Accelerating Joins with Filters: Keeping a Limited Memory is Robust

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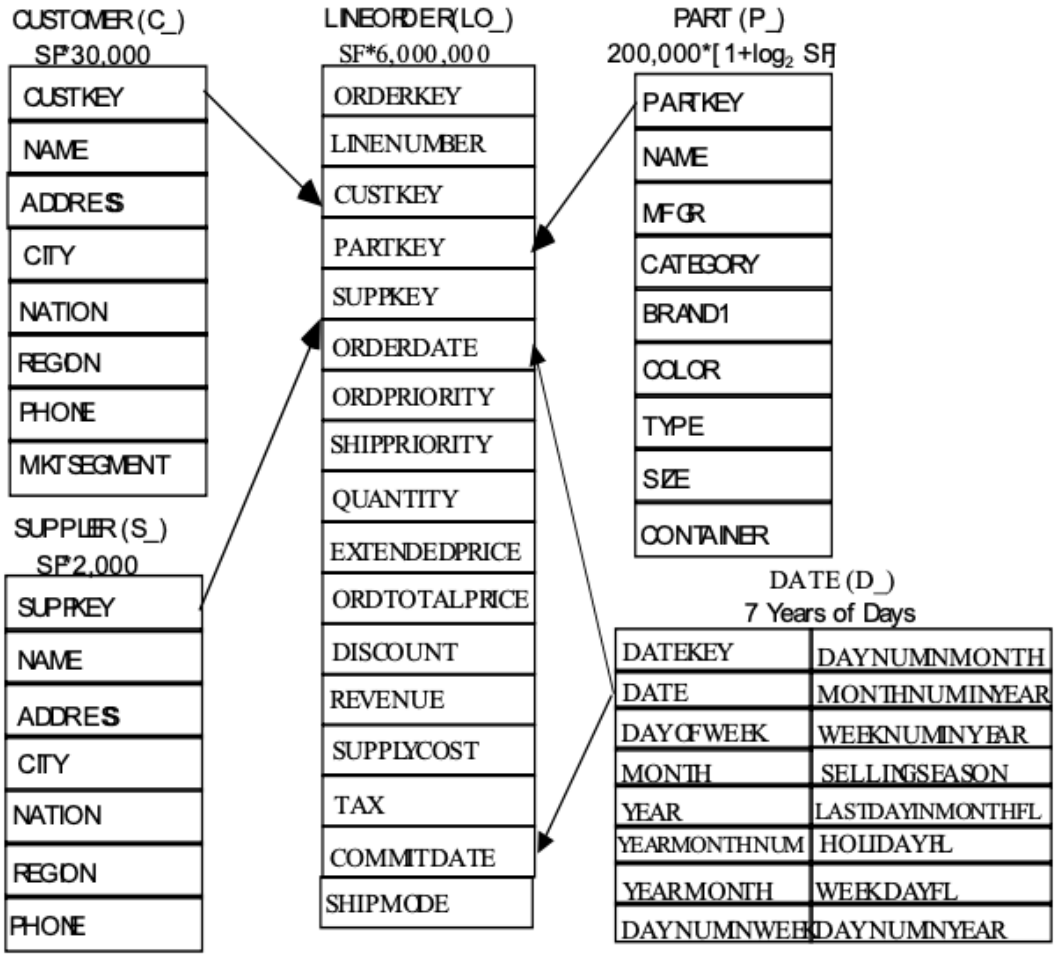
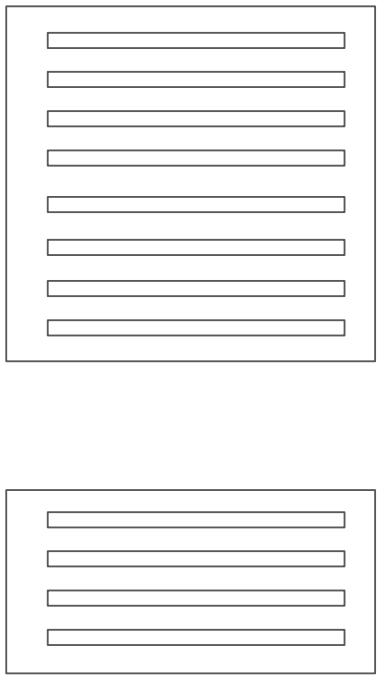
University of Wisconsin-Madison

Star Schema



- Gigantic intermediate tables
- Filtering ahead of time before join

Lookahead Information Passing (LIP)



