

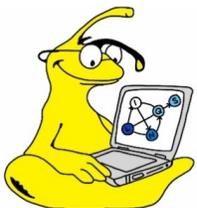


CSLS Panel

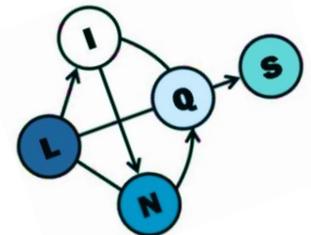
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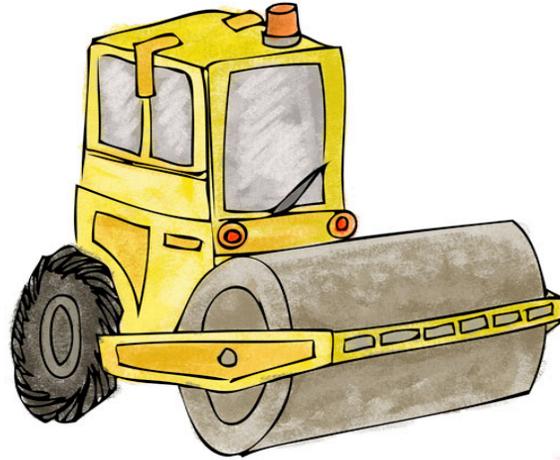
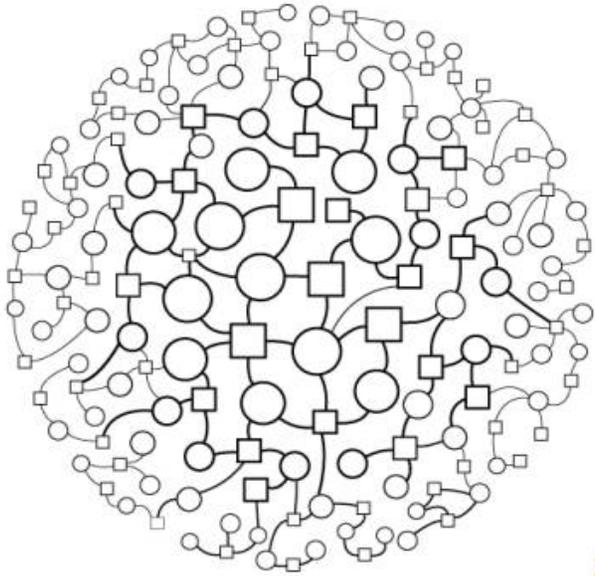
August 30, 2016





ML



A screenshot of an Excel spreadsheet titled "Arania_Eggs.xls". The spreadsheet displays a grid of data with columns labeled with letters (A through X) and rows numbered from 1 to 72. The data appears to be organized into several columns, with some cells containing text and others containing numerical values or symbols. The spreadsheet is viewed in a window with a standard menu bar and toolbar.

**NEED: ML methods that take
into account *relational context***

CSLS ML Patterns

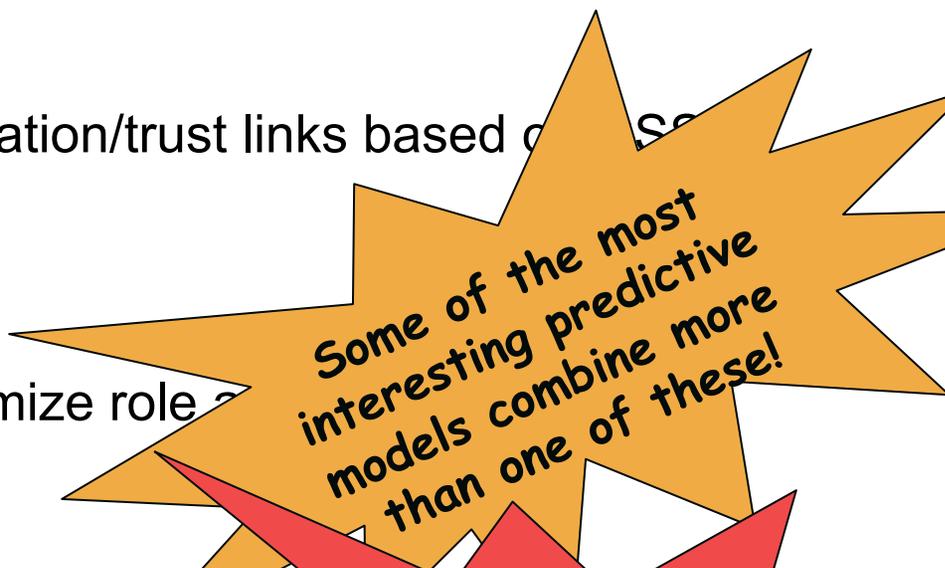
Predictive
Model Type
Intervention

x

Individual
Dyads
Social Context
Community
Society

Predictive Models

- Individual
 - Personalized recommendation
 - e.g., use CSS information to improve user-level predictions
- Dyad
 - Link recommendation
 - e.g., recommend collaboration/trust links based on social network
- Community
 - Ecosystem optimization
 - e.g., team formation, optimize role assignments
- Society
 - Predict tipping points
 - e.g., when will everyone own electric cars?



