4DN4
Advanced Internet Communications

Choosing a Programming Language

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Lecture Videos: on Avenue-to-Learn.

Choosing a Programming Language

- An important part of this course is teaching you how to program web-based applications, like Youtube, Skype, Instagram, Whatsapp, etc

- We have explored these web-programming languages in 4DN4 in the last 5 years:
    - C, C++, C#, Objective-C:
    - JAVA

- For 4DN4 assignments we use MATLAB, which is fairly easy to use

- No web-programming language has proven to be really easy to learn

- We usually use an 'Integrated Development Environment' (IDE) for each language, and just finding and installing an IDE can take a few days

- This year, the prof. will use C, PYTHON and MATLAB

Why C and Python ?

- C is one of the most widely used programming languages, despite its shortcomings

- JAVA is a great object-oriented web-programming language, but it has a steeper learning curve compared to MATLAB and JAVA

- C and JAVA **use static data types** to declare the variables before they are used

- **Static data types** are great if you already know exactly what you plan to write in your software

- If you are exploring what to do, **dynamic data types** are easier: there is no need to declare a type for each variable before it is used; there is no need to declare each variable before it is used; just write what you want, ie

- X = 5   or   X = "hello world"

- This saves many lines of code, thereby reducing the number of syntax errors you can possibly make

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Why C and Python ?

- In C, you need to declare strings as character arrays, and you need to declare more complicated data-structures as 'records'

- In C, every string must be terminated with an invisible 'end of string' character, which is often '\0' or '\n'

- To compare 2 strings in C, we need to call a C function like:

  - strcmp(pointer to string1, pointer to string 2, length of 2 strings in bytes)

- If the strings are not properly terminated, the function will not work properly

- In C, you need to declare space for a data-structure/record; we also need to know how many bytes the data-structure takes, and you often need to zero out (clear) the data-structure memory before its used

- The clearing of memory requires a call to the Operating System (OS), with a pointer to the memory, and the number of bytes to clear

- C works at a **very low level of abstraction**, where all the details must be specified and managed by the programmer; hence, its often harder to program and debug

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Why Python and Matlab ?

- In PYTHON and MATLAB, dynamic data types are used

- You can write anything you want

  - X = 'my dog' or X = 3.50 or Y = 3 or Y = 'my cat'

- You can easily compare 2 variables, without worrying about end-of-string symbols if they are strings, ie

  - If (X == Y) then do something

- If X and Y are different types, they wont be equal and everything works out

- The prof. has easily spent 10-20 hours each year when teaching 4DN4, debugging C code to manage strings and data-structures and types

- MATLAB, PYTHON and JAVA remove much of the burden of working at such a low level of abstraction

Why MATLAB for Assignments ?

- We need **a mathematical programming language** to perform an analysis of networks

- If you are exploring what to program**, dynamic data types** are easier: there is no need to declare a type for each variable before its used; there is no need to declare each variable before its used; just write what you want, ie

- X = 5 or X = "hello world"

- This saves many lines of code, thereby reducing the number of syntax errors you can possibly make

- MATLAB installs relatively easily, on many types of machine operating system : Windows 7, Windows 8, Windows XP, MAC OS 10.6, MAC OS 10.7, MAC OS 10.8, Linux

- PYTHON is pretty close to MATLAB too, so you can probably do all the assignments in PYTHON as well, without having to buy a student edition of MATLAB

How do Python and Matlab Compare ?

Python for scientists

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Python 3k
Python vs Matlab
Speed
Sitemap

Python vs Matlab

(from www.goggle.com)

Updated version at http://www.pyzo.org/python_vs_matlab.html

I believe that in many cases Python can replace Matlab. On this page I will try to explain the differences between Matlab and Python, and explain why I prefer Python.

Scientific Python distributions

But first a few links to help you get started quickly. You could be coding Python in a matter of minutes!

The easiest way to get started with scientific computing in Python is to use one of the distributions. In that way you automatically get most of the important scientific packages. Some distros also come with an IDE.

- Pyzo, free distribution based on Python 3, comes with the Interactive Editor for Python (IEP)
- python(x,y) and WinPython are two free distributions based on the Spyder IDE.
- Anaconda, Continuum's Python distribution. A free (community) edition is also available.
- EPD, Enthhoughts Python distribution. A free version is also available

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How do Python and Java Compare ?

