Benchlex: A Benchmark for ALEX

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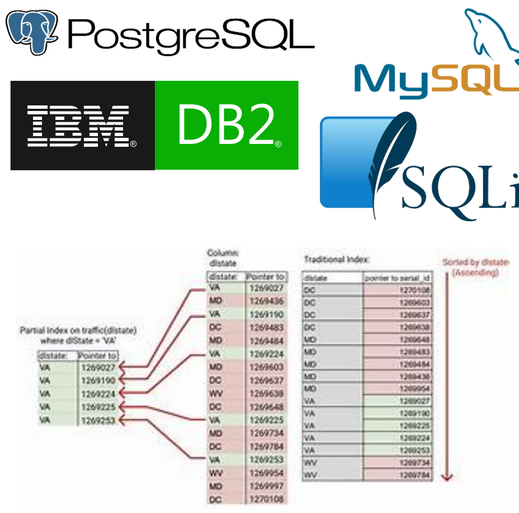
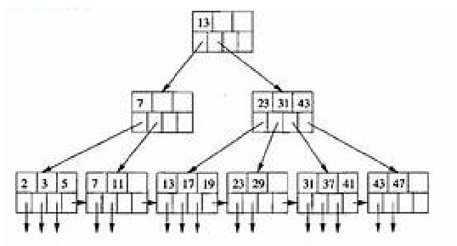
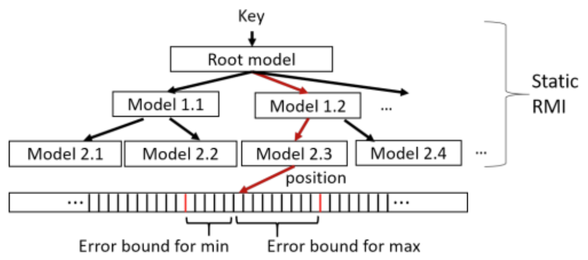
Traditional Indexes

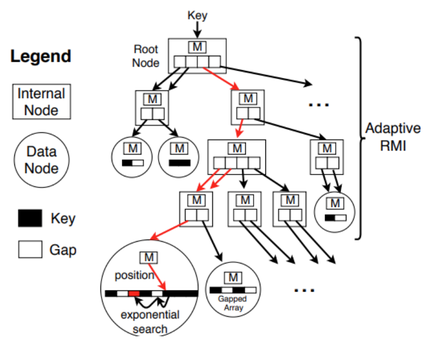


Indexes are ubiquitous in society to store important data.

Learned Indexes







Learned Indexing replaces conventional indices.

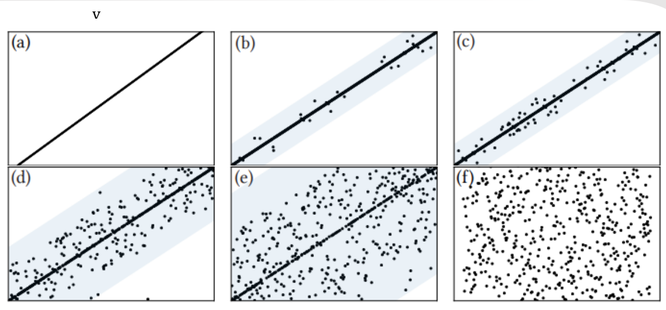
The recursive model index guides queries to other machine learning models and then the result.

ALEX: An Adaptable Learned Index, accommodates for updates.

Sortedness

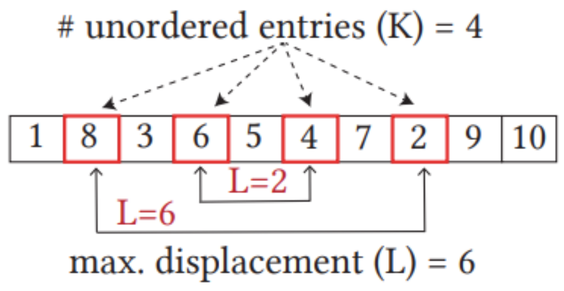
How sorted is the data? Sortedness - how scrambled the dataset is

Real world datasets are often nearly sorted



Key vs. Position

<u>BoDs Sortedness Benchmark</u>:
K - total displaced keys
L - maximum displacement of any key



Benchmarking ALEX with BoDs

Experimental Process

Generate a dataset with BoDs → **Build a C++ Benchmark in ALEX to read the BoDs dataset** → **Plot Performance using Python MatPlotLib**

