Scaling up Correlation Clustering through Parallelism and Concurrency Control

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Michael I. Jordan

amplab

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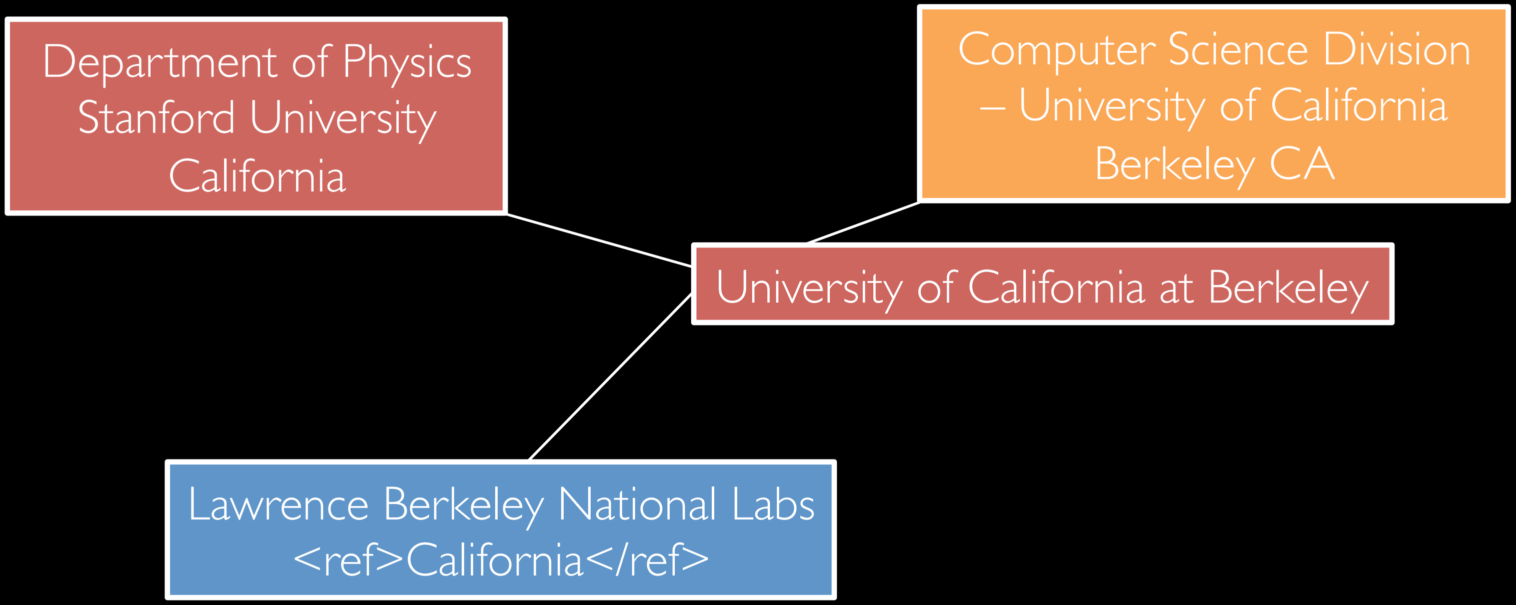
LET THERE BE LIGHT
1868

Correlation Clustering for Deduplication



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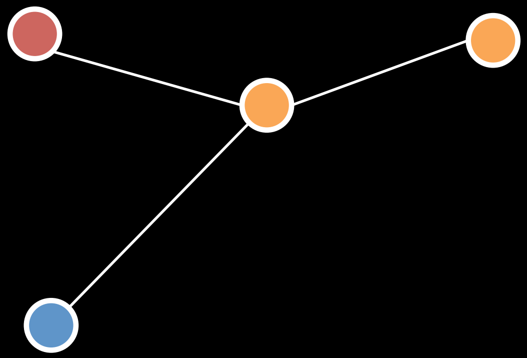

