

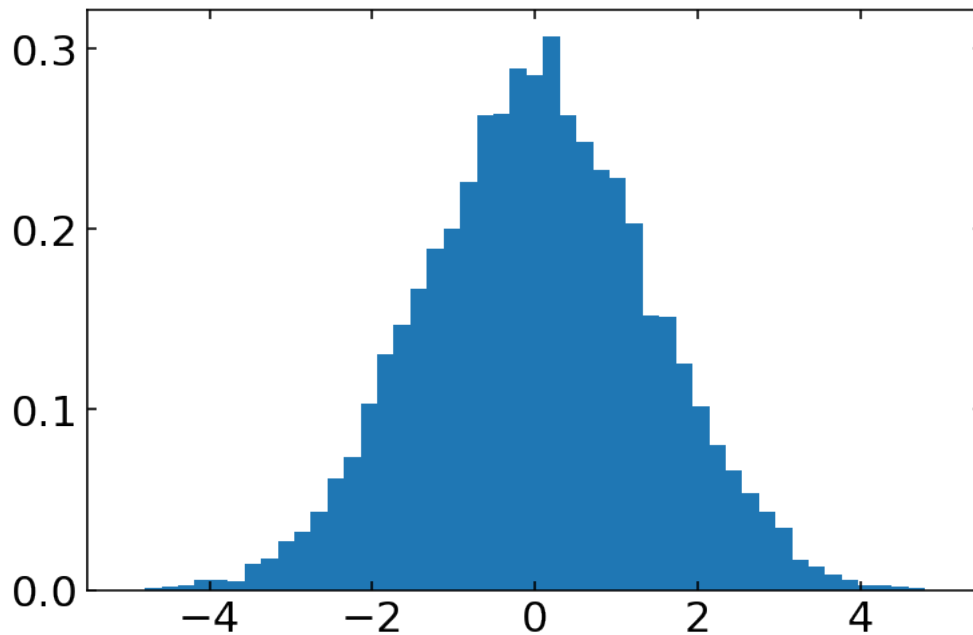
# ps2

May 28, 2024

## 1 Problem Set 2

### Exercise

Plot a histogram of the random numbers drawn from a normal distribution as provided by the function *randn*. Write a script calculating the variance of the normally distributed random numbers using the numpy function *sum(data)*.



### Exercise

Write a short script which calculates normally distributed numbers with a variance  $\sigma^2$  and a mean  $x_0$ . Plot a histogram of  $10^6$  random numbers using 50 bins. Calculate the mean and the variance of  $10^6$  random numbers drawn from this distribution.

### Exercise

Calculate the mean value of the exponential distribution.

### Exercise

Construct a series of single photon events separated by periods which are exponentially distributed.

### Exercise

Create 10 different random walks in 2-dimensions. Assemble the x,y coordinates with the zip command and write it to a text file so that we can use it later for plotting.

### Exercise

Create a data file with the data shown below.

- Read the data into Python program and plot  $t$  vs  $y$  using circles for data points with error bars. Use the data in the  $dy$  column as the error estimates for the  $y$  data. Label the horizontal and vertical axes “time (s)” and “position (cm)”.
- On the same graph, plot the function below as a smooth line. Make the line pass behind the data points.

$$y(t) = \left[ 3 + \frac{1}{2} \sin \frac{\pi t}{5} \right] t e^{-t/10} \quad (1)$$

Data for Exercise

Date: 8-May-2017

Data taken by Karl and Heinz

t	d	dy
1.0	2.94	0.7
4.5	8.29	1.2
8.0	9.36	1.2
11.5	11.60	1.4
15.0	9.32	1.3
18.5	7.75	1.1
22.0	8.06	1.2
25.5	5.60	1.0
29.0	4.50	0.8
32.5	4.01	0.8
36.0	2.62	0.7
39.5	1.70	0.6
43.0	2.03	0.6