Final Kaon & Pion Fittings

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Motivation

- Strengthen understanding of subatomic particles
- Discover how isolated factors affect response of the particles
- Development of fit aids in design of future experiments to obtain further data

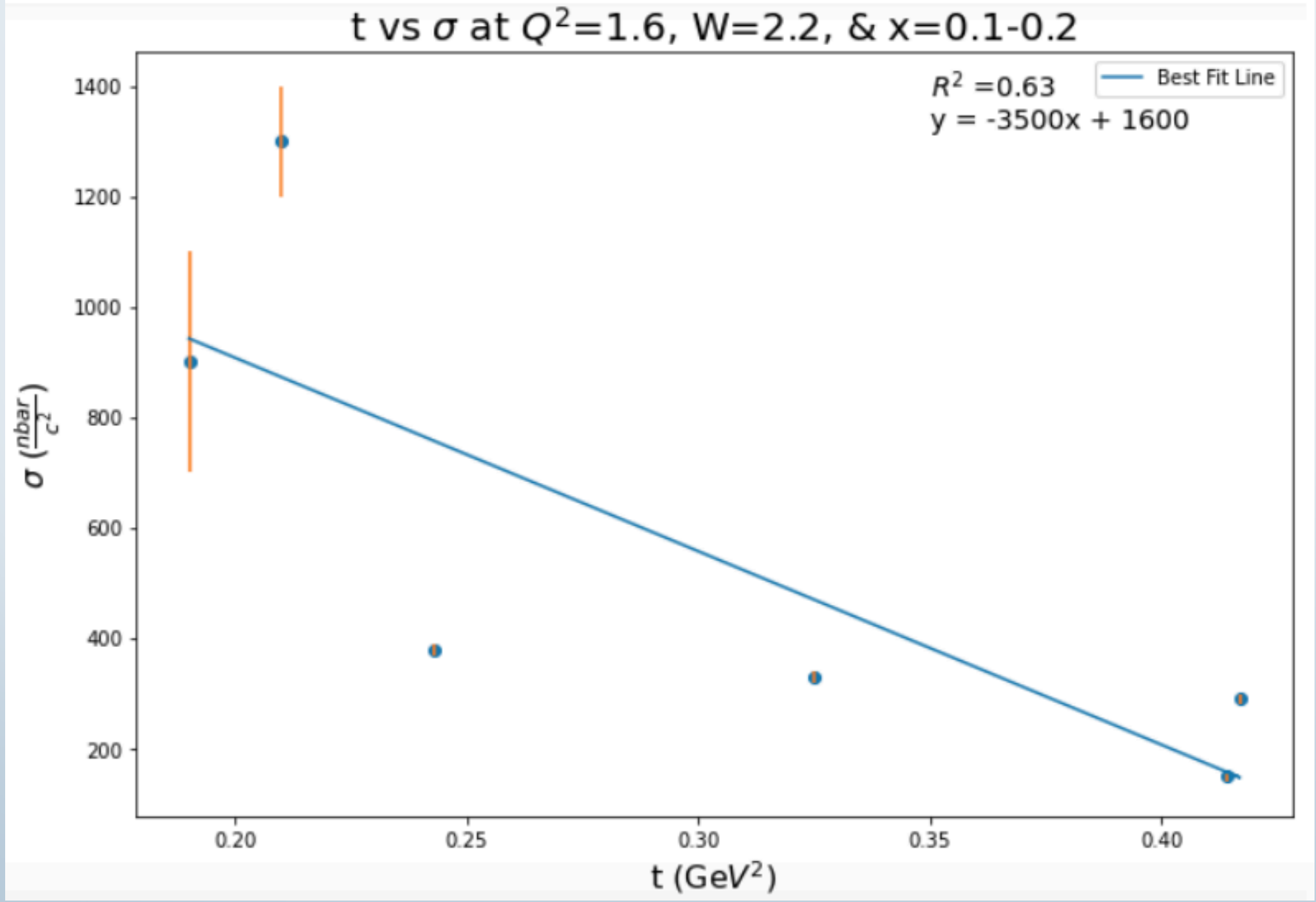
Goal

develop fit function for pion and kaon data

Method

- Match significant figures of sigma with the uncertainty's
- Scatter plot raw data using Python including error bars
- Manipulate axis till linear fit is achieved based on R^2 value
- Compare fits of various datasets
- Reassess dataset for outliers