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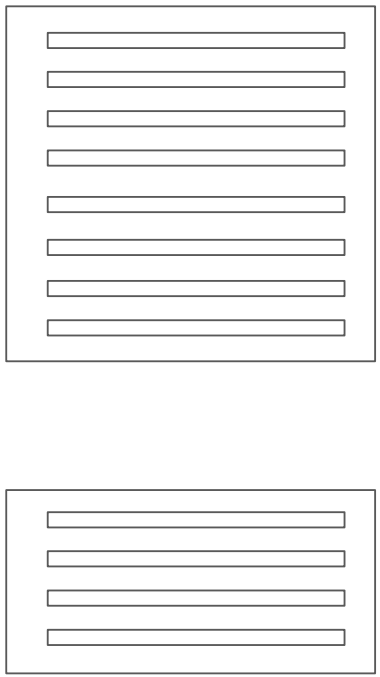

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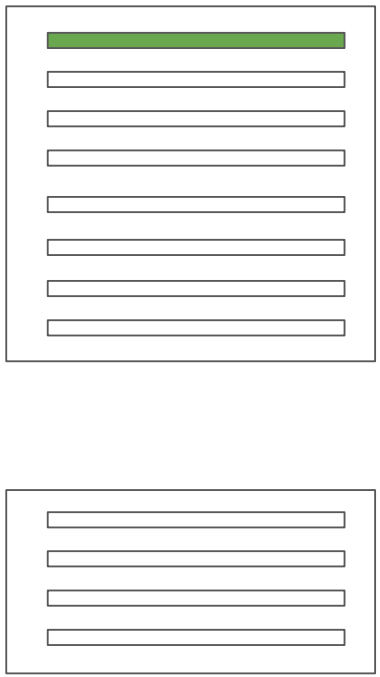

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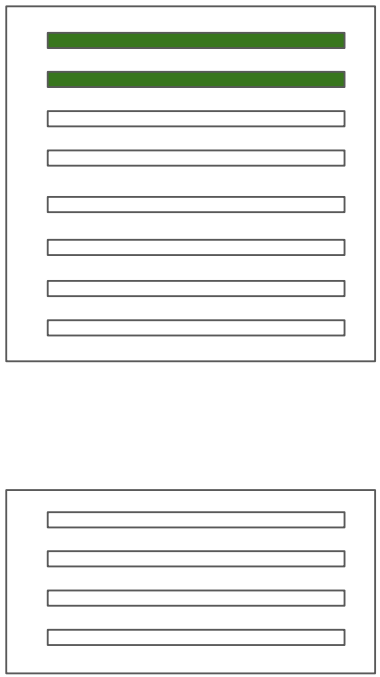

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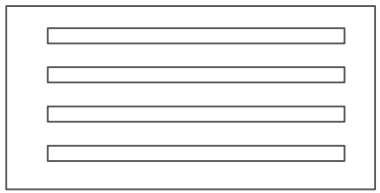

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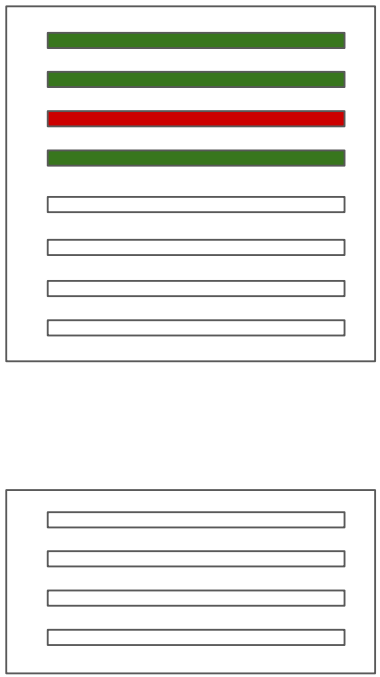

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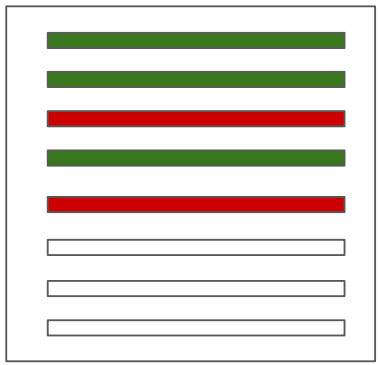

