Phase paper

1 Questions

- How do you detect phase
  - What are the methods of phase detection
- What can you do with phase once you have it
- What does phase tell you with respect to physiological systems

2 Problems

- noise in data
- phase slips
- time-varying frequencies in data
- choosing how to access the frequencies of interest
  - bandpass and use a range of frequencies
  - methods of choosing the correct frequency at which to acquire the phase

3 Methods

- Filters
  - filter types and their effects on data
- Phase detectors
  - Hilbert transform
    - what does the HT actually do
  - Wavelets
  - Fourier transform
    - is this different from HT and how

- Choosing frequency for phase detection
  - averaging frequencies (Hilbert)
  - maximum likelihood method
  - line fitting

4 Data

- Human
  - BP
  - IBI
  - CBF
  - SCG
- Rat
  - BP
  - RBF
  - Speckle contrast
- Simulation
  - Time series with multiple frequencies corresponding to the systems we are investigating
    - heart rate
    - interbeat interval
    - meyer waves?
    - myogenic mechanism in kidney
    - tubuloglomerular feedback
    - respiration?
    - others?
  - set frequencies and adjust them
  - add noise to the signal at varying levels
  - Make an interaction between two oscillators
    - seems like differential equation