LEARN CODING

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github.com/ale66/learn-coding

INTERACTING

- From spreadsheet to Python
- More definitions
- Crank up Python

SPREADSHEET ANALYSIS

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3,
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SPREADSHET INTERACTION: INPUT

- fill some cells with values
- inport a datafile, e.g, `biostats.csv`.

SPREADSHET INTERACTION: COMPUTING

cells were we type in values are the input to the spreadsheet

computed cells, those with =, are the assignments

=(A1+A2+A3)/

Some assigment use functions:

=AVERAGE(A1, A2, A3)

=AVERAGE(A1:A3)

From the execise:

=AVERAGEIF($B2 :B$19,“F”,C2:C19)

here =, $, " " and : all have a specific, agreed meaning:

the *semantics* of MS Excel cells

OBSERVATIONS:

We begin using a formal language:

- all symbols have meaning in the Spreadsheet language: `=`, `+`, `,` and `:`
- the key symbol `=` means `compute the value of what follows`
- in CS, often `eval()` or λ. are used
- in Python: `lambda x, y: (x + y)/2` stands for a number

OBSERVATIONS, CONT'D:

- cell names become `variable names:` we name them in formula to operate with its content
- functions like `AVERAGE()` are evaluated and their result is substituted in place
- we can *nest* functions as needed:

Cell A4: `=AVERAGE(A1:A3)`

Cell A5: `=A4/2` is the same as `=AVERAGE(A1:A3)/2`

MORE OBSERVATIONS

To write down the needed formulae, often we need to have some intermediate result on an extra column.

Improper example:

- in column E, compute the SI equivalents of each height
- compute the average of the SI heights.

A CRITIQUE OF SPREADSHEETS

- WYSIWYG: what you see is what you get.
- evaluation is done continuosly and in parallel for each cell
- input data, computation (or business logic) and specific outputs are all in the same file or sheet.
- hard to check for logical mistakes: do we need average or median or max?

EXAMPLE SPREADSHEET ERROR

The most serious was that, in their Excel spreadsheet, Reinhart and Rogoff had not selected the entire row when averaging growth figures: they omitted data from Australia, Austria, Belgium, Canada and Denmark.

In other words, they had accidentally only included 15 of the 20 countries under analysis in their key calculation.

When that error was corrected, the "0.1% decline" data became a 2.2% average increase in economic growth.

See more on The Conversation

CRITICAL EVALUATION, CONT'D

- data, code and outputs evolve at different *speed*: they must be separated
- data changes every minute, and so do outputs
- code change seldom, but could be re-applied thousands of times
- few error messages: hard to assess correctness

MORE DEFINITIONS

PROGRAM, SOURCE CODE

A sequence of instructions that specifies how to perform a computation.

Instructions mostly are of one of these types:

- input
- output
- conditional execution
- repetition

IN PRACTICE...

A *program* is a file in text/txt format

Inside, instructions are in a formal language designed to express computation, e.g., Python

Instructions are to be executed top-down, left to right

Extra comments/annotations are possible with the # character

CORRECTNES

- syntactical: the code is written followinng rules (names, commas parentheses...)
- runtime: the code runs on the data provided
- semantical: the code computes the expected answer wrt. the present data

DEBUGGING

The process by which a code with errors is amended to reach syntactical, runtime and semantical correctness.

D. takes more time and experience than simply writing code

D. cannot be entirely authomatized, for deep mathematical reasons

CRANK UP PYTHON

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CHAT

```
>python
Python 3.12.6 (tags/v3.12.6:a4a2d2b, Sep  6 2024, 20:11:23) [MSC v.1940 64 bit (AM
Type "help", "copyright", "credits" or "license" for more information.
>>>>>> 6+11
17
>>> print('Python is fun')
Python is fun
>>> help(exit)
Help on Quitter in module _sitebuiltins object:

class Quitter(builtins.object)
 |  Quitter(name, eof)
 |
 |  Methods defined here:
 [...]
 >>>exit()
 >
```

COMPILATION

(not in this module)

INTERPRETATION

```
1  >python myproject.py
```

the chat starts

NOTEBOOK: JUPYTER

A special file format that mixes Python code, its output and extra documental material that guides the reader through a step-by-step execution of the code.

A Python interpreter, called *kernel*, runs in the background.

```
1  jupyter mynotebook
```

interaction is via a browser

The best use today is via VS Code with the Jupyter extension

CLOUD

Connect to a web site that shows a Jupyter notebook and runs a kernel on the *server* computer

Files must be uploaded *there*