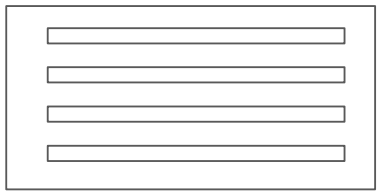

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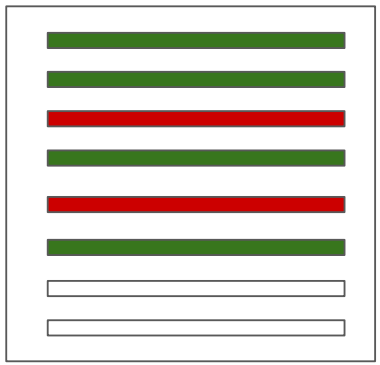

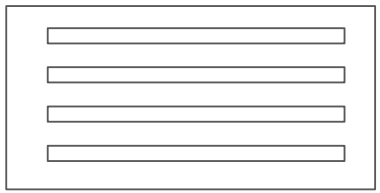

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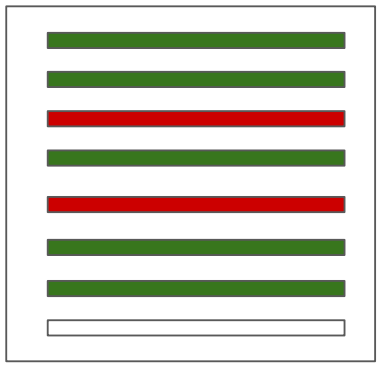

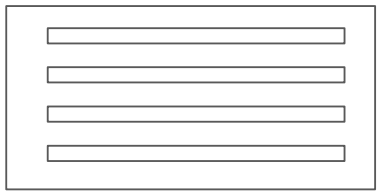

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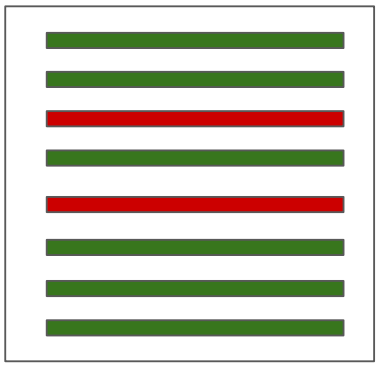

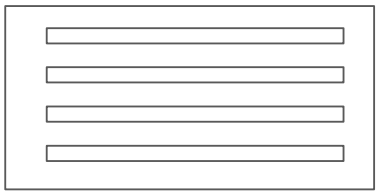

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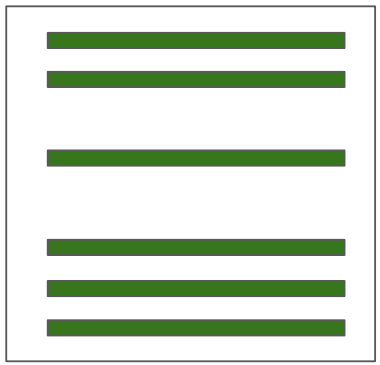

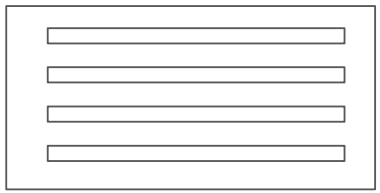

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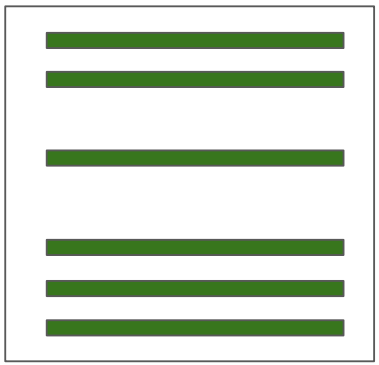

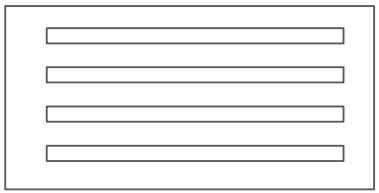

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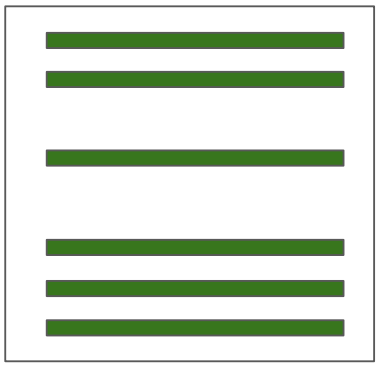

