

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: modal 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