Some of the most interesting predictive models combine more than one of these!



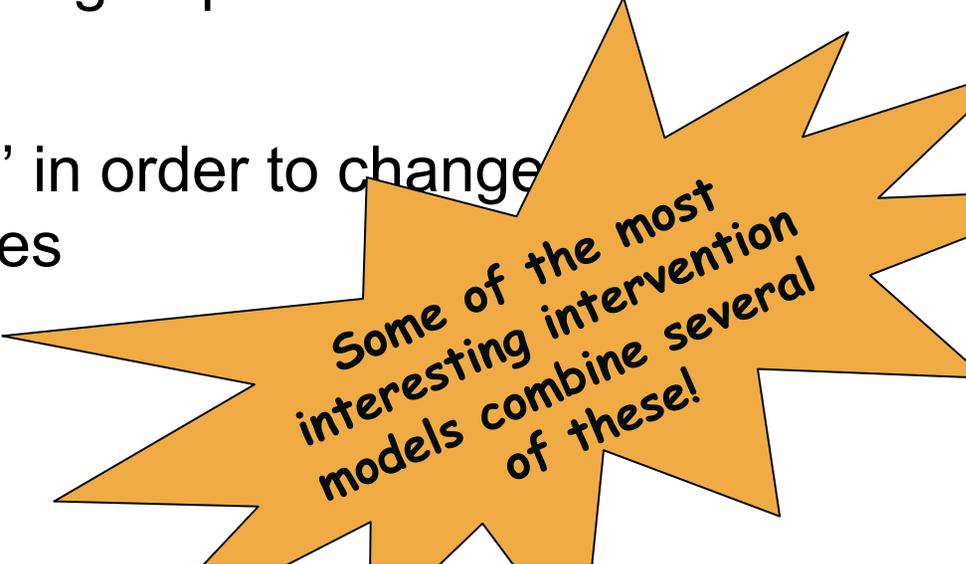
Collective: predictions depend on each other

Interventions

- Support what/if analysis: if an intervention/treatment was made, what would be the outcome
 - Benefits from a causal model
- Possible interventions:
 - New: information, social interaction, group membership
 - Optimize: engagement, health, cost
- Challenges in CSLS: social interference
 - Outcomes of treatments may not be independent
 - E.g., get out the vote, HIV treatment

Models that Support Interventions

- Individual
 - Treatment recommendation
- Dyads
 - Which links to make to maximize information flow
- Community
 - Which members to recruit to optimize group performance, e.g. support groups
- Society
 - Which individuals to 'flip' in order to change population level outcomes



Some of the most interesting intervention models combine several of these!

bias

Bias: Three Interpretations

- Sampling Bias
 - Subset of the population overrepresented in data
- Statistical Bias
 - Bias-Variance Tradeoff:
 - Want model that accurately captures the regularities in its training data and also generalizes well to unseen data
 - impossible to do both simultaneously
 - High-variance learning methods may be able to represent their training set well, but are at risk of overfitting to noisy or unrepresentative training data.
 - Algorithms with high bias typically produce simpler models that fail to capture important regularities in training data, failing to capture important regularities
- Ethical Bias
 - Fairness, equity
- CSLS Bias?

These interact in complex ways!

Interpretability is important



ethics

social engineering (noun) :
a discipline in social science that refers to efforts influence particular attitudes and social behaviors on a large scale, whether by governments, media or private groups in order to produce desired outcomes in a target population.



Challenges

- Who defines social good?
- Dimensions
 - Personal good
 - Collective good
 - Societal good
- Aligning incentives to maximize benefit

A stylized illustration of a hat, possibly a fedora or a similar style, rendered in two shades of red. The crown of the hat is a bright red, and the brim is a darker, maroon red. The hat is outlined with a thick black border. The text 'CSLS' is written in white, bold, sans-serif capital letters across the center of the crown. The entire hat is set against a solid black background.