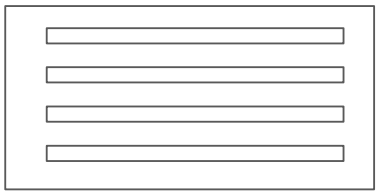

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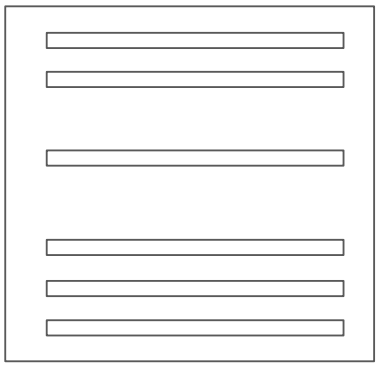

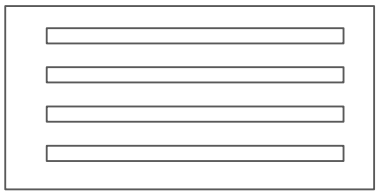

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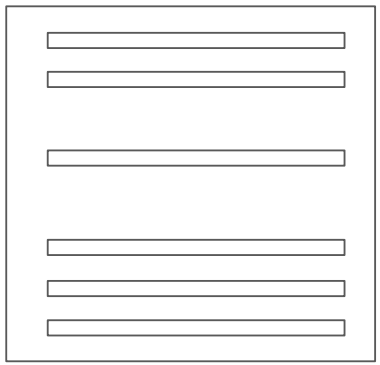

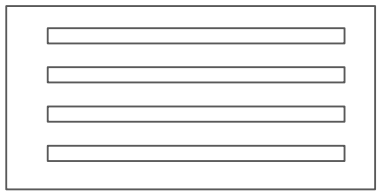

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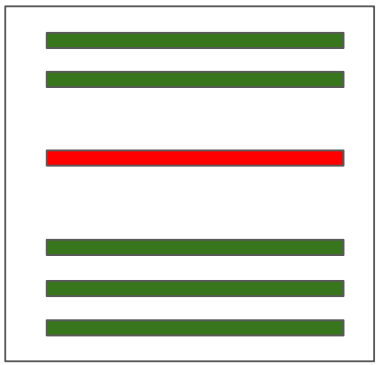

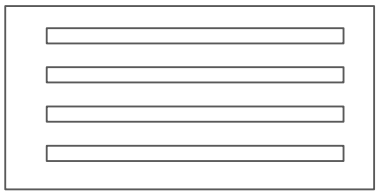

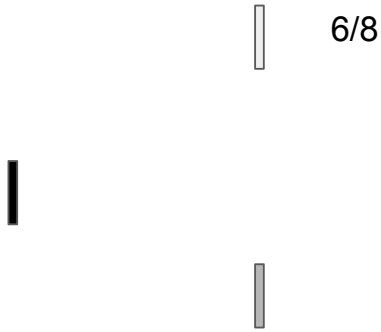

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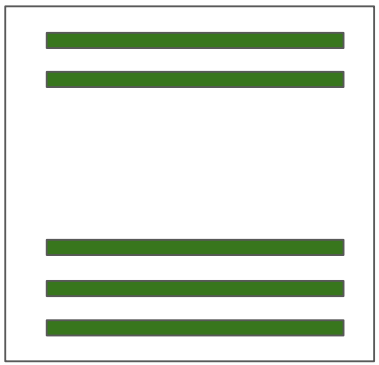

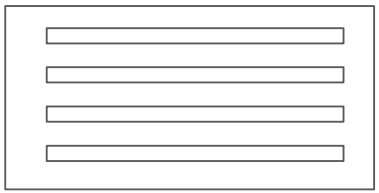

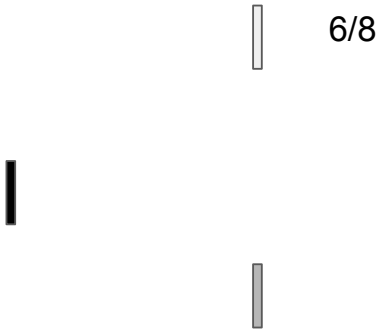

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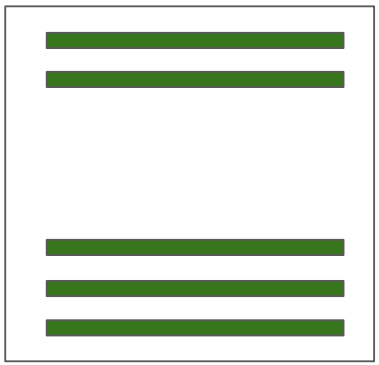

