Spatial assignment of test sample
December 12, 2016

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Input

Website Identifier: 232

Isotope values of test sample

Table 1: Isotope values of test sample

<table>
<thead>
<tr>
<th>13C/12C</th>
<th>15N/14N</th>
<th>18O/16O</th>
<th>2H/1H</th>
<th>34S/32S</th>
</tr>
</thead>
<tbody>
<tr>
<td>-22.7</td>
<td>6.2</td>
<td>17.7</td>
<td>-41.5</td>
<td>13.2</td>
</tr>
</tbody>
</table>

Output

Model

##
## Call:
## train.kknn(formula = fmla, data = ivory.train, kmax = 15, distance = 2, kernel = knl)
##
## Type of response variable: nominal
## Minimal misclassification: 0.1889986
## Best kernel: triangular
## Best k: 14
Classifier: region
Map of best fitted reference sample

Best fitted reference sample:

- Site: South Africa, Ithala
- Country: ZA
- Region: Southern Africa
- CITES: Appendix II
- Lat: -27.51
- Lon: 31.29
Assignment of test sample to nearest neighbours

Best fitted reference entries

Table 2: Details of best fitted reference entry (row 1) and other fitted entries within best classifier

<table>
<thead>
<tr>
<th>lon</th>
<th>lat</th>
<th>location</th>
<th>13C/12C</th>
<th>15N/14N</th>
<th>18O/16O</th>
<th>2H/1H</th>
<th>34S/32S</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.29</td>
<td>-27.51</td>
<td>South Africa, Ithala</td>
<td>-22.1</td>
<td>6.5</td>
<td>17.9</td>
<td>-37.8</td>
<td>10.7</td>
</tr>
<tr>
<td>25.95</td>
<td>-16.03</td>
<td>Southern Zambia</td>
<td>-22.0</td>
<td>5.6</td>
<td>18.1</td>
<td>-46.4</td>
<td>10.9</td>
</tr>
<tr>
<td>31.29</td>
<td>-27.51</td>
<td>South Africa, Ithala</td>
<td>-21.4</td>
<td>7.1</td>
<td>18.3</td>
<td>-39.9</td>
<td>11.8</td>
</tr>
<tr>
<td>20.00</td>
<td>-17.00</td>
<td>Angola, Cenando-Cubango im Sosten Ango</td>
<td>-22.1</td>
<td>8.0</td>
<td>17.3</td>
<td>-40.5</td>
<td>12.6</td>
</tr>
<tr>
<td>33.45</td>
<td>-11.02</td>
<td>Malawi, Rhumpi, Vwasa Marsh Game Reserve</td>
<td>-22.2</td>
<td>6.1</td>
<td>18.6</td>
<td>-45.1</td>
<td>10.4</td>
</tr>
<tr>
<td>30.21</td>
<td>-15.78</td>
<td>Zimbabwe, in the north of the country</td>
<td>-22.3</td>
<td>8.0</td>
<td>16.7</td>
<td>-41.1</td>
<td>12.8</td>
</tr>
<tr>
<td>31.29</td>
<td>-27.51</td>
<td>South Africa, Ithala</td>
<td>-21.2</td>
<td>7.0</td>
<td>17.7</td>
<td>-42.2</td>
<td>11.1</td>
</tr>
<tr>
<td>31.29</td>
<td>-27.51</td>
<td>South Africa, Ithala</td>
<td>-21.8</td>
<td>6.6</td>
<td>18.1</td>
<td>-42.4</td>
<td>10.0</td>
</tr>
<tr>
<td>NA</td>
<td>NA</td>
<td>South Africa, HiP</td>
<td>-21.7</td>
<td>7.6</td>
<td>18.9</td>
<td>-39.1</td>
<td>13.7</td>
</tr>
<tr>
<td>32.00</td>
<td>-14.75</td>
<td>Mozambique, Kambako</td>
<td>-23.6</td>
<td>7.7</td>
<td>17.4</td>
<td>-37.0</td>
<td>11.5</td>
</tr>
</tbody>
</table>

Region of prediction: Southern Africa

Testing robustness of assignment: Wilcoxon signed rank test

If p-value > 0.05, the test concludes that the isotope signature of the test sample is similar to the respective nearest neighbour reference sample.
P-values for the k nearest neighbours in Wilcoxon Test

“0.7563768, 0.0106990, 0.0010194, 0.0000372, 0.0000194, 0.0000067, 0.0000045, 0.0000019, 0.0000007, 0.0000004”

Goodness of fit of test sample:

- good fit: if $p > 0.05$ for at least two tested nearest neighbour reference samples;
- moderate fit: if $p > 0.05$ for at least one tested nearest neighbour reference samples;
- uncertain: if $p > 0.05$ for none of the tested nearest neighbour reference samples.

Assumption: At least two nearest reference samples are available.

Overall goodness of fit of test sample: “moderate fit”