Accuracy-Efficiency Trade-Offs and Accountability in Distributed ML Systems

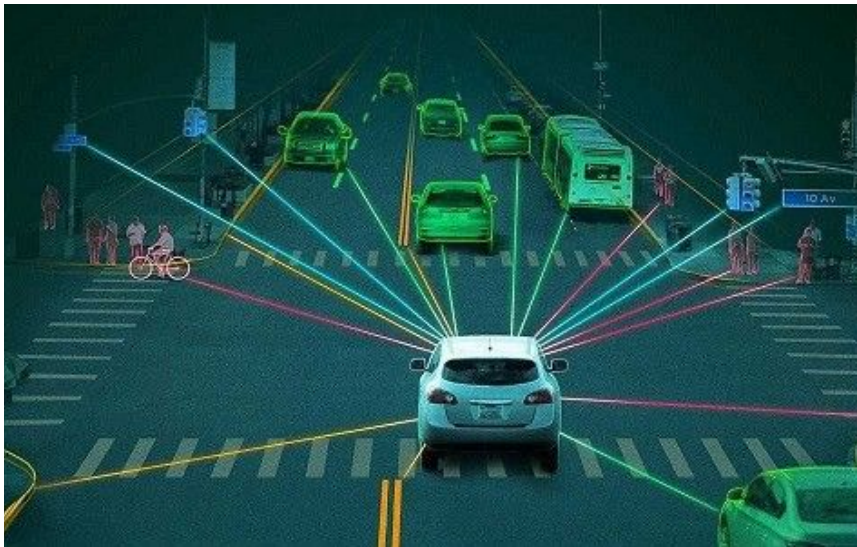A. Feder Cooper, Karen Levy, and Chris De Sa

Our argument at a glance

Accuracy-efficiency trade-offs are...

everywhere in policymaking + especially common in computing

➡ **useful for policymaking concerning computer systems**
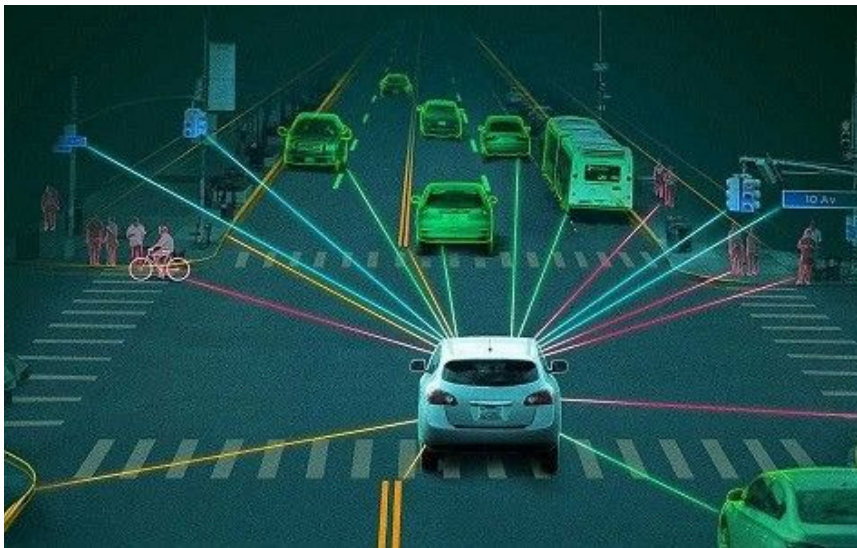
Our argument at a glance

