

85301 – Algorithms and Data Structures in Biology

Lab 3 – Typesetting Programs, Pseudocode, and Tables

Enrico Malizia and Riccardo Treglia

DISI

University of Bologna, Italy

2nd semester, 2022/23

(parts of these slides are based on material by Prof. Ugo Dal Lago)

Where Are We?

- So far, we have seen how to:
 - ▶ *Measure* the time performance of your Python programs by way of the `cProfile` and `Timer` modules
 - ▶ Use the `numpy` and `scipy` modules as a way to get the curve (among those of a certain shape) which *best fits* a given dataset
 - ▶ Use \LaTeX as a way to typeset scientific documents of high quality, and in particular documents which include mathematical formulas and graphs
- Today, we will see how to add more elements inside a \LaTeX document:
 - ▶ Program *code*, by way of the `listing` package
 - ▶ Program *pseudocode*, by way of various \LaTeX packages
 - ▶ *Tables*, by way of the `tabular` \LaTeX environment

You May Have Wondered...

- ...how Python code can be typeset in a \LaTeX document
- As an example, in the following code, Python keywords are in bold:

```
import numpy
import scipy.optimize as optimization

xdata = numpy.array([10.0,20.0,30.0,40.0,50.0])
ydata = numpy.array([7.3,8.46,10.2,11.4,13.08])

def func(x, a, b):
    return a + b*x

print optimization.curve_fit(func, xdata, ydata)
```

The listing Package

- The answer is in the listings package, which you can call from your \LaTeX source in the usual way:

```
\usepackage{listings}
```

- In the preamble of the \LaTeX document, you can declare a code style:

```
\lstdefinestyle{simplestyle}{  
  commentstyle=\slshape,  
  keywordstyle=\bfseries,  
  basicstyle=\ttfamily,  
  breakatwhitespace=false,  
  breaklines=true,  
  keepspaces=true,  
  columns=fullflexible,  
  showstringspaces=false}
```

- To be sure to have things working properly, in the preamble of the \LaTeX document, use the package `lmodern`

```
\usepackage{lmodern}
```

- You can declare various code styles with different names

The listing Package

- If you prefer a bigger difference between bold and non-bold text, like:

```
import numpy
import scipy.optimize as optimization

xdata = numpy.array([10.0,20.0,30.0,40.0,50.0])
ydata = numpy.array([7.3,8.46,10.2,11.4,13.08])

def func(x, a, b):
    return a + b*x

print optimization.curve_fit(func, xdata, ydata)
```

- Then, in the preamble of the \LaTeX document, use the package `lmodern` with the option `lighttt`

```
\usepackage[lighttt]{lmodern}
```

but, in this case, you *have* to use `commentstyle=\slshape` in the definition of your code style (otherwise, you get errors when compiling)

The listing Package

- When you want to typeset python code in your \LaTeX document, you can enclose your code into a `lstlisting` environment:

```
\begin{lstlisting}[style=simplestyle,language=python]
# This is an example of code

print("Hello World!")
\end{lstlisting}
```

- And the result in the PDF generated is:

```
# This is an example of code

print("Hello World!")
```

- If you want to know more about the package `listings` and know how to use colours, please refer to a guide (see, e.g., [link](#) and [link](#))
- If you do not care about fancy syntax highlighting, you can even use the `verbatim` environment

- Pseudocode, contrary to Python code, *does not follow* precise syntactical rules, but, as we have seen, it is rather informally specified
- Pseudocode can be *precisely* specified without being *formally* specified
- Hence, you can typeset pseudocode *the way you prefer*, e.g., by way of the `enumerate` environment, or using the `verbatim` environment
- If you want to typeset pseudocode in a way looking nice and professional, there are *plenty of packages* you can use (see, e.g., [link](#))

Tables in L^AT_EX

- Often, typesetting tables in your L^AT_EX documents turns out to be necessary (e.g., when including results in your reports)
- To typeset in your document a table like the following:

A	34	45
B	12	89
C	23	67

- The following code does the job:

```
\begin{tabular}{|l|c|c|}  
  \hline\hline  
  A & $34$ & $45$ \\  
  \hline  
  B & $12$ & $89$ \\  
  C & $23$ & $67$ \\  
  \hline\hline  
\end{tabular}
```

- For more information on the table environment, see, e.g., [link](#) and [link](#)