5118014 Programming Language Theory

Ch 2. Scala Basics

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Functional Programming

- a declarative programming paradigm where computation is defined as function evaluation rather than sequential updates of program states by statements

- functional programming is to construct programs using only pure functions which have no side effects

Example

- find the greatest value in a finite list of positive integers, L

```
int i ;
int greatest = 0 ;
for (i = 0 ; i < len(L) ; i++){
  if (greatest < L[i])
    greatest = L[i] ;
}
```

```
max(L) {
  L[0] if len(L) == 1,
  L[0] if len(L)>1 && L[0] > max(L[1:]),
  max(L[1:]) if len(L) > 1 &&
     L[0] <= max(L[1:])
}
```

Functional Programming Paradigm

- Immutability
  - avoid variables, data structures, and objects being mutable
- First-class function
  - use a function as a value
- Pattern-matching
  - use a condition on the structure of data

Functional Programming in Industry

- widely adopted in parallel and distributed processing
  - e.g., Akka, Apache Apark
- powerful for constructing automatic reasoning systems
  - e.g., Facebook Infer