Distributed ML systems

are **urgent**

present **novel risks**
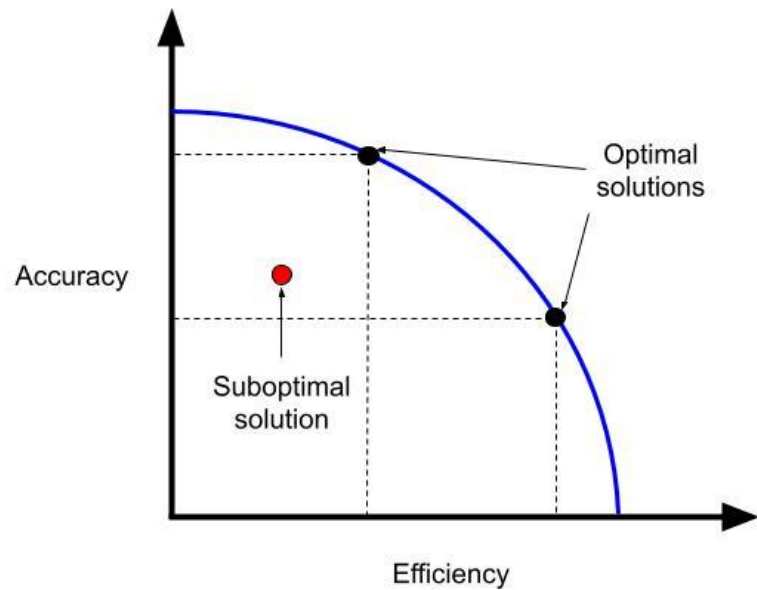
Our argument at a glance
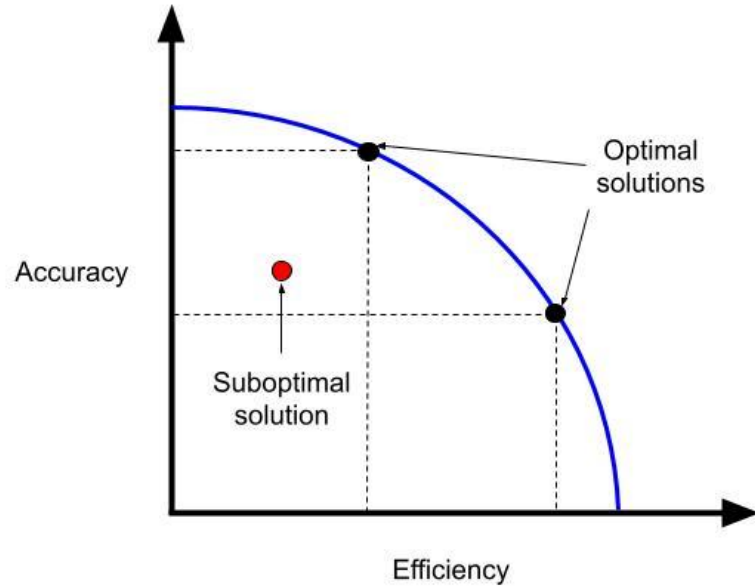

Distributed ML *systems*

are **urgent**

present **novel risks**

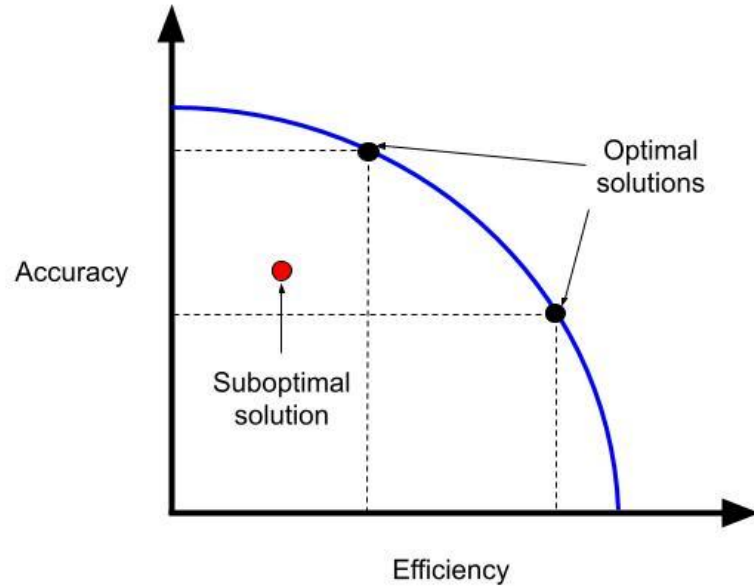**Scalability, speed, and their impact on correctness are under-explored w.r.t. accountability**