Python vs Java: Key Differences

AUGUST 9, 2013 BY KASIA MIKOLUK

(from www.udemy.com)

Python and Java are two very different programming languages, but both can be useful tools for modern developers. If you are thinking about learning to program for the first time, then you might find Python easier to master. Python's syntax is designed to be intuitive and its relative simplicity allows newbies to quickly start writing code for a variety of applications. While Java has a steeper learning curve, it is extremely useful for developing applications that will run on any platform

How do Python and Java Compare ?

Dynamic vs Static Typing

One of the biggest differences between Python and Java is the way that each language handles variables. Java forces you to define the type of a variable when you first declare it and will not allow you to change the type later in the program. This is known as static typing. In contrast, Python uses dynamic typing, which allows you to change the type of a variable, by replacing an integer with a string, for example.

Dynamic typing is easier for the novice programmer to get to grips with, because it means you can just use your variables as you want to without worrying too much about their types. However, many developers would argue that static typing reduces the risk of undetected errors plaguing your program. When variables do not need to be explicitly declared before you use them, it is easy to misspell a variable name and accidentally create a whole new variable.

How do Python and Java Compare ?

Braces vs Indentation

Python is unusual among programming languages in that it uses indentation to separate code into blocks. Java, like most other languages, uses curly braces to define the beginning and end of each function and class definition. The advantage of using indentation is that it forces you to set your program out in a way that is easy to read, and there is no chance of errors resulting from a missing brace.

You can learn more about the unique features of Python in **The Ultimate Python Programming Tutorial**. This course will teach you to create clear, efficient code, as well as how to debug your applications after writing them.

How do Python and Java Compare ?

Speed vs Portability

The great advantage of Java is that it can be used to create platform-independent applications. Any computer or mobile device that is able to run the Java virtual machine can run a Java application, whereas to run Python programs you need a compiler that can turn Python code into code that your particular operating system can understand. Thanks to the popularity of Java for web applications and simple desktop programs, most devices already have the Java virtual machine installed, so a Java programmer can be confident that their application will be usable by almost all users. The disadvantage of running inside a virtual machine is that Java programs run more slowly than Python programs.
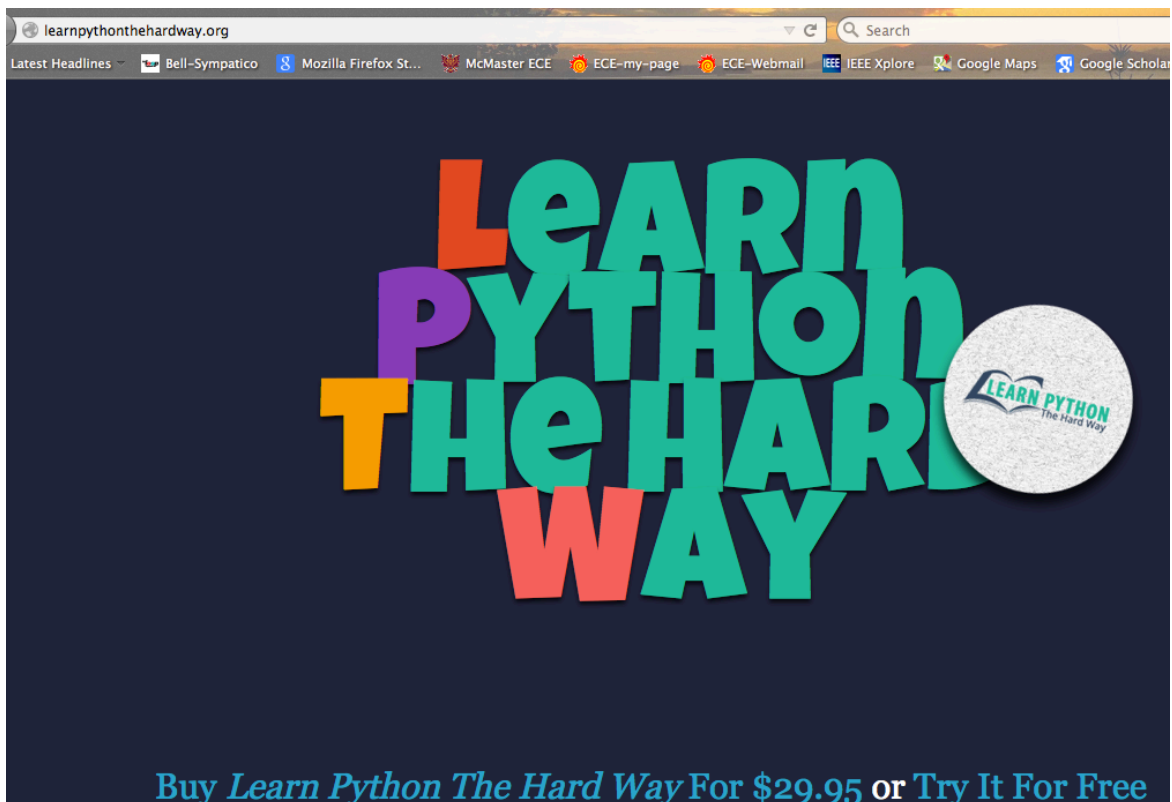
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Installing an IDE

