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

• Improvements

• Value-based CAT

• Empirical model-based CAT

• Specialized CAT

• Better compiler structures
Value-based CAT

• Static value range CAT

• Profile-guided CAT
  • Use training inputs

• Dynamic CAT
From our class to the state-of-the-art

• Improvements

• Value-based CAT

• Empirical model-based CAT

• Specialized CAT

• Better compiler structures
Empirical model-based CAT

• Automatically tuning CAT (autotuner)

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

- Improvements
- Value-based CAT
- Empirical model-based CAT
- Specialized CAT
- Better compiler structures
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)