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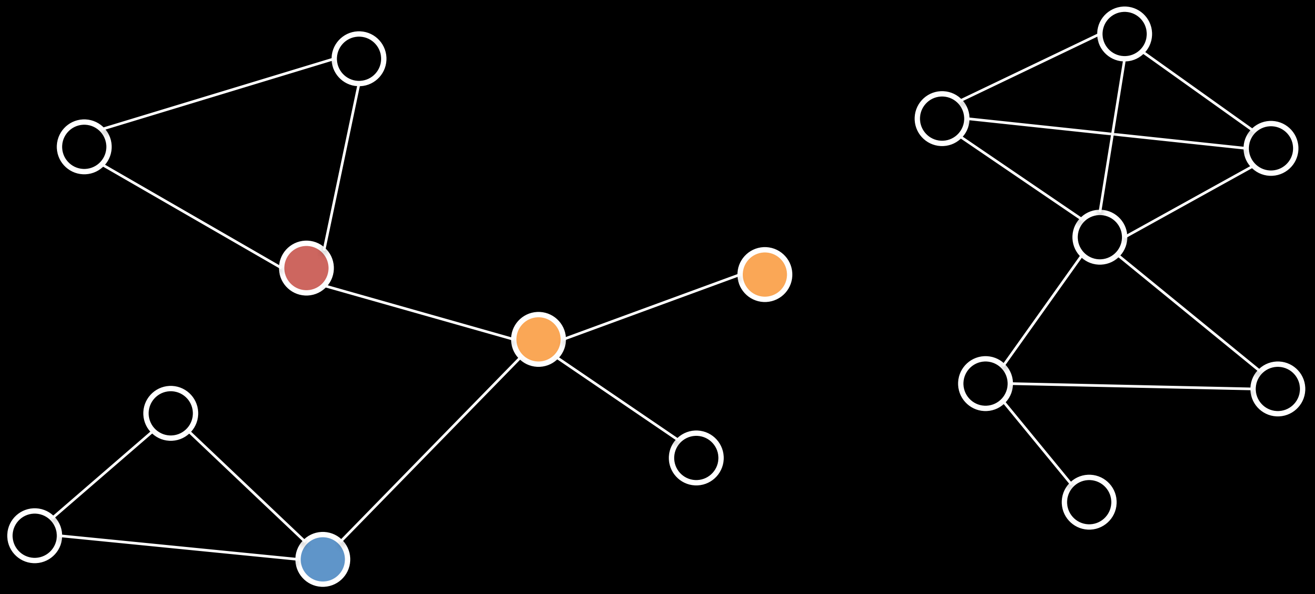