Kaon Data Set #3



Data Manipulation

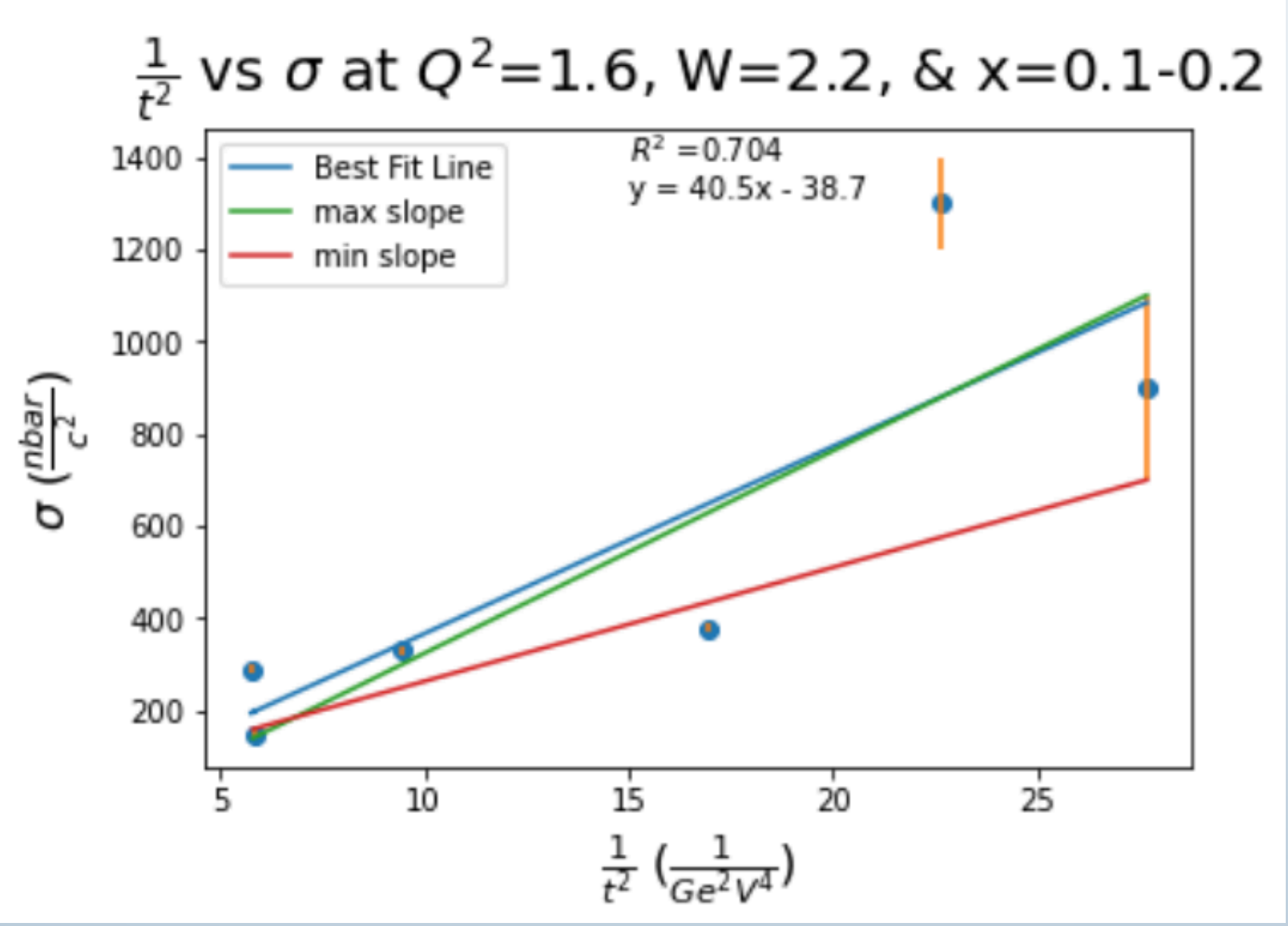
In [61]:
```
x_2 = x_1**-2

print (x_2)
```

```
[27.70083102 22.67573696 16.93508781  9.46745562  5.75079505  5.83444188]
```

