PROGRAMMING IN PYTHON I

Fast Numerical Computations in Python

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Copyright Statement

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  - Very convenient to use
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  - Very convenient to use
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- We can use modules in Python that allow us to write fast code in Python
  - By providing optimized functions (e.g., `NumPy`, ...)
  - By providing tools for optimizing Python-like code (e.g., `Numba`, `PyTorch`, `Tensorflow`, ...)

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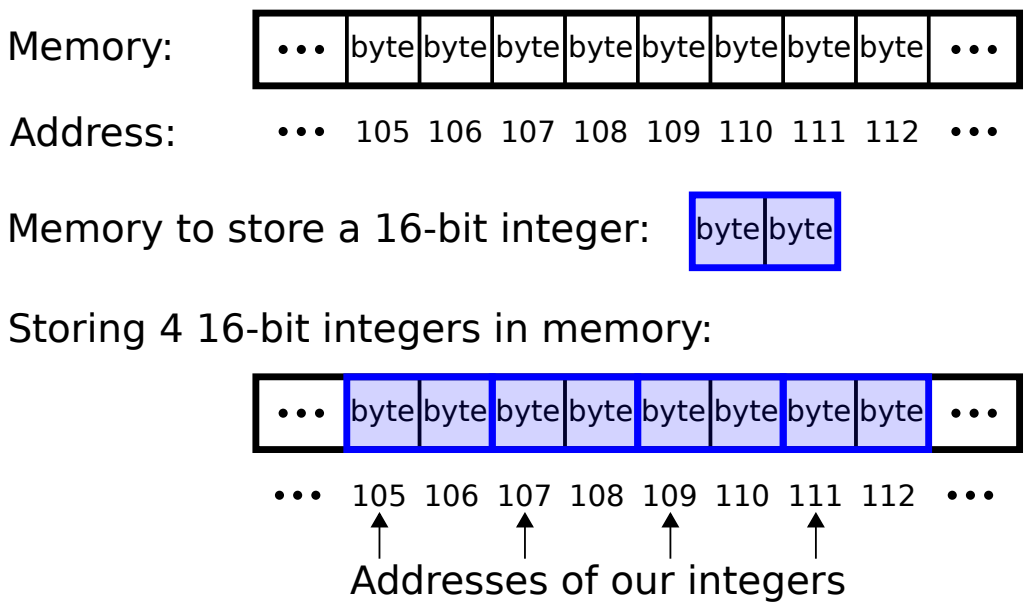
- NumPy mainly deals with (multidimensional) array data based on the `numpy.ndarray` object
- Documentation/Tutorials:

  https://numpy.org/doc/stable/index.html

Arrays in NumPy (1)

- Elements are stored as one block with contiguous addresses in memory
- Elements are fast to access since we can quickly compute their addresses



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  - → Operations on elements can be optimized and are faster

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Multidimensional Arrays: Example (1)

- We want to store a 2D array with 3 rows and 5 columns
  - 5 elements per row, 3 per column, 15 in total

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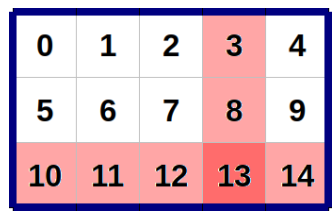

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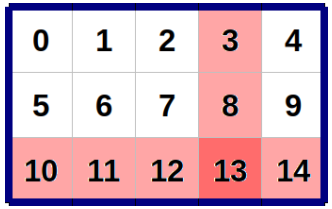

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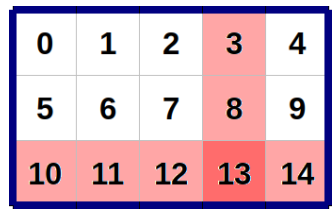

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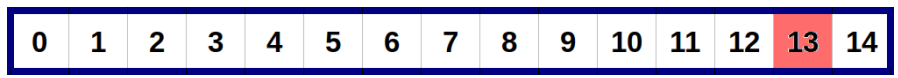

- This is automatically done in the background for you, you do not have to worry about the correct index calculation

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    `my_array[i]`
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- More examples in the accompanying code file

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- Many NumPy methods in the provided library require to specify the axis on which to perform some operation