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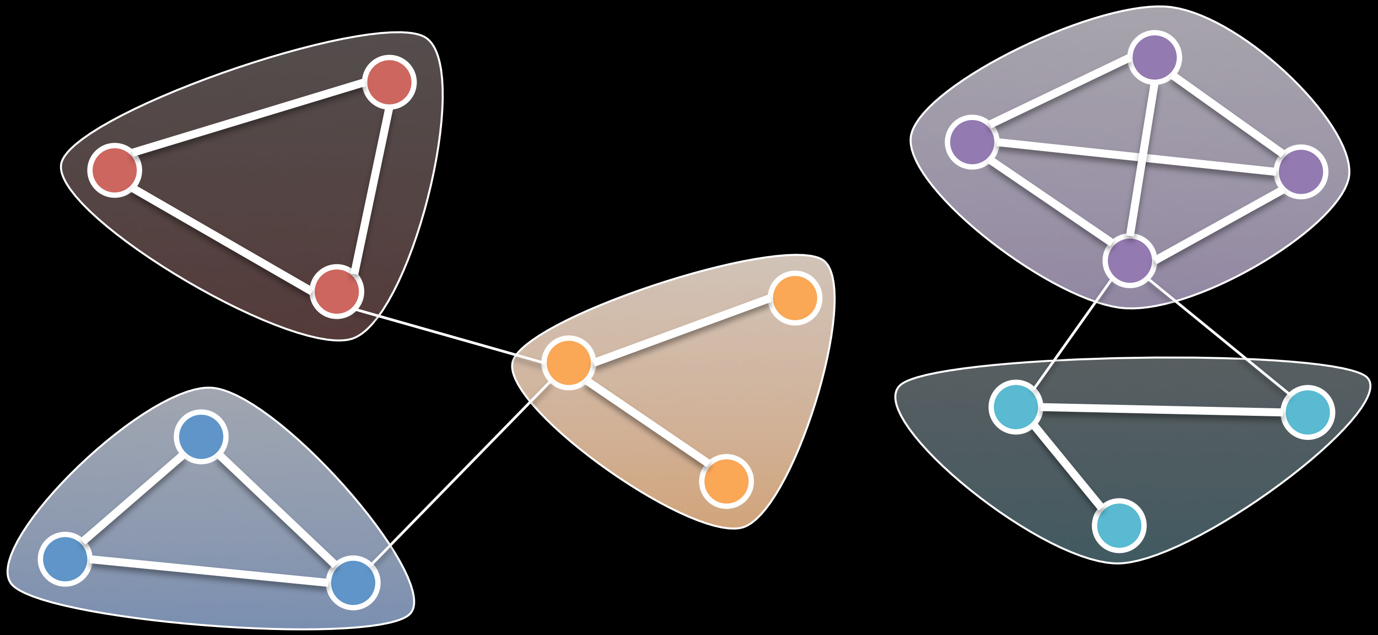
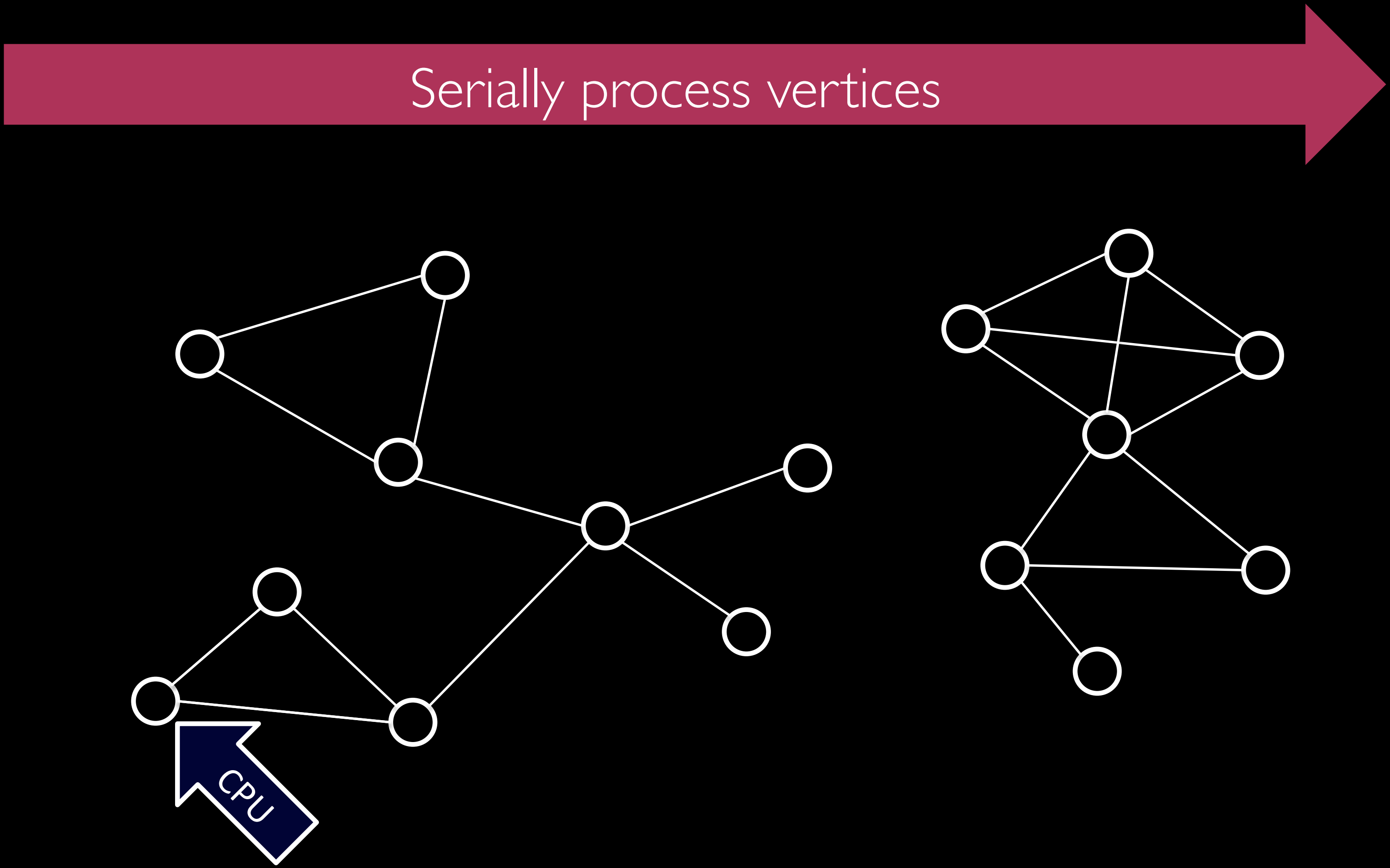


Serial Correlation Clustering



Serially process vertices

Nir Ailon, Moses Charikar, and Alantha Newman.
Aggregating inconsistent information: ranking and clustering.
Journal of the ACM (JACM), 55(5):23, 2008.

