

Significance test and Bayes

Class work:

In this week's class, we want to understand significance tests for microfossil based reconstructions and apply Bayes rule. Choose three out of the five exercises listed. You have to complete either exercise 1 or 2.

1. Significance of pH reconstruction

We want to test our pH reconstructions from the Round Loch of Glenhead using diatoms with *randomTF* and *obs.cor* (data available in the *rioja* package, *data(SWAP)* and *data(RLGH)*).

1. Test MAT, WA and WAPLS based reconstructions using *randomTF*.
2. Test WA and WAPLS based reconstructions using *obs.cor*.

2. Significance of pollen based reconstructions

We want to test the significance of our MAT, WA and WAPLS based reconstructions of week 8, 9 and 10.

Reconstruct July temperature and mean January temperature using MAT, WA and WAPLS.

1. Assess the significance of all reconstructions using *randomTF*
2. Assess the significance of WA and WAPLS based reconstructions using *obs.cor*
3. Check which reconstruction (temperature or precipitation) explains more of the variance of the fossil data.
4. Remove the influence of the more important environmental variable and test the second environmental variable for significance.

3. Bayesian inference

Clinical tests are important tools to diagnose diseases. Unfortunately, these tests are not perfect. Bayes theorem is a powerful means to determine the probability of suffering of a disease after being positively tested for that disease.

In this example, the test correctly detects 67% of the probands suffering of the disease while it correctly identifies 86% of the probands not affected by the disease. On average, one in a million persons suffer of this disease.

1. Define events (in our 'has the sun gone nova' example, event A was: the sun has gone nova, event B was: the detector tells us that the sun has gone nova).
2. Determine the probability of actually suffering of a disease after a positive diagnose.

4. and 5

Exercise 1 and 2 in Kruschke (Puppy Book).