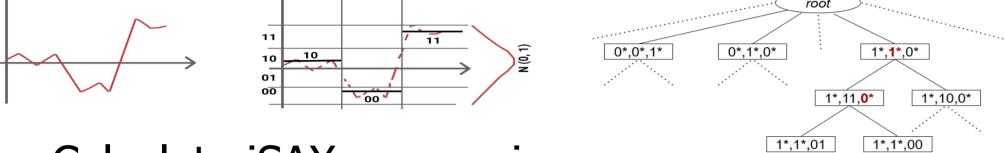
FRESH: A Lock Free Data Series Index

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Motivation and Challenges

Data Series Many Applications Seismology Astrophysics Neuroscience Engineering etc.

Data Series Processing



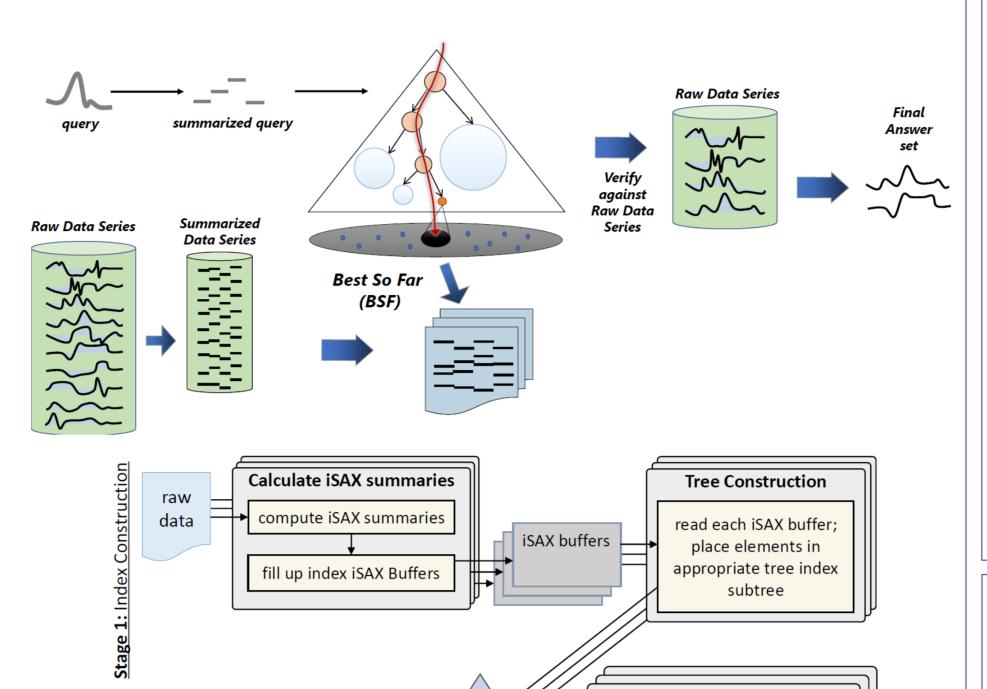
Calculate iSAX summaries

Similarity Search

Find the most similar series of a collection to a query series

thread 1

How an iSAX data series index works



Search

calculate real distance

1-NN answer

in expeditive mode

(while not helped)

in standard mode,

(if helped)

Blocking Implementations



- Use of locks
 - Convoying
 - Priority Inversion
 - Restricted Parallelism
 - Thread holding the fails

Transform to non-Blocking Implementations

- Some sort of helping is needed.
 - Helping is costly
 - Adds complexity
 - It's not always easy to implement.

Refresh

process part

Search

traverse index

build priority queue(s)