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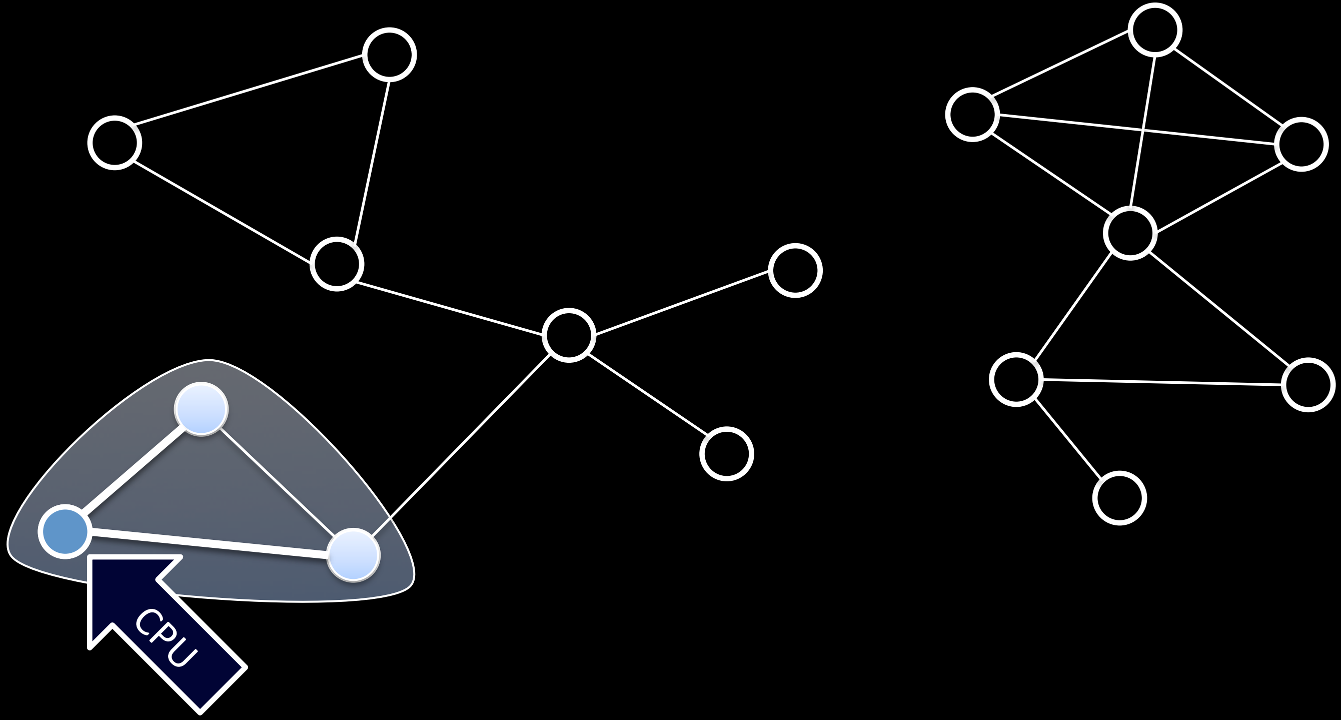

