Compression and Analysis of Golden Gate Bridge Wireless Sensor Network Data

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Outline

- Motivation:
  - Structural Health Monitoring
    - Estimation of the “modes” of vibration of a structure: modAI parameters
    - Data collection using Sensor Networks
  
- Physical model
  - Modal parameters
    - Deterministic properties
    - Stochastic properties
  
- Communication aware regularization:
  - Spatially “sparse” multivariate AR models

- A simulation example

- Application to Golden Gate Bridge data

- Concluding remarks/Future Work
Structural Health Monitoring

- National Bridge Inventory (DOT Report to Congress, 2004):
  - Approx. 591,000 bridges in the U.S.
  - Approx. 81,000 (∼14%) are structurally deficient
  - Routine inspections by Federal Highway Adm. (FHWA):
    - Annually: 71,000 bridges
    - Bi-annually: 490,000 bridges
    - Every 4 years: 28,000 bridges

- Structural Health Monitoring Strategies:
  - Direct damage detection
  - Indirect damage detection:
    - Detection of changes in dynamic properties of the structure