Beta-Regression Code for Using Tree-Based Models to Identify Factors Contributing to Trait Negative Affect in Adults with and without Major Depression Manuscript

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2023-04-28

Loading the data

```
affectivity_data_df <-read_excel("data/Psico_New.xlsx")
```

Wrangle data

```
rename_binary <- function(x) {
  return(
    case_when(
      x == 1 ~ " Yes",
      x == 0 ~ "No"
    )
  )
}

demographics_df <-
  affectivity_data_df  %>%
  select(
    Age = EDAD,
    `Disconnection and Rejection` = DYRYSQ,
    `Impaired Autonomy` = PADYSQ,
    `Impaired Limits` =LIYSQ,
    `Other-Directedness` = THOYSQ,
    `Over-Vigilance/Inhibition` = SEIYSQ,
    `IDER Score` = IDERR_total,
    `Number of Stressful Events` = ESVfrec,
    Sex = SEXO,
    `Negative Attribution` = dummyPosNeg,
    `Unexpected Attribution` = dummyEsInes,
    `Out of Control Attribution`  = dummyConNocon,
```

```
    `Childhood Adversity` = ABUSOINFANCIA,
    `Physical Excercise` = deporte,
    `Smoking Cigarettes` = fuma,
    `Alcohol Use` = Alcohol,
    `Psychoactive Substance Use` = psicoactiva
    ) %>%
  mutate(across(Sex:`Psychoactive Substance Use`, factor)) %>%
  mutate(
    Sex = case_when(
      Sex == 1 ~ "Female",
      Sex == 0 ~ "Male"
    )
  ) %>%
  mutate_at(
    vars(
      `Negative Attribution`:`Psychoactive Substance Use`),
      ~ rename_binary(.))
```

Beta Regression

```
# I have to transform the outcome to be from 0 to 1 given that it is a score that
only goes from 10 to 40, it is bounded. This function was created by Dr. Gabriel
Odom. Please find the documentation in script named liker_squeezer_202303314

Squeeze <- function(xBdd, lower, upper, squeeze = 0.5) {
    N <- length(xBdd)
    x1 <- (xBdd - lower) / (upper - lower)
    x2 <- (x1 * (N - 1) + squeeze) / N
    x2

}

# Transforming the variable
affectivity_df <- demographics_df %>%
  mutate(IDER = Squeeze(
    xBdd = demographics_df$`IDER Score`,
      lower = 10L, upper = 40L
    )
  ) %>%
  select(-`IDER Score`)
```

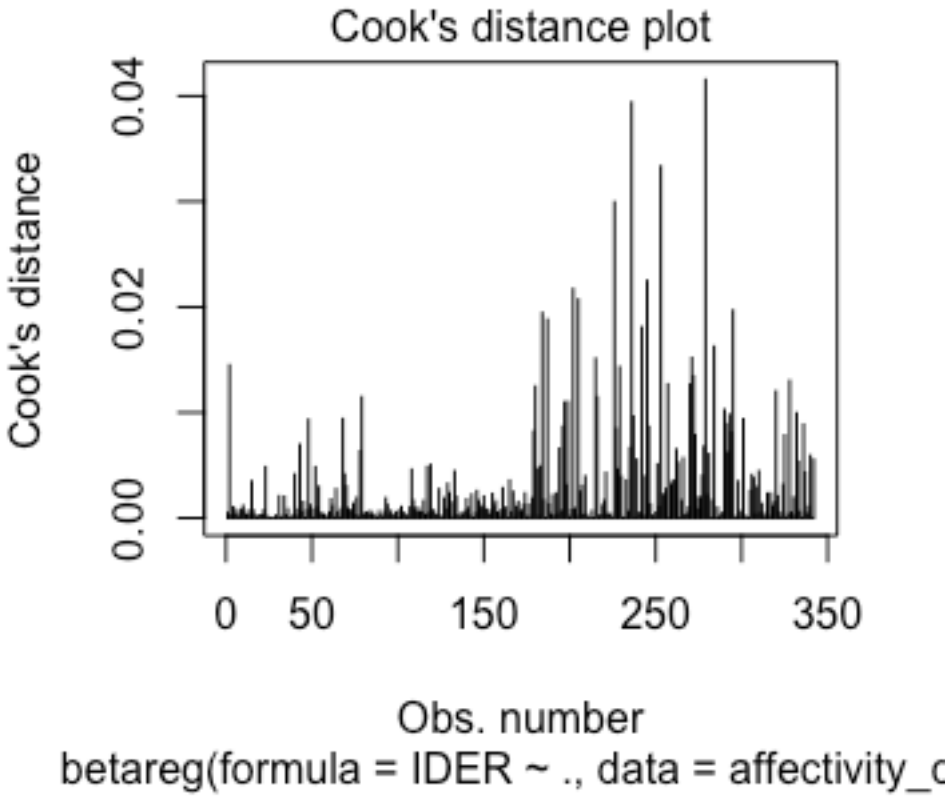
```
beta_fit <- betareg(IDER ~ ., data = affectivity_df)
summary_beta <- summary(beta_fit)
conf_ints <- confint(beta_fit, level = 0.95)

summary_beta
```

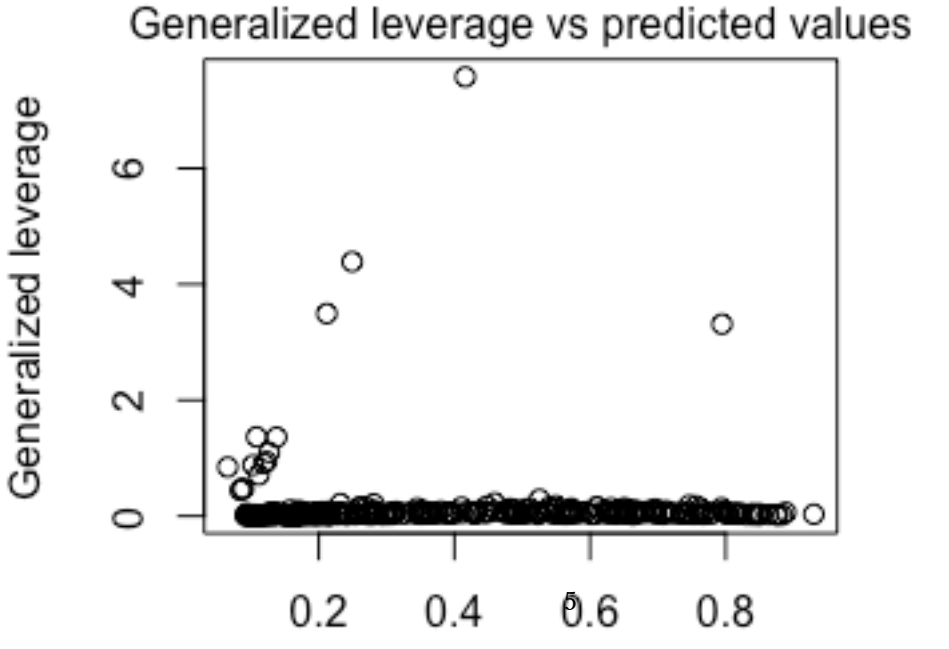
```
Call:
betareg(formula = IDER ~ ., data = affectivity_df)

Quantile residuals:
    Min      1Q  Median      3Q     Max
-3.4633 -0.6360 -0.0989  0.5649  6.2435

Coefficients (mean model with logit link):
                                Estimate Std. Error z value Pr(>|z|)
(Intercept)                   -1.8240348  0.3952193  -4.615 3.93e-06 ***
Age                           -0.0103167  0.0040793  -2.529 0.011437 *
`Disconnection and Rejection`  0.0636254  0.0164024   3.879 0.000105 ***
`Impaired Autonomy`            0.0798309  0.0163999   4.868 1.13e-06 ***
`Impaired Limits`              0.0192334  0.0125646   1.531 0.125827
`Other-Directedness`           0.0009408  0.0123753   0.076 0.939404
`Over-Vigilance/Inhibition`    0.0006187  0.0131395   0.047 0.962443
`Number of Stressful Events`  -0.0015294  0.0056149  -0.272 0.785324
SexMale                        0.0718595  0.1009377   0.712 0.476515
`Negative Attribution`No      -0.4110667  0.1167578  -3.521 0.000430 ***
`Unexpected Attribution`No     0.0432397  0.1031468   0.419 0.675066
`Out of Control Attribution`No -0.2971213  0.1176300  -2.526 0.011540 *
`Childhood Adversity`No       -0.3363619  0.0936297  -3.592 0.000328 ***
`Physical Excercise`No         0.0268285  0.0931060   0.288 0.773232
`Smoking Cigarettes`No        -0.2852899  0.1168429  -2.442 0.014620 *
`Alcohol Use`No               -0.0487717  0.1295649  -0.376 0.706599
`Psychoactive Substance Use`No  0.3603303  0.2592901   1.390 0.164626

Phi coefficients (precision model with identity link):
      Estimate Std. Error z value Pr(>|z|)
(phi)   6.4487     0.4811    13.4   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Type of estimator: ML (maximum likelihood)
Log-likelihood:   218 on 18 Df
Pseudo R-squared: 0.5962
Number of iterations: 29 (BFGS) + 3 (Fisher scoring)
```

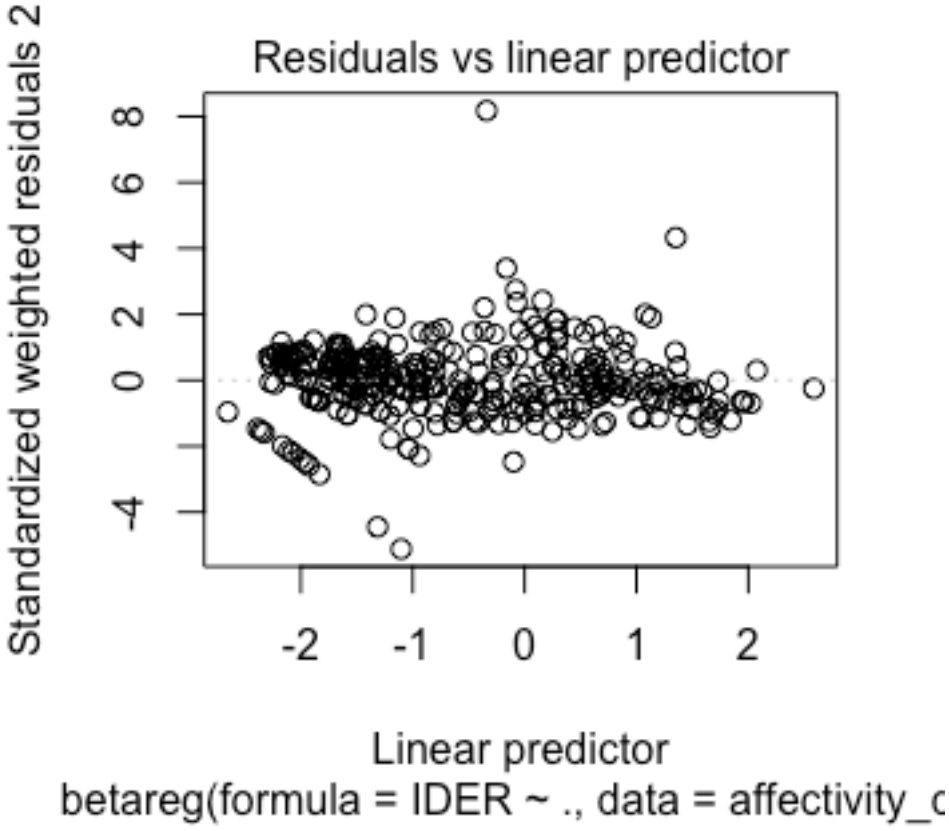
```
conf_ints
```

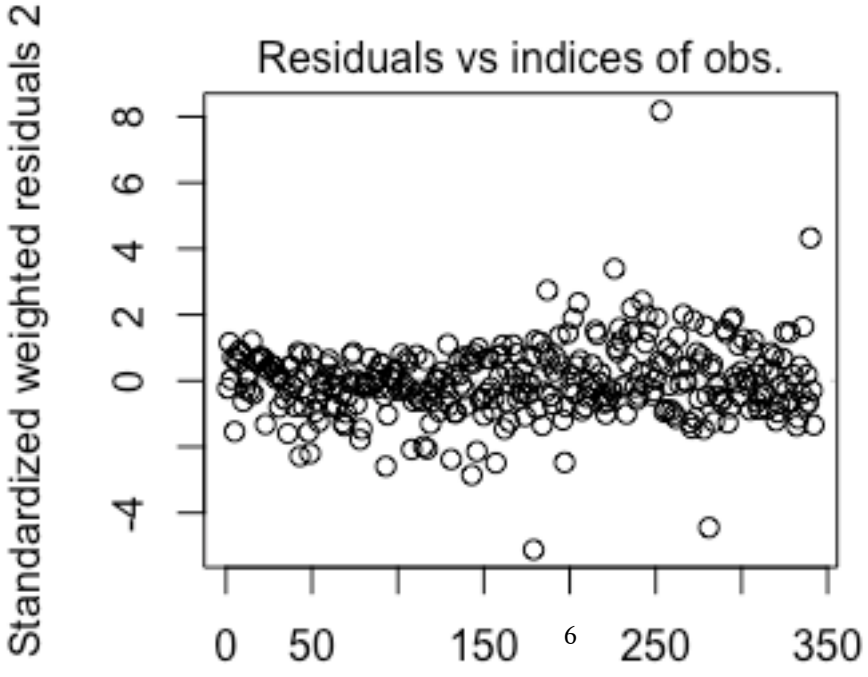
```
                                    2.5 %       97.5 %
(Intercept)                   -2.598650394 -1.049419131
Age                           -0.018311876 -0.002321489
`Disconnection and Rejection`  0.031477291  0.095773531
`Impaired Autonomy`            0.047687772  0.111974091
```

```
`Impaired Limits`              -0.005392666  0.043859555
`Other-Directedness`           -0.023314308  0.025195828
`Over-Vigilance/Inhibition`    -0.025134309  0.026371727
`Number of Stressful Events`   -0.012534449  0.009475585
SexMale                        -0.125974700  0.269693734
`Negative Attribution`No       -0.639907810 -0.182225689
`Unexpected Attribution`No     -0.158924334  0.245403764
`Out of Control Attribution`No -0.527671924 -0.066570680
`Childhood Adversity`No        -0.519872732 -0.152851007
`Physical Excercise`No         -0.155655864  0.209312815
`Smoking Cigarettes`No         -0.514297733 -0.056282021
`Alcohol Use`No                -0.302714239  0.205170750
`Psychoactive Substance Use`No -0.147869000  0.868529629
(phi)                           5.505800302  7.391676278
```