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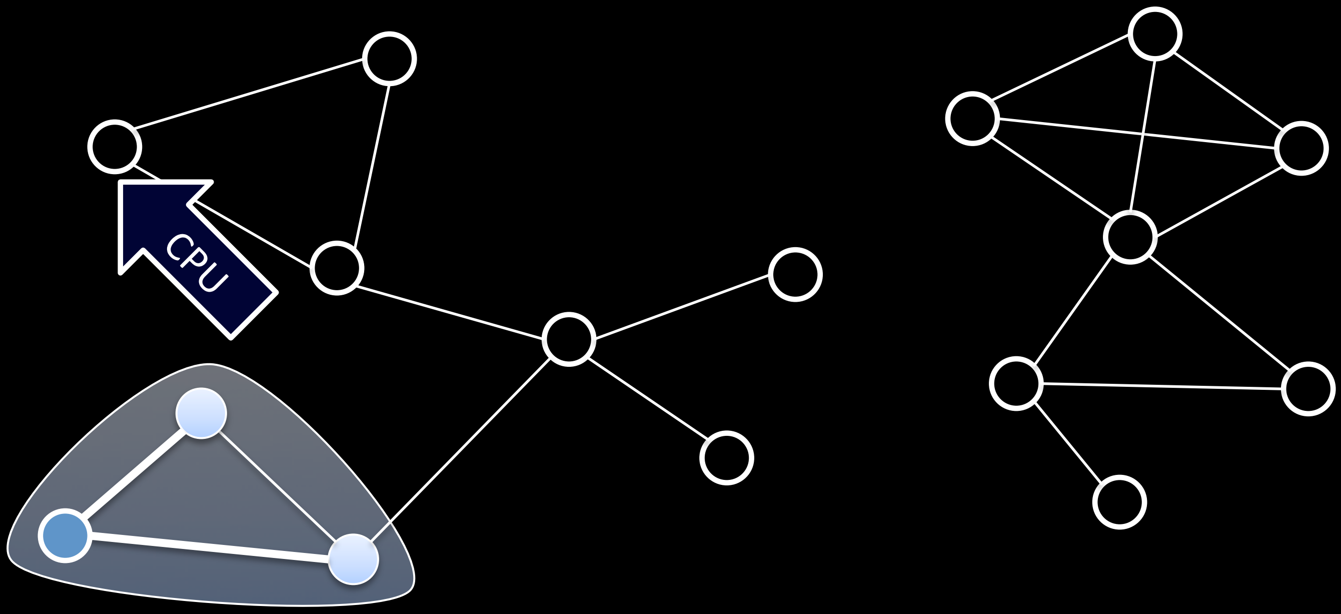

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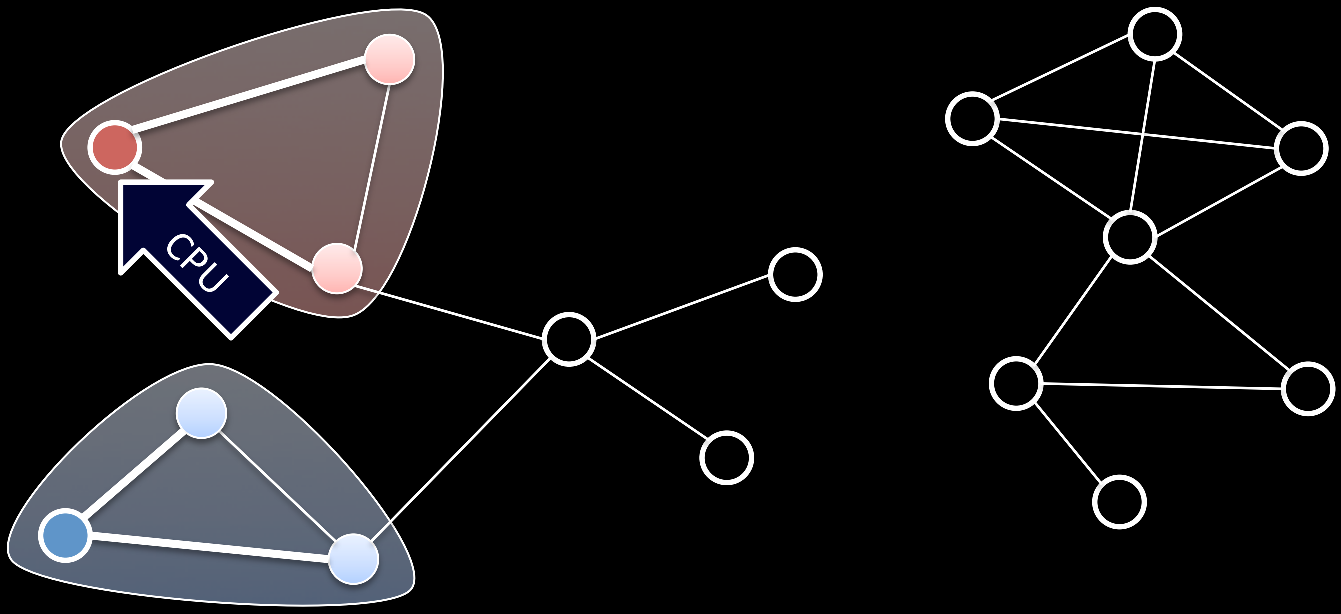

