

Python 3.9.13 (main, Aug 25 2022, 23:51:50) [MSC v.1916 64 bit (AMD64)]  
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IPython 7.31.1 -- An enhanced Interactive Python.

```
In [1]: import numpy as np
...: from scipy.stats import norm
...: from matplotlib import pyplot as plt
...: from astroML.resample import bootstrap
...: from astroML.stats import sigmaG

In [2]: p=1000

In [3]: q=10000

In [4]: np.random.seed(123)
...: data = norm(0, 1).rvs(p)

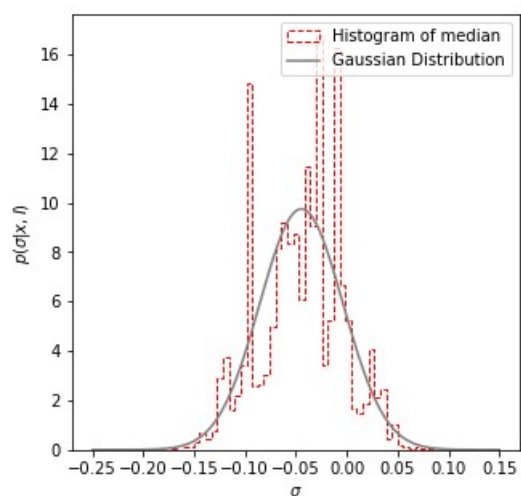
In [5]: mu1_bootstr = bootstrap(data, q, np.median, kwargs=dict(axis=1))

In [6]: x = np.linspace(-0.25, 0.15, 1000)

In [7]: sigma1 = np.sqrt(np.pi/(2*q))
...: print(sigma1)
0.012533141373155003

In [8]: gaussian_mean=np.mean(mu1_bootstr)
...: gaussian_std=np.std(mu1_bootstr)
...: pdf1=norm(gaussian_mean,gaussian_std).pdf(x)

In [9]: fig, ax = plt.subplots(figsize=(5, 5))
...: ax.hist(mu1_bootstr, bins=50, density=True, histtype='step',
...:         color='red', ls='dashed', label='Histogram of median')
...: ax.plot(x, pdf1, color='gray',label='Gaussian Distribution')
...: ax.set_xlabel(r'$\sigma$')
...: ax.set_ylabel(r'$p(\sigma|x,I)$')
...: ax.legend()
...: plt.show()
```



```
In [10]:
```

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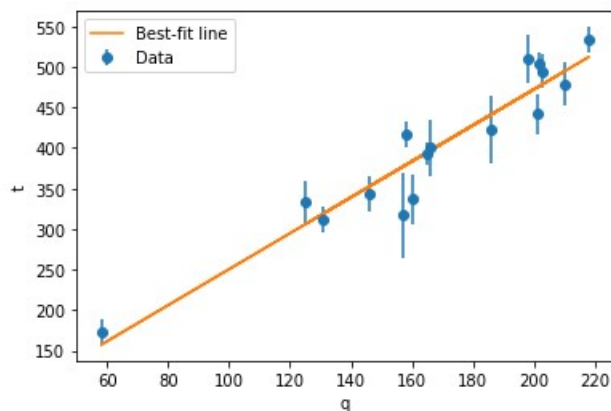
In [2]: q=[203,58,210,202,198,158,165,201,157,131,166,160,186,125,218,146]
...: q=np.array(q)

In [3]: t=[495,173,479,504,510,416,393,442,317,311,400,337,423,334,533,344]
...: t=np.array(t)

In [4]: sigmat=[21,15,27,14,30,16,14,25,52,16,34,31,42,26,16,22]
...: sigmat=np.array(sigmat)

In [5]: print(q)
...: print(t)
...: print(sigmat)
[203  58 210 202 198 158 165 201 157 131 166 160 186 125 218 146]
[495 173 479 504 510 416 393 442 317 311 400 337 423 334 533 344]
[21 15 27 14 30 16 14 25 52 16 34 31 42 26 16 22]