acquire parts

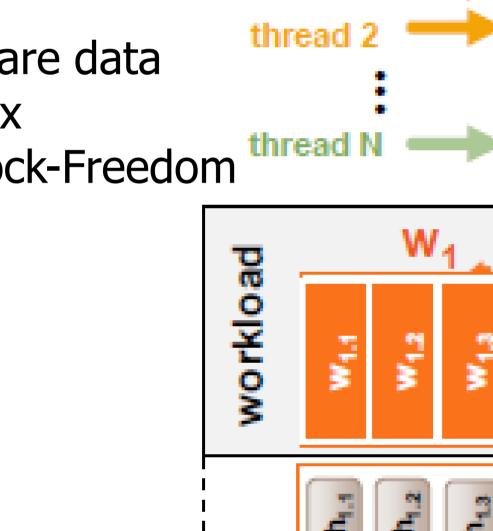
(one after the other,

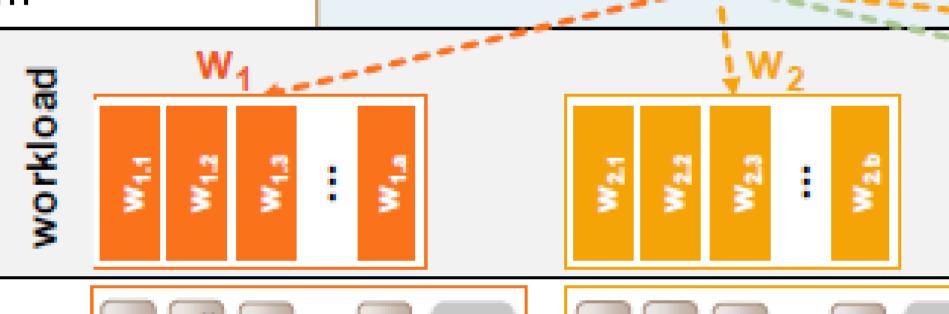
using a counter object)

Generic approach

 Applicable to any blocking locality-aware data series index

Ensures Lock-Freedom





mark helped part as processed

mode (set d_s)

help unprocessed parts in standard (set h₃)

set helper flag of unprocessed part

helping stage

mark part as

processed

(set d_i)

if no more parts to

acquire,

go to helping phase

scan for

unprocessed parts

(read d₁,...,d_k)

