Towards an interactive web based global fitter

Herambeshwar Pendyala
Old Dominion University

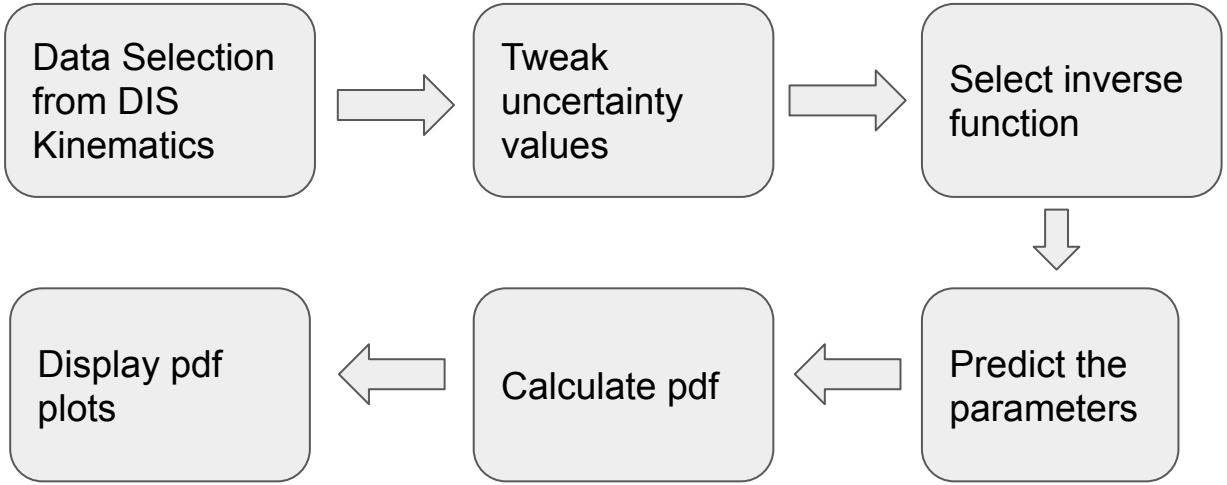
Collaborators

Jefferson lab: W. Melnitchouk, N. Sato
Old Dominion University: Y. Li, Y. Alanazi, M. Almaeen
Davidson College: M. Houck, E. Tsitinidi, M. Kuchera, R.Ramanujan

Idea

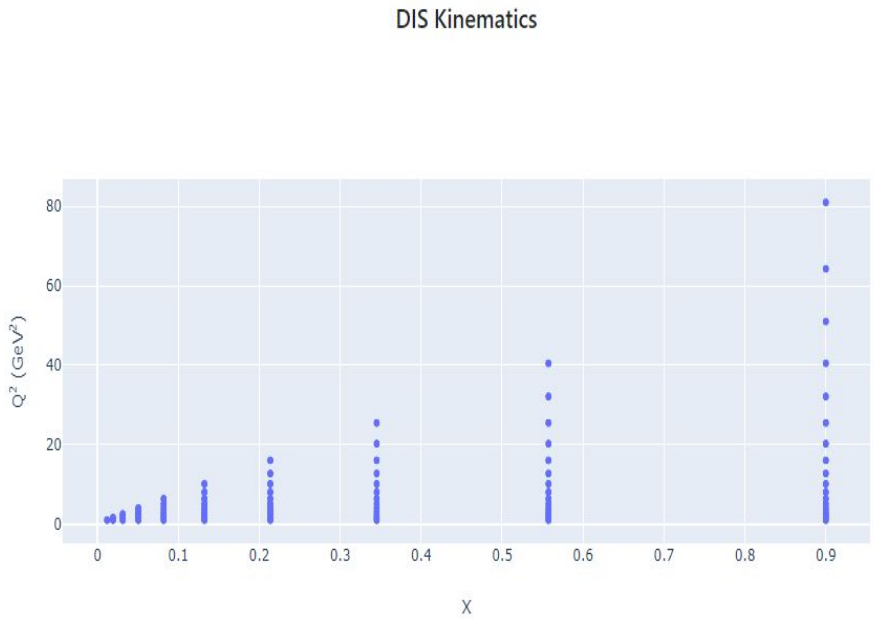
- During analysis, lot of machine learning models were built and trained.
- Idea was to use these trained models on various data samples and analyze the behaviour of the predicted outcome.
- To build a interactive web based tool for users to test and analyze QCD data in real time in a more faster way.

