAE    RMSESD  RsquaredSD     MAESD
## 1      TRUE 8.622476 0.01786559 6.10027 0.2538065 0.009511182 0.1596935
```

```
##       RMSE    Rsquared      MAE Resample
## 1 8.590490 0.017126070 6.237623    Fold1
## 2 8.926210 0.031429311 6.215915    Fold2
## 3 8.309046 0.009930978 5.895469    Fold3
## 4 8.664158 0.012975984 6.052072    Fold4
```

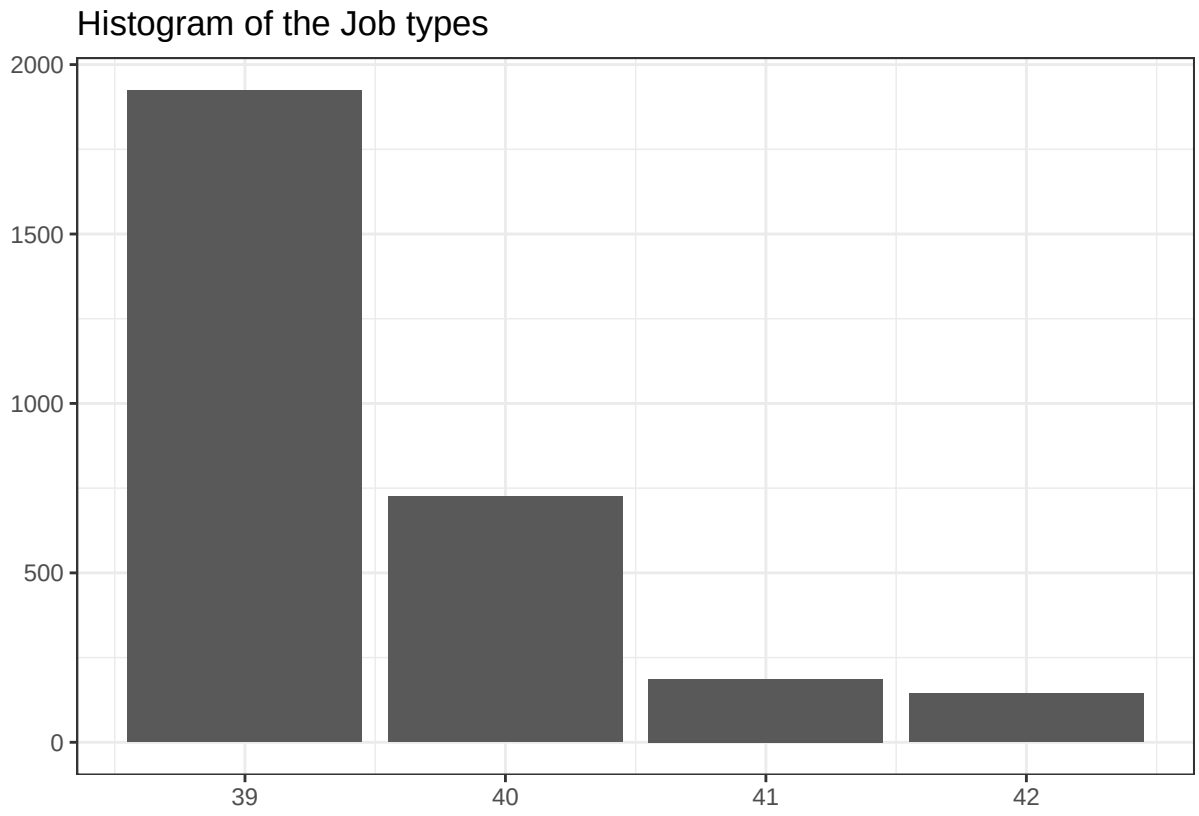
```
##   Resample   Model1   Model2   Model3   Model4   Model5
## 1    Fold1 8.590490 8.474870 8.338192 8.293918 8.297041
## 2    Fold2 8.926210 8.814151 8.682432 8.744360 8.745257
## 3    Fold3 8.309046 8.223868 8.162299 8.162094 8.186240
## 4    Fold4 8.664158 8.685491 8.634375 8.647591 8.676497
## 5  Average 8.625277 8.552521 8.457033 8.465423 8.479631
```



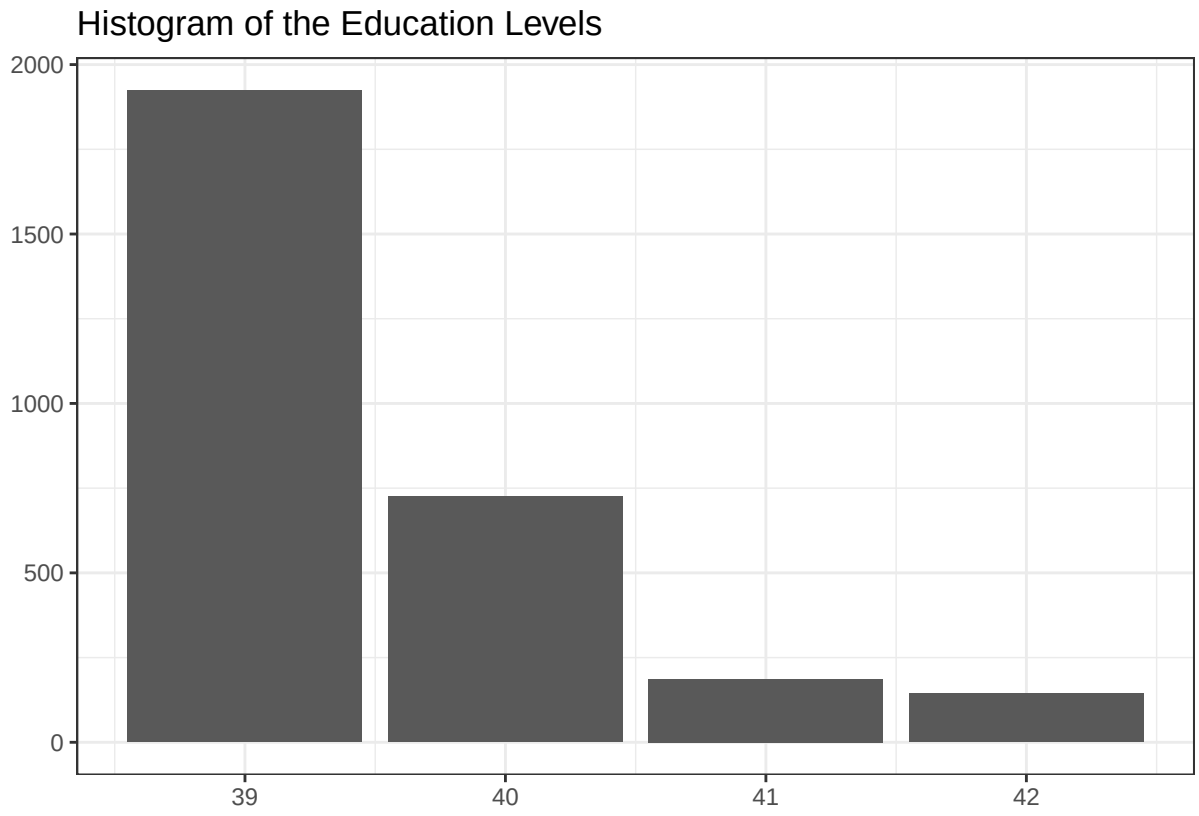

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



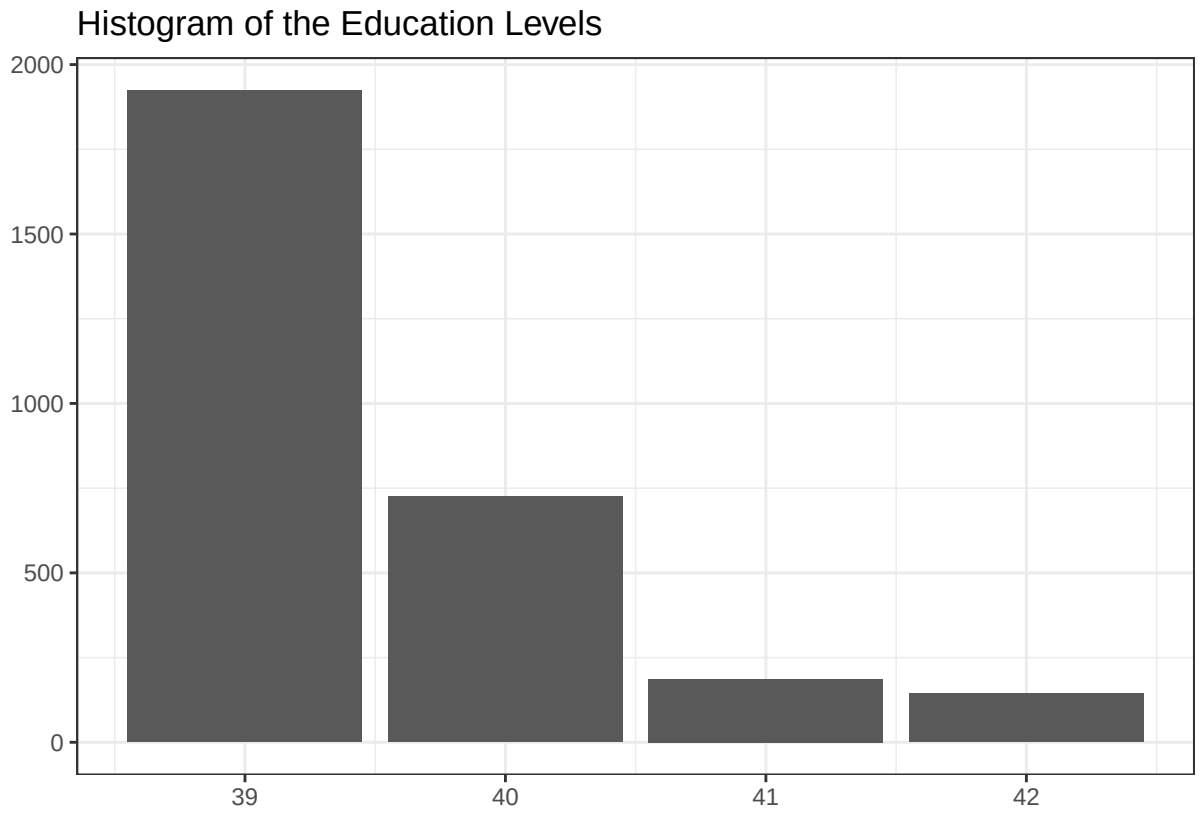

```
## Warning: Ignoring unknown parameters: binwidth, bins, pad
```




```
## Warning: Ignoring unknown parameters: binwidth, bins, pad
```




```