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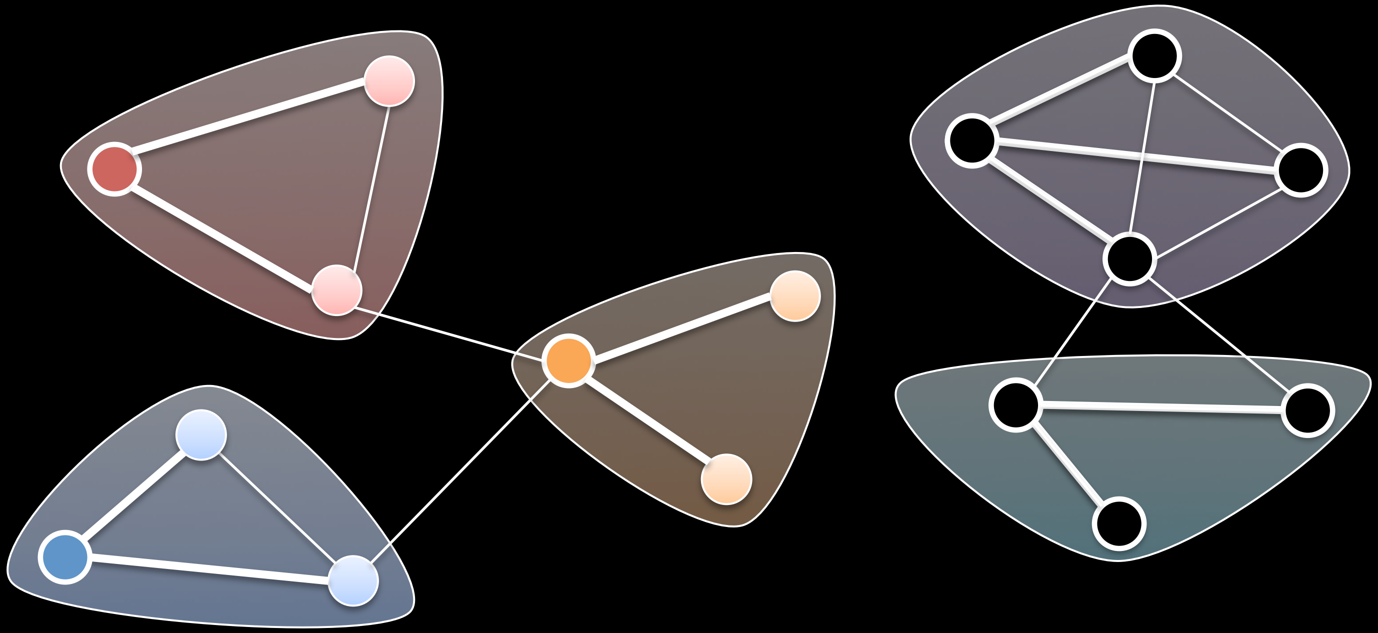

Approximation 3 OPT (in expectation)

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Objective: Parallelize **Correlation Clustering**
with strong guarantees and high concurrency.

Idea: Operations on vertices ⇔ Database transaction.
Apply concepts of **concurrency control** from databases.

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Machine Learning + Concurrency Control

(Xinghao Pan et al.)

Serial ML algorithm

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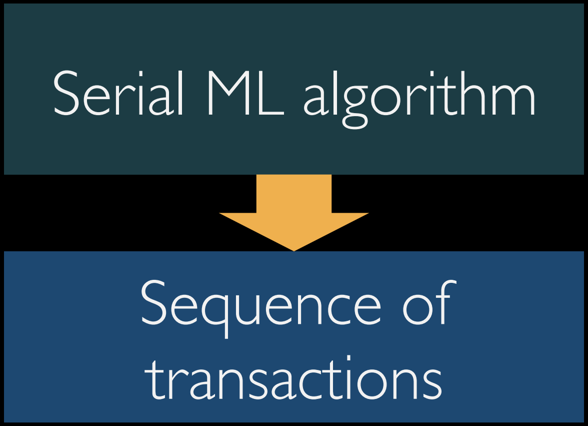

