Coding 101

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Installing Python

Required software:

- Python 3
- Python packages:
  - Matplotlib (for plotting)
  - NumPy (math and science)
  - H5py (data file handling)

We recommend using Anaconda Python installer

- Installation documentation:
  `https://conda.io/docs/user-guide/install/index.html`
- Go to Windows, MacOS, or Linux link

Exercise:

- Download or clone the following repository:
  - `https://github.com/nneveu/coding101`
- Open the "**emittance_calc.py**" file
- Begin exercise!
- N = number of particles

$$\text{Beam Size} \quad \sigma_x^2 = \frac{\Sigma x^2}{N} - \left(\frac{\Sigma x}{N}\right)^2 \tag{1}$$

$$\text{Momentum} \quad \sigma_{p_x}^2 = \frac{\Sigma p_x^2}{N} - \left(\frac{\Sigma p_x}{N}\right)^2 \tag{2}$$

$$\text{Corelation} \quad \sigma_{xp_x} = \frac{\Sigma\,(x\,p_x)}{N} - \left(\frac{\Sigma x}{N}\right)\left(\frac{\Sigma p_x}{N}\right) \tag{3}$$

$$\text{Emittance} \quad \epsilon_n = \sqrt{\sigma_x^2\,\sigma_{p_x}^2 - \sigma_{xp_x}^2} \tag{4}$$