CS-683 project presentation

Designing a Cost-Effective Cache Replacement policy using Machine learning

Team : Paradox Bits

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agenda

introduction

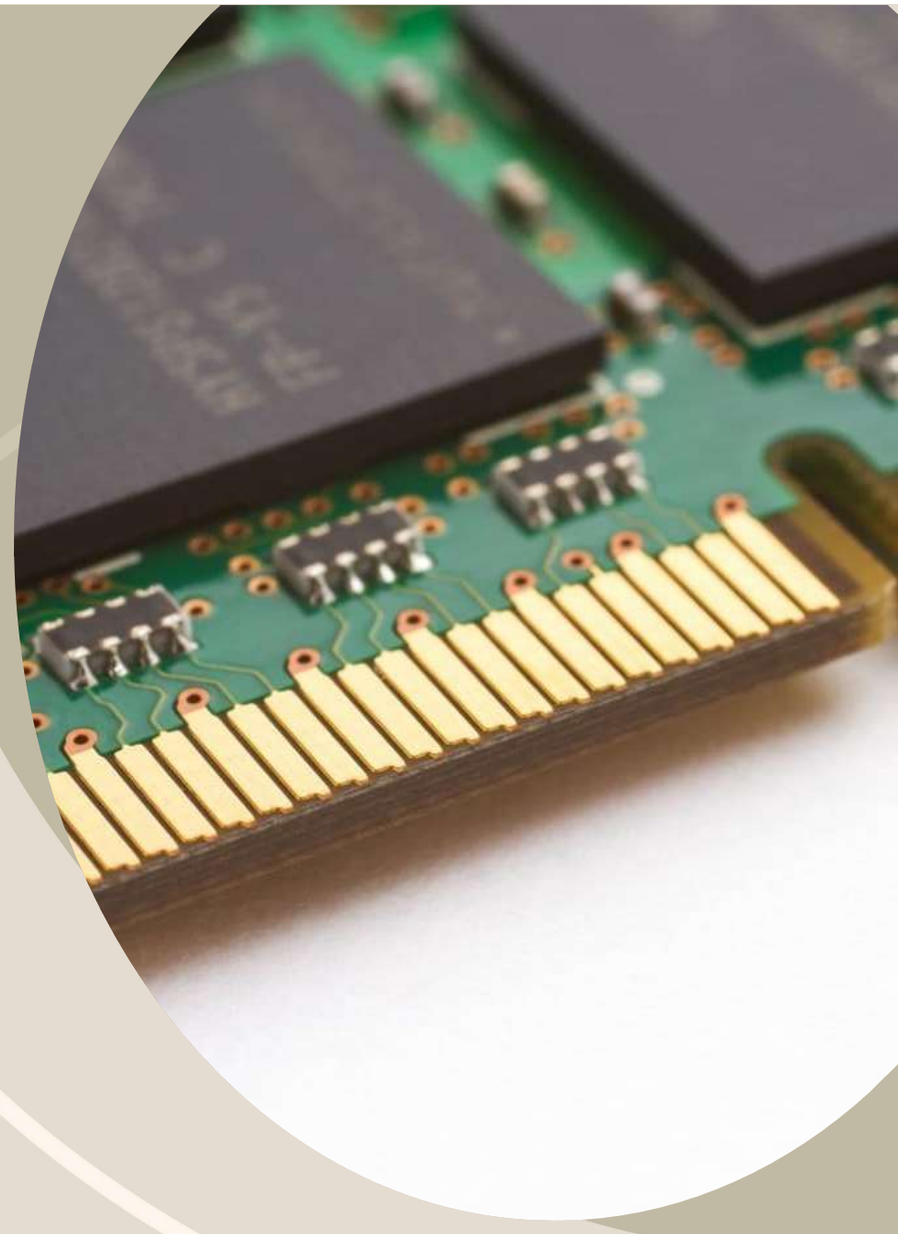
- What this project is all about???

→To design a robust and cost-effective cache –replacement policy.

- How ??

→By training a Learning Agent using MLP, by rewarding decisions close to Belady.

→By observing MLP weights, the replacement policy is designed.



work in progress...