Flow


Data Selection from DIS Kinematics
Tweak uncertainty values
Select inverse function
Predict the parameters
Calculate pdf
Display pdf plots

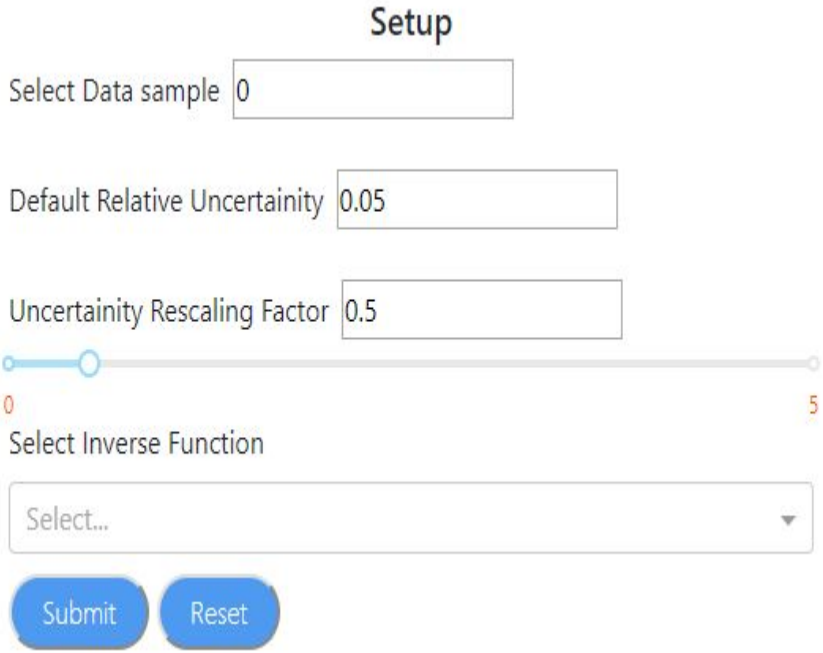
DIS Kinematics Data Selection

- User can select the data points
- Uncertainty values updated are applied only on selected data.



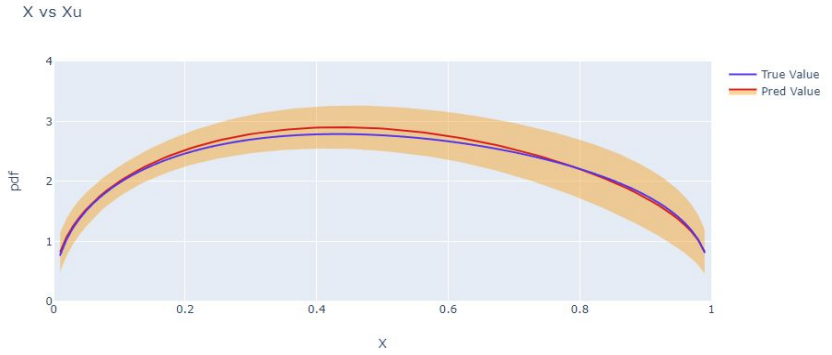
Setup before analysis

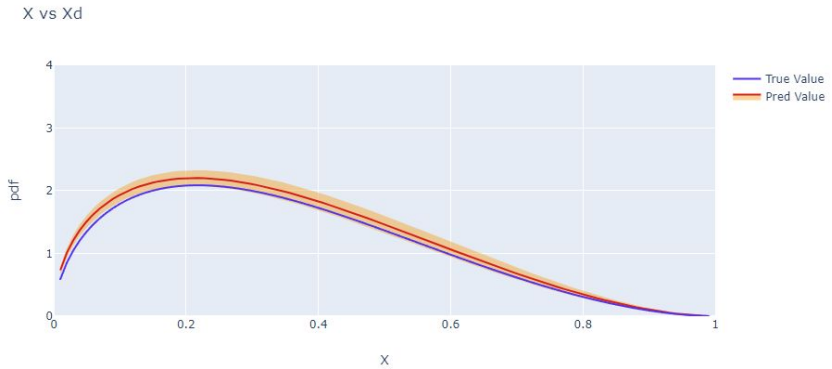
- Select a data sample.
- Tweak the uncertainty values by changing the default relative uncertainty, rescaling factor.
- Inverse Function Selection