In [6]: from scipy.stats import linregress
...: slope, intercept, r_value, p_value, std_err = linregress(q, t)
...: sigma_m = std_err / np.sqrt(len(q))
...: plt.errorbar(q, t, yerr=sigmat, fmt='o', label='Data')
...: plt.plot(q, slope*np.array(q) + intercept, '-', label='Best-fit line')
...: plt.xlabel('q')
...: plt.ylabel('t')
...: plt.legend()
...: plt.show()
...: print("Standard uncertainty on the slope of the line:", sigma_m)
```



Standard uncertainty on the slope of the line: 0.04838899281730518

In [7]:

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```
In [1]: import numpy as np
....: from scipy import stats
....: from matplotlib import pyplot as plt
....: from astroML.plotting import setup_text_plots
....: setup_text_plots(fontsize=8, usetex=True)
....:
....: # Generate Dataset
....: np.random.seed(1)
....: N = 50
....: L0 = 10
....: dL = 0.2
....: t = np.linspace(0, 1, N)
....: L_obs = np.random.normal(L0, dL, N)
....: # Plot the results
....: fig = plt.figure(figsize=(5, 5))
....: fig.subplots_adjust(left=0.1, right=0.95, wspace=0.05,
....: bottom=0.1, top=0.95, hspace=0.05)
....: y_vals = [L_obs, L_obs, L_obs, L_obs + 0.5 - t ** 2]
....: y_errs = [dL, dL * 2, dL / 2, dL]
....: titles = ['correct errors',
....: 'overestimated errors',
....: 'underestimated errors',
....: 'incorrect model']
....:
....: chi2s=[]
....: chi2dofs=[]
....:
....: for i in range(4):
....:     ax = fig.add_subplot(2, 2, 1 + i, xticks=[])
....:
....:     mu = np.mean(y_vals[i])
....:     z = (y_vals[i] - mu) / y_errs[i]
....:     chi2 = np.sum(z ** 2)
....:     chi2s.append(chi2)
....:     chi2dof = chi2 / (N - 1)
....:     chi2dofs.append(chi2dof)
....:
....:     sigma = np.sqrt(2. / (N - 1))
....:     nsig = (chi2dof - 1) / sigma
....:
....:     ax.errorbar(t, y_vals[i], y_errs[i], fmt='k', ecolor='gray', lw=1)
....:     ax.plot([-0.1, 1.3], [L0, L0], ':k', lw=1)
....:
....:     ax.text(0.95, 0.95, titles[i], ha='right', va='top',
....: transform=ax.transAxes,
....: bbox=dict(boxstyle='round', fc='w', ec='k'))
....:     ax.text(0.02, 0.02, r'$\hat{\mu} = %.2f$' % mu, ha='left', va='bottom',
....: transform=ax.transAxes)
....:     ax.text(0.98, 0.02,
....: r'$\chi^2_{\rm dof} = %.2f$, (%.2g\,\sigma)$' % (chi2dof, nsig),
....: ha='right', va='bottom', transform=ax.transAxes)
....:
....: ax.set_xlim(-0.05, 1.05)
....: ax.set_ylim(8.6, 11.4)
....: ax.yaxis.set_major_locator(plt.MultipleLocator(1))
....:
```

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...: if i>1:
...:     ax.set_xlabel('observations')
...: if i%2==0:
...:     ax.set_label('Luminosity')
...: else:
...:     ax.yaxis.set_major_formatter(plt.NullFormatter())
...:
...: plt.show()
...: print('Chi squares DOF values \n',chi2dofs)
...: print('p values are \n', np.array(1)-stats.chi2(chi2dofs).cdf(chi2s))
C:\Users\et22m\anaconda3\lib\site-packages\astroML\linear_model\linear_regression_errors.py:10:
UserWarning: LinearRegressionwithErrors requires PyMC3 to be installed
  warnings.warn('LinearRegressionwithErrors requires PyMC3 to be installed')
Traceback (most recent call last):

