# Comparison of C# to Python

This is a short comparison of 2 programming languages that I have learned and worked with during my time at NMIT. This course covered the learning of python, and I will be comparing it with C# which I have learned and worked with in a couple of other courses.

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|  | C# | Python |
| Heritage | The first version of C# was released by Microsoft in 2002. It was designed to be a “simple, modern, general-purpose object-oriented language.”  The programming language is maintaining and is continuing to be improved by Microsoft moving from being closed source, to the most modern versions of .NET moving towards open source and cross platform development. | Guido Van Rossum created python as a successor to a previous language that his company was working with called ABC. |
| Philosophy | It was designed for those developers who were already familiar with C and C++ development. Microsoft had a working project originally called “C-like Object Orientated Language”.  It was designed so that the large number of developers in the 90’s who were are already working with C, C++ and Java would feel comfortable with working with the language. | The Philosophy of python is best captured by the Zen of Python written by Tim Peters. It is a set of 19 guiding principles for writing python.  Beautiful is better than ugly.  Explicit is better than implicit.  Simple is better than complex.  Complex is better than complicated.  Flat is better than nested.  Sparse is better than dense.  Readability counts.  Special cases aren't special enough to break the rules.  Although practicality beats purity.  Errors should never pass silently.  Unless explicitly silenced.  In the face of ambiguity, refuse the temptation to guess.  There should be one– and preferably only one –obvious way to do it.  Although that way may not be obvious at first unless you're Dutch.  Now is better than never.  Although never is often better than right now.[b]  If the implementation is hard to explain, it's a bad idea.  If the implementation is easy to explain, it may be a good idea.  Namespaces are one honking great idea – let's do more of those! |
| Code Libraries | C# has a large amount of libraries that ship with the language. To use the libraries the keywork “using” is used to bring the library into a file.  Nuget is the package manager used by c#. It was originally released as part of Visual Studio, and later released as an open-source command line tool.  NuGet packages are used in code by adding the package name into the namespaces. | Python has a large standard library that provide large functionality. The keywork “import” is used to bring libraries into a file for use.  Code libraries in python are imported into modules or classes using the keyword “import”.  There are several package managers including pip, PyPI, PYPM and Anaconda.   For the project I used PyCharm. When adding new packages or modules that are outside of the current environment, pip can be used to install those packages via the terminal, or python code just be written, and the editor will realize that you intend to use a package that is not currently install and offer to install it for you via a context action (available from a keyboard shortcut). |
| IDE’s | Microsoft originally released Visual Studio alongside C# as the primary IDE for its development. Slowly, other text editors and IDE’s have integrated C# including VS code, Eclipse, Rider, and Kite. | During this semester I have worked with several different programming languages and have had needed to change throughout the day between them. To simplify this process, I decided early that I would work with a tool set that was consistent across all of them, so that I would have some familiarity and comfort with the tools I was using.  For these reasons, I worked with the Jet Brains IDE’s, of which PyCharm is used for writing Python. PyCharm features include an automated refactoring tool that helps to safely rename files, move files and rename all usages, intelligent coding assistance offered with automated refactoring’s and an inbuilt configurable terminal as well as a python specific terminal.  Management of Virtual environments is also handled automatically by the IDE and do not have to be manually configured.  The downside to this is that as a fully featured IDE it does consume a larger amount of system resources than other text editors such as VS code. |
| Characteristics | * Strictly Typed * Supports Object oriented programming * Utilizes Microsoft common language run time (CLR) * Manages unneeded objects via the garbage collector * Open source and cross platform via .NET * High level language, no memory management, or pointers | * Dynamically Typed * Supports Object orientated and Procedural orientated programming * Easy to start, low initial learning curve * Free and open source * Large Standard library * High level language, no memory management, or pointers   Python is a dynamically typed language that is very readable. This provides a |
| Strengths | Type safety provides feedback to the developer early in the development process in write time rather than compile time or run time.  The Garbage Collector automatically manages memory allocation and removes old or unneeded objects.  The language is cross platform and open source, which allows it to be used on all operating systems and can be used to develop applications on websites, API, desktop applications, mobile applications, and games  Maintained and updated regularly by Microsoft | Supports both object orientated programming and functional programming  The code tends to be very human readable since style is the syntax. There is no usage of curly bracket for a block of code, but rather the use of indention. |
| Weaknesses | Unable to directly manage memory allocation for objects  Code must be recompiled to see the effects of any change in code | Python is interpreted, which can lead to run time issues and slow execution of code.  As much as it is a strength, python style being syntax forces very specific usage of style and indentation.  Dynamic typing can mean that variables do not get typed and run time errors can occur when variables are used incorrectly. |