- Implementation of RLR policy in champSim for shared LLC cache.
- Finding benchmarks with a varied range of LLC MPKI values.
- Making tracefiles compatible to train the learning agent in python based cache simulator.

technicalities

BENCHMARKS CURRENTLY BEING USED:

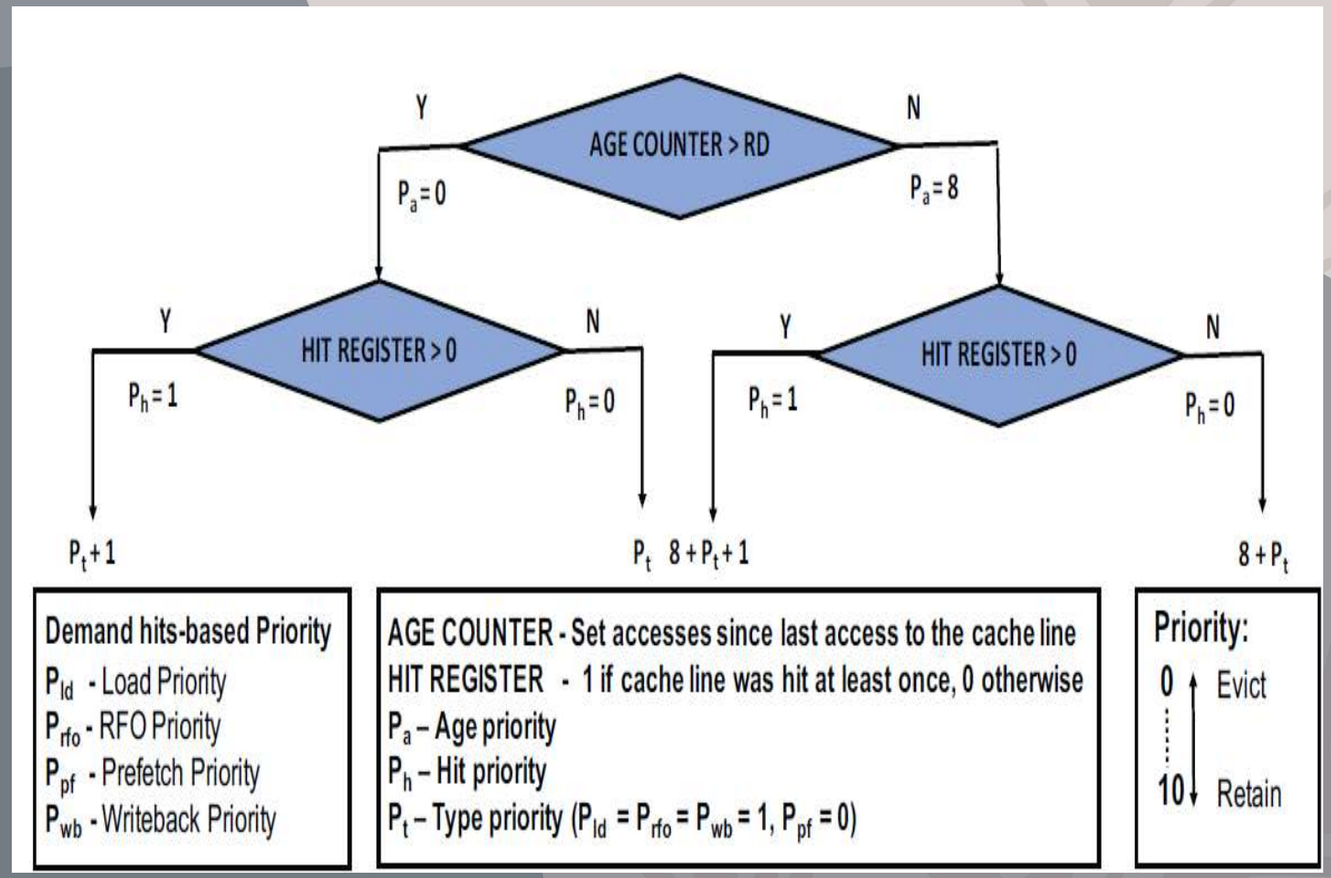
459.GemsFDTD,
403.gcc,
429.mcf,
450.soplex,
470.lbm,
437.leslie3d,
471.omnetpp,
483.xalancbmk

FEATURES USED TO TRAIN MLP:

Feature
offset
preuse
access type
set number
set accesses
set accesses since miss
offset
dirty
preuse
age since insertion
age since last access
last access type
LD access count
RFO access count
PF access count
WB access count
hits since insertion
recency

about RLR policy...

- reuse distance is predicted based on preuse distance of cache lines. Cache lines with age less than predicted distance are protected.
- When a replacement decision is made, the cache lines in the set are assigned priority levels.
- On a cache miss, the cache line with the lowest priority will be evicted.



things to do...

- Finishing off the work in progress.
- Implementing Deep Reinforcement Learning and matching our insights with the RLR replacement policy.
- If time permits, making modifications to RL model for better results.

thank you