# Welcome to cs655 - 801 (Spring-2020)

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- Office hour: TBD
- Room: EMS 9th floor computer lab
- Slides: [github.com/amir734jj/cs655-lecture-notes]
   (https://github.com/amir734jj/cs655-lecture-notes)

## Compiler Steps (according to textbook)

- Front-end:
  - Lexical analysis
    - Tokenizing
  - Syntax analysis
    - Parsing
  - Semantic analysis
    - Name resolution, binding, type-checking
    - Optimize AST
    - Intermediate code generation
- Back-end
  - Code generation
    - Machine independent code generation
    - Target code generation
    - Machine specific code generation

## **Essential Concepts**

- AST
- BNF / E-BNF (Option, Repetition, Grouping, Concatination)
- Visitor pattern

# **Reading Recommendations**

- Cool manual
- Textbook
- optional textbook "Dragon Book"

## Cool

#### **Subset of Scala**

Cool or "Classroom Object Oriented Language" is a:

- static (not dynamic): types are determined at the compile-time as oppose to runtime
- strong (not weak): restrictions for type conversions
- manifest (not inferred): variable types are explicitly defined as oppose to implicit

# Cool (Cont.)

### More about "static" aspect.

Types are defined (or deduced) in AST (or Abstract Syntax Tree) before code is generated.

In dynamic languages like Python, JavaScript types are derived at the run-time hence, REPL

(or Read–Eval–Print-Loop).

## More about "strong" aspect.

There is no pointer in Cool but we have reference type variables (Any, ArrayAny and etc.). All types

extend Any (actually Any extends Nothing but that is a special type). Moreover, we can only

extend one type in Cool unlike C++ multiple interihance is not allowed.

Cool is strongly typed because we can only type convert between types that are possible. For example:

In the following we should **not** be able to pattern matching from c to String (in one step):

```
Nothing -> Any -> | A -> B -> C
| String
| ArrayAny
```

# Cool (Cont.)

#### More about manifest.

Unlike Scala which is a super-set of Cool, we have be explict about types. Scala comes with "duck" typing.

```
var i : Int = 234;
```

# **Cool syntax vs Java (part #1)**

```
public class HelloWorld {
    public static void main(String[] args) {
        System.out.println("Hello, World");
    }
}
```

```
class Main() extends IO() {
          out("Hello, World");
    }
}
```

### **Vector**

Very similar to ArrayList in Java but not thread-safe and resizes by doubling the size as oppose to increase the size by half.

- Vector
  - size(): Int
  - add(Any): Unit
  - clear(): Unit
  - elements(): Enumeration
- Enumeration:
  - next(): Any
  - hasNext(): Boolean