AutoMon: Automatic Distributed Monitoring for Arbitrary Multivariate Functions

GitHub and paper

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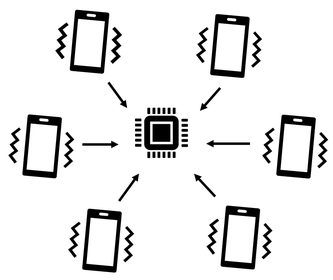
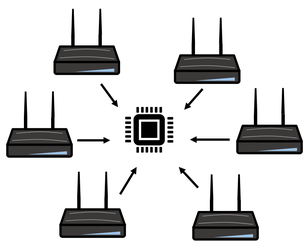
Motivation

Distributed monitoring of arbitrary functions

Earthquake detection from mobile-phone accelerometer data



Intrusion detection

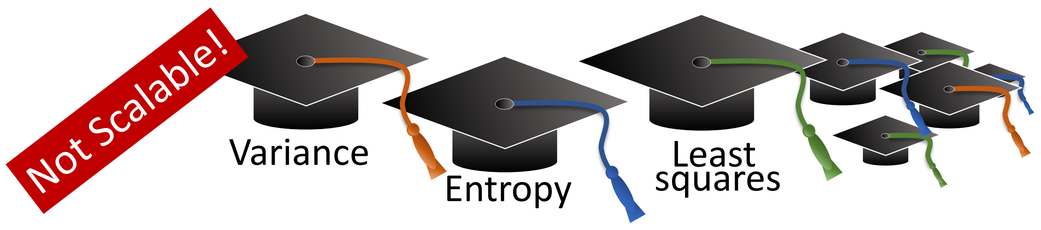


and more...

The Problem

Communication is costly... Need a communication-efficient algorithm!

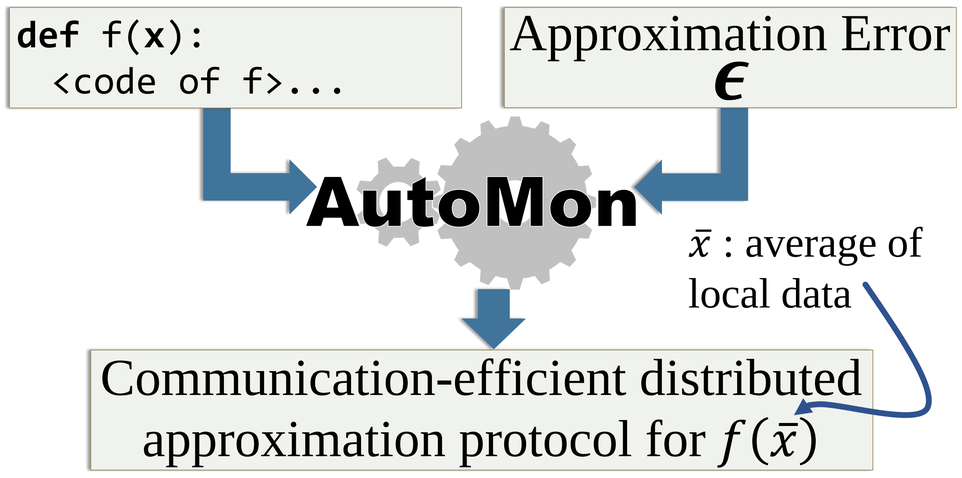
What about sketches or geometric monitoring algorithms?
Need an expert to develop a sketch/bound for every individual function!



Most SW developers don't have a PhD in computer science.

Our Solution: AutoMon

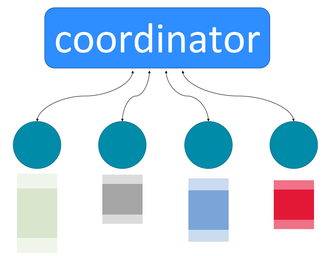
Given **source code** for computing f from data and desired approximation error, **automatically** implements a communication-efficient distributed approximation protocol for $f(\bar{x})$.