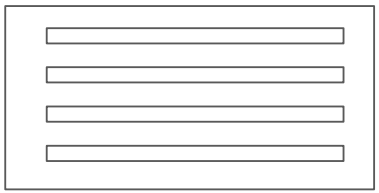

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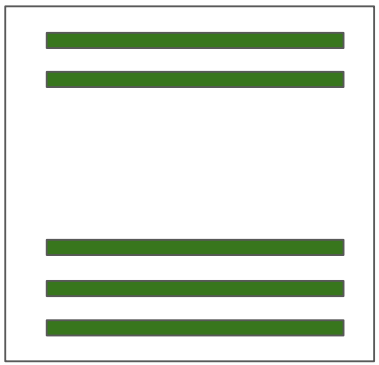

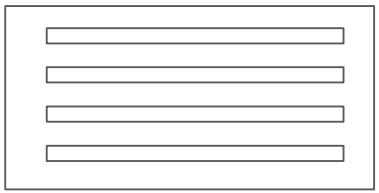

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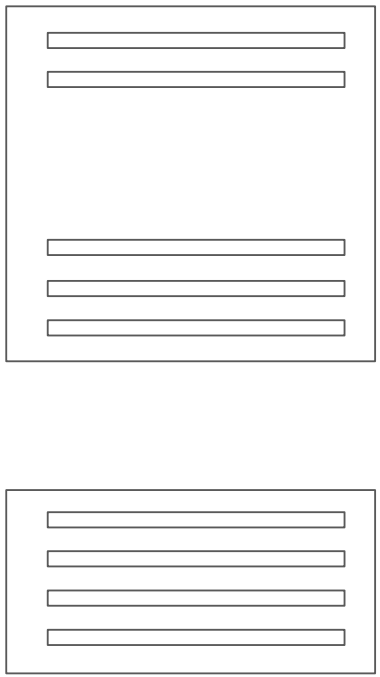

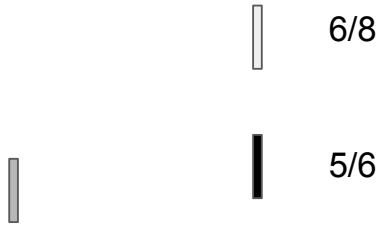

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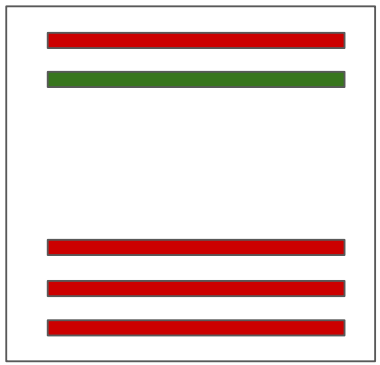

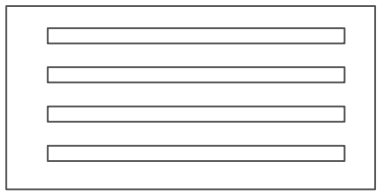

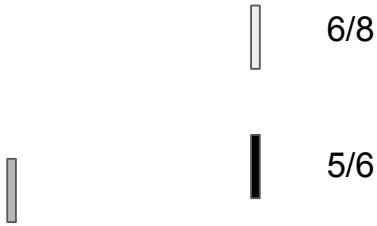

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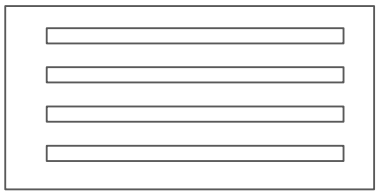

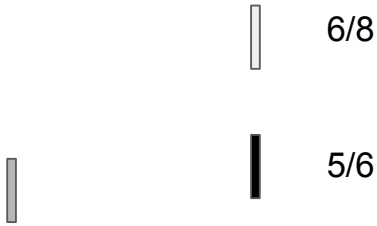

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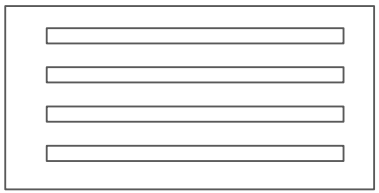

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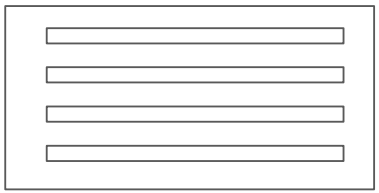

