Analysing activities in a classroom – Remembrances of John Aitchison in Hong Kong

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Outline

- Background
- HKU
- CODA book examples
- Classroom studies
- CODA in business analytics
My location

Newcastle upon Tyne

London
BACKGROUND
HKU Statistics

- Completed PhD in Newcastle, UK
- Joined HKU Education Department as Statistician 1986
- Moved to HKU Statistics Department 1987
- P/T consultant at Baring Securities
- John Aitchison was Head 1976 – 1989
- Taught CODA to BSc and tutored on MSc
Professor John Aitchison
John Aitchison

- Inaugural lecture included live demonstration of probability
- That failed
- The statistical analysis of compositional data
- “To M. the constant among many variables”
John Aitchison

- Inspirational HoD
- Raised my interest in hierarchical testing in ANOVA
- Lots of examples of data, e.g. the statistician’s life
- PCs with no variance show interesting equation
Ternary plots

- Example data of activities in a statistician’s day recorded over 20 days.
- Closeness to vertex implies greater proportion of time spent on activities.
- Proximity to Work vertex shows almost 50% of the day is spent working.
Compositions of a statistician's day

W: work
S: sleep
G: grubbing around
Example data of proportions of different blood genotypes (MM, MN and NN) in 26 samples of people from different ethnic groups.
Genotype example

- Example data of proportions of different blood genotypes (MM, MN and NN) in 26 samples of people from different ethnic groups.
- PC1 of centred log ratios contrasts MN and NN genotypes
- PC2 leads to Hardy-Weinberg Equilibrium
Eigenanalysis of the Covariance Matrix

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>3.1858</th>
<th>0.0447</th>
<th>-0.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion</td>
<td>0.986</td>
<td>0.014</td>
<td>-0.00</td>
</tr>
<tr>
<td>Cumulative</td>
<td>0.986</td>
<td>1.000</td>
<td>1.00</td>
</tr>
<tr>
<td>Variable</td>
<td>PC1</td>
<td>PC2</td>
<td></td>
</tr>
<tr>
<td>log(MM/g)</td>
<td>0.012</td>
<td>0.816</td>
<td></td>
</tr>
<tr>
<td>log(MN/g)</td>
<td>0.701</td>
<td>-0.418</td>
<td></td>
</tr>
<tr>
<td>log(NN/g)</td>
<td>-0.713</td>
<td>-0.398</td>
<td></td>
</tr>
</tbody>
</table>
2\log(MM/g) - \log(MN/g) - \log(NN/g) = \text{constant}

\frac{MN^2}{(MN*NN)} = 4 \text{ estimated from the data}

Hardy-Weinberg Equilibrium model

states that genotype frequencies in a population remain constant from generation to generation in the absence of other evolutionary influences.
Classroom activities

- This prompted an analysis of classroom activities in a range of classes and schools encountered during teacher training within the Professional Educational Studies department of Hong Kong University.

- It was found that the nature of the target class and the school level affected the pattern of lesson activities with more listening carried out in the higher target classes and higher level schools.

- More time was spent dealing with educational equipment in lower level schools.
Applications to a service provider

- Service providers deal with users and people do not always attend their appointments. The situation can be monitored by bar charts, or analysed further.
Data analytics in a healthcare SME

Appointments kept, did not attend and cancelled % in each day

- Monday
- Tuesday
- Wednesday
- Thursday
- Friday

- Appointments
- DNA
- Cancelled
Applications to a service provider

- Service providers deal with users and people do not always attend their appointments. The situation can be monitored by bar charts, or analysed further.

- Service providers offer a range of services, some more lucrative than others.

- Their performance in terms of mix of activities is a useful marker for monitoring their progress in achieving strategic objectives.

- Ternary plots are a nice way to communicate
Business insight from data

Changing focus of activities

- Routine examination
- Advanced practice
- Standard practice

Closeness to vertex indicates greater proportion of time spent on this activity.
THANK YOU FOR LISTENING
References


• Pritchett, R., Coleman, S.Y., Campbell, J and S. Pabary. (2017), DIY: An Introduction to Data Analytics in Dental Practice In Review with Dental Update