PY410 / 505
Computational Physics 1

Salvatore Rappoccio
Array programming

• Now, we’re able to get around one of the major limitations of python: for loops
  – Very, very slow! Avoid them at all costs!

numpy instead!
Array programming

• Why is numpy okay to use for performance?
  – It’s written in C++ and you just use python as an interface!
  – Deeply vectorizing the loops in the C++ module!

• So, just make everything look like an array operation!
  – This looks more like excel sheet programming psychologically. Think of it like that.
Array programming

• Nice resource (again):
  – https://www.datacamp.com/community/tutorials/python-numpy-tutorial

• Key concept: Broadcasting.
  – https://jakevdp.github.io/PythonDataScienceHandbook/02.05-computation-on-arrays-broadcasting.html

\[
\begin{align*}
\text{n. arange}(3) + 5 & \quad 0 & 1 & 2 \\
\text{n. ones}(3, 3) + \text{n. arange}(3) & \quad 1 & 1 & 1 \quad 0 & 1 & 2 \\
\text{n. arange}(3).\text{reshape}(3, 1) + \text{n. arange}(3) & \quad 0 & 1 & 2 \quad 0 & 1 & 2
\end{align*}
\]
Array Programming

• Let’s do this in jupyter again:

• “ArrayProgramming/ArrayProgramming.ipynb”