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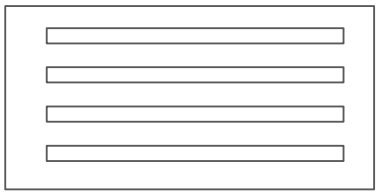

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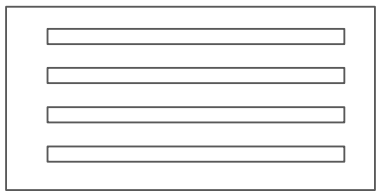

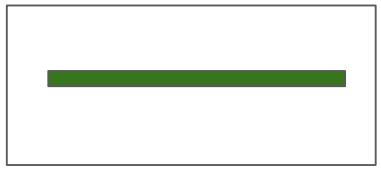

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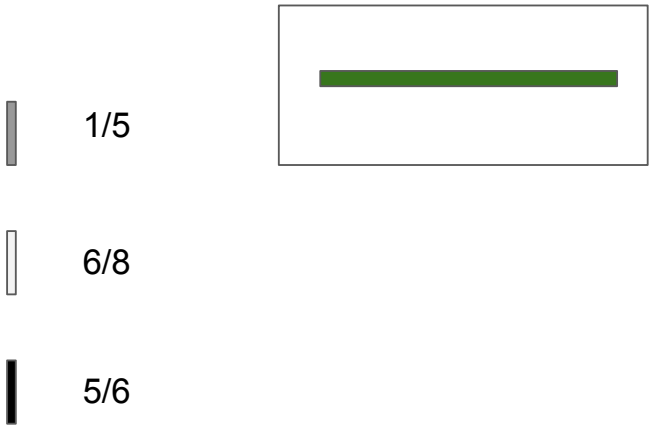

- Using statistics from all previous batches
- Just the previous k

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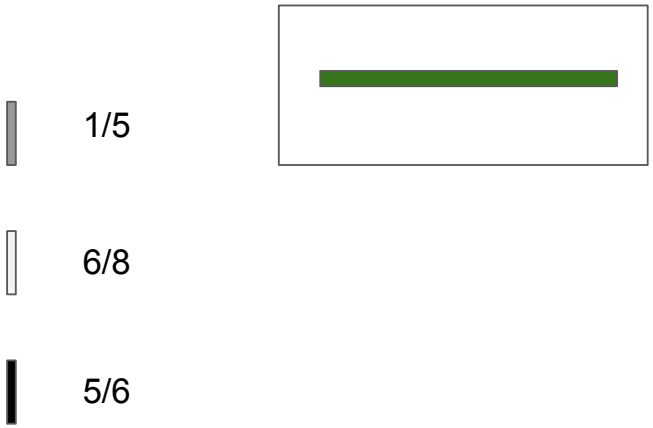
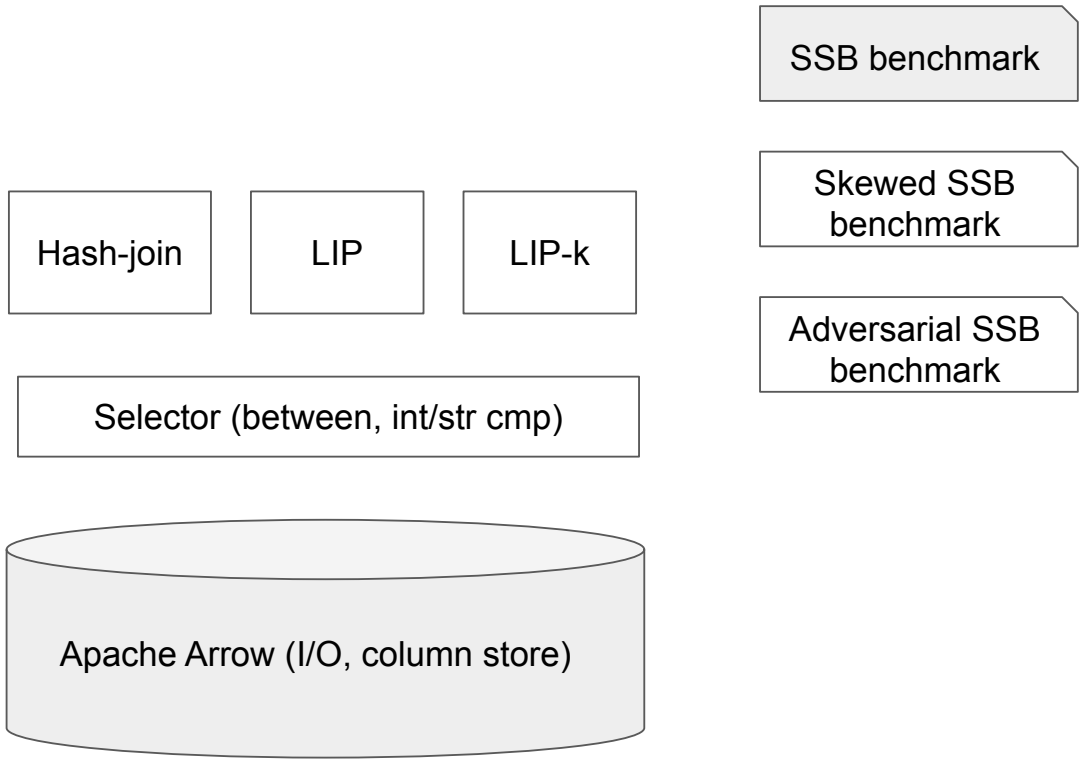


