data don't speak for themselves

a quick introduction to Bayesian statistics

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Disclaimer

I'm not a statistician.

I never gave this course before.

I borrowed (heavily) from material presented in the references.

But, unless otherwise noted, all opinions are my own.

Outline

- main differences between frequentist and Bayesian statistics
    - problems with p-values, confidence intervals and null hypothesis testing
- the basic rules of probability theory
- how to assign probability distributions
    - the role of priors
    - the likelihood
- the simplest models in Bayesian statistics
    - linear regression
    - beta-binomial model
    - hierarchical models

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- MCMC

Q/A

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- "astrostatistics" emerged in the late 1990s – collaborations between astronomers and statisticians
  names like Babu, Feigelson, Gregory, Hobson
- statistics today is mostly Bayesian
  (many) astronomers are (very) sceptical of (sophisticated) statistics

frequentist and Bayesian

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Calculate their mean $\bar{x}$ and standard deviation σ

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what you want it to mean:

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frequentist and Bayesian

Here is the main difference:

- Frequentists assign a probability to what is *random*
- Bayesians assign a probability to what is *unknown*

Blocks

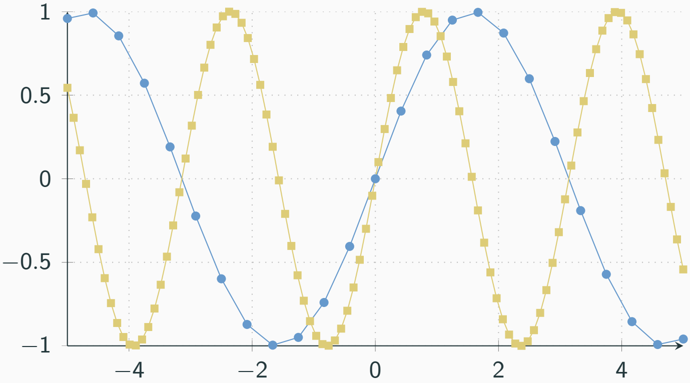
Three different block environments are pre-defined and may be styled with an optional background color.

Default	**Default**
Block content.	Block content.
Alert	**Alert**
Block content.	Block content.
Example	**Example**
Block content.	Block content.

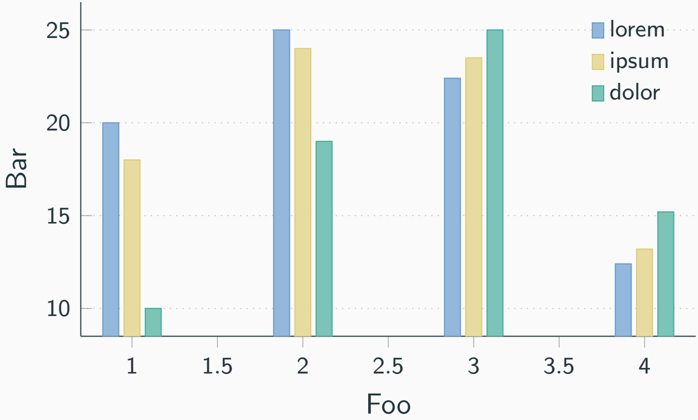
Math

$$e = \lim_{n \to \infty} \left(1 + \frac{1}{n}\right)^n$$

Line plots



Bar charts



Quotes

Veni, Vidi, Vici

References

Some references to showcase [allowframebreaks] [4, 3, 1, 2]

Conclusion

Summary

Get the source of this theme and the demo presentation from

`github.com/matze/mtheme`

Q/A

everything

References I

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