Cook's distance plot
Cook's distance
0.00
0.02
0.04
0
50
150
250
350
Obs. number
betareg(formula = IDER ~ ., data = affectivity_c


Generalized leverage vs predicted values
Generalized leverage
0
2
4
6
0.2
0.4
0.6
0.8
Predicted values


Residuals vs linear predictor
Standardized weighted residuals 2
8
6
4
2
0
-4
-2
-1
0
1
2
Linear predictor
betareg(formula = IDER ~ ., data = affectivity_c


Residuals vs indices of obs.
Standardized weighted residuals 2
8
6
4
2
0
-4
0
50
150
250
350
Obs. number

```r
vif(beta_fit)
```

```
                         Age `Disconnection and Rejection`
                    1.235624                     4.927414
         `Impaired Autonomy`             `Impaired Limits`
                    3.985481                     2.564155
        `Other-Directedness`   `Over-Vigilance/Inhibition`
                    2.426282                     1.957390
 `Number of Stressful Events`                          Sex
                    1.269538                     1.094951
      `Negative Attribution`      `Unexpected Attribution`
                    1.722457                     1.412952
 `Out of Control Attribution`         `Childhood Adversity`
                    1.275194                     1.117944
        `Physical Excercise`          `Smoking Cigarettes`
                    1.101797                     1.194950
              `Alcohol Use`  `Psychoactive Substance Use`
                    1.200714                     1.188520
```

```r
tab_model(beta_fit,
          title = "Table 3 Beta Regression for the IDER Score in a Sample of
          342 Depressed and Non-depressed Adults")
```

	IDER		
Predictors	Estimates	CI	p
(Intercept)	0.16	0.07 – 0.35	**<0.001**
Age	0.99	0.98 – 1.00	**0.011**
Disconnection and Rejection	1.07	1.03 – 1.10	**<0.001**
Impaired Autonomy	1.08	1.05 – 1.12	**<0.001**
Impaired Limits	1.02	0.99 – 1.04	0.126
Other-Directedness	1.00	0.98 – 1.03	0.939
Over-Vigilance/Inhibition	1.00	0.98 – 1.03	0.962
Number of Stressful Events	1.00	0.99 – 1.01	0.785
Sex [Male]	1.07	0.88 – 1.31	0.477
Negative Attribution [No]	0.66	0.53 – 0.83	**<0.001**
Unexpected Attribution [No]	1.04	0.85 – 1.28	0.675
Out of Control Attribution [No]	0.74	0.59 – 0.94	**0.012**
Childhood Adversity [No]	0.71	0.59 – 0.86	**<0.001**
Physical Excercise [No]	1.03	0.86 – 1.23	0.773
Smoking Cigarettes [No]	0.75	0.60 – 0.95	**0.015**
Alcohol Use [No]	0.95	0.74 – 1.23	0.707
Psychoactive Substance Use [No]	1.43	0.86 – 2.38	0.165
Observations	342		
R^2	0.596		

Table 1: Table 3 Beta Regression for the IDER Score in a Sample of 342 Depressed and Non-depressed Adults