CSLS

Research Opportunities #1

○ ML

- Most ML methods designed for independent, identifiably distributed data (IID) represented as a table
- Often need causal models, not just predictive models
- Models need to be able to handle social interference

○ Social Science

- How to mix psychological with sociological models?
Social and geographic? Social and political?
- How to mix big data (ML), small data (ethnographic) and social science theory?
- How does culture affect data? Affect context?

Research Opportunities #2

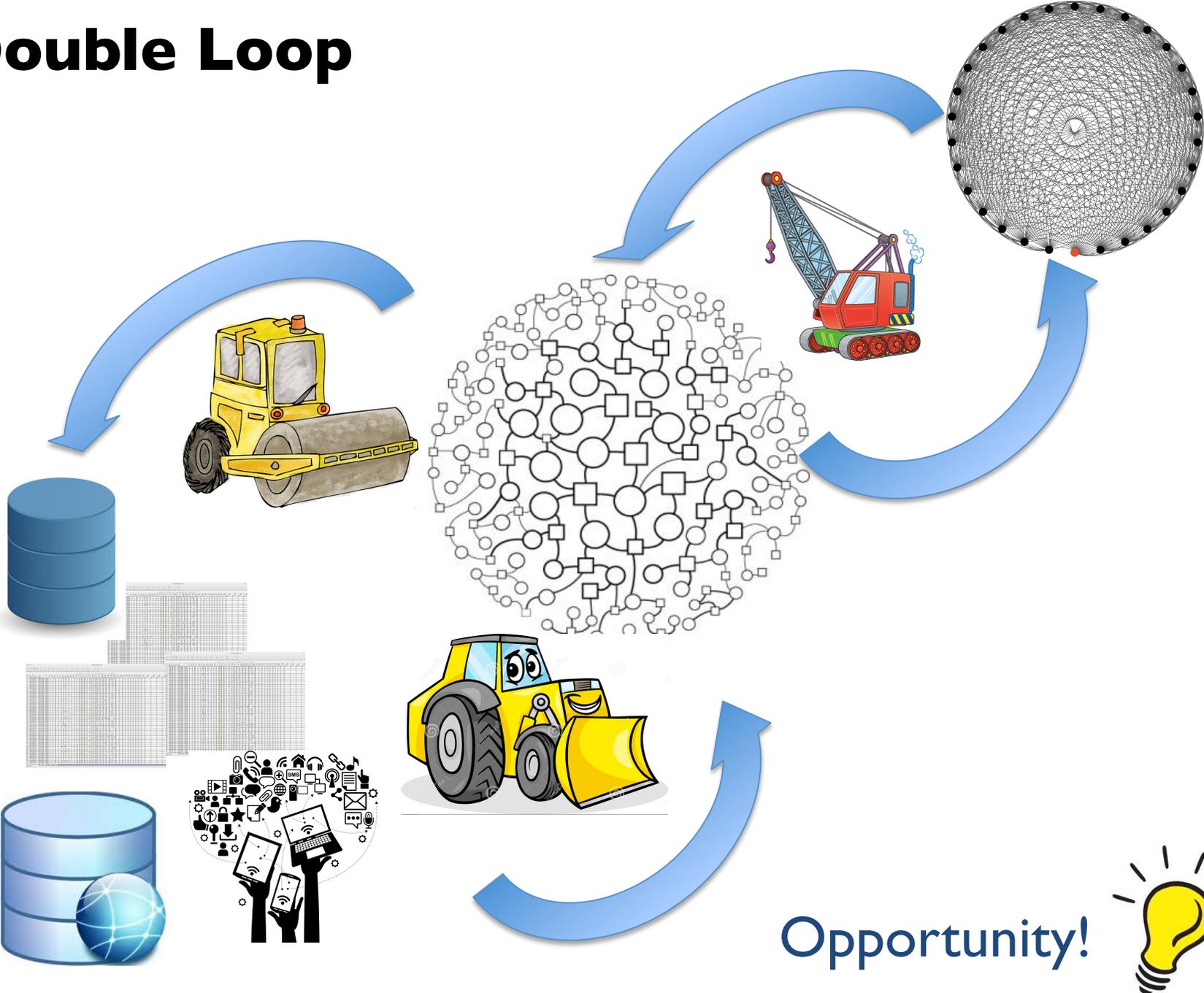
- Human in the loop
 - Human in the data
 - Human in the system
- Communities and societies in the loop
 - Human*s*
 - Develop new systems engineering science for understanding how people and data and systems interact
 - And how to improve systems over time

Research Opportunities #3

- There **are** common abstractions that go across a broad number of the most compelling cyber-social systems domains including health, education, smart cities, citizen engagement and more
- Three Cs:
 - Context
 - Comparative modeling
 - Collective reasoning



Double Loop



Opportunity!