## Warning: Ignoring unknown parameters: binwidth, bins, pad
```



Resample	Model1	Model2	Model3	Model4	Model5
Fold1	8.590490	8.474870	8.338192	8.293919	8.297041
Fold2	8.926210	8.814151	8.682432	8.744360	8.745257
Fold3	8.309046	8.223868	8.162299	8.162094	8.186240
Fold4	8.664158	8.685491	8.634376	8.647591	8.676497
Average	8.625277	8.552521	8.457033	8.465423	8.479631

With 5-fold cross validation Model 3 has the best RMSE

Evaluation of the models using all the sample

	reg1	reg2	reg3	reg4	reg5
	(1)	(2)	(3)	(4)	(5)
Dependent Var.:	earnho	earnho	earnho	earnho	earnho
Intercept	1.915 (2.392)	1.676 (2.371)	3.992 (2.504)	3.407 (2.563)	-2.449 (9.631)
age	0.6876***	0.7182***	0.6146***	0.6460***	1.095 (0.7073)
	(0.1157)	(0.1149)	(0.1172)	(0.1187)	
age squared	-0.0069***	-0.0072***	-0.0063***	-0.0067***	-0.0173
	(0.0013)	(0.0013)	(0.0013)	(0.0013)	(0.0167)
female		-3.639***	-4.000***	-4.073***	-4.134* (1.917)
		(0.4378)	(0.4510)	(0.4575)	
unionized			3.532***	3.543***	0.4839 (1.890)
			(0.4268)	(0.4212)	
divorced			0.4361 (0.4939)	0.3766 (0.4937)	0.3872
