Sensitivity Analysis

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Summary

A sensitivity analysis with 4 datasets and 5 applications has been performed to have an Increased understanding of the relationships between input and output variables in a system.

Input variables: graph size, prefetcher, replacement policy

Output variable: LLC miss rate.

Datasets

Slashdot Dataset

Slashdot is a technology-related news website know for its specific user community. The website features user-submitted and editor-evaluated current primarily technology oriented news.

Number of Nodes	77360
Number of Edges	905468
Diameter (Longest Shortest Path)	10
90-percentile effective diameter	4.7
Type	Directed

Epinions Dataset

This is a who-trust-whom online social network of a general consumer review site Epinions.com. Members of the site can decide whether to "trust" each other. All the trust relationships interact and form the Web of Trust.

Number of Nodes	75888
Number of Edges	508837
Diameter (Longest Shortest Path)	14
90-percentile effective diameter	5
Type	Directed

Dblp Dataset

The DBLP computer science bibliography provides a comprehensive list of research papers in computer science. It constructs a co-authorship network where two authors are connected if they publish at least one paper together.

Number of Nodes	425957
Number of Edges	1049866
Diameter (Longest Shortest Path)	21
90-percentile effective diameter	8
Type	Undirected

Gowalla Dataset

Gowalla is a location-based social networking website where users share their locations by checking-in. The friendship network is undirected and was collected using their public API.

Number of Nodes	50515
Number of Edges	819090
Diameter (Longest Shortest Path)	14
90-percentile effective diameter	5.7
Type	Directed

Applications

Breadth-First Search (BFS)

This BFS implementation makes use of the Direction-Optimizing approach [1].

Connected Components (CC)

This CC implementation makes use of the Afforest subgraph sampling algorithm [2].

Connected Components (CC_SV)

This CC implementation makes use of the Shiloach-Vishkin [3] algorithm with implementation optimizations from Bader et al. [4].

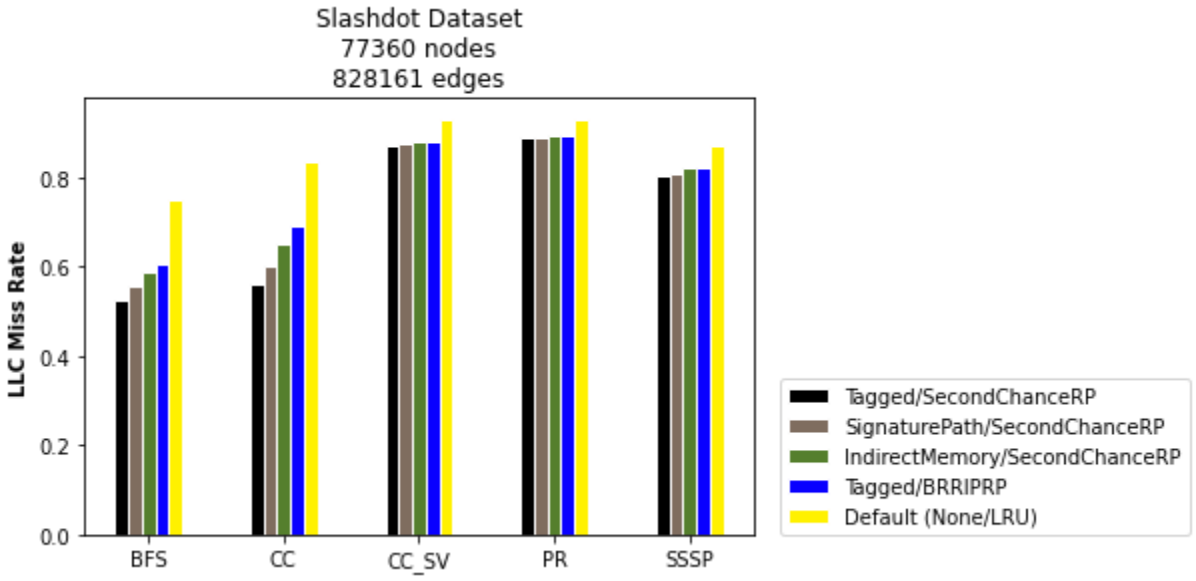
Page Rank (PR)

This PR implementation uses the traditional iterative approach.

