CS245: A Brief Introduction to Haskell
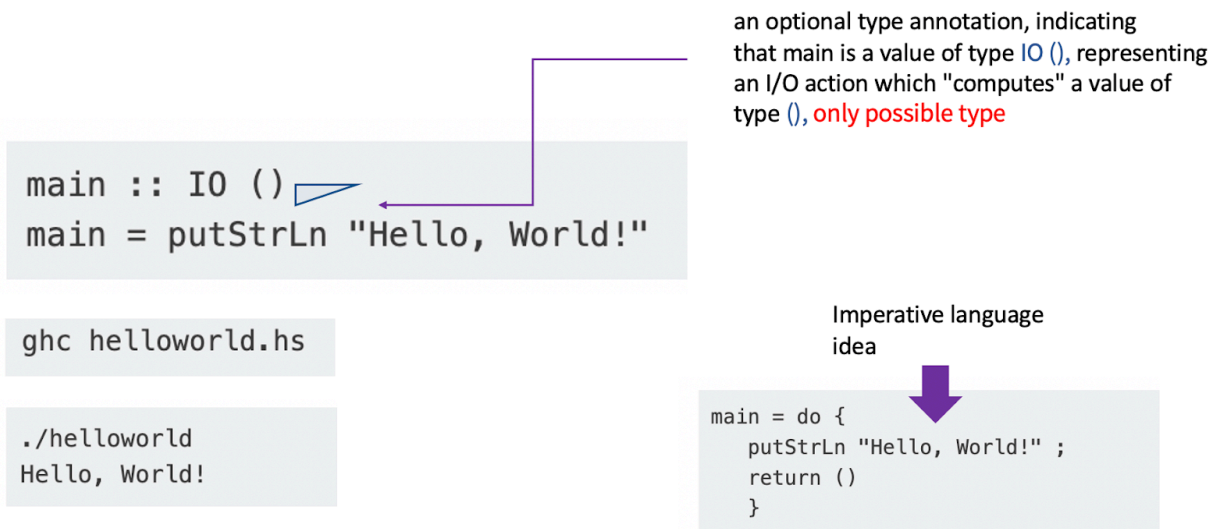
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1. History of Haskell

- Haskell was named after Haskell B. Curry, an American mathematician and logician.
- This language is widely used in academia and the industry.
- Haskell ranks at the 44th place on TIOBE Index for September 2020
- Haskell ranks at 25th place on the Ranking Programming Languages by GitHub users chart.

2. Some Key Features of Haskell

- Haskell is a purely functional language:
    - Remember: functional languages focus on the computation, not the "how to"!
    - Different between this and Java/C:

an optional type annotation, indicating that main is a value of type IO (), representing an I/O action which "computes" a value of type (), only possible type

```
main :: IO ()
main = putStrLn "Hello, World!"
```

```
ghc helloworld.hs
```

```
./helloworld
Hello, World!
```

Imperative language idea

```
main = do {
    putStrLn "Hello, World!" ;
    return ()
    }
```

- The program is a function!
- Variables and Assignments aren't useful as variables are assigned on the go!
- Haskell is statically typed: Type determined at runtime instead of before runtime (Just like Java!)
    - Code compiled more quickly
    - Class errors are caught early.
- Haskell uses type inference: The user does not have to explicitly state every type in a program. Instead, the type of variables or functions is automatically inferred.
- Haskell uses lazy evaluation (also called call-by-need): Functions don't evaluate their arguments. An expression will only be evaluated when its value is needed. This:
    - Reduces running time, memory usage becomes hard to predict

- o Allows for processing infinite data and bypassing undefined values (e.g results of infinite loops)
- Haskell is immutable and concurrent:
  - o Immutability: Once a variable is assigned in Haskell, it's immutable. This helps "reduc[ing] coupling between components, simplif[ing] concurrency and parallelism, and decreas[ing] the total number of moving pieces in a system, making it easier to maintain and develop over time." (Snoyman, 2017)
  - o Concurrency: Allow multiple threads to be run at the same time.
- Haskell has garbage collection, like Java: garbage collector collects unused objects, freeing up spaces.

Sources:

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