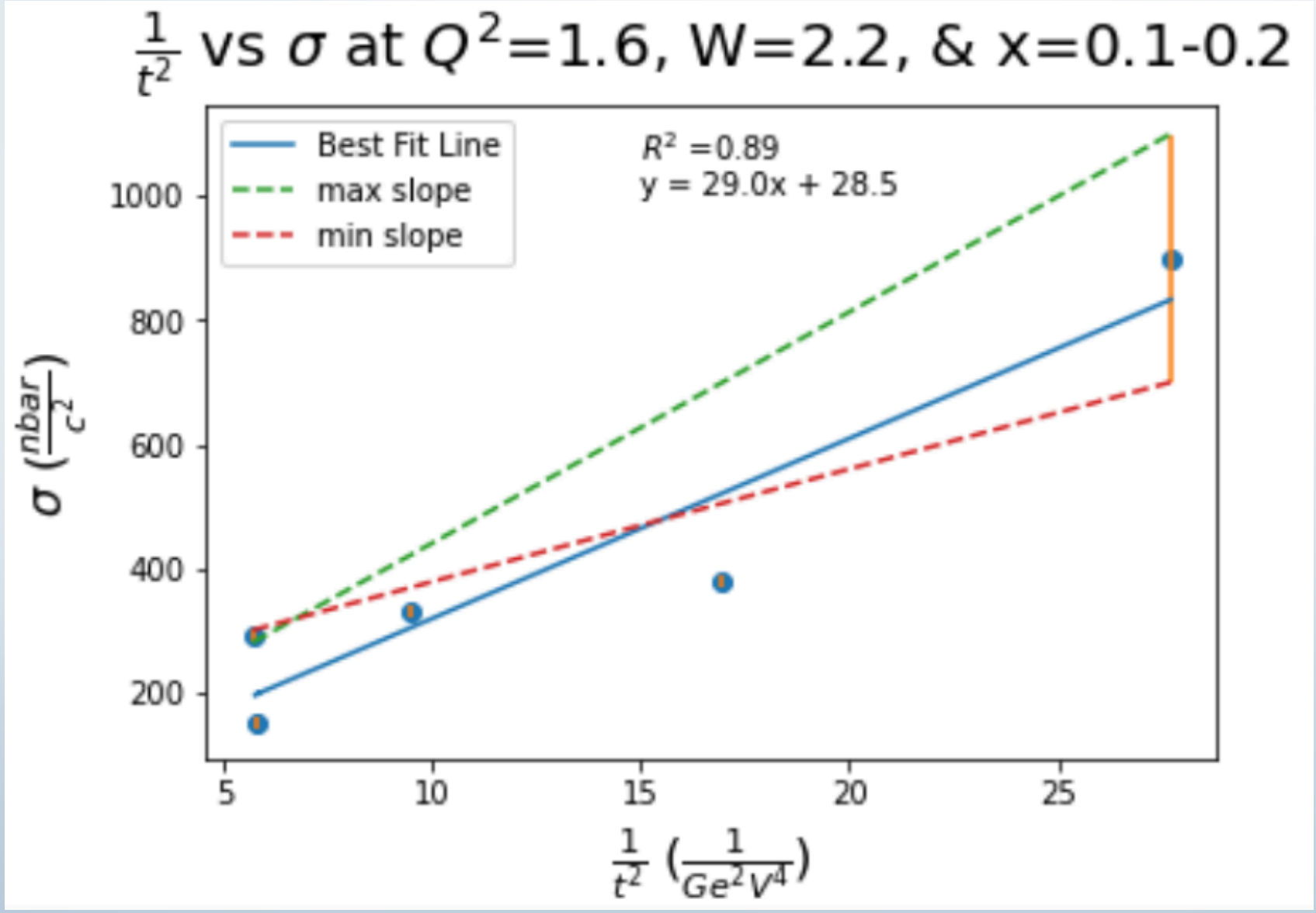
In [108]:
```
plt.scatter(x_2,y_1)
m_2, b_2 = np.polyfit(x_2, y_1, 1)


plt.plot(x_2, m_2*x_2 + b_2, label = 'Best Fit Line')
plt.errorbar(x_2,y_1,y_unc, fmt = ' ')
plt.plot(x_max, y_max, label = 'max slope')
plt.plot(x_min, y_min, label = 'min slope')
plt.legend()

plt.title(r'$\frac{1}{t^2}$ vs $\sigma$ at $Q^2$=1.6, W=2.2, & x=0.1-0.2', fontsize =20)
plt.xlabel(r'$\frac{1}{t^2}$ ($\frac{1}{Ge^2V^4}$)', fontsize =16)
plt.ylabel(r'$\sigma$ ($\frac{nbar}{c^2}$)', fontsize =16)
plt.text(15, 1310, "$R^2$ =" + str(round(r_squared_2, 3))+ "\ny = 40.5x - 38.7")

plt.show
```