- The Windows OS uses a **custom library** of socket code,

- The Windows OS does not use the default (unix-based) socket library, so extra attention must be paid to convert UNIX socket code to Windows socket Code, in any IDE

- Every term, some students using windows encounter the problem that the class socket code (unix based) does not work on the windows machines (the unix code needs some simple software changes to run on window)

- Installing an IDE can take several hours/days, depending upon the version of the IDE and the version of your operating system

- If you choose to install NETBEANS: When installing NETBEANS on Windows or the MAC OS, be careful about which versions you are installing: for example, try to use an older version (ie NETBEANS 7.2) if you are running MAC OS 10.6, otherwise it won't install !

- If you install PYTHON, it seems to be relatively machine and OS independent

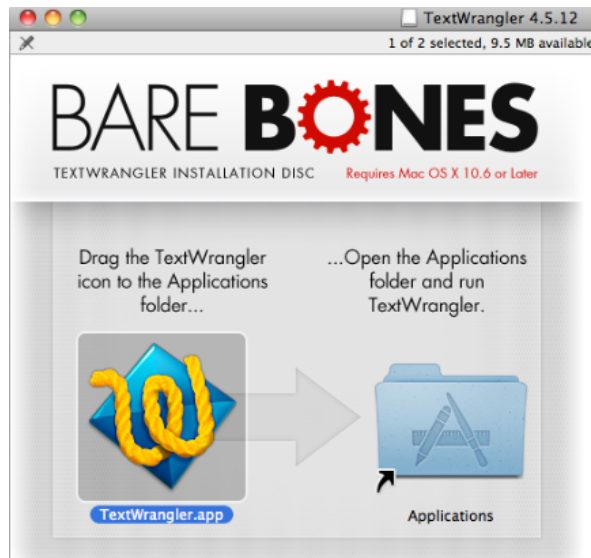- (for Python, see http:// learnpythonthehardway.org)

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Installing Python

- The prof. has never programmed in Python (not even one line)

- On Sunday Jan. 4. 2015, the prof. spent one hour installing Python on his laptop, and managed to complete several exercises from the online textbook 'http:// learnpythonthehardway.org'

- The prof. also managed to get a basic python client-server socket program running, all before the Canada vs Slovakia world junior hockey game

- This is quite amazing, when considering it often takes several hours just to install an IDE (and without learning a new language, and without getting a socket client-server program running)

- Based on this short 1 hour experience, the prof. will try using more Python (along with C) in the 2015 version of 4DN4

- Unfortunately, there is no concise textbook like' TCP/IP Programming in Python', since Python is pretty new and it takes years for someone to write a book on a new topic

- To try Python yourself, see http:// learnpythonthehardway.org ; you can buy the general-purpose python book, or use the online book for free

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http://learnpythonthehardway.org

- You will be asked to install Python version 2, and to install the BareBones TextWrangler text editor to create and edit Python code. You will be asked to open a unix command-line terminal window, where you can run python using the command line interface.

- There might be a nice IDE for Python, that runs on Windows/MAC OS X/Linux, but I have not found one yet.

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Installing Python

- The prof. made a short 1 hour video of his experience in installing and running Python on an Apple MAC computer (with OS 10.6.8)

- I could not install NETBEANS 8.0 on MAC OS 10.6.8, since the install requires MAC OS 10.8 and JAVA 8.0

- You can check out the profs. video to see if you might want to install Python on your computer. (There are many long pauses in the video, while I try to figure out what to do next.)

- I presume Python will run on Windows and Linux, by following this book's instructions.

- There may be other online tutorials on how to install Python on your machine OS: if you find out and if its works nicely, then please let the prof. know.

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