  File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\texmanager.py", line 233, in
_run_checked_subprocess
    report = subprocess.check_output(

  File "C:\Users\et22m\anaconda3\lib\subprocess.py", line 424, in check_output
    return run(*popenargs, stdout=PIPE, timeout=timeout, check=True,

  File "C:\Users\et22m\anaconda3\lib\subprocess.py", line 505, in run
    with Popen(*popenargs, **kwargs) as process:

  File "C:\Users\et22m\anaconda3\lib\site-packages\spyder_kernels\customize\spydercustomize.py", line
108, in __init__
    super(SubprocessPopen, self).__init__(*args, **kwargs)

  File "C:\Users\et22m\anaconda3\lib\subprocess.py", line 951, in __init__
    self._execute_child(args, executable, preexec_fn, close_fds,

  File "C:\Users\et22m\anaconda3\lib\subprocess.py", line 1420, in _execute_child
    hp, ht, pid, tid = _winapi.CreateProcess(executable, args,

FileNotFoundError: [WinError 2] The system cannot find the file specified

```

The above exception was the direct cause of the following exception:

Traceback (most recent call last):

```

  File "C:\Users\et22m\anaconda3\lib\site-packages\IPython\core\formatters.py", line 341, in __call__
    return printer(obj)

  File "C:\Users\et22m\anaconda3\lib\site-packages\IPython\core\pylabtools.py", line 151, in
print_figure
    fig.canvas.print_figure(bytes_io, **kw)

  File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\backend_bases.py", line 2295, in
print_figure
    self.figure.draw(renderer)

  File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\artist.py", line 73, in draw_wrapper
    result = draw(artist, renderer, *args, **kwargs)

  File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\artist.py", line 50, in draw_wrapper
    return draw(artist, renderer)

  File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\figure.py", line 2837, in draw
    mimage._draw_list_compositing_images(

```

```

File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\image.py", line 132, in
_draw_list_compositing_images
    a.draw(renderer)

File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\artist.py", line 50, in draw_wrapper
    return draw(artist, renderer)

File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\axes\_base.py", line 3091, in draw
    mimage._draw_list_compositing_images(

File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\image.py", line 132, in
_draw_list_compositing_images
    a.draw(renderer)

File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\artist.py", line 50, in draw_wrapper
    return draw(artist, renderer)

File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\axis.py", line 1159, in draw
    ticklabelBoxes, ticklabelBoxes2 = self._get_tick_bboxes(ticks_to_draw,

File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\axis.py", line 1085, in
_get_tick_bboxes
    return ([tick.label1.get_window_extent(renderer)

File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\axis.py", line 1085, in <listcomp>
    return ([tick.label1.get_window_extent(renderer)

File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\text.py", line 910, in
get_window_extent
    bbox, info, descent = self._get_layout(self._renderer)

File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\text.py", line 309, in _get_layout
    _, lp_h, lp_d = renderer.get_text_width_height_descent(

File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\backends\backend_agg.py", line 259, in
get_text_width_height_descent
    w, h, d = texmanager.get_text_width_height_descent(

File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\texmanager.py", line 335, in
get_text_width_height_descent
    dvifile = self.make_dvi(tex, fontsize)

File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\texmanager.py", line 271, in make_dvi
    self._run_checked_subprocess(

File "C:\Users\et22m\anaconda3\lib\site-packages\matplotlib\texmanager.py", line 237, in
_run_checked_subprocess
    raise RuntimeError(

```

**RuntimeError:** Failed to process string with tex because latex could not be found

```

<Figure size 360x360 with 4 Axes>
Chi squares DOF values
[0.9592891608441547, 0.23982229021103868, 3.837156643376619, 2.847675397709133]
p values are
[6.36735109e-12 6.63208859e-05 0.00000000e+00 0.00000000e+00]

```

In [2]: