

NISS

Infrastructure Risk

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Prior:

Prediction is the Name of the Game

- Enormous legacy system
 - Electric power
 - Water
 - Telecomm
 - Transportation
 - ...
- Many, not necessarily well understood connections
- Multiple time scales
- Staggering economics
 - Much larger than medicine
- Humans are central players
- So, prediction is a nightmare

What do We Need to Predict?

- Ongoing: operating policies
 - Electricity transfers
 - Water releases
- Short (sometimes very short) term: response to problems
 - (Pre-)blackouts
 - New Orleans levees
 - Houston evacuation
- Medium term: response to changing “context”
 - Gas prices
 - Feedback: new roads affect land use
- Longer term: Allocation of resources
 - Maintenance
 - Investments
- Also multiple spatial scales

The Good

- (Parts of) Many infrastructural systems can be modeled at some level
 - Power transmission
 - Deterioration of roads
 - Internet
- Some systems are highly instrumented
- Many measurement processes are understood
 - Even some standards

The Bad

- Don't even have good data about current state of some systems
 - Deteriorating bridges
- Massive DQ problems
- Data collection fails when systems do
- Modeling human behavior is hard
 - Hurricane evacuation plans
- Modeling large system perturbations is even harder
 - Blow up 14th Street bridge in DC

The Ugly

- Multiplicity of stakeholders (“powerful interests”)
 - Government agencies at all levels
 - Private sector
 - People
- Multiplicity of business models
 - NC has four kinds of electricity providers: municipal-owned, co-ops, private monopolies, deregulated private
- Low public visibility (except in times of crisis or in HS contexts)
- Risk perceptions are wacky
 - Is driving to the airport more dangerous than getting on the plane?
- Privacy concerns

Some Way Cool Problems

- Prediction across multiple (time and space) scales
- Models and risk assessments that couple multiple systems
- Risk perception models that handle
 - Multiple individuals
 - Multiple risks
- New forms of data
 - Virtual worlds
- Modeling the consequences of false positives
 - Economic
 - Social

Some More Problems

- Space-time models of risk
- Getting serious about predicting costs
- Visualization of uncertainty