

# Mitigation plan

## Theme A: Watermarking

- DNA sequences are not adequately modeled by Markov sources. In this case, we will develop alternate piecewise models in which we segment the sequence and solve the problem separately on each segment of the sequence. This increases the computational cost of barcode design -- however, this cost is not a major consideration, since the problem remains tractable and barcodes are not designed often.
- SSR repeat rates do not support uniqueness; i.e., the frequency of SSRs is such that their frequencies may be replicated by chance. In this case, we will investigate combinations of intrinsic and extrinsic barcodes -- which in turn pose additional interesting technical problems.

## Theme B: Optimization

- Inability to derive novel theory: we will focus on empirical evaluations in real and simulated data.
- Supply chain data is too sparse to build reasonable models: we will interface with Theme C to develop incentive mechanisms for supply chain entities to reveal more data.
- There is significant departure from the full and partial models -- in this case, we will focus on the identification of constraints that cause significant departure across the models and develop methods for reconciling these constraints.

## Theme C: Mechanism Design

- Incentives needed for adoption are more expensive than the savings from adoption: While this is possible, we do not believe the likelihood of this is high. By exploring the space of incentives, we will determine combinations of incentives that will justify cost of adoption.
- Theoretical models for entities with incomplete system views do not yield tight bounds: This is indeed a concern. We will address this concern by imputing data from other supply chains, where possible, by inferring/ interpolating parameters, and making reasonable assumptions on system composition and behavior.

## Theme D: Blockchain

- MPC based techniques are expensive/ do not scale: While this is a concern, we have every expectation that based on our current work and deployment in real systems, we will be able to solve these challenges.
- We will not get sufficient data on constraining/ partially revealing the core supply chain logic. This is indeed a concern. However, we have a number of closely related projects on blockchains for supply chains that we believe we will be able to patch this missing information.

## Theme E: Analytics

- Inability to get provenance data to inform phenotyping -> We will focus on WHIN data and also Co-PI Rainey's experiments, along with openly available data.
- Inability to integrate data -> We will focus on alternative approaches, such as tensor methods, that can work with a variety of data types.