

Introduction to Computer Programming

Week 9.2: Curve Fitting



In-class Demos

Example 1:

Fit third degree polynomial function the x,y data given.

Find the root mean square error for the fitted data

$$RMSE = \sqrt{\frac{1}{N} \sum_{i=1}^N \epsilon_i^2}$$

In []:

```
x = np.array([1, 6, 3, 4, 10, 2, 7, 8, 9, 5])
y = np.array([2, 4, 5, 4, 13, 3, 4, 8, 12, 4])
```

In [71]:

```
# Find coefficients of polynomial
coeffs_3 = np.polyfit(x, y, 3)

# Generate fitted data
yfit3 = np.poly1d(coeffs_3)(x)

# RMSE
rmse = RMSE(x,y,yfit3) # using RMSE function defined in earlier example
```

Example 2:

Import data in from sample_data/signal_data.csv .

Fit a function of the form $y = a \sin(x + b)$ to the data.
(i.e. find constants a and b).

Plot the raw and fitted data on the same graph.

In [82]:

```
# IMPORT DATA
s = np.loadtxt('sample_data/signal_data.csv', dtype=float, delimiter=',')
x = s[0]
y = s[1]

# DEFINE FUNCTION TO FIT
def sin_func(x, a, b):
    y = a * np.sin(x + b)
    return y

# FIT CONSTANTS
c, cov = curve_fit(sin_func, x, y)
c = curve_fit(sin_func, x, y)[0]

# GENERATE FITTED DATA
x_new = np.array(sorted(x))          # sort x data monotonically
y_fit = sin_func(x_new, *c)          # run function on sorted data

# PLOT
plt.plot(x, y, 'o', label='raw')
plt.plot(x_new, y_fit, 'r', label='fit')
plt.legend(loc='best');
```

