

程序代写代做 CS编程辅导



# CSCI-GA-2130: Compiler Construction

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# Instructor

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# What is this about?

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- Compilers translate programming languages to machine code.



- How do we structure a compiler to be:
  - Correct
  - Maintainable
  - Extensible

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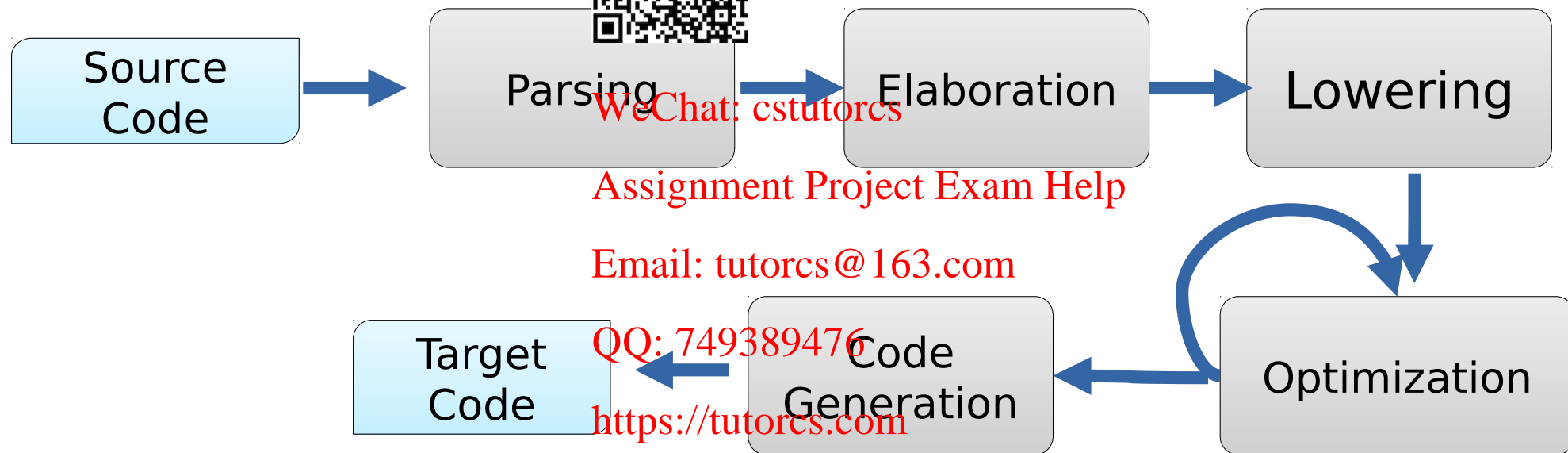
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# Compiler Architecture

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# Front End

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- Convert a string to a data structure:
  - Lexing: Convert raw characters into list of **tokens**
  - Parsing: List of tokens into abstract syntax tree

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Strings/Files



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Tokens

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Abstract  
Syntax Trees

# Elaboration

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- Type-checking
- Resolve variables/modules/names
- Check other “well-formedness” properties



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Untyped  
Syntax Trees

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Typed  
Syntax Trees

# Lowering

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- Translate high-level features into lower-level constructs:

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E.g. while/for replaced by “goto”

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Typed Syntax  
Trees

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Intermediate  
ASTs

# Optimization

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- Make code more efficient:



- Remove “dead” code

- Simplify computations (replace  $3+6$  with  $9$ )

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- Reuse repeated computations

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# Code Generation

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- Convert Intermediate code to target:
  - Register Allocation
  - Instruction Selection



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Intermediate  
AST



Machine Code

# Required Background

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- Officially:

- CSCI-GA 1170, CSCI-GA 2110, and CSCI-GA 2250.

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- Unofficially:

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- Passing familiarity with basic computer systems/architecture

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- Willingness to work hard to fill gaps

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# Administrative Details

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- Website: BrightSpace\*

- Assignment submission: GradeScope

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- ~9 assignments determine the entirety grade.

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- 3 late days total throughout semester

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- See collaboration policy on website

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# Programming Environment

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- OCaml

- Functional programming language, very good for writing compilers
- Intensive introduction in first week

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- SPIM

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- Simulator for MIPS assembly language

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# Resources

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- No official book, but there are many references about OCaml and compilers



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- Closest to what we're doing:

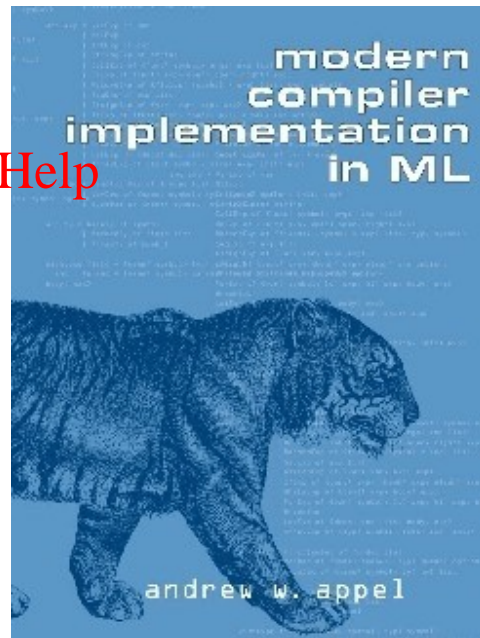
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Modern Compiler  
Implementation in ML  
by Andrew Appel



# Assignments (Tentative)

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0. Ocaml warm-up

1. MIPS Simulator

2. Fortran-ish → MIPS

3. C-ish → MIPS

4. Scheme-ish → C-ish

5. ML-ish → Scheme-ish

6. Optimization

7. Control-Flow Graphs

8. Register Allocation



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# Learning Outcomes

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- Understand how compilers work:



- What can they do?

- What can they not do?

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- Lots of functional programming experience

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- Thinking of languages as an extensible programming interface

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