Introduction (week 1, part 1)

2 Jan 2023

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## integrity

* Stack Overflow and ChatGPT
* group work, copying

## technical skills/tools

* reproducibility: version control (Github)
* machinery
  + R, Julia
  + VScode
  + reproducibility: Quarto or Sweave or Jupyter notebook

## Goals

* understand theory behind (novel) methods
* read papers
* (choose methods)
* implement methods
* read/understand/improve existing methods

## About me

* weird background (physics u/g, Zoology PhD, epidemiological modeling)
* biases:
* interested in scientific answers (but see @navarroScience2019)

## Themes

* preventing overfitting
  + shrinkage
  + regularization
  + penalization
  + dropouts (NN)
  + constraining tree depth
  + learning rate (boosting)
  + early stopping
  + priors
* basis construction/feature engineering
  + splines
  + GPs
  + tree splits
  + wavelets
  + Fourier bases
  + neural network architecture
* optimization
  + gradient descent, SGD
  + IRLS
  + BFGS etc.
* loss functions
* assessment and diagnostics
  + cross-validation (blocked, etc.)
  + bootstrap
* sparsity
* continuous vs discrete structures