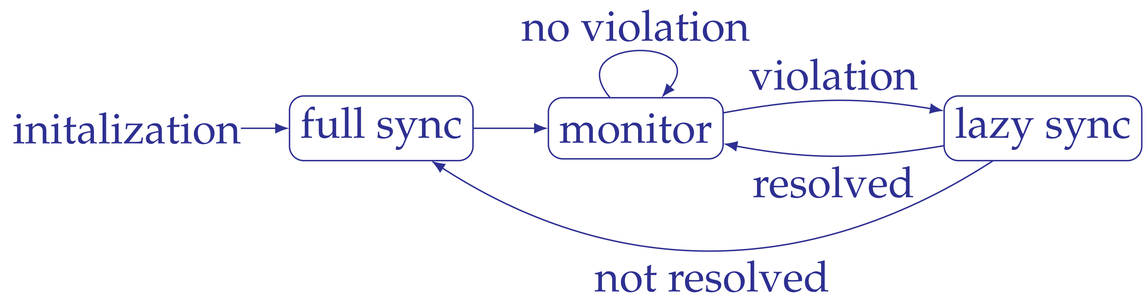
Protocol Overview

Setting: n nodes with local data streams that communicate with **coordinator**.

Input: f's source code and approximation error ϵ.

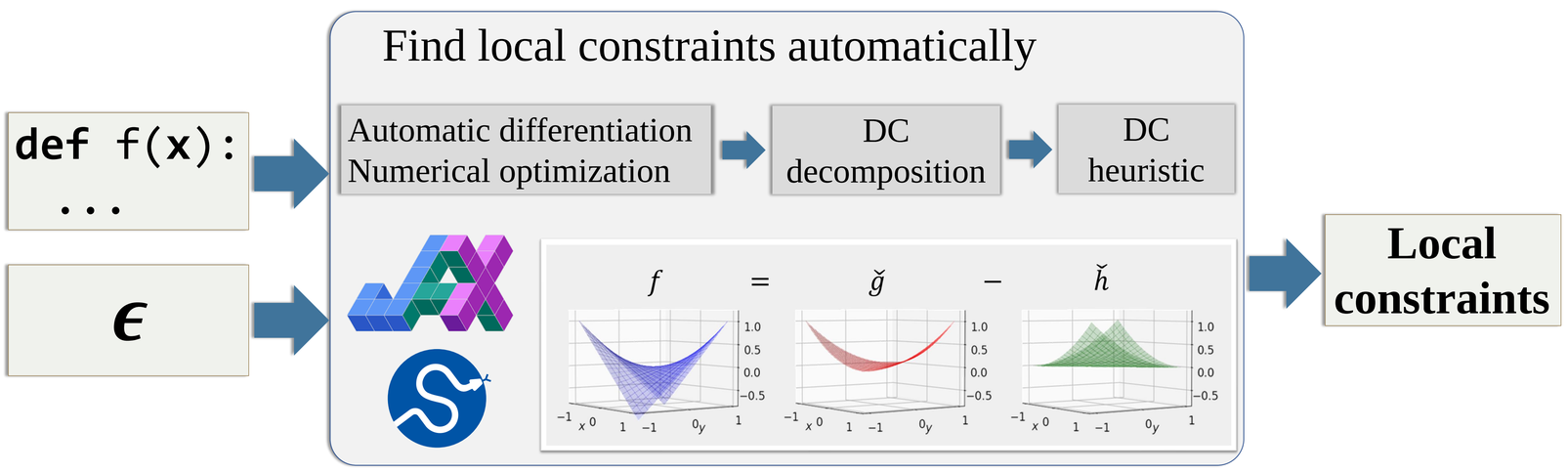


AutoMon adopts the Geometric Monitoring protocol:



Full sync: coordinator finds local constraint and updates nodes
Monitor: Nodes monitor the local constraint with local data

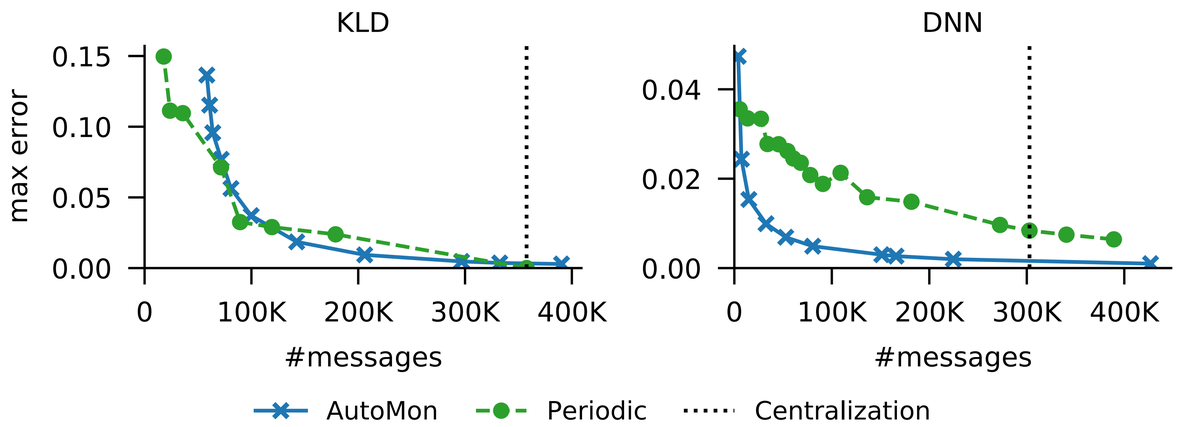
AutoMon's Core



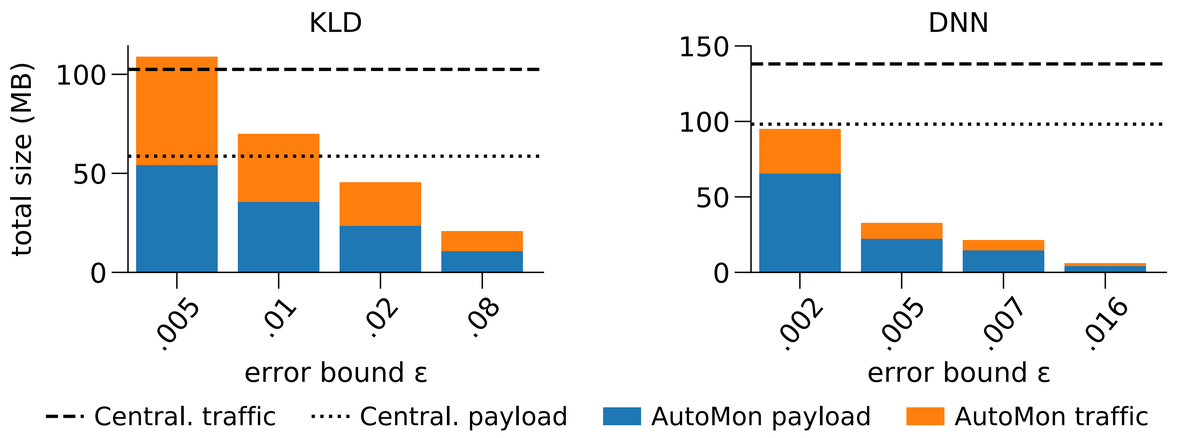
Why AutoMon?

- ✓ Reduces communication by up to ×50
- ✓ Works on complicated, non-convex f
- ✓ No need for math

Results



Error-communication tradeoff. AutoMon provides equivalent or superior tradeoff to current approaches.



Bandwidth usage in distributed experiments. Traffic volume was reduced by up to 98%, depending on ϵ.