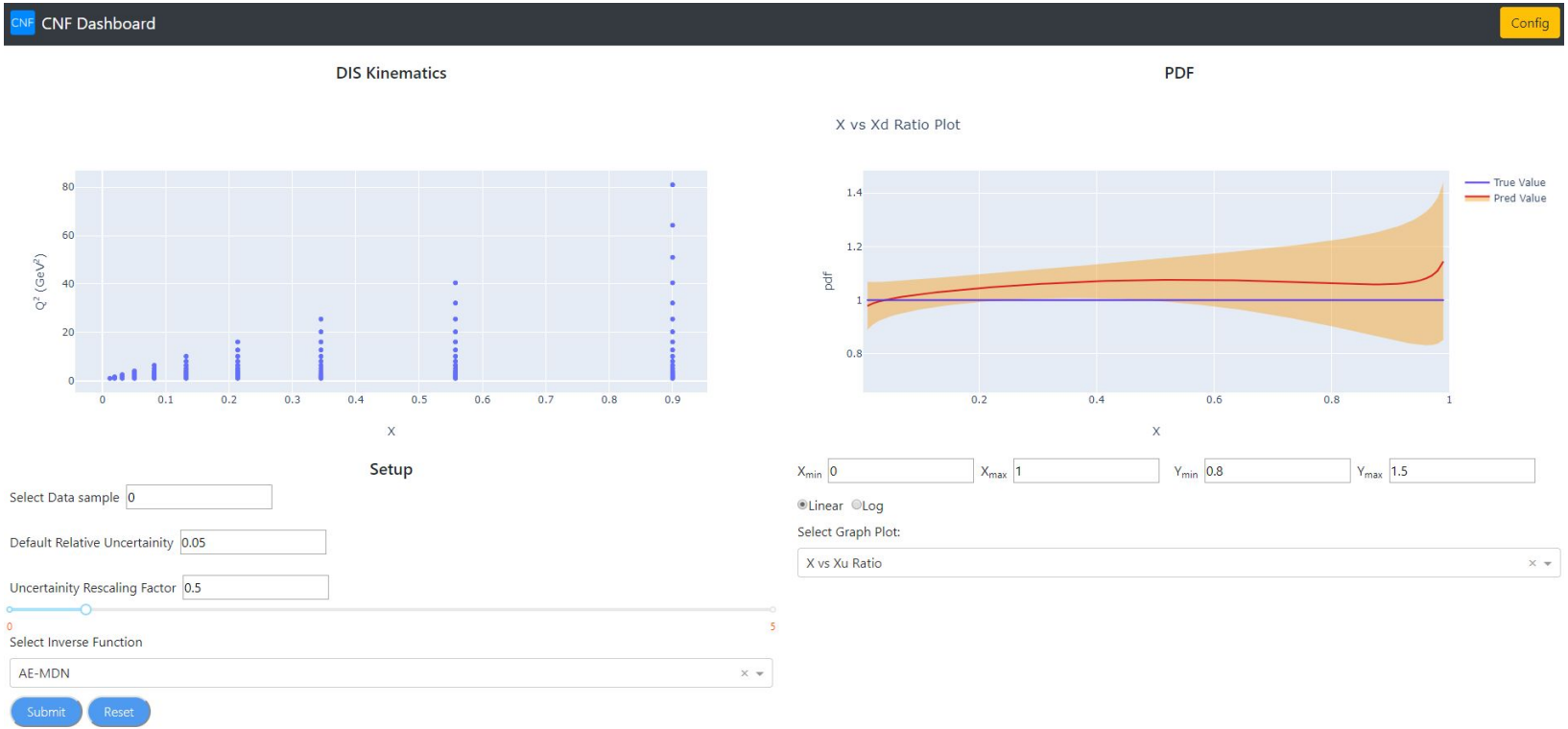
Output

- ❏ Generates both pdf-up and pdf-down plots.
- ❏ Plots displaying error bars to show the variance in the predicted parameter space.
- ❏ Ratio plot of the pdfs compared with true values to get more accurate





Demo


CNF Dashboard
Config
DIS Kinematics
PDF
X vs Xd Ratio Plot
Q^2 (GeV^2)
X
pdf
True Value
Pred Value
Setup
Select Data sample 0
Default Relative Uncertainity 0.05
Uncertainity Rescaling Factor 0.5
Select Inverse Function
AE-MDN
Submit
Reset
X_{min} 0
X_{max} 1
Y_{min} 0.8
Y_{max} 1.5
Linear
Log
Select Graph Plot:
X vs Xu Ratio

Features

- ➔ Rapid Simulation and analysis in real time
- ➔ PDF Visualization
- ➔ Data selection capability
- ➔ Pretrained model selection

Summary

Goal :

Ability to analyze the QCD data in real time using pre trained Machine Learning models

Challenges :

➔ Testing on Real data
➔ Adding more features

Thank You