

# Introduction (week 1, part 1)

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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 @navarro-Science2019)

?quarto-cite: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.
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- loss functions
- assessment and diagnostics
  - cross-validation (blocked, etc.)
  - bootstrap
- sparsity
- continuous vs discrete structures