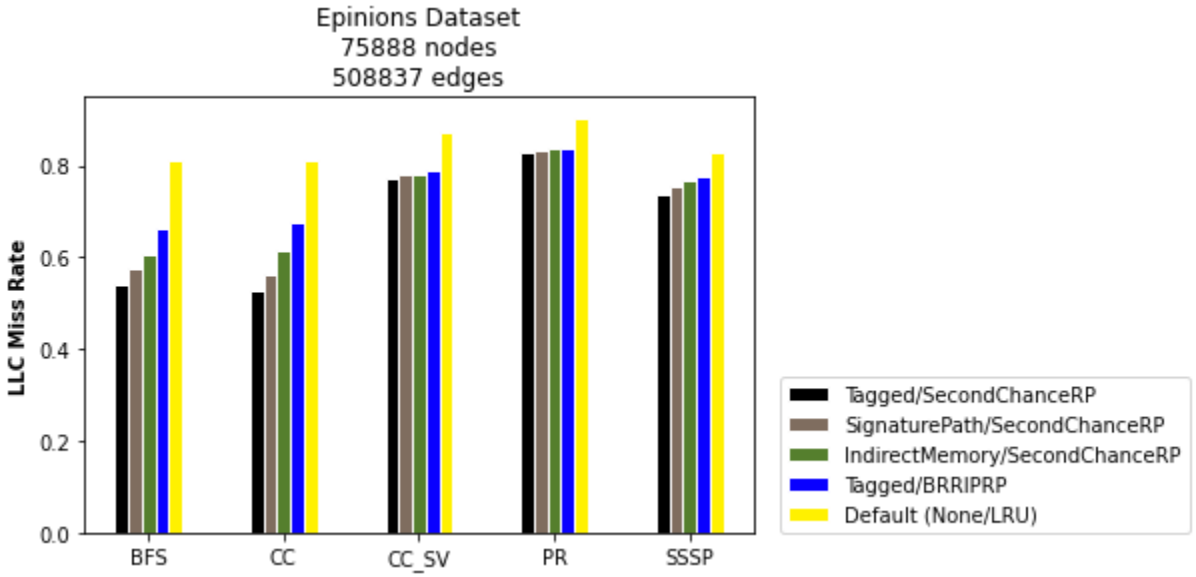
Single Source Shortest Path (SSSP)

This SSSP implementation makes use of the Δ-stepping algorithm [5].