for each

unprocessed

part

Evaluation

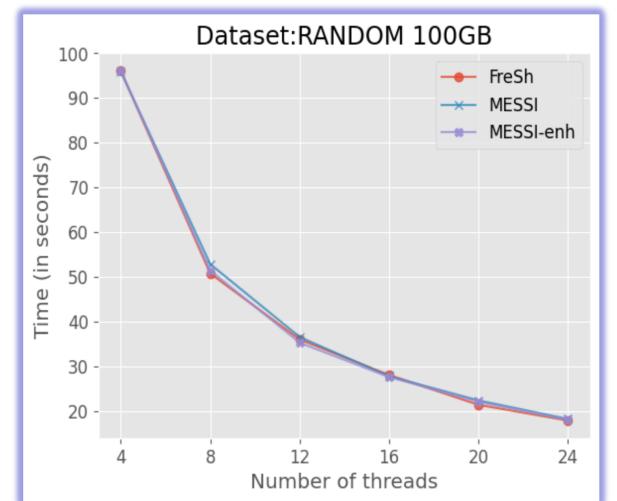
Results

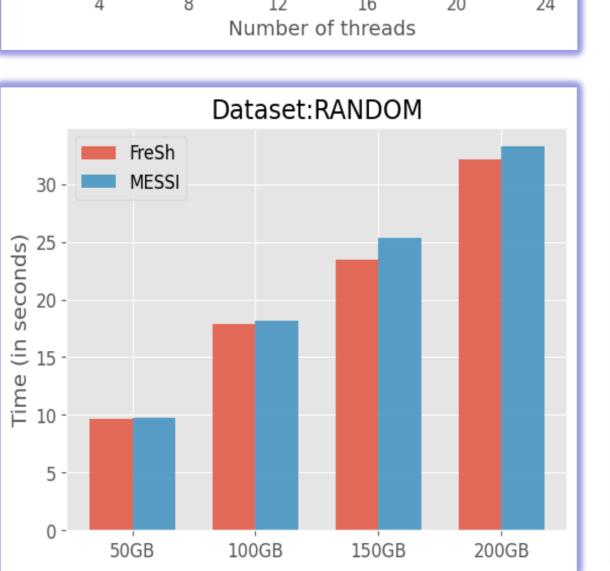
Configurations and Datasets

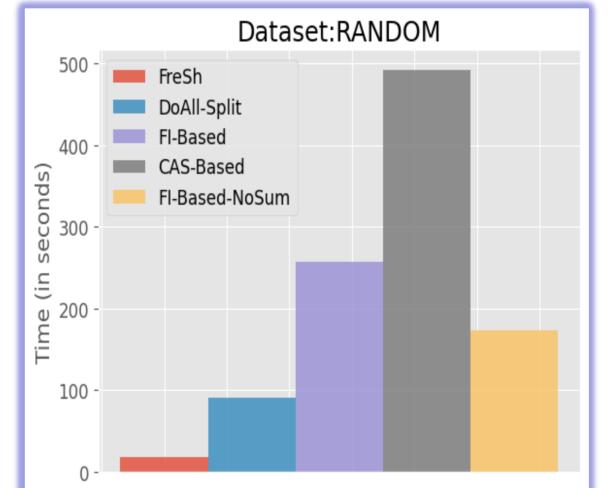
- Compared with optimized SOTA MESSI index.
- Use both synthetic and real datasets.

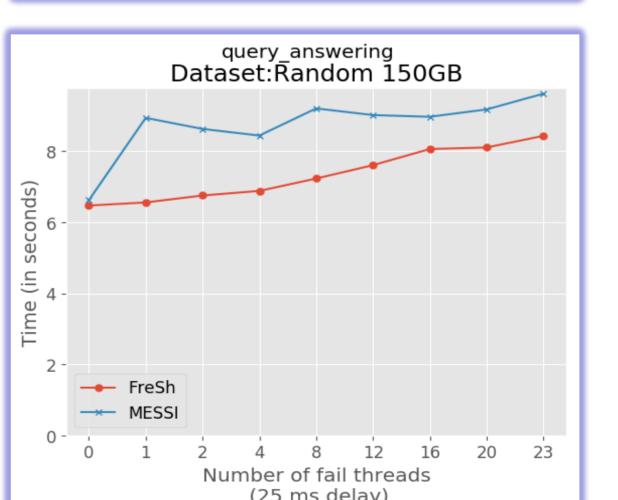
Experimental Findings

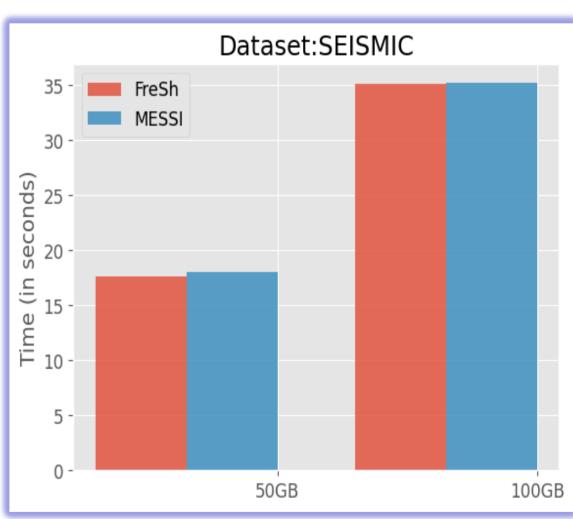
- FreSh performs as good as the SOTA blocking index.
- No penalty for providing lock-freedom.
- FreSh outperforms by far several lock-free baselines we have designed.
- In case of delays achieves better performance.

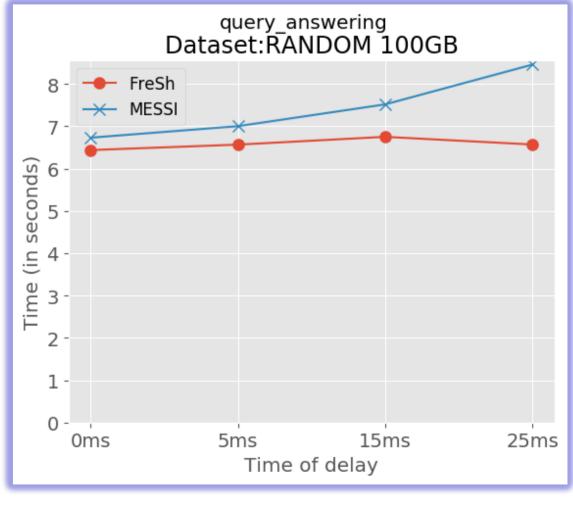




















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