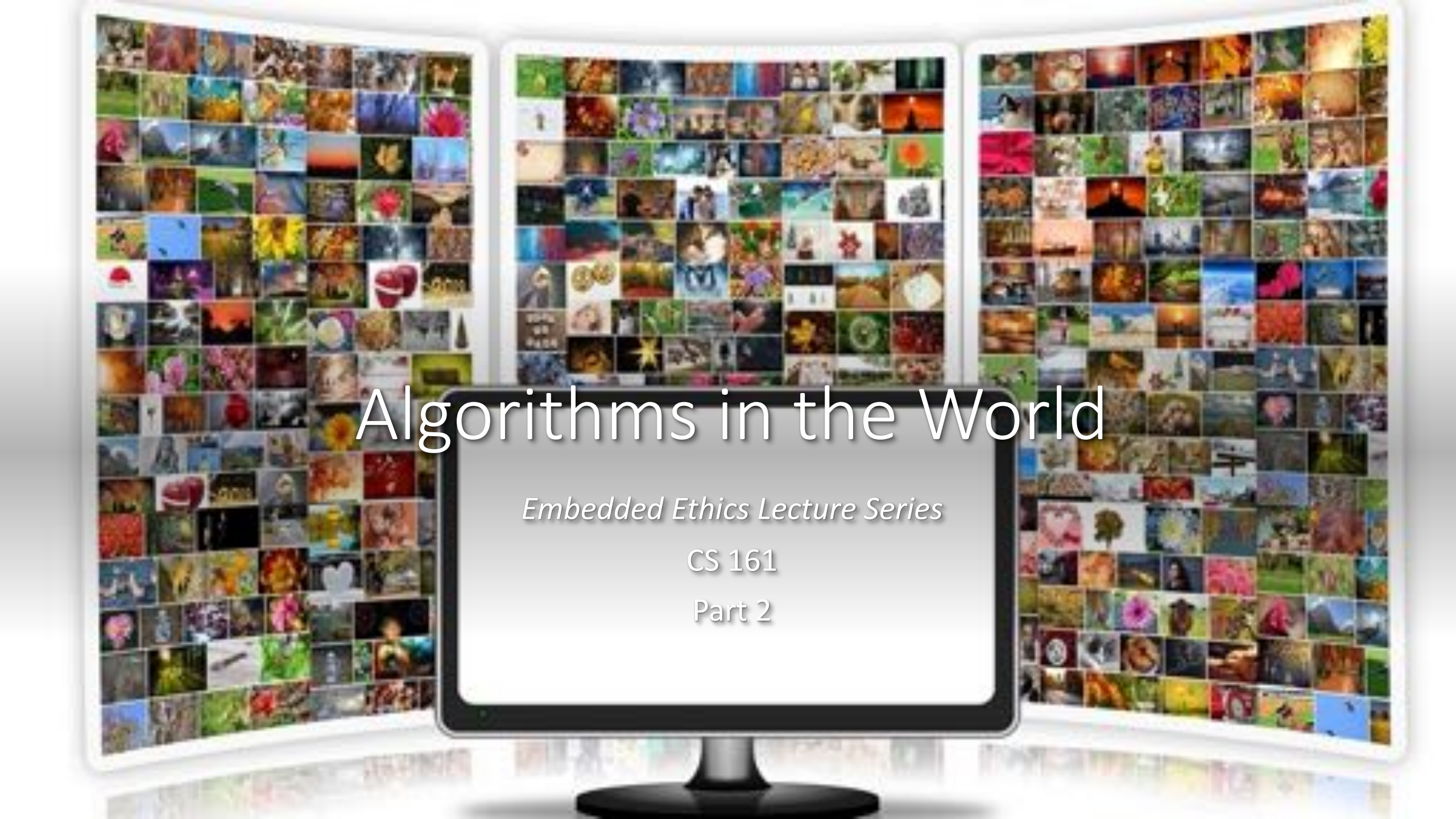
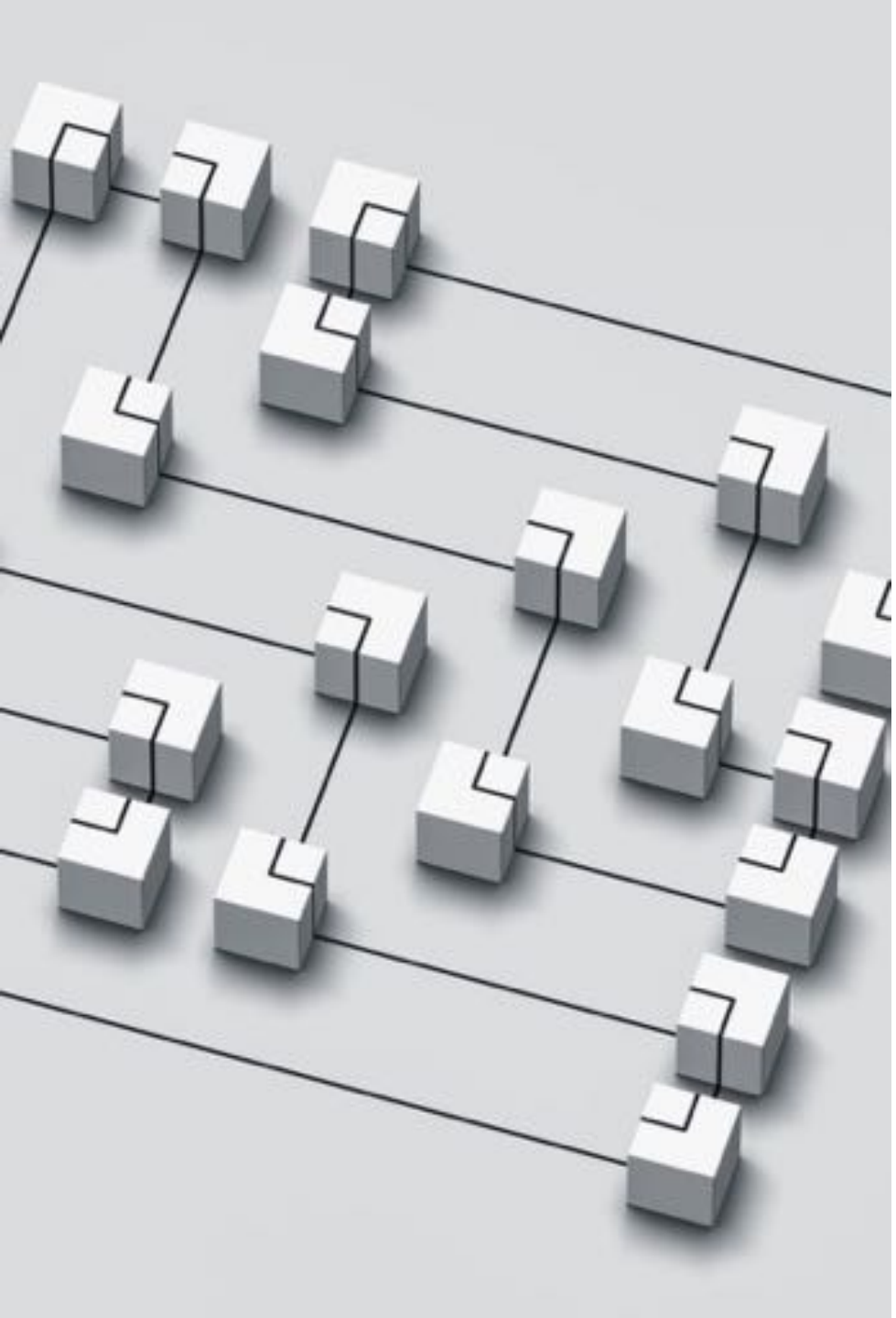


Algorithms in the World

Embedded Ethics Lecture Series

CS 161

Part 2



Algorithms in the World

Challenges of Algorithmic Formalization

- Measurement
- Comparison
- Faithful Translation

Challenging Problem Spaces

- Applying rules to novel cases
- Addressing wicked Problems

Street Level Algorithms

Have you ever felt frustrated, when interacting with bureaucracies?

Parking tickets 😖

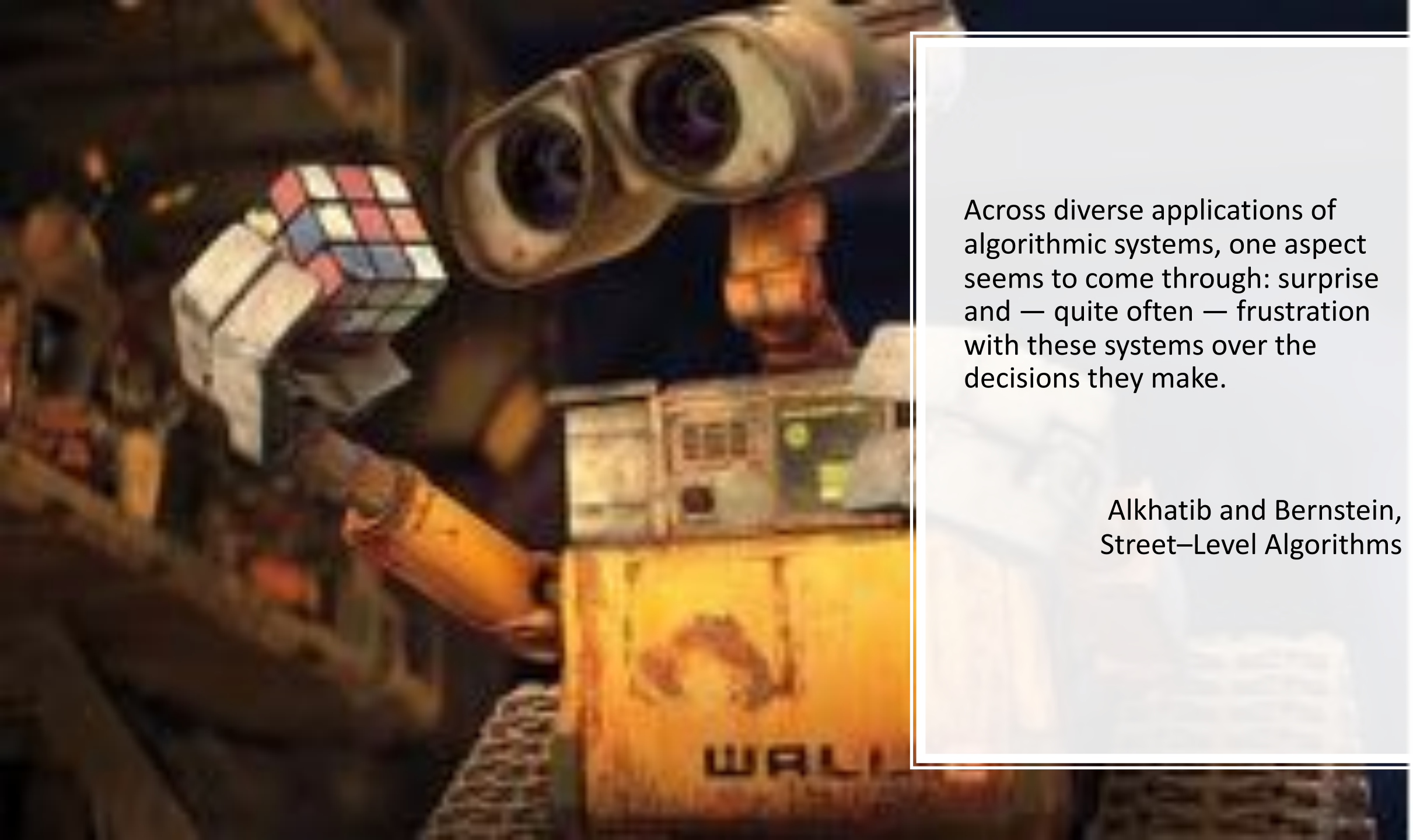
IRS 😵

Standardized tests 😒

Immigration authorities 😓

Health insurance 😫

Credit evaluations 🤬



Across diverse applications of algorithmic systems, one aspect seems to come through: surprise and — quite often — frustration with these systems over the decisions they make.

Alkhatib and Bernstein,
Street–Level Algorithms

"A defendant finds that a criminal risk prediction system categorized him as high risk for failure to appear in court, based on the behavior of others like him, despite his having every intention of appearing in court on the appointed date."

Barocas, Hardt, and Narayanan,
Fairness and Machine Learning: Limitations and Opportunities

"An automated system locks out a social media user for violating the platform's policy on acceptable behavior. The user insists that they did nothing wrong, but the platform won't provide further details nor any appeal process."

Barocas, Hardt, and Narayanan,
Fairness and Machine Learning: Limitations and Opportunities

Filling the Gap

- Policies and laws are general rules that need to be applied to concrete situations.
- In some situations, it is clear what they dictate and how they should be applied
- But there are cases at the margins where this is not so clear
- Someone needs to fill the gap between the general rule and its particular application.

Street Level Bureaucrats

Civil servants who have direct contact with members of the public interpret and apply laws and policies. Such as…

- Police officers
- Teachers
- Social Workers
- Judges
- Evaluators of welfare applications
- Immigration officers
- IRS agents

Street Level Bureaucrats

Street level bureaucrats rely on their *discretion* in order to interpret the rules in ”edge cases,” novel circumstances, and extenuating circumstances.

- Nuance
- Responsiveness to special circumstances
- Flexibility

- **Reflexive policy execution**: consider and refine the contours of their decision before taking action.
  - Decisions not to enforce the policies as stated, even if it means failing their task, when it furthers the organization’s overarching goal.

Street Level Algorithms

Street level algorithms are algorithmic systems that directly interact with and make decisions about people in a sociotechnical system.

Decisions about human lives and welfare, filling in the gaps between policy and implementation.

- Resume Screening
- Content Moderation
- Bail recommendation systems

Alkhatib and Bernstein,
Street–Level Algorithms

Street Level Algorithms

- When street–level algorithms encounter a novel or marginal case, they default to their pre–trained classification boundary, sometimes with erroneously high confidence.
- Adjustment of boundaries can only occur after the system receives feedback or additional training data.
- Sometimes they make nonsensical decisions, which are not revisited until they prompt human review.

Case Study: Crowdworkers

- Algorithms play the role of foremen in crowdwork:
  - Assign workers to suitable work given their qualifications
  - Respond to workers when they needed assistance
  - Provide feedback on the output of the work.
- Quality control:
  - Which workers are allowed to continue working on the task?
  - Who is given/denied payment?

Case Study: Crowdworkers

- Crowd workers must execute tasks that are open to various interpretations, but quality control algorithms only recognize the most common one.

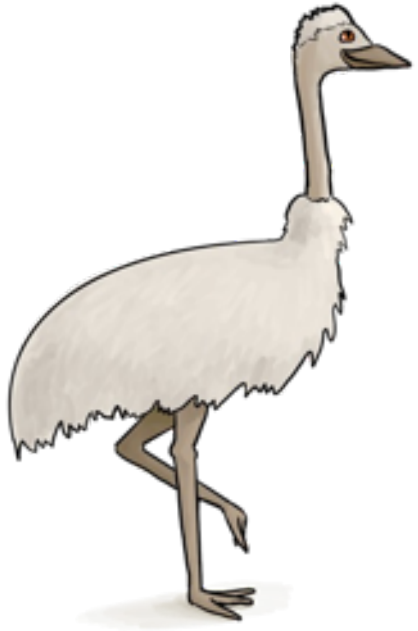
- Algorithmic foremen can’t distinguish novel answers from wrong answers.

Case Study: Crowdworkers

Consequences:

- Rejection
- Reputational harm
- Wage theft

Case Study: Crowdworkers



Consequences:

- Rejection
- Reputational harm
- Wage theft

Discretion & Algorithms

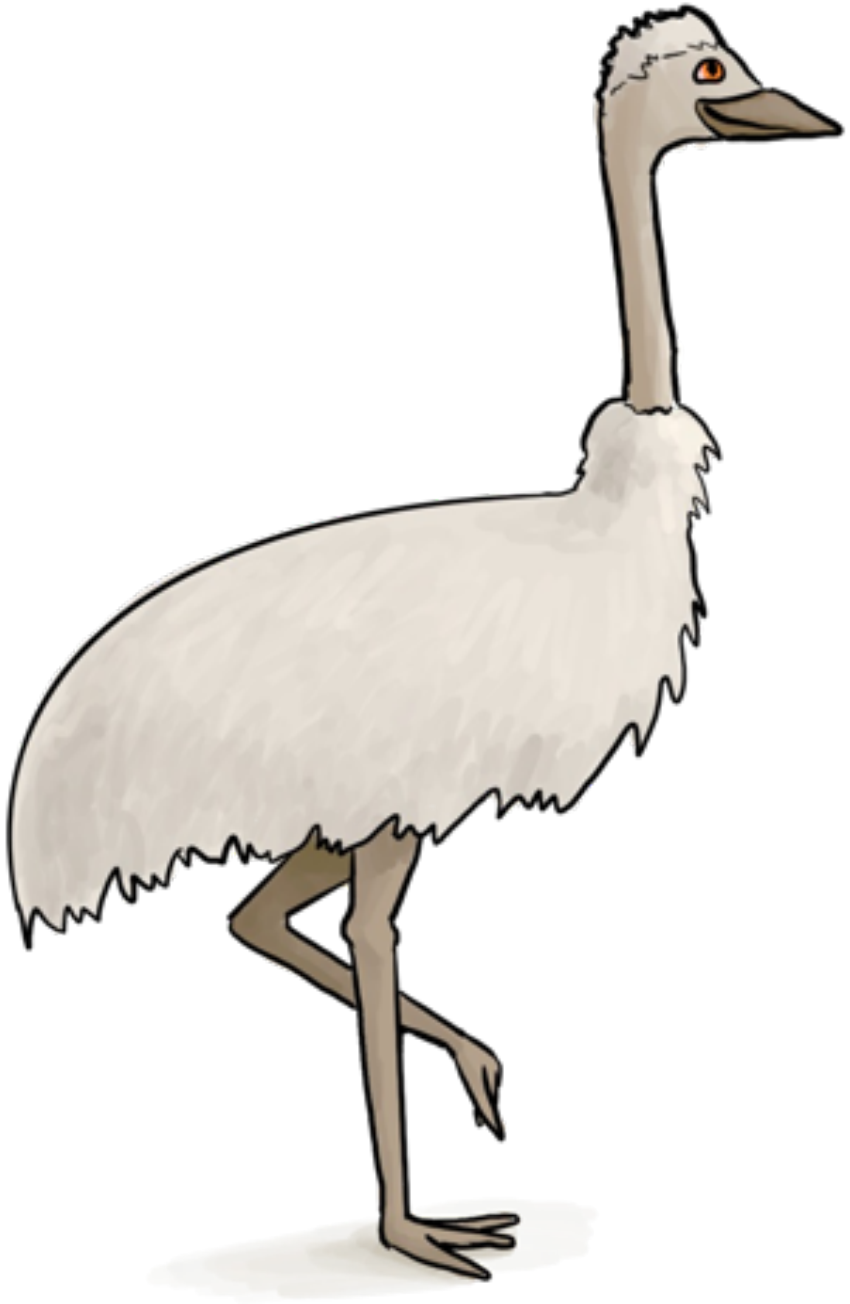
- Algorithmic decision-making systems lack discretionary judgement
- Their decision boundaries are typically fixed
- Their procedures can be revised, but only after the decision is made incorrectly
- In the meantime, they may affect people's lives negatively.

Discretion & Algorithms

- It is crucial to identify cases that require discretion and flexibility
- These cases should be diverted to human bureaucrats that may exercise discretion and make decisions reflexively
- Robust mechanisms for recourse and appeal
- Understanding, oversight, and auditability.

Discretion & Algorithms

- Depending on the stakes of the decision, rather than deciding what *outcome* is best we ought to focus on what *decision-making process* is most legitimate.
- Allowing those affected by algorithmic decisions to deliberate about what matters to then and how to balance tradeoffs.
- Brings its own set of challenges but it is worth considering!



Wicked and Benign Problems

Problem that the classic paradigm of science and engineering is meant to address

Definable

Separable

Findable Solutions

VS

Problems of open societal systems

Ill-defined

Interconnected

Rely on political judgment for resolution

Rittel and Webber, “Dilemmas in a General Theory of Planning”

Benign Problems

- Also called tame problems
- Problems that scientists and engineers are used to working on
  - Solving an equation
  - Analyzing the chemical structure of a compound
  - Checkmate

Benign Problems

- Solving an equation
- Analyzing the chemical structure of a compound
- Achieving checkmate

Clarity concerning

- End goal
- When the end goal has been attained

Plucky’s Subway Adventure

- Purchasing the cheapest ticket that allows her to visit her numerous relatives.

- Challenging
- But tractable!

The New York Times

Reduce Subway Fares for Poor New Yorkers

By The Editorial Board

Dec. 2, 2016

PEW

TOPICS PROJECTS FEATURES ABOUT GET INVOLVED SEARCH

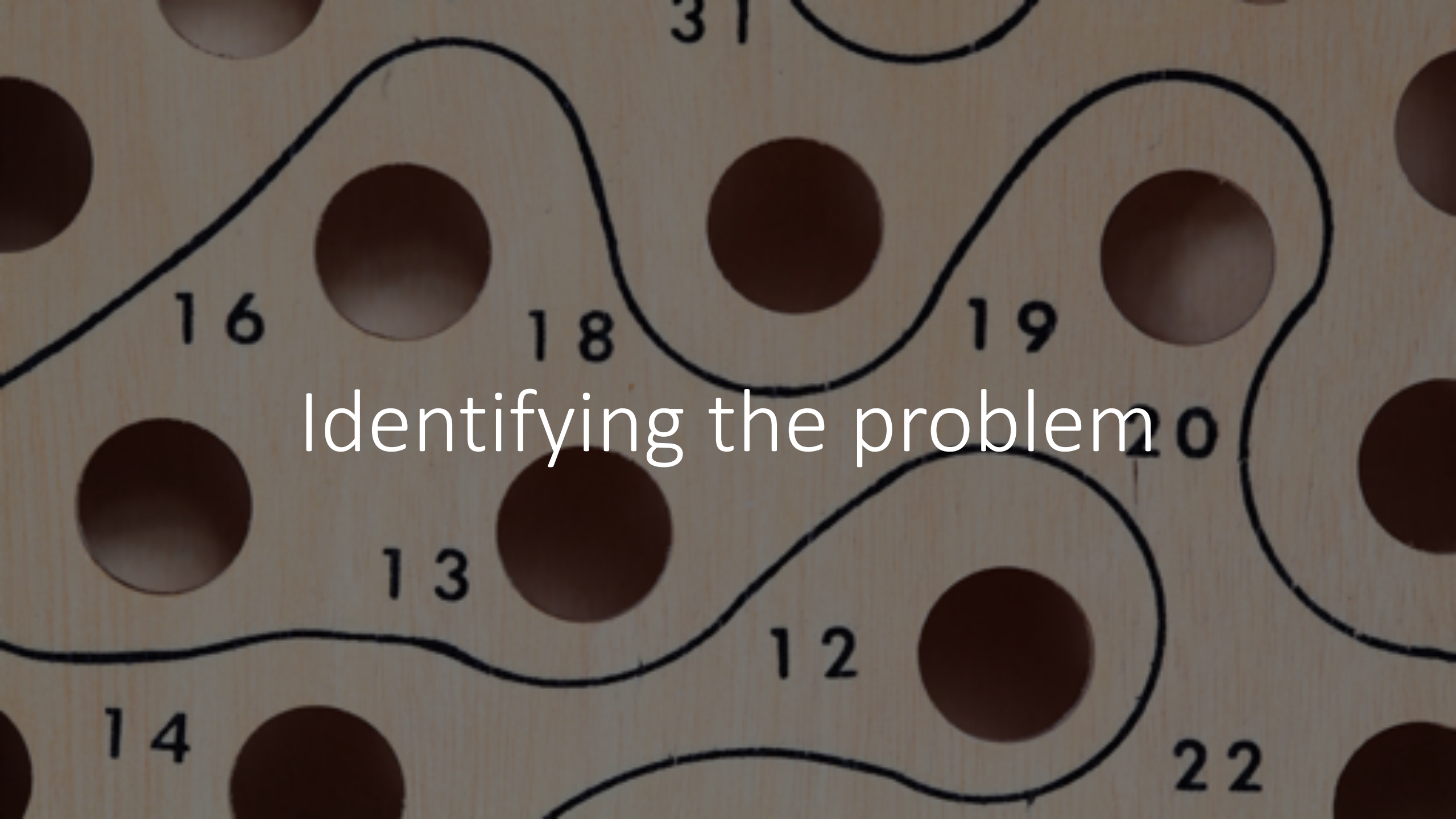
Tackling Social Inequity, Some Cities May Ditch Bus, Subway Fares

STATELINE ARTICLE | June 10, 2021 | By: Jenni Bergal | Read time: 7 min

Equitable transit fares…

Wicked Problems

Wickedly difficult!



Identifying the problem

Plucky’s Subway Adventure

What is the Problem?

- **Definitive and exhaustive formulation**: Cheapest ticket that allows her to visit all relatives.
- **Known category of problems**
- **Separable:** Independent of other problems

The Transportation Policy Expert

- **No definitive formulation**
  - Equitable transportation policy?
  - Zero fares?
  - Reducing fares for low-income riders?
  - Secure access to transit for low-income commuters?
- **Unique**
  - Pre/post COVID?
  - Where?
- **Symptomatic of and interconnected with other problems**
  - Inequality is a broader problem
  - Other remedies may be more efficient
  - Reducing fares may increase the problem in the long term by affecting quality of public transport

Identifying a Solution

Plucky's Subway Adventure

- **Stopping Rule:** She can tell when the problem is solved
- **True/False:** Solutions are either correct or incorrect
- **Clear set of potential solutions and permissible operations :** Plucky knows which kinds of algorithms may solve the problem and has clear formal rules to operate with.

The Transportation Policy Expert

- **No stopping rule**
  - How could we know whether we have an equitable fare system?

- **Solutions are not true-or-false**
  - Have we made transit more accessible to the worst off?
  - Who did we leave out?
  - What about safety?
  - Would it have been better to charge a symbolic fare?

- **No enumerable set of potential solutions, or well-described set of permissible operations**
  - What about better bike lanes?
  - Or shared mobility apps?

Testing

Plucky’s Subway Adventure

- **Immediate and ultimate test:** She may immediately know whether her solution was correct.
- **Discrepancy:** When the world doesn’t behave as her solution predicted, she knows the solution is incorrect.
- If Plucky’s algorithm fails, she can always try again. That is what testing is for!

The Transportation Policy Expert

- **No immediate or ultimate test of a solution**
  Even if things work out initially, there could be a problem down the road: pandemic, unemployment…

- **No rule or procedure to deal with discrepancy**
  If we implement the policy and riders still don't use transit, was it because we were wrong or for some other reason?

- **"One shot operation"**
  If things don't work out, the policy could seriously affect the quality/sustainability of the system in the long term and the wellbeing of riders.

- **No right to be wrong**
  Someone will be held accountable if things turn out badly

Wicked Problems

- What exactly is the problem?
- What counts as a solution?
- What are the stakes of trying and getting it wrong?

If we treat wicked problems as benign problems…

- Wasting time and resources addressing a symptom of a deeper problem.
- Settling for inappropriate solution.
- Mistake early signs of success (or failure) for a definitive test
- Harming people’s interests with misguided solutions

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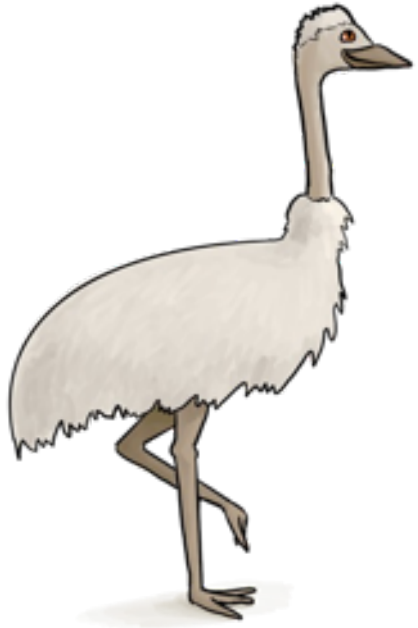
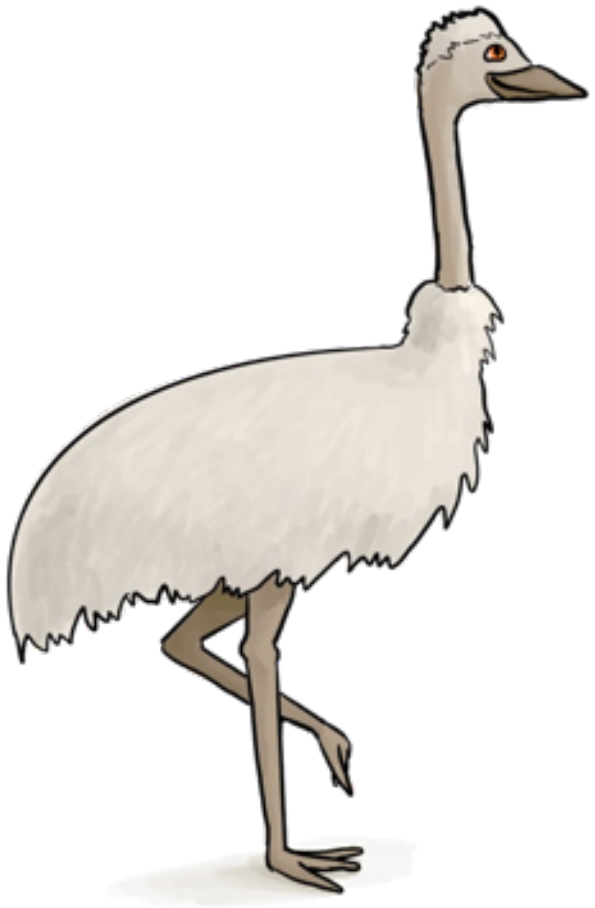
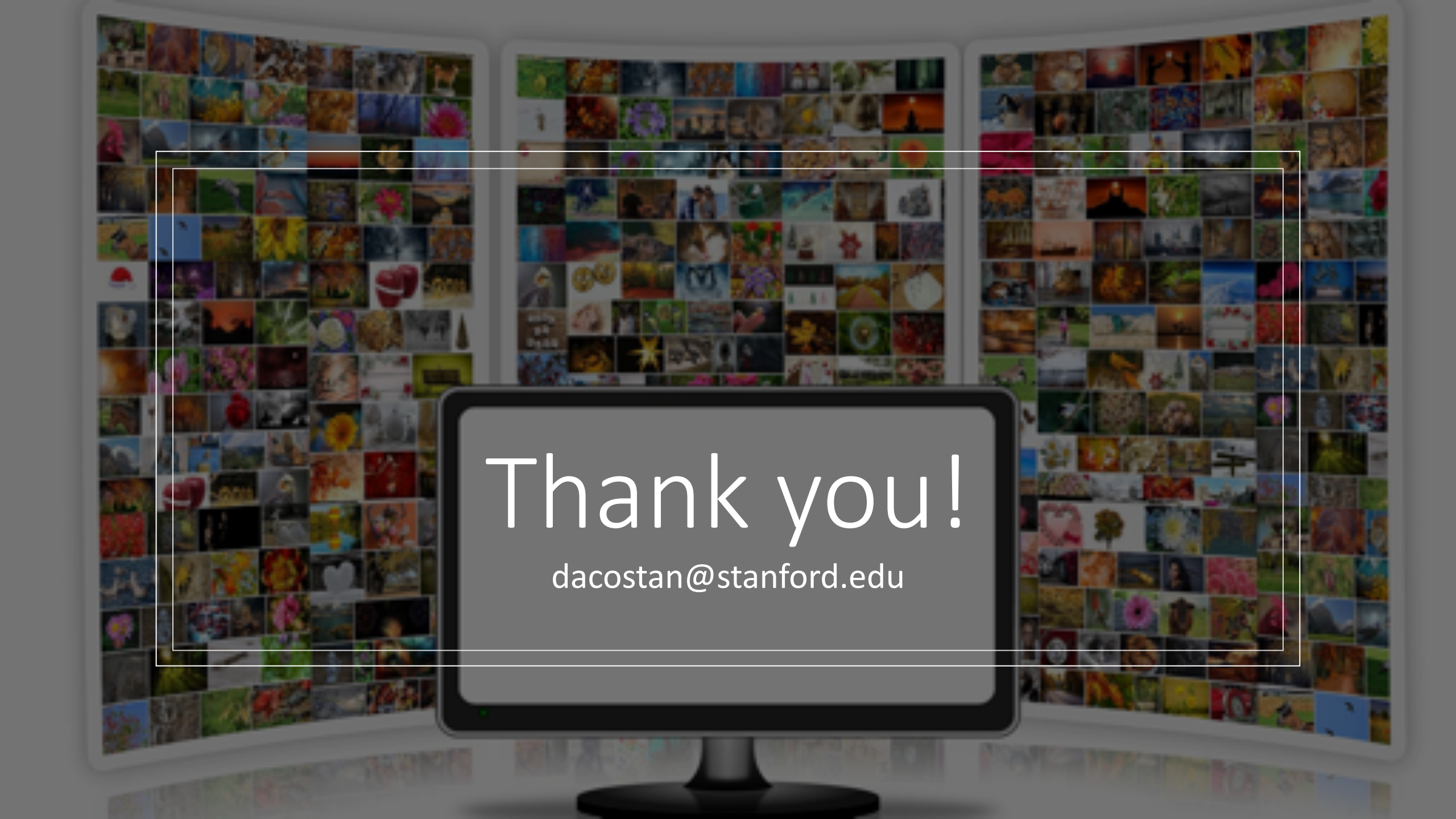




Conclusions

- Societal problems are different from algorithmically tractable ones.
- With benign problems, there is clarity about the problem, its possible solution, and the stakes.
- Wicked problems are not just more difficult, but they are not clearly tractable.
- No clarity over problem definition or solution space, and the stakes of getting it wrong are much higher.
- Treating a wicked problem as a tame problem may lead to poor outcomes and risk of harm.


Thank you!
dacostan@stanford.edu