Model selection

Data

```
library(mgcv)
library(terra)

# Load occurrence data
d <- read.csv("../data/occurrences.csv")

# Load climate data
ff <- paste0(
  "../data/",
  paste0("wc2.1_10m_bio_", c(1, 4, 12, 15), ".tif")
)
r <- ff |> rast() |> crop(ext(-13, 33, 33, 62))
```

First model

```
enm1 <- gam(
  occ ~ s(wc2.1_10m_bio_1, k = 5) +
    s(wc2.1_10m_bio_4, k = 5) +
    s(wc2.1_10m_bio_12, k = 20) +
    s(wc2.1_10m_bio_15, k = 5),
  data = d,
  family = "binomial"
)
```

Build all possible ENMs

```
vars <- names(r)
n <- sum(sapply(2:4, \(m) dim(combn(vars, m))[2]))
enm <- as.list(rep(NA, n))
for (m in 2:4) {
  combs <- combn(vars, m)
  cat(sprintf("\t%d variables\t%d combinations\n", m, dim(combs)[2]))
  for (i in seq_len(dim(combs)[2])) {
    form <- paste0("s(", combs[, i], ", k = 5)")
    form <- paste(form, collapse = " + ")
    form <- as.formula(paste0("occ ~ ", form))
    enm[[min(which(is.na(enm)))]] <- gam(form, data = d, family = "binomial
  }
}
```

```
    2 variables 6 combinations
    3 variables 4 combinations
    4 variables 1 combinations
```

Model selection

```
aic <- data.frame(
  formula = sapply(enm, \(x) as.character(x$formula)[3]),
  AIC = sapply(enm, \(x) AIC(x))
)
aic$DeltaAIC <- aic$AIC - min(aic$AIC)
head(aic[order(aic$AIC), c("AIC", "DeltaAIC")], n = 3)
```

```
        AIC DeltaAIC
11 3094.850   0.0000
10 3220.864 126.0141
7  3229.306 134.4557
```

```
aic$formula[which.min(aic$AIC)]
```

```
[1] "s(wc2.1_10m_bio_1, k = 5) + s(wc2.1_10m_bio_4, k = 5) + s(wc2.1_10m_bi
```

```
saveRDS(enm[[which.min(aic$AIC)]], "../data/enm.rds")
```