

# 1.5 The World of Programming Languages

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- You may be used to doing these things with a graphical windowed interface (dragging and dropping, etc.).
  - But the shell is still around and is useful for many things.
  - We can be very precise about what we want and automate some low-level tasks.

## Shell Script (cont.)

- Depending on your operating system, there may be variations in the commands and format that you will use.

```
#!/bin/sh
language=0
echo "Language $language: I am the shell. So there."
```

## Data-Oriented Languages

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- These languages treat data as a principal unit of analysis.
- They do what they do well but struggle to do more. They make poor general purpose languages.

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  - Other tasks may be difficult to perform (or slow, or messy...).

```
language <- 1
print(paste("language ", language,
           ". I am R, I make datasets easy to work with.", sep =
           ""))
```

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  - E.g., before we can use a variable like `language` in C++, we have to declare it with a statement like `int language = 2`. This allocates enough memory to store an integer and cannot be changed.
  - C++ is statically typed. This means that once we declare `language` to be an integer, it can never hold another type of data.

## C++ (cont.)

- This helps performance but reduces flexibility.

```
#include <iostream>
using namespace std;
int main() {
    int language = 2;
    cout <<"Language " << language <<\
        ": I am C++! Pay no attention to that C behind the
    curtain!" <<\
        endl;
    return(0);
}
```

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- It's very verbose. You must explicitly state how different program components interact with each other.
  - This is restrictive but makes for organized code.

```
public class Overlord {  
    public static void main (String[] args) {  
        int language = 3;  
        System.out.format("Language %d: I am Java! Scarier  
than C!\n", language);  
    }  
}
```

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### 1. Perl

```
my $language = 4;
print "Language $language: I am Perl, the camel of
languages.\n";
```

### 2. Ruby

- Popular because of web development in Ruby on Rails.

```
language = 5
puts "Language #{language}: I am Ruby, ready and aglow."
```

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- It uses lots of parentheses and Polish notation.
- "Lisp" stands for "LISt Processing."
- It has a steep learning curve but is very expressive.

```
(defn hello-world [lang-number hello-to]
  (println
    (str "This is Language " lang-number ". Hello " "World
to " hello-to)))

(hello-world 6 "Clojure")
```

## Python

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- It's gained popularity rapidly since it's so fast to develop in, and programmers generally like using it.

```
language = 7  
print("Language %s: I am Python. What's for supper?" %  
      language)
```

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- Worse performance than C or Java
  - But the interpreter has been optimized a lot, and the gap is not significant for most applications.

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  - That's changing, and most data analysis tasks are now easy to do in Python.
  - The syntax of Python is also clean and easy to deal with, and errors are a lot easier to debug.
  - If you're analyzing data as part of a larger system, Python makes the general programming part a lot easier.

**Python vs. R (cont.)**

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- The answer is ultimately unclear.
  - Python and R both have their strengths and weaknesses.

