Quick start guide for the `ncvreg` package

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This guide is intended to briefly demonstrate the basic usage of `ncvreg`. For more details, see the documentation for individual functions, as well as the references.

`ncvreg` comes with a few example data sets; we'll look at `prostate`, which has 8 features and one continuous response, `prostate$lpsa`, the PSA levels (on the log scale) from men about to undergo radical prostatectomy. The data is available as a data frame; we will turn it into a design matrix `X` and response vector `y` for the purpose of analysis

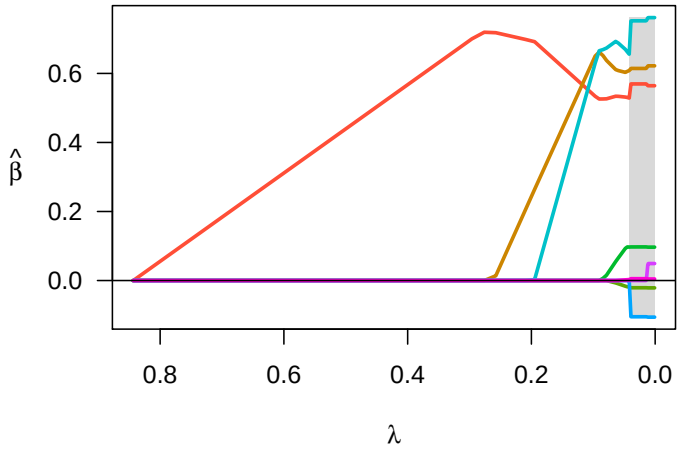
```
> ## Linear regression
> data(prostate)
> X <- as.matrix(prostate[,1:8])
> y <- prostate$lpsa
> head(X)

      lcavol  lweight age      lbph svi       lcp gleason pgg45
1 -0.5798185 2.769459  50 -1.386294   0 -1.386294       6     0
2 -0.9942523 3.319626  58 -1.386294   0 -1.386294       6     0
3 -0.5108256 2.691243  74 -1.386294   0 -1.386294       7    20
4 -1.2039728 3.282789  58 -1.386294   0 -1.386294       6     0
5  0.7514161 3.432373  62 -1.386294   0 -1.386294       6     0
6 -1.0498221 3.228826  50 -1.386294   0 -1.386294       6     0

> head(y)

[1] -0.4307829 -0.1625189 -0.1625189 -0.1625189  0.3715636  0.7654678
```

To fit a penalized regression model to this data:

```
> fit <- ncvreg(X, y)
```

The default penalty here is the minimax concave penalty (MCP), but SCAD and lasso penalties are also available. This produces a path of coefficients, which we can plot with

```
> plot(fit)
```

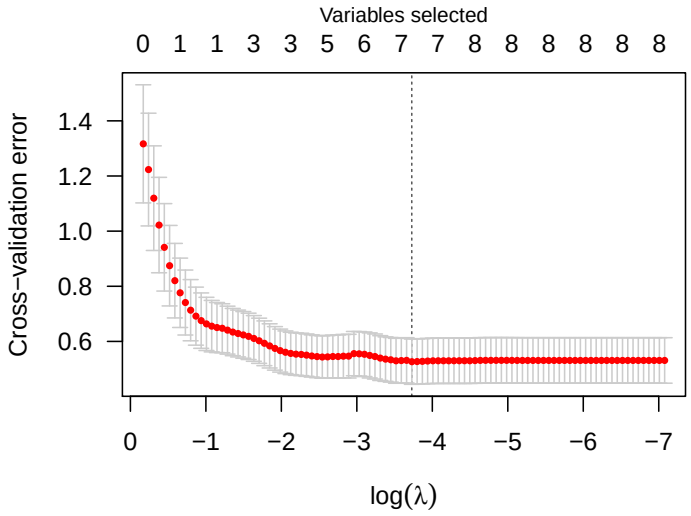


Notice that variables enter the model one at a time, and that at any given value of λ, several coefficients are zero. To see what the coefficients are, we could use the `coef` function:

```
> coef(fit, lambda=0.1)

(Intercept)      lcavol     lweight         age        lbph         svi
 -0.6973059   0.5387509   0.6382717   0.0000000   0.0000000   0.6102800
        lcp     gleason       pgg45
  0.0000000   0.0000000   0.0000000
```

Typically, one would carry out cross-validation for the purposes of assessing the predictive accuracy of the model at various values of λ:

```
> cvfit <- cv.ncvreg(X, y)
> plot(cvfit)
```



The coefficients corresponding to the value of λ that minimizes the cross-validation error can be obtained via `coef`:

```
> coef(cvfit)

 (Intercept)       lcavol      lweight          age         lbph
 0.494155488  0.569546029  0.614419592 -0.020913469  0.097352619
         svi          lcp      gleason        pgg45
 0.752398445 -0.104959575  0.000000000  0.005324463
```

Predicted values can be obtained via `predict`, which has a number of options:

```
> predict(cvfit, X=head(X))

        1         2         3         4         5         6
0.8304041 0.7650906 0.4262073 0.6230117 1.7449492 0.8449595

> predict(cvfit, type="nvars")

0.02402
      7
```

Note that the original fit (to the full data set) is returned as `cvfit$fit`; it is not necessary to call both `ncvreg` and `cv.ncvreg` to analyze a data set. Methods for logstic regression and Cox proportional hazards regression are also available.