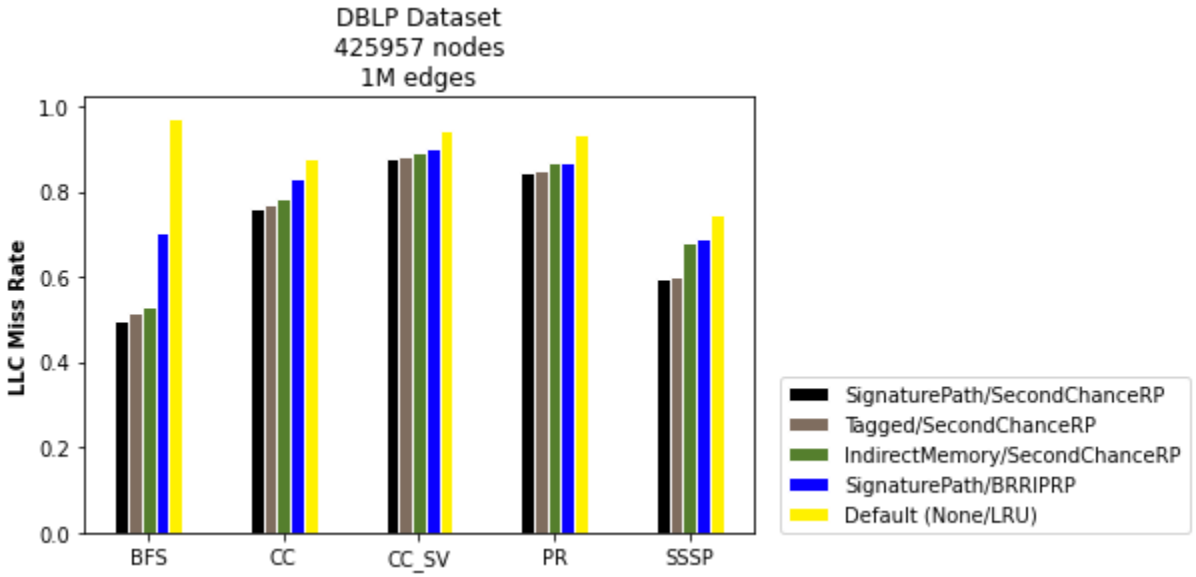
Results



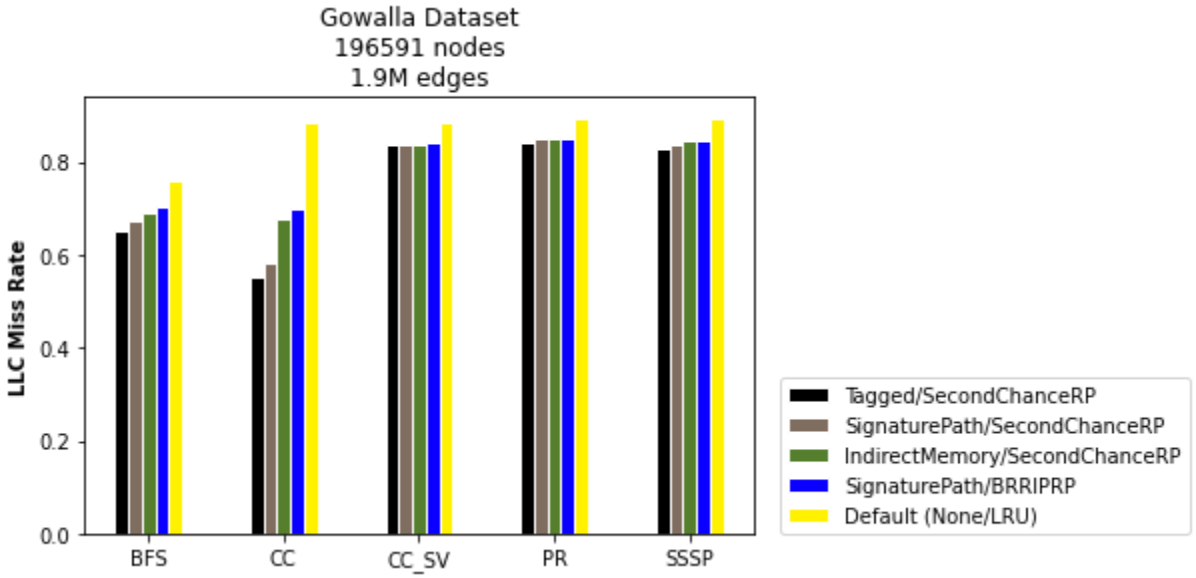
	Default	Tagged/SecondChanceRP	SignaturePath/SecondChanceRP	IndirectMemory/SecondChanceRP	Tagged/BRRIPRP
BFS	0.748423	0.525052	0.558751	0.588292	0.606446
CC	0.837282	0.561367	0.6	0.650704	0.691732
CC_SV	0.928267	0.893658	0.891136	0.876161	0.880064
PR	0.930235	0.899028	0.893188	0.890874	0.892922
SSSP	0.869364	0.801879	0.809855	0.846231	0.819807



	Default	Tagged/SecondChanceRP	SignaturePath/SecondChanceRP	IndirectMemory/SecondChanceRP	Tagged/BRRIPRP
BFS	0.81128	0.539218	0.575377	0.606988	0.663788
CC	0.812321	0.527175	0.563273	0.61334	0.676248
CC_SV	0.8727	0.823381	0.820147	0.805258	0.779469
PR	0.903583	0.839574	0.836246	0.827588	0.837741
SSSP	0.828615	0.738026	0.752557	0.808971	0.769559



	Default	Tagged/SecondChanceRP	SignaturePath/SecondChanceRP	IndirectMemory/SecondChanceRP	Tagged/BRRIPRP
BFS	0.972542	0.528286	0.515376	0.496283	0.706281
CC	0.879928	0.758552	0.768606	0.785342	0.838289
CC_SV	0.942018	0.88229	0.878804	0.889557	0.907787
PR	0.933353	0.849124	0.843484	0.869014	0.866496
SSSP	0.745035	0.601948	0.598279	0.719454	0.695563



	Default	Tagged/SecondChanceRP	SignaturePath/SecondChanceRP	IndirectMemory/SecondChanceRP	Tagged/BRRIPRP
BFS	0.75888	0.651075	0.675026	0.733543	0.688945
CC	0.886265	0.552715	0.582304	0.675658	0.698945
CC_SV	0.884983	0.845873	0.839478	0.836064	0.846165
PR	0.894537	0.8523	0.843465	0.849513	0.852334
SSSP	0.891739	0.83055	0.83922	0.864494	0.847548

Conclusions

- Using a prefetcher for LLC decreases LLC miss rate.
- Tagged Prefetcher - Second Chance Replacement Policy combination usually performs the best for the applications and datasets used.

References

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