Heart Rate and Meditation
Heart Rate Variability Before and During Meditation

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Outline

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  - Stationarity & Ergodicity
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- Results
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Description of Data & Objective

- Heart Rate Data
  - 4 subjects (S1, S2, S3, S4)
  - before and during Kundalini meditation
  - All subjects advanced practitioners
- Objective
  - Characterize the change in heart rate induced by meditation
- Why Heart Rate?
  - Non-invasive measurement
  - Indicator of autonomic activity

Stationarity & Ergodicity

- Resting Heart Rate
  - Similar for people of same age and fitness level
  - Heart Rate Variability
  - Max and min HR
  - HR changes temporarily in response to physical activity, emotional state
- Assume WSS and Ergodic in mean and correlation IF all internal and external influences are known

Data Overview

Methodology

- Prior to analysis:
  - Resampled at 2 Hz.
  - Removed sample mean
- Time domain
  - Sample variance
  - ACF, biased estimator
- Frequency domain
  - PSD, Blackman-Tukey estimation
S1 HRV Before and During

S2 HRV Before and During

S3 HRV Before and During

S4 HRV Before and During

S1 Estimated ACF

S2 Estimated ACF
Discussion

- During Meditation
  - HR higher
  - HR more variable
  - ACF more oscillatory
  - PSD has peaks in 0.02 to 0.06 frequency band
    - Possibly indicates increased activity of the parasympathetic branch of the autonomic nervous system.