Accuracy-efficiency trade-offs

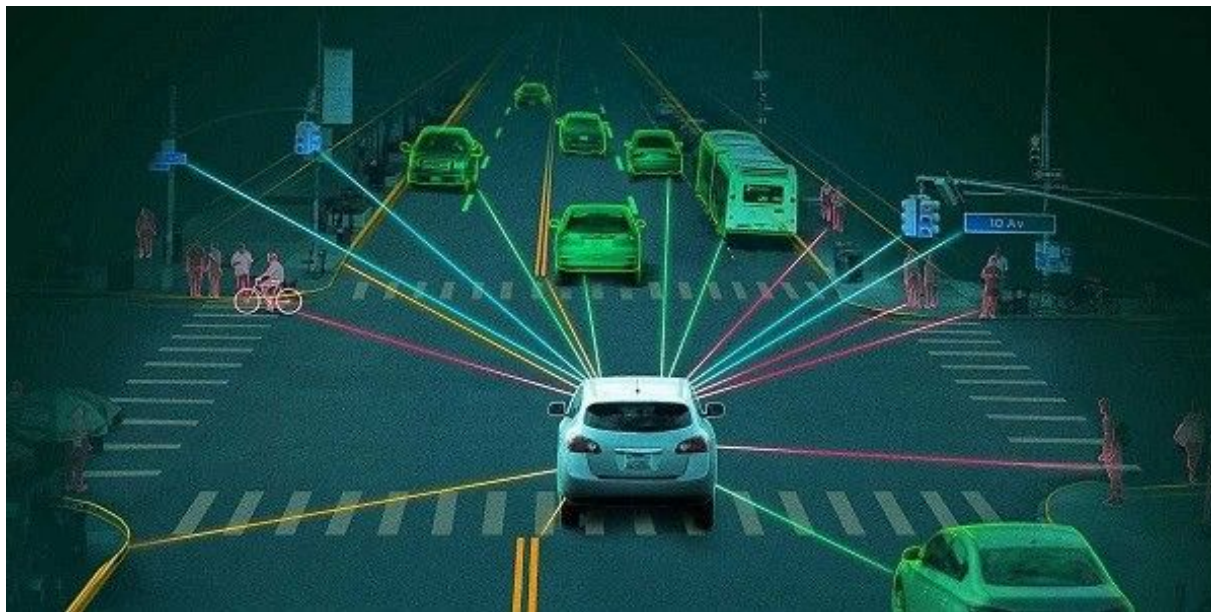# Accuracy-efficiency trade-offs

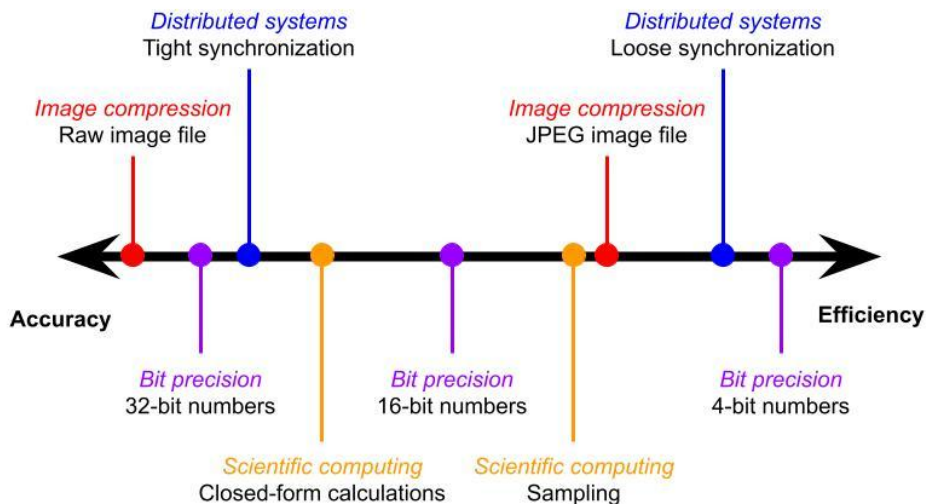# Accuracy-efficiency trade-offs
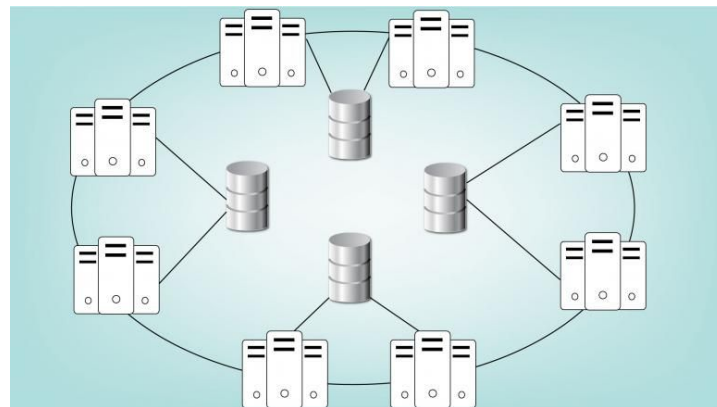
Policymaking for distributed ML systems