Serial ML algorithm

Sequence of transactions

Machine Learning + Concurrency Control

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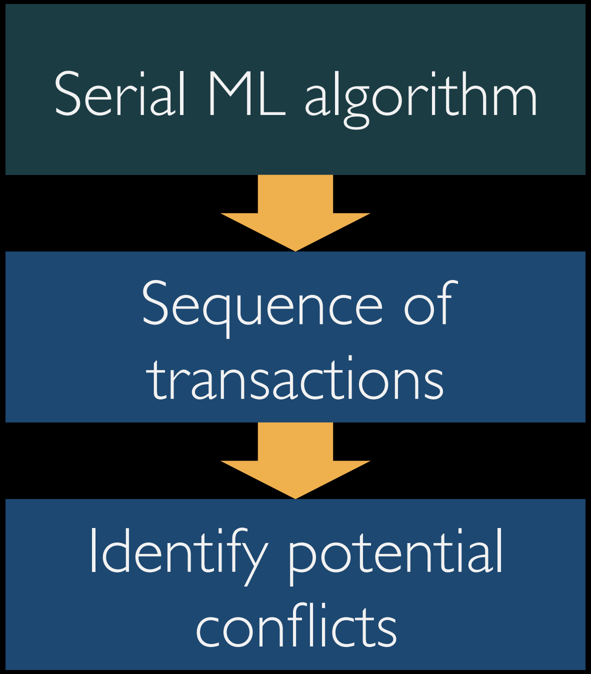

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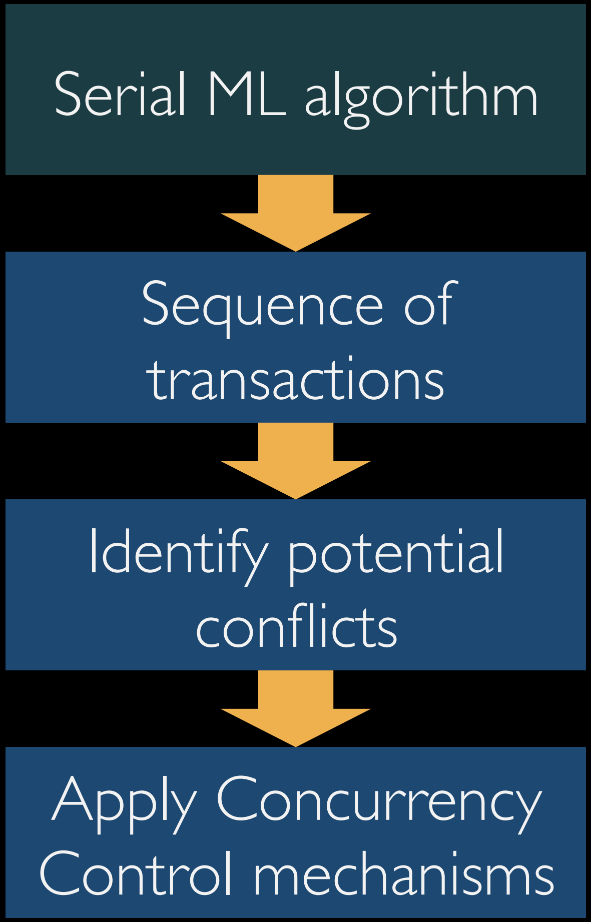

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Apply Concurrency Control mechanisms

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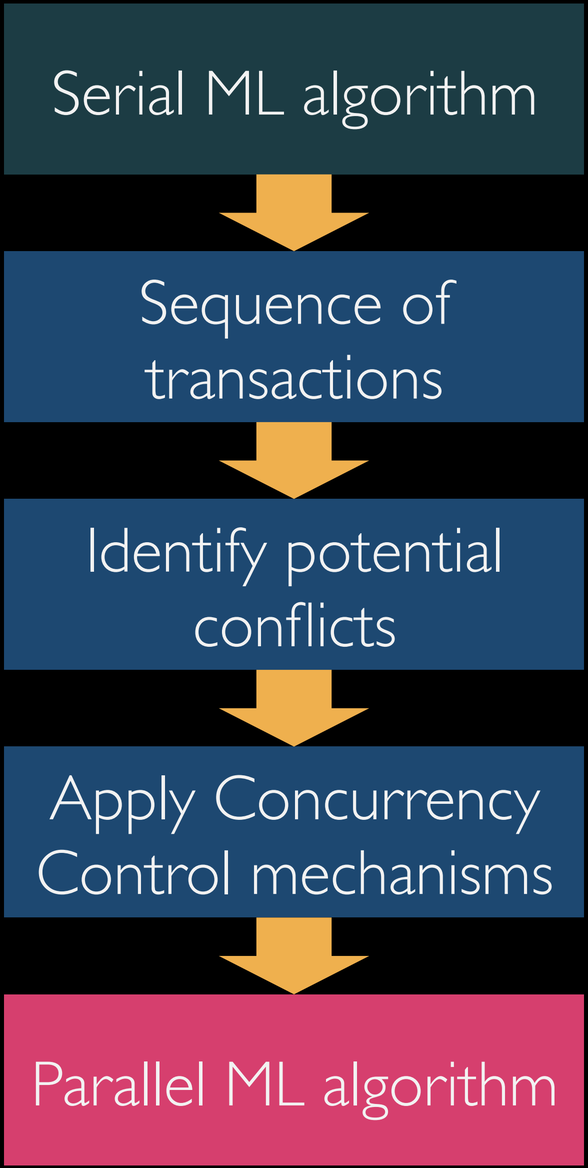