					(0.4928)
never married			-0.9001*	-0.7635.	-0.7563.
			(0.4349)	(0.4357)	(0.4352)
other marital			-0.1950 (0.5845)	-0.1103 (0.5855)	-0.1091
status					(0.5852)
black				-0.8400*	-0.8445*
				(0.3966)	(0.3972)
asian				-1.219 (1.022)	-1.175 (1.023)
other race				-1.991* (0.8207)	-2.073*
					(0.8215)
college drop-out				0.5206 (0.3849)	0.5151
					(0.3854)
occupational				-1.838***	-1.849***
degree				(0.5385)	(0.5381)
academic degree				2.000* (0.8355)	2.019*
					(0.8368)
age cubed					7.87e-5
					(0.0001)
age x female					0.0012
					(0.0428)
age x unionized					0.0645
					(0.0396)
S.E. type	Heteroskedast.-rob.	Heteroskedast.-rob.	Heteroskedast.-rob.	Heteroskedast.-rob.	Heteroskedas.-rob.
AIC	21,297.8	21,243.4	21,173.7	21,157.6	21,160.7
BIC	21,315.8	21,267.4	21,221.7	21,241.6	21,262.7
RMSE	8.6150	8.5339	8.4234	8.3837	8.3797
R2	0.01795	0.03636	0.06115	0.06997	0.07085
Observations	2,980	2,980	2,980	2,980	2,980
No. Variables	2	3	7	13	16

According to BIC, Model 3 is the best. According to RMSE Model 5 is the best.