- Using statistics from all previous batches
- Just the previous k — LIP-k

Implementation and benchmarking



Experiments

LIP is solving an online problem

- Tuples arriving one at a time
- Upon arrival, decide a sequence of filters
- Minimize the total probes
- Deterministic!

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Theorem

Let n be the number of filters in the LIP problem. There is no deterministic mechanism $\mathcal{M}$ achieving a competitive ratio less than n for the LIP *problem.*

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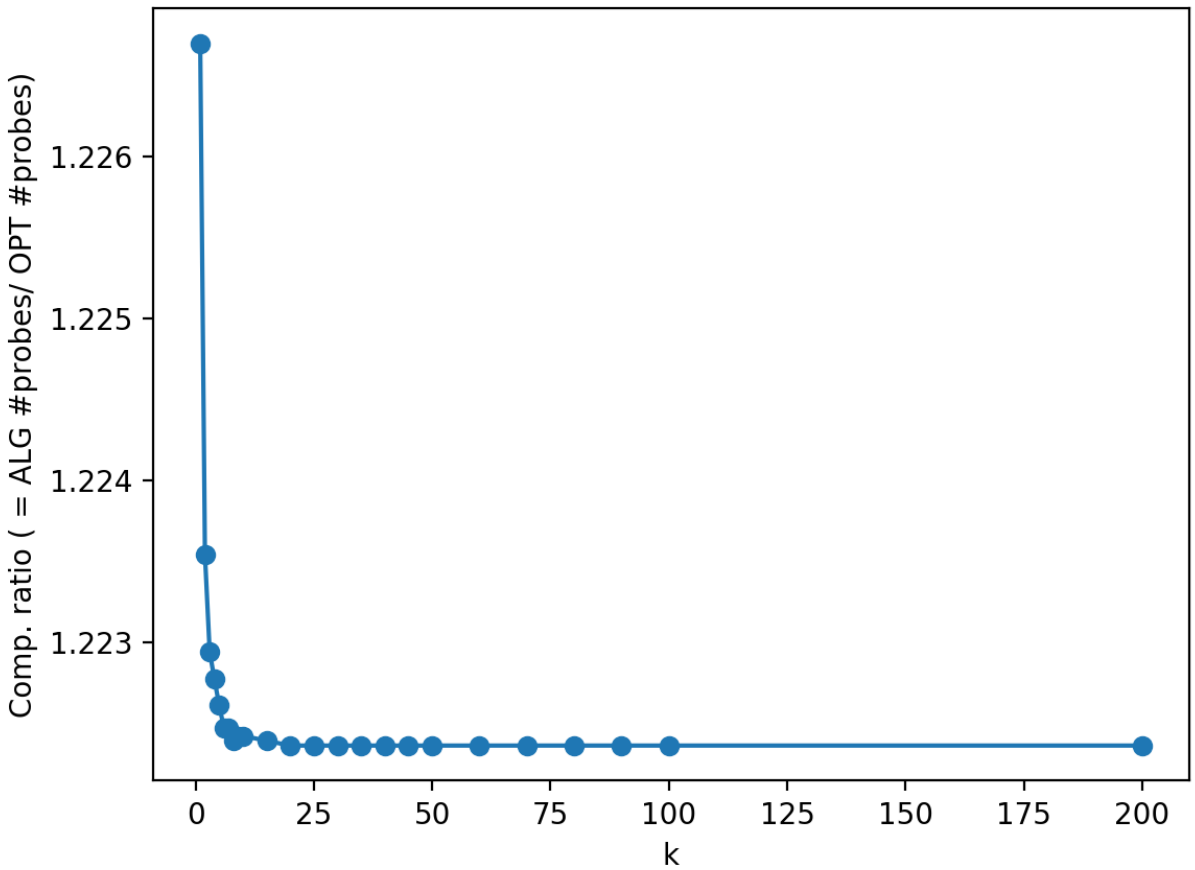
Theorem

