

Code-based, open-source software for teaching interactive data visualisation

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Problem

Tukey (1965, p. 25)

Today, software and hardware together provide far more powerful factories than most statisticians realize, factories that many of today's most able young people find exciting and worth learning about

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- How does interactivity benefit data analysis?
- Which interactive techniques are 'worth learning'?
- Which code-based, open-source software to use?

Method

- Literature review of interactive techniques.
 - ▶ Interactive data visualisation using **GGobi** graphical user interface (Cook and Swayne, 2007)
- Survey of current code-based, open-source software.
- Application to exploratory data analysis of 2016 National Certificate Educational Achievement (NCEA) results.
 - ▶ Explore how interactive techniques further insight into data.

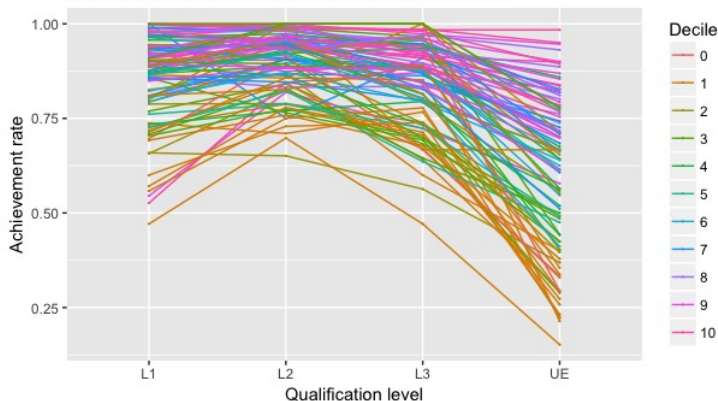
Findings

- Key interactive techniques that enrich data analysis:
 - ▶ Linked brushing
 - ▶ Identification
 - ▶ Scaling
 - ▶ Subset selection
 - ▶ Tours
- A focal set of **R** packages for applying interactive data visualisation: **plotly**, **crosstalk** & **shiny**.
 - ▶ Coverage of interactive techniques
 - ▶ Ease of installation and application
- The benefits of interactivity justify the effort of teaching interactive tools.

Leveraging static plots

Parallel coordinates plot (PCP)

Achievement rates of Auckland schools in 2016



Leveraging static plots

- **Linked brushing** and **identification** allow fast querying of unusual patterns, groups and/or individuals.
- **Subset selection** via filtering views alleviates issues with overplotting and colour schemes.
- Interactive **scaling** to compare and explore the different patterns revealed.
- Further exploration of the data.
 - ▶ Questions are quickly addressed and more questions arise from probing the data with interactive techniques

A focal set of software

Coverage of interactive techniques by **shiny**, **plotly** and **crosstalk**.

Package	Active R session	Tooltip Identification	Scaling	Subset selection	Linked brushing (except lines)	Animation (for tours)
Shiny	Yes			Analysis & filtering views	Aggregate brush possible	Yes
Plotly		Yes	Zoom in or out	Filtering views only		Yes
Crosstalk				Filtering views only	Easiest for 1-to-1	Yes

Conclusion

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Conclusion

- Interactive techniques benefit data analysis.
 - ▶ Insights beyond static plots
 - ▶ Further exploration of the data
- The **R** packages **shiny**, **plotly** and **crosstalk** enable interactive data visualisation with code-based, open-source software.
- The benefits of applying interactive techniques to data analysis warrant teaching interactive data visualisation to future statisticians.

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