Pillar 1 - Conformal Prediction

DARS

2019-05-15

1 Set up

2 Course selection

I select courses with large and small n, and large and small CV error. I do not select courses whose lasso model contains less than 3 non-zero coefficients (df).

- COR1002: large n
- COR1004: large n and smaller CV error (mean absolute error) than COR1002
- SCI3003: small n and large CV error
- SCI2040: small n and small CV erro
- SSC3044: small CV error
- SSC3038: small CV error and n twice as large as SSC3044
- SCI2018: large CV error
- SCI2010: large CV error and n twice as large as SCI2018

```
## # A tibble: 8 x 4
##   target      n cv_error    df
##   <chr>   <dbl>    <dbl> <dbl>
## 1 SSC3044   136    0.382    13
## 2 SSC3038   272    0.398     7
## 3 SCI2040    29    0.546     9
## 4 COR1004  1998    0.669    22
## 5 COR1002  2067    0.998    20
## 6 SCI2010   417    1.41     18
## 7 SCI2018   198    1.62     14
## 8 SCI3003    30    1.83     14
```

3 Conformal Prediction setp by step

3.1 Cross-validation

3.2 Training, callibration and test sets

3.3 Fit lasso on training set

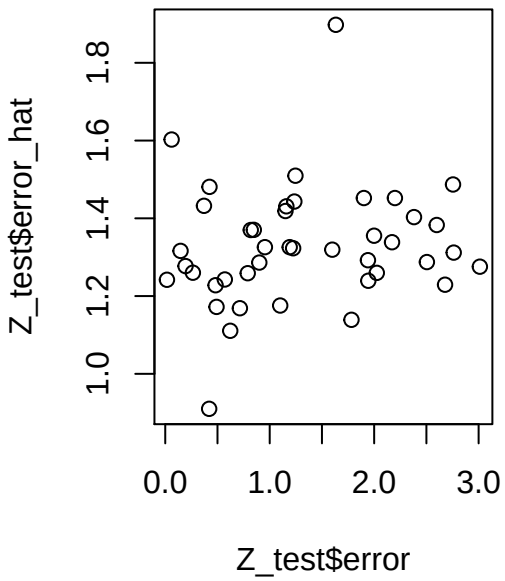
3.4 Compute non-conformity scores on callibration test

3.5 Evaluate error rate on test set

4 Loop through all courses

Illustration of the effect of error_hat on interval's width (for significance of 99%):

```
## # A tibble: 42 x 8
##        Y Y_hat  error error_hat width border_low border_high hit
##    <dbl> <dbl>  <dbl>     <dbl> <dbl>      <dbl>       <dbl> <lgl>
##  1   8    7.98 0.0164      1.24 0.307       7.68        8.29 TRUE
##  2   8.7  6.10 2.60        1.38 0.342       5.76        6.44 FALSE
##  3   9.7  9.08 0.622       1.11 0.274       8.80        9.35 FALSE
##  4   6    6.85 0.848       1.37 0.339       6.51        7.19 FALSE
##  5   9.7  7.02 2.68        1.23 0.304       6.72        7.33 FALSE
##  6   5.8  5.61 0.194       1.28 0.316       5.29        5.92 TRUE
##  7   5    6.94 1.94        1.24 0.306       6.64        7.25 FALSE
##  8   9    7.76 1.24        1.44 0.357       7.41        8.12 FALSE
##  9   5.5  6.72 1.22        1.32 0.327       6.40        7.05 FALSE
## 10   7.8  5.77 2.03        1.26 0.311       5.46        6.09 FALSE
## # ... with 32 more rows
```



Correlation between the actual errors and the predicted errors (error_hat):

```
## [1] 0.1516001
```