Research on CAT

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From our class to the state-of-the-art

- Improvements
- Value-based CAT
- Empirical model-based CAT
- Specialized CAT
- Better compiler structures
Improvements of our algorithms

- Alias analysis with
  - higher accuracy
  - Faster
  - Less memory consumption
- Better heuristics for
  - When to inline
  - When to unroll/peel/etc...
  - When to apply transformation X
- Better inter-procedural CAT
  - Better summary nodes
  - Better contexts
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Value-based CAT

• Static value range CAT

• Profile-guided CAT
  • Use training inputs

• Dynamic CAT
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Empirical model-based CAT

• Autotuner
  • Typically: heuristic drives the CATs
  • Instead: use ML-based techniques to generate the model that drives the CATs

• Superoptimizers
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Specialized CAT

• Domain-specific CAT

• Hardware-specific CAT
  • Parallelism extractions

• Programming language-specific CAT

• Hardware-software co-designed CAT
From our class to the state-of-the-art

• Improvements

• Value-based CAT

• Empirical model-based CAT

• Specialized CAT

• Better compiler structures
Better compiler structures

• Better compiler constructions
  • LTO
  • Better PassManager

• Certifying compilers

• Better IRs
Are you interested?

Advanced Topics in Compilers

talk to me (independent studies/projects)