Why not use this framework for making policy concerning distributed ML systems?
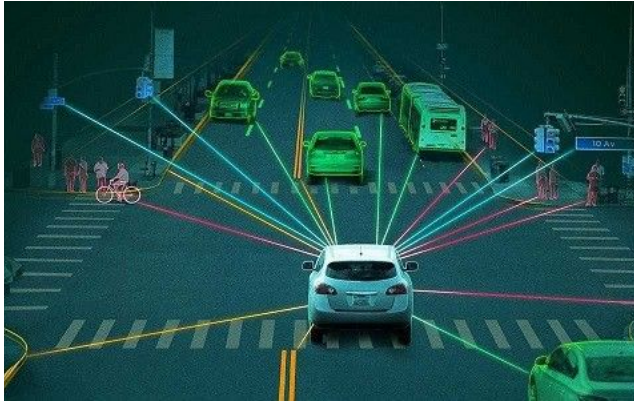
Accuracy-efficiency trade-offs in computing
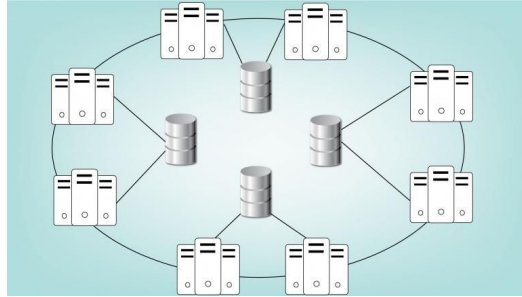

Distributed computing

Less communication **increases time-efficiency**, but causes **inconsistent** views of system state

We lack tools to measure accuracy-efficiency trade-offs in distributed ML systems

Distributed ML systems

raise different accuracy-efficiency questions than

distributed systems that do not involve ML

or

ML systems that are not distributed

Addressing risk assessment gaps
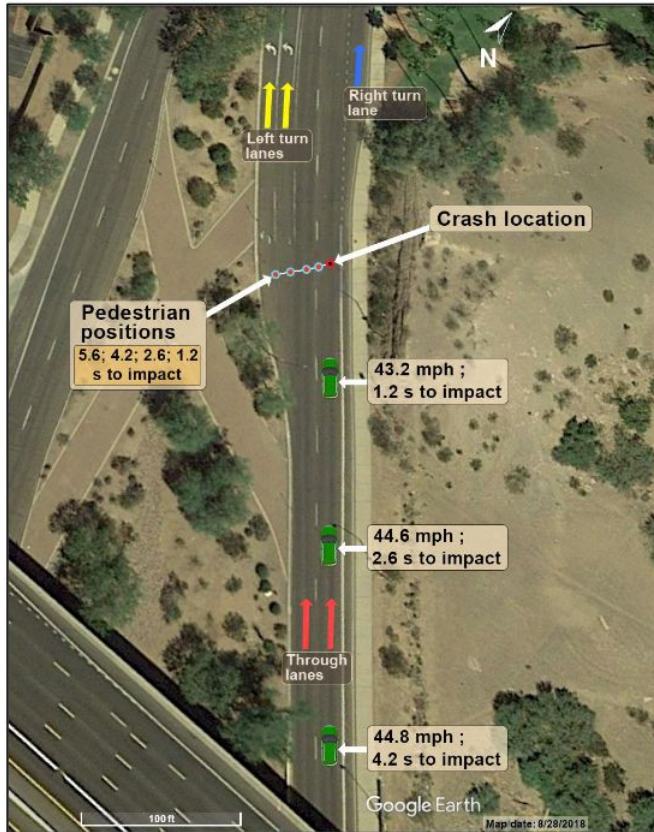
1) **Computer scientists**
   must build tools to expose underlying
   accuracy-efficiency trade-offs

2) **Policymakers**
   should use these tools to assess
   trade-off implementations

   ensure implementations align with public values

The 2018 Uber crash shows risk assessment gaps

The AV made a choice that was **neither accurate nor efficient**

The tools we suggest will
   help **prevent** some accidents **before they occur**

   help **analyze** unavoidable accidents **after-the-fact**

Takeaways for public governance

Distributed ML systems articulate unique concerns for accuracy-efficiency trade-off implementations

Without appropriate assessment tools, these concerns will not be **transparent** to policymakers

With appropriate tools, policymakers can more effectively ensure accountability mechanisms before and after accidents occur

Thank you!

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