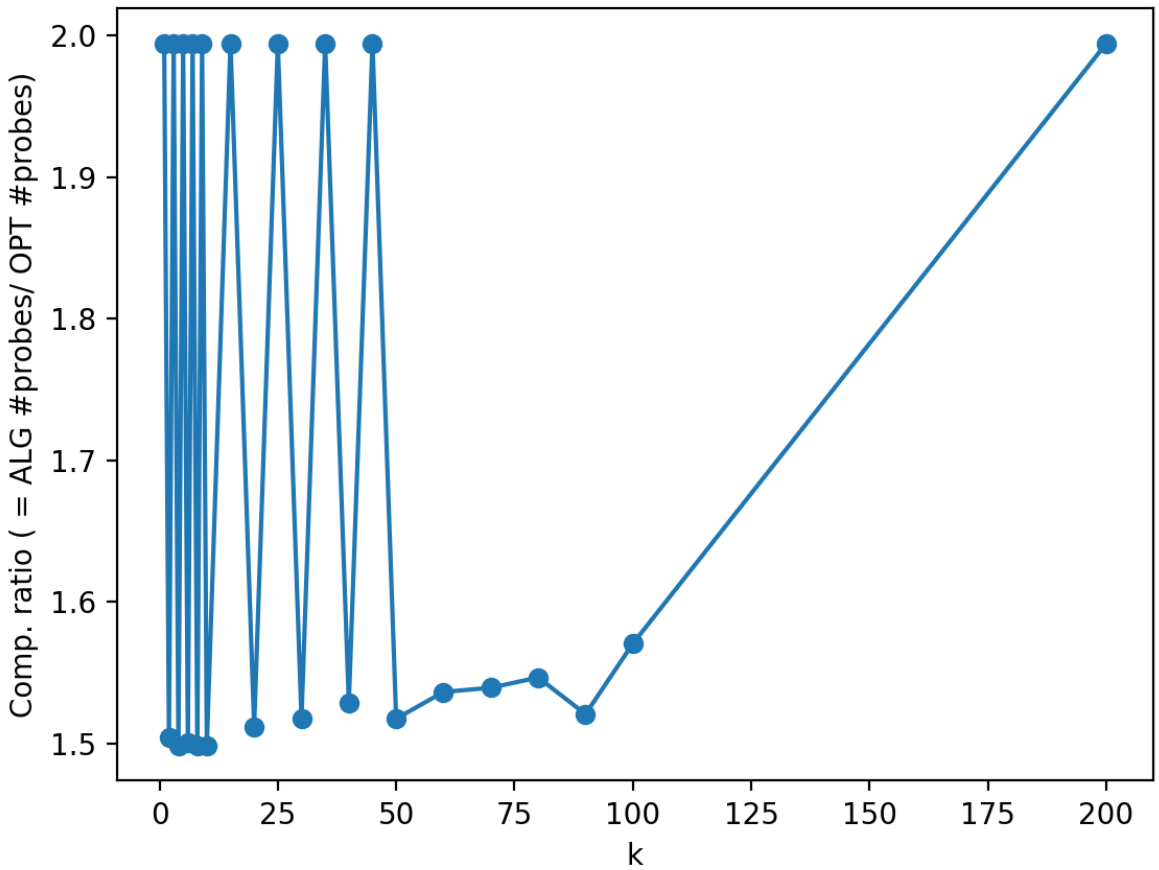
Let n be the number of filters in the LIP problem. There is no deterministic mechanism $\mathcal{M}$ achieving a competitive ratio less than n for the LIP *problem.*

- Not observed in practice, but a theoretical lower bound
- Randomness?

Competitive ratio vs. k on Uniform



Competitive ratio vs. k on skewed



Conclusion

- Implemented LIP and its variant LIP-k
- LIP-k is better than LIP in the adversarial/skewed settings
- Randomness to achieve better robustness guarantee

Thank you!

Questions?