BART priors

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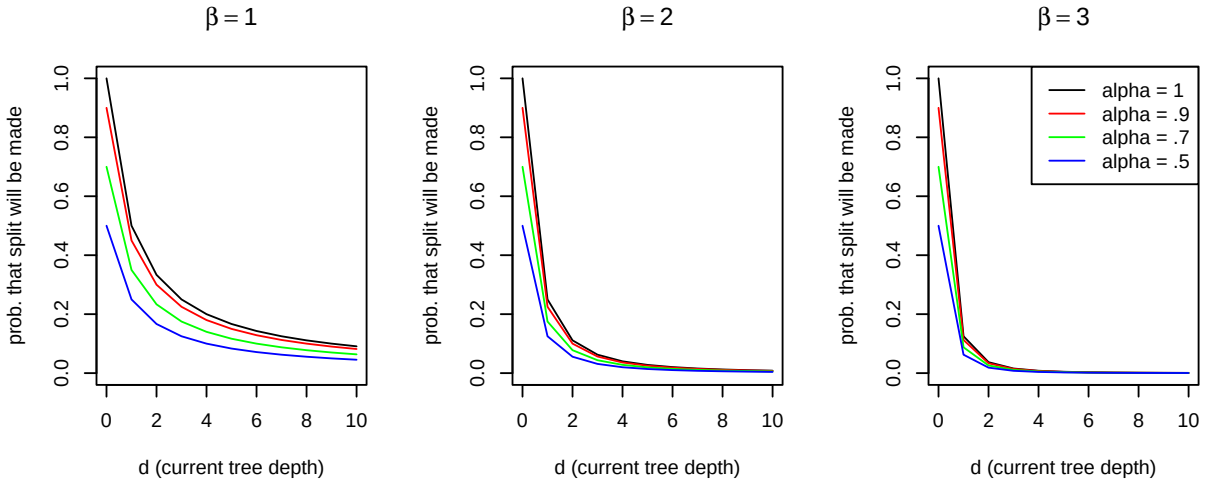
Equation 3: Tree size prior

The α and β parameters determine the probability that a node at depth d is non-terminal (i.e., will be split); the probability is given by:

$$p = \alpha(1 + d)^{-\beta}$$

With α taking values from 0 to 1, and β taking values from 0 to Inf. The probability of splitting is always quite high at depth $d = 0$ and lowers fast with increasing d. The lower the value of α and the higher the value of β, the lower the probability of splitting. α completely determines the probability of splitting the root node; β controls the rate at which the probability of splitting declines when tree size increases.



Equation 4: Node means prior

$$\mu_{ht} \overset{\text{iid}}{\sim} N(0, \sigma_\mu^2) \text{ where } \sigma = \frac{0.5}{k\sqrt{m}}$$

```
m <- 0:1000
k <- 0:4
ylim = c(0, 0.5)
par(mfrow = c(1, 2))
plot(m, 0.5/(k[1]*sqrt(m)), type = "l", main = "Prior SD of means", ylim = ylim,
     ylab = expression(sigma[mu]), xlab = "m (number of trees in ensemble",
     cex.lab = .7, cex.axis = .7, cex.main = .7)
```

```
lines(m, 0.5/(k[2]*sqrt(m)), type = "l", col = "red")
lines(m, 0.5/(k[3]*sqrt(m)), type = "l", col = "green")
lines(m, 0.5/(k[4]*sqrt(m)), type = "l", col = "blue")
legend("topright", legend = c("k = 0", "k = 1", "k = 2", "k = 3"),
       lty = 1, col = c("black", "red", "green", "blue"), cex = .7)
```