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Parallel ML algorithm

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(Concurrency Control Correlation Clustering)

Correctness

Theorem: C4 is **correct.**

C4 preserves same guarantees as serial algorithm (3 OPT).

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Expected #blocked transactions < $2\tau\ |E| / |V|$.

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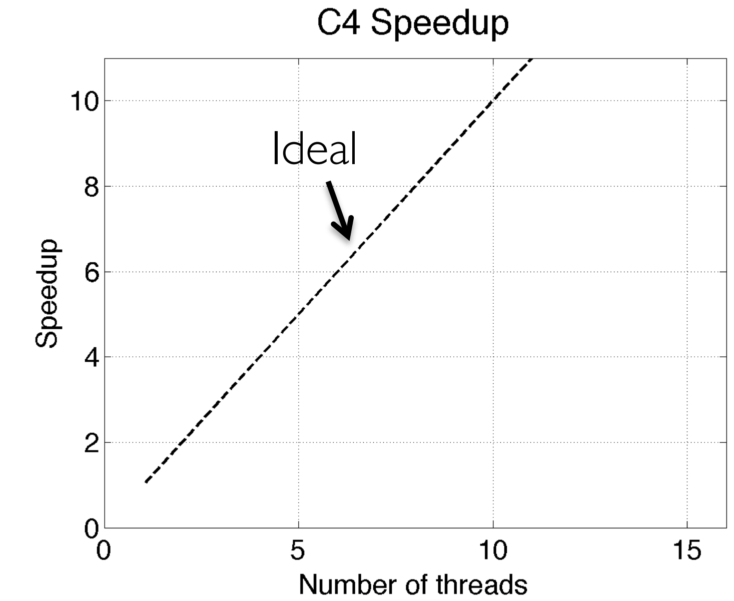

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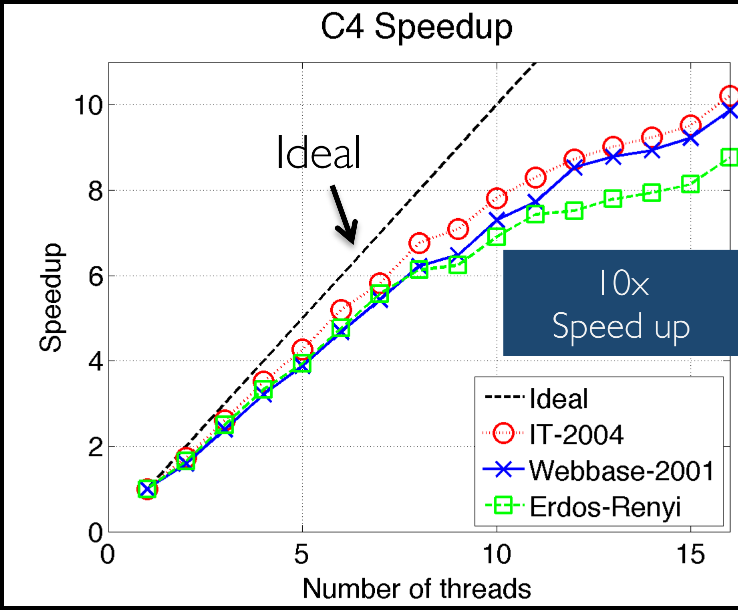

10x
Speed up