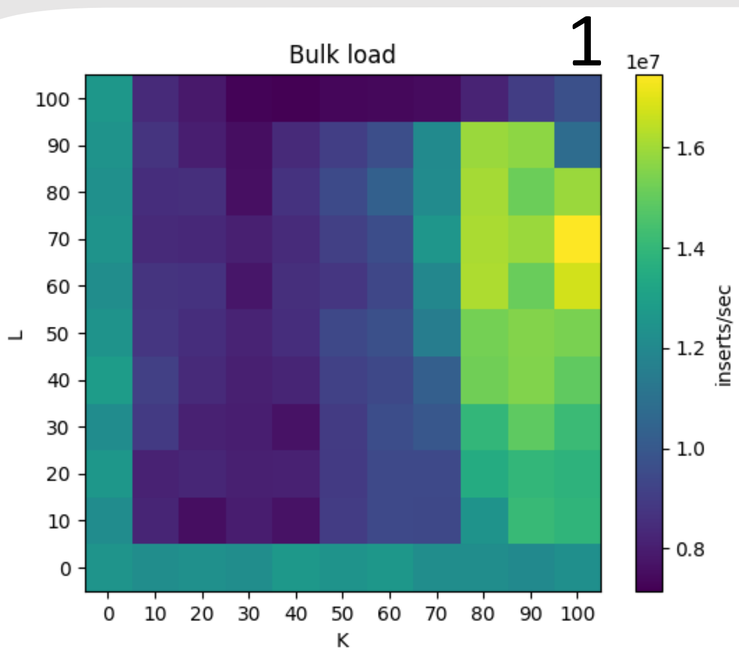
Experimental Values

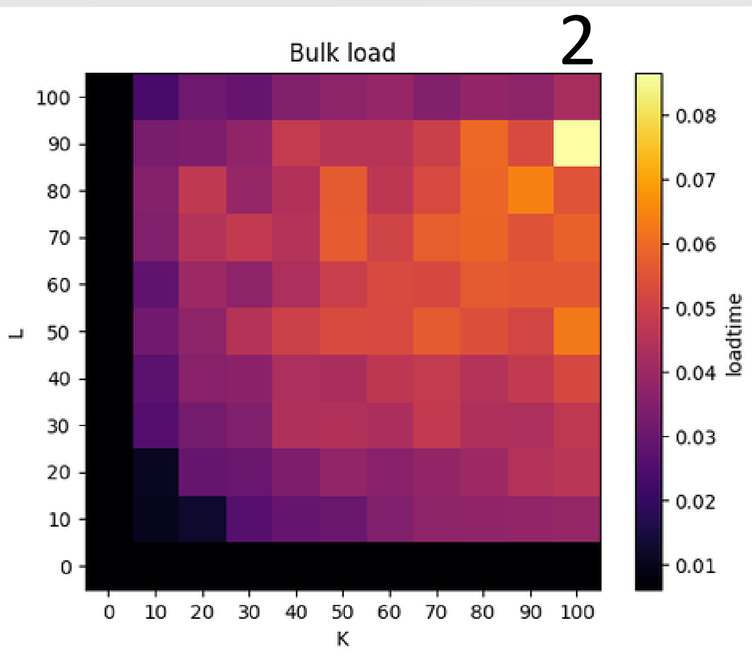
<u>Sortedness</u>: Values from 0-100% on both K and L **[graphs below]**

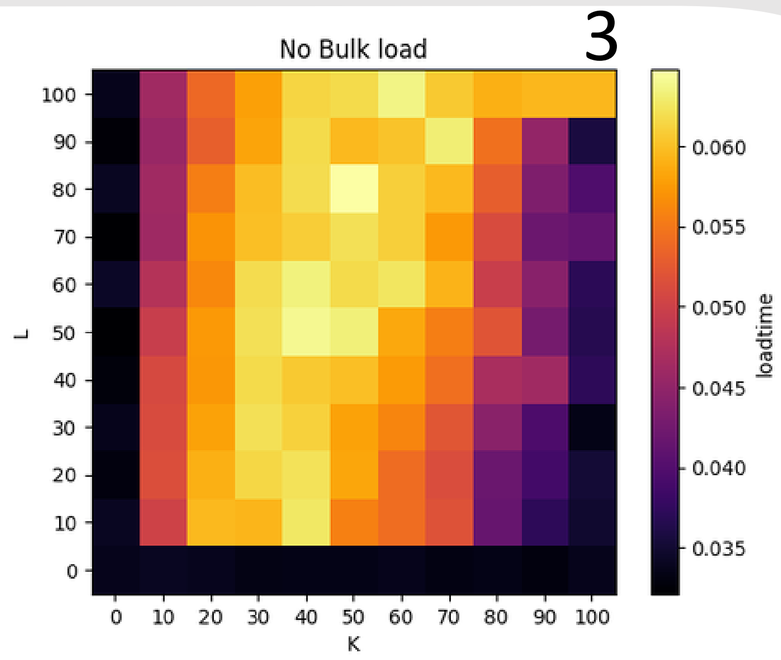
<u>Data Set</u>: On different sizes of data.

<u>Bulk Loading</u>: Pre-sorted and inserted in bulk instead of individually. Without bulk loading, individual inserts are learned.

Results







Observations

Mostly Unsorted data is quicker → **Machine Learning performs better on random data**

Completely sorted datasets performed well, as expected. (K=0 or L=0)

Large K, Small L is locally unsorted, so it is as fast as fully sorted in graph 3.

Bulk loading has a much quicker overall load time than individual inserts.

Conclusion

ALEX learns better on randomized data as shown in an increase of performance with greater sortedness.

Without bulk loading (graph 3), it is easy to learn locally unsorted data, and therefore, load time is almost as quick as in fully sorted data.

<u>Future Inquiry</u>

How does ALEX's learning model interact with bulk loaded datasets and single insert datasets?

How can this be adapted to take advantage of near sorted data which is more relevant?

References

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https://github.com/BU-DiSC/BenchLex.git