a definition...

• to present (often complex) information in such a way that we are able to efficiently and effectively extract the relevant features in and for our given context...
Napoleon’s Moscow campaign

Source: Tufte; The visual display of quantitative information.
• ...and perhaps to gain insight which would not have been possible without the particular visualisation.
some examples...

Source: Tufte; The visual display of quantitative information.

Source: Spence: Information Visualisation
MIGRATION FROM RUAṬĀHUNA

Urbanisation encompassed moves to country of any size, Ruaṭok, which was almost completely Māori-speaking.

Population 100
Population 10,000
Population 13,897

The Māori population of the timber towns grew rapidly in the 1960s, with migration being significant in the former district of Waitakere.

Number of migrants (from a survey in 1958)

Source: McKinnon: New Zealand Historical Atlas
Books Everyone Should Read
A consensus cloud

Catch-22
Pride And Prejudice
Slaughterhouse-Five
Great Expectations

Grapes Of Wrath
The Alchemist
A Portrait Of The Artist As A Young Man

Tess Of The D’Urbervilles
Brave New World
The Lord Of The Rings
Catcher In The Rye

To Kill A Mockingbird
The Great Gatsby
A Clockwork Orange

One Hundred Years Of Solitude
War And Peace

Source: McCandless: The Visual Miscellaneum
20th Century Death
What’s killed the most?

- famine 111m
- food 76m
- disease 1390m
- war 124m
- tobacco 71m
- suicide 70m
- murder 20m
- nature 9.7m
- revolution 9.5m
- ideology 16m
- technology 0.2m

source: Internet and Wikipedia. Data very coarse. Some guesswork and extrapolation.

Source: McCandless: The Visual Miscellaneum
• An animated map of Auckland’s public transport system:

http://vimeo.com/18966477
• An interactive visualisation of the 2013 NZ budget:
  http://chewydata.com/budget2013.html

• And a summary of your tax dollars from 2011:
  http://wheresmytaxes.co.nz
• Animation showing New York carbon emissions:

• Lines of code comparison

http://www.informationisbeautiful.net/visualizations/million-lines-of-code/
http://www.gapminder.org/world/
London Underground map

Source: Spence: Information Visualisation
The Moscow Metro map
St Petersburg

Shanghai

Paris

Madrid
Chernoff faces

Source: Tufte; The visual display of quantitative information.
Treemaps

Source: Disk Inventory X
Figure 2.12 If space is too limited to accommodate all bargrams, many can be diminished in size so that some aspects of all bargrams are visible. A scrolling action determines which bargrams are fully displayed.
“The real voyage of discovery consists not in seeking new landscapes but in having new eyes.”

-Proust
• Which is the largest number?

57.689
2.3987
44.7
1.41456
43.6785
101.3
4.243
Hot or not?

Affordance
Abstraction

Large Data Sets

<table>
<thead>
<tr>
<th>Inherently graphical data</th>
<th>Non-graphical data</th>
</tr>
</thead>
<tbody>
<tr>
<td>direct</td>
<td>graphical abstraction</td>
</tr>
<tr>
<td>Large information space (Graphical)</td>
<td>Large information space (non-graphical)</td>
</tr>
</tbody>
</table>
The visualisation pipeline

- Data Set $S$
- Data representation technique
- Represented Data Set $S_1$
- Data presentation technique
- Screen $S_2$
- Interaction task

Expressiveness $E_1$
Efficiency $E_2$
Effectiveness $E_3$
Data types

- Numerical data
- Ordinal data
- Categorical data

Source: Spence: Information Visualisation
Bertin’s guidance - encoding mechanisms vs. tasks
Cleveland and McGill’s findings:
encoding mechanism vs. accuracy of assessing quantitative value
Mackinlay’s guidance for encoding quantitative, ordinal and categorical data
• Multidimensional data - parallel coordinates
• Multidimensional data - other techniques

• Star plots
Multidimensional data - other techniques

- Scatterplot matrix
- Linked histograms
- Mosaic plots
- Icons

Mosaic plot representing statistical data from the Titanic
The incidence of warfare in early Anglo-Saxon England between 550 AD and 700 AD. Red indicates the aggressor, green the attacked.
(a) The reporting structure of the employees of a company. (b) One employee of interest, Rachel Anderson, has been moved towards the centre, revealing her subordinates
Distorted presentation of the London Underground map, illustrating continuity across the boundary of the distorted region
History of the English language:

http://www.danshort.com/ie/timeline.htm
Fleetwood Mac timeline:

The Beatles: Working Schedule
1963 - 1966

Diagram showing the recording, filming, and touring schedule of The Beatles from 1963 to 1966.
Paul Monigatti’s meter with a flexible pointer.

This one, on a 1-minute scale (tip to centre) shows the disturbance on the NZ electricity grid during the 2011 Christchurch earthquake.
An interesting example showing the perspective of time

Paris to Lyon train timetable.

Anette Olsson’s PhD study of transactions carried out face-to-face and over a telephone.

Distribution of duration of utterances across all samples.
Number of utterances per sample exchange versus mean length of utterance.
Moving window analysis across all samples.
Moving window analysis for single sample transactions.
Designing a visualisation is a creative process, exploiting:

• The designer’s knowledge and experience of visualisation techniques;
• An understanding of the problem(s) that users will be attempting to resolve with the benefit of the visualisation;
• An awareness of the context in which this problem resolution will be carried out.
Battery State of Charge vs Time:
Original data sorted by time:

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<th>Value</th>
<th>Error (%)</th>
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Data re-sorted by value:

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Battery State of Charge Duration Curve:
Electricity network peak generation load-duration curve: