Motivation

- “Accountability” has various definitions
  - NIST: “actions of an [agent] [that can] be traced uniquely to that [agent]” that supports “nonrepudiation, deterrence, fault isolation, intrusion detection and prevention, and after-action recovery and legal action”

- Difficult to formalize
  - Kacianka et al. study\(^1\) from 2017: “20 of the 45 papers provide no explicit definition of accountability. 17 papers provide their own definition, not taking other sources into account.”

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Motivation

- Provenance has been put forth as a way of demonstrating accountability
  - Moreau and Groth\(^2\) from 2013: “Provenance is a substrate that can be used to perform policy checks and to make systems accountable”

- How has accountability been formalized? (mechanisms, properties)

- How can we relate it to data provenance?

- What are the relevant challenges for data provenance?

Accountability Mechanisms

- Binds a system’s states and events to identities of agents or principals within a system
- Provides validation and compliance mechanisms either during operation or after the fact to ensure correctness of intended behavior or acceptable standards
- Ensures the integrity of records about past events when agents misbehave

Accountability Properties

- Feigenbaum et al. (2011): accountability as quantifying punishment
- Chockler and Halpern (2004): accountability as a causality problem involving degrees of responsibility and blame
- Jagadeesan et al. (2009): accountability as the capability of judging blame
- Küsters et al. (2010): accountability properties of fairness and completeness in protocol design
Data Provenance Challenges

- Reconciling PROV with accountability
- Semantic gaps (e.g., responsibility, attribution)
- Dependencies and modeling
- Causality analysis needs reference events and patterns
Future Work

- Study provenance link to accountability with greater formality about how to define accountability
- Systems building: Being able to collect provenance is non-trivial
- Modeling: Capturing provenance relative to the system in question and what kinds of questions it should be able to answer
- Analysis: Provenance metrics for responsibility and blame
Questions?

- Thanks for listening!
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