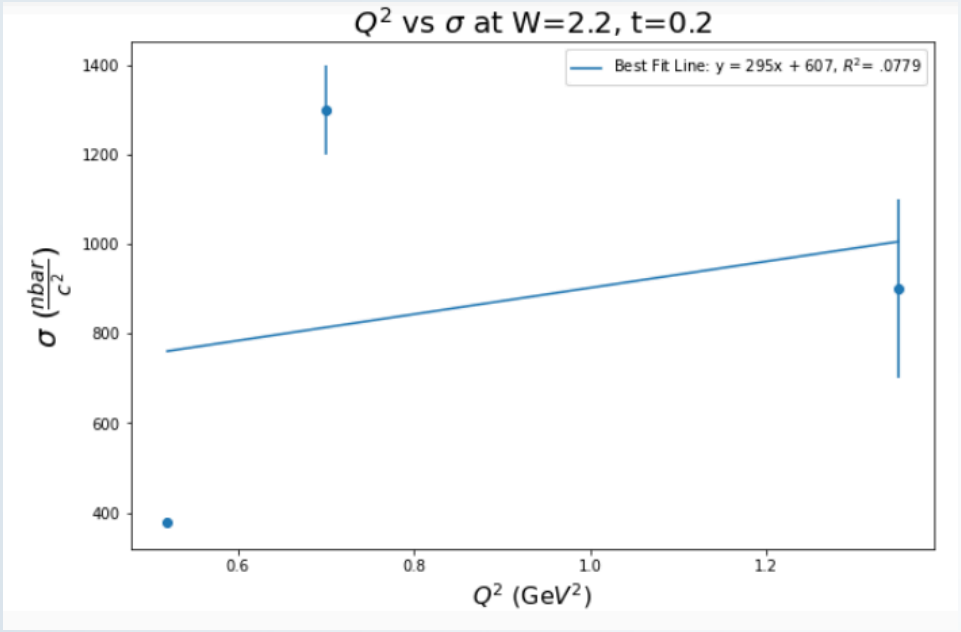
Out[108]:
```
<function matplotlib.pyplot.show(*args, **kw)>
```

Linearized Graph



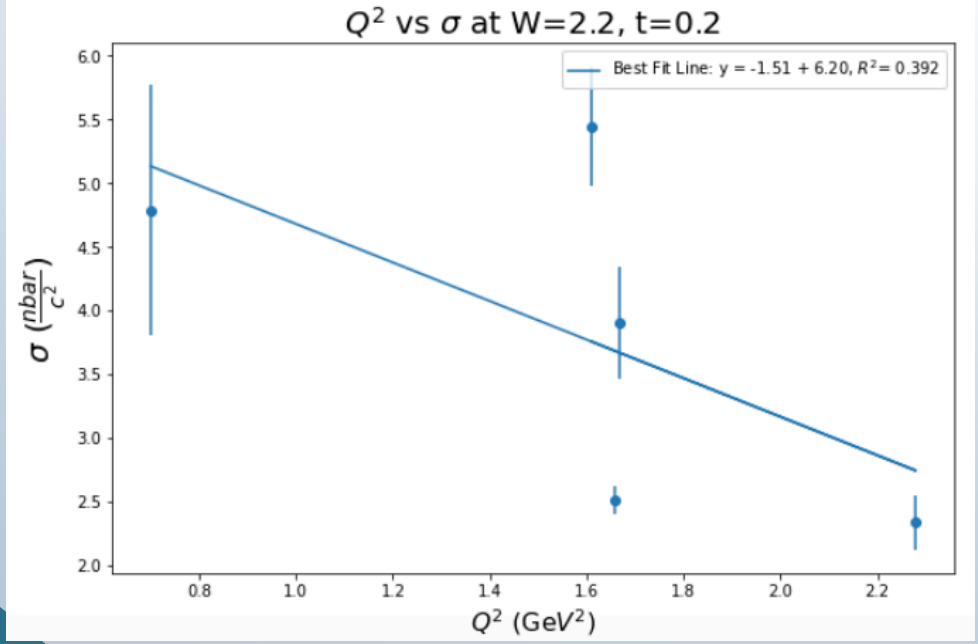
Linearized Data with Point Removal





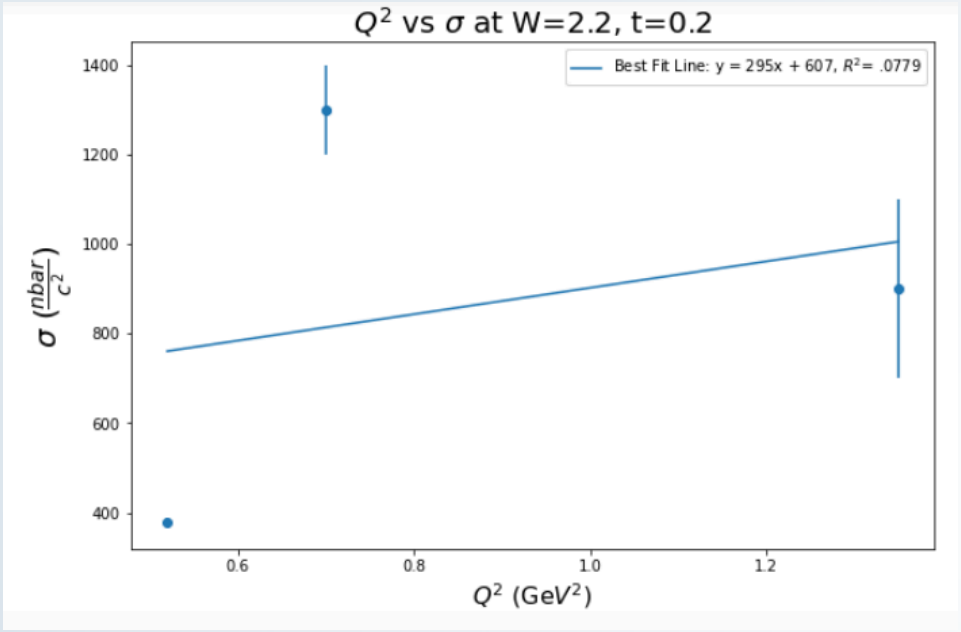
Raw Kaon Data

$y = 295x + 607$



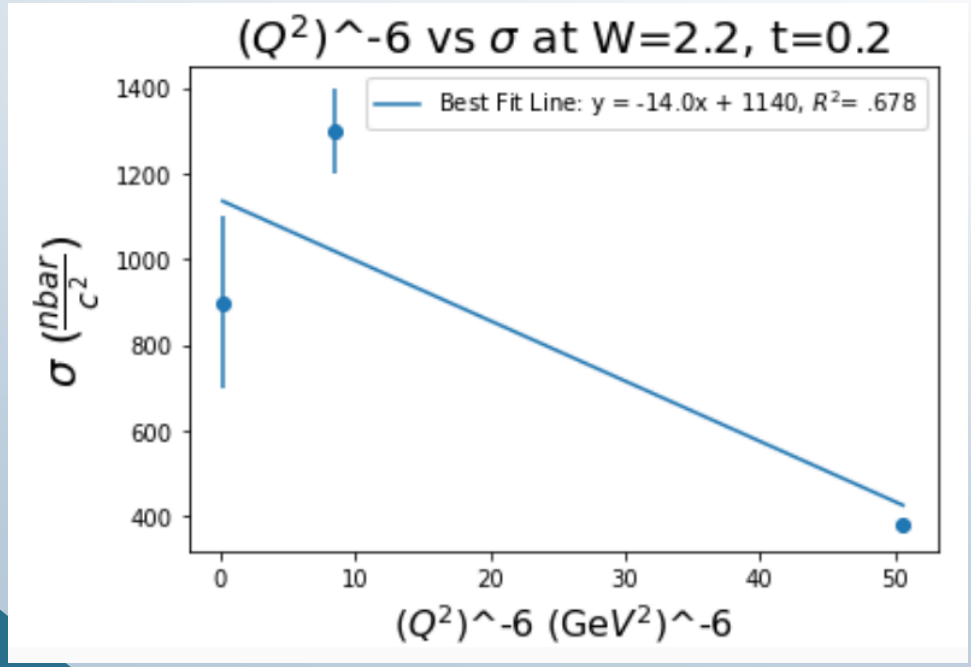
Raw Pion Data

$y = -1.51 + 6.20$



Raw Kaon Data

R^2 = .0779



Linearized Kaon Data

R^2 = .678

Summary

- Lack of data points led to difficulty finding consistent fits
- Theoretical fits do not perfectly fit data

Extensions

- Collect more data points to create stronger fits
- Spend more time comparing different data sets to extrapolate more about patterns
- Improve code to increase graphing efficiency

Thank You & Questions