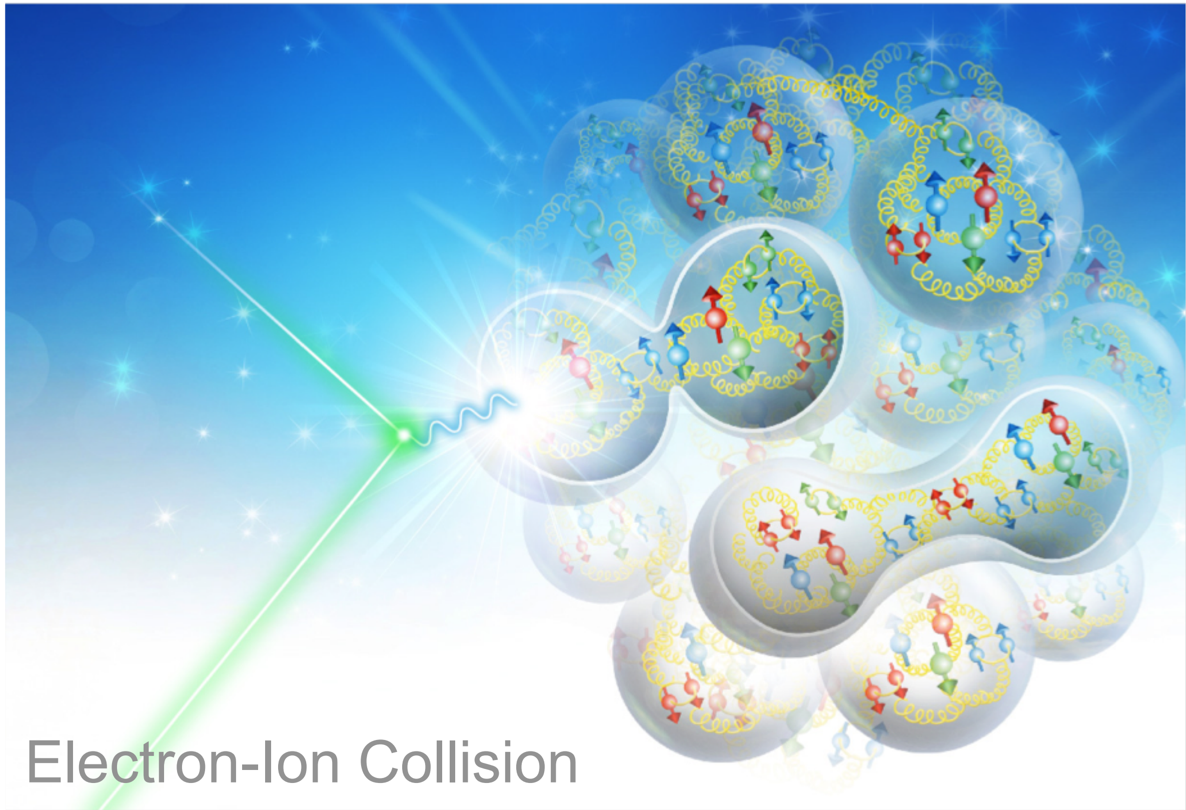
Reaching out to the Semi-Inclusive Reactions Subgroup

Update from EICUG Software Working Group

Update from Center for Nuclear Femtography

EIC²
EIC Center at Jefferson Lab

Markus Diefenthaler



Update from

EICUG Software Working Group

Role of Software Working Group

Develop

Support

Workflow environment for EIC simulations

- **to use** (tools, documentation, support) **and**
- **to grow with user input** (direction, documentation, tools)

Involvement from EICUG

e.g. benchmark processes,
detector design, tracking algorithms,
MC reweighting, SSA analysis

Point of entry

HOME | JOIN EICUG | SCIENCE | ORGANIZATION | PHONEBOOK | CALENDAR | SOFTWARE | DOCUMENTS | MEDIA | LOGIN

Home » EIC Software

EIC Software

Software Working Group

The EICUG has formed a Software Working Group that collaborates with EIC Software initiatives and other experts in NP and HEP on detector and physics simulations for the EIC. The short-term goal of the working group is to meet in FY20 the requirements for common tools and documentation in the EICUG. The current work focusses on a common Geant4 infrastructure for the EIC that allows geometry exchange between the eRHIC and JLEIC concepts.

JupyterLab

The Software Working Group has adapted JupyterLab as a collaborative workspace to further develop EIC Science, to examine detector requirements, and to work on detector designs and concepts. JupyterLab is a web-based interactive analysis environment to create and share documents that contain the analysis code, the narrative of the analysis including graphics and equations, and visualizations of the analysis results. This will allow the EICUG not only to pursue simulations in a manner that is accessible, consistent, and reproducible to the EICUG as a whole, but also to build a collection of analyses and analysis tools in the fully extensible and modular JupyterLab environment. A quick start tutorial for fast simulations is available on the website for EIC Software.

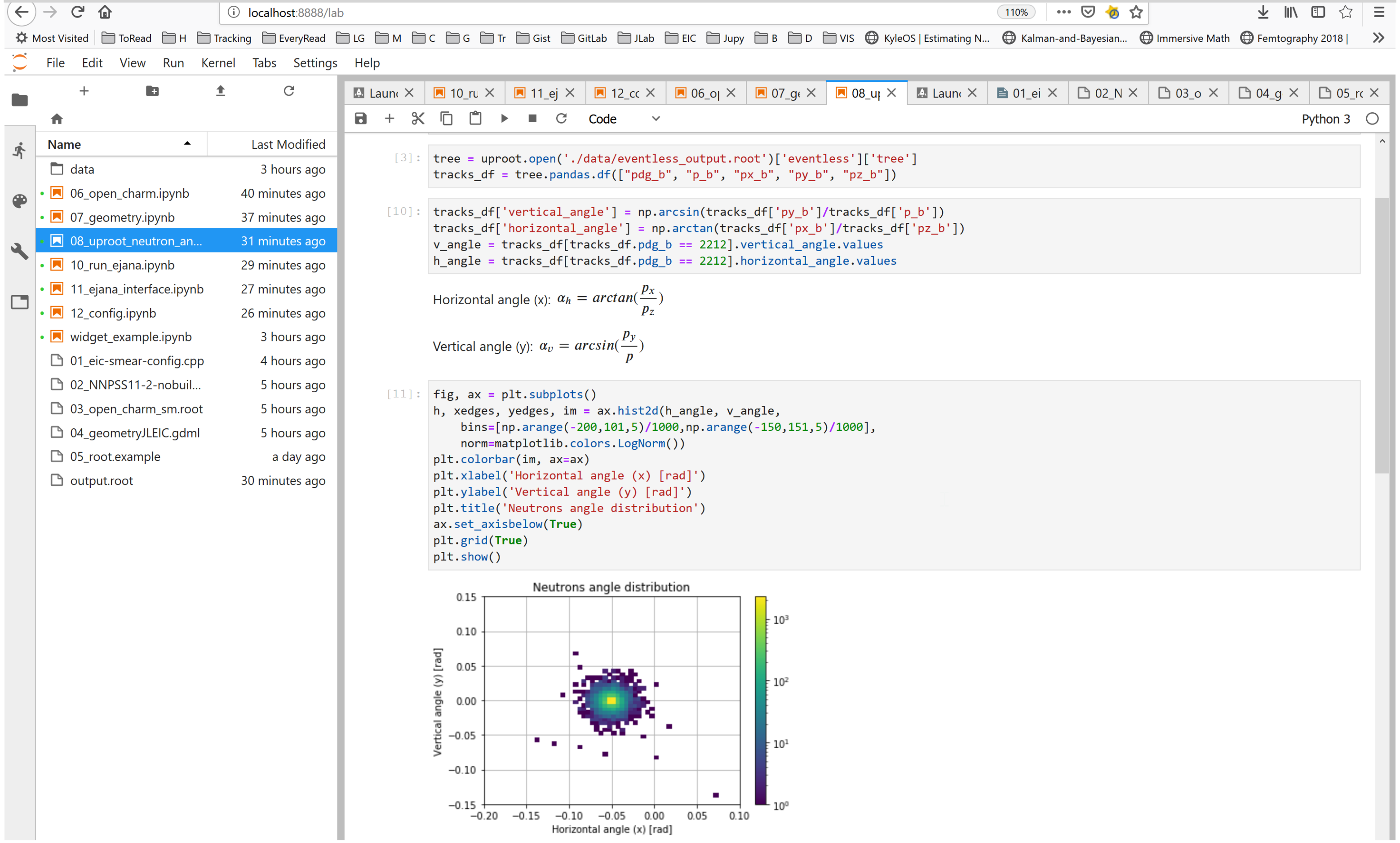
Important links

Mailing list	eicug-software@eicug.org (subscribe via Google Group)
Repository	http://gitlab.com/eic
Website	https://software.eicug.org

Collaborative workspace for EIC simulations

JupyterLab

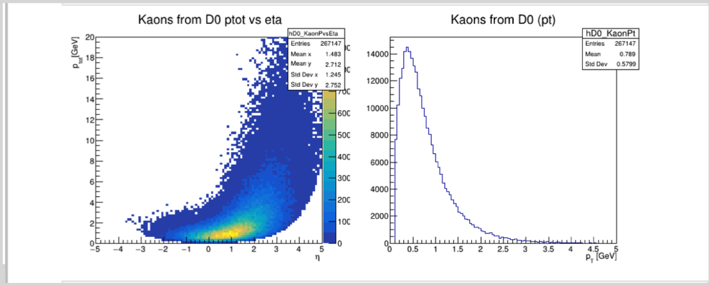
- web-based interactive analysis environment



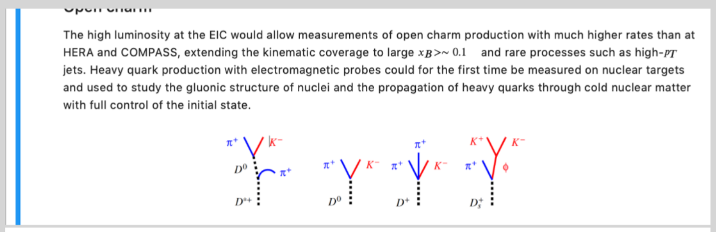
Jupyter Notebooks

- writing analysis code

- visualization of results

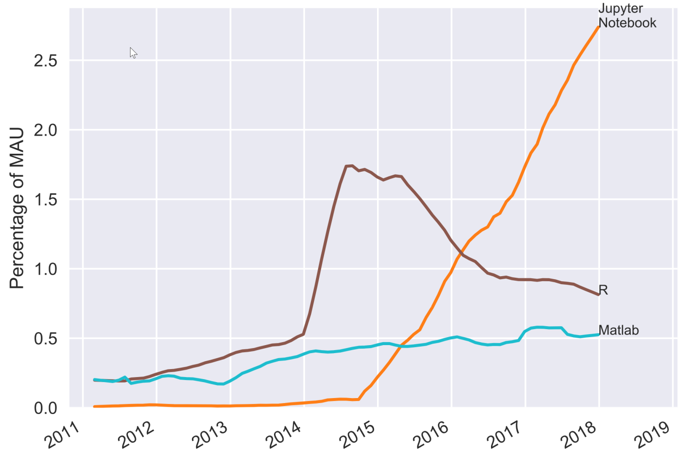


- narrative of the analysis



JupyterLab environment

- **bridge to modern data science**, e.g.,



- *Nature* **563**, 145-146 (2018): “Why Jupyter is data scientists’ computational notebook of choice”
- more than three million Jupyter Notebooks publicly available on GitHub

- **collaborative workspace** to create and share Jupyter Notebooks

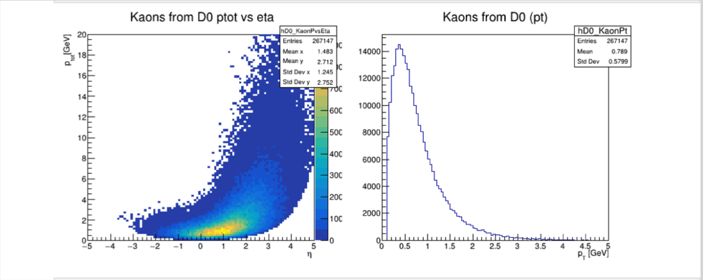
- **web-based interactive analysis environment** accessible, consistent, reproducible analyses

- **fully extensible and modular** build a collection of analyses and analysis tools

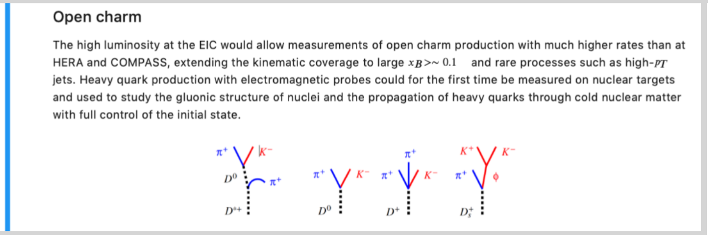
Jupyter Notebooks

- **writing analysis code**

- **visualization of results**



- **narrative of the analysis**



Modular design

Escaping complexity scaling trap

- provide interfaces to internal layers
- interaction between layers must be clear

Modularity each layer must be replaceable

simple	JupyterLab web interface
moderate	analysis scripts, python
complex	eJANA, plugins, C++
expert	JANA, eic-smear, *fun4all*, ROOT, Geant4

```
../data/beagle_eD.txt

[3]: jana.run()

Total events processed: 10001 (~ 10.0 kevt)

▸ Full log

▾ Run command

ejana
-Pplugins=beagle_reader,vmeson,event_writer
-Pnthreads=1
-Pnevents=10000
-Poutput=beagle.root
../data/beagle_eD.txt
-Pjana:debug_plugin_loading=1
```

EIC Software

Simulation of physics processes

Monte Carlo Event Generators
Tutorials in preparation

Simulation of detector responses

Fast simulations
Tutorials ✓

Full simulations
Tutorials ✓

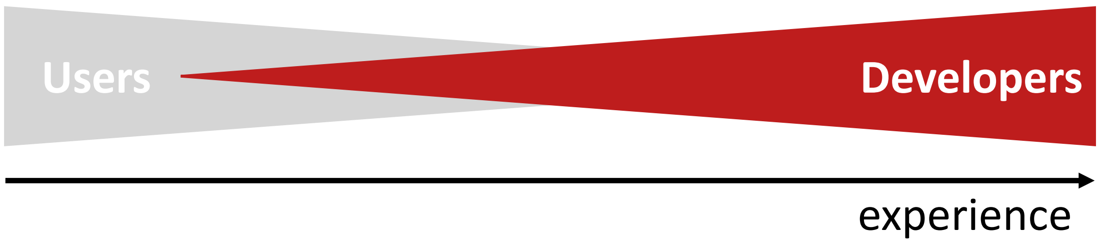
Physics analysis

Reconstruction of physics processes
Tutorials in preparation

Support

support team

being built up
weekly shifts



software-support@eicug.org

Mailing list (anyone can contact)
Google forum (for archive of support requests and start of knowledge base)

http://eicug.slack.com/

EICUG Slack workspace with software-support channel

Requests from EICUG Software Working Group

Develop

Support

Workflow environment for EIC simulations

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Semi-Inclusive Reactions Subgroup

Engage with us

- Make your MC samples available
- Integrate your software into our workflow environment
- Send us requests

Update from Center for Nuclear Femtography

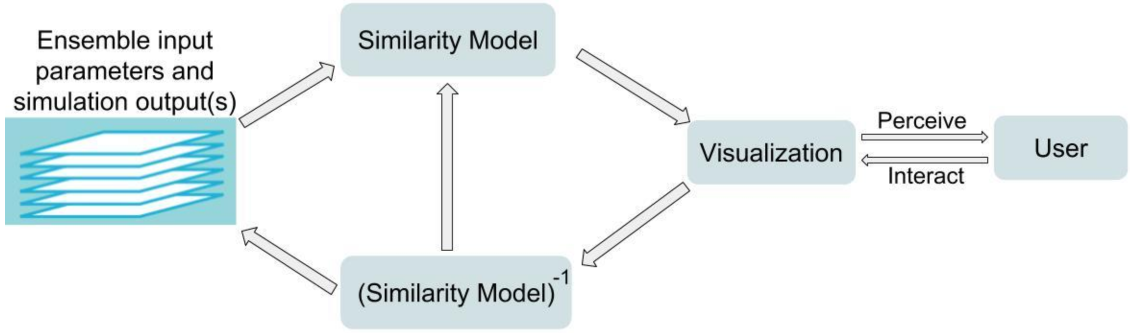
Next-generation Visual Analysis Workspace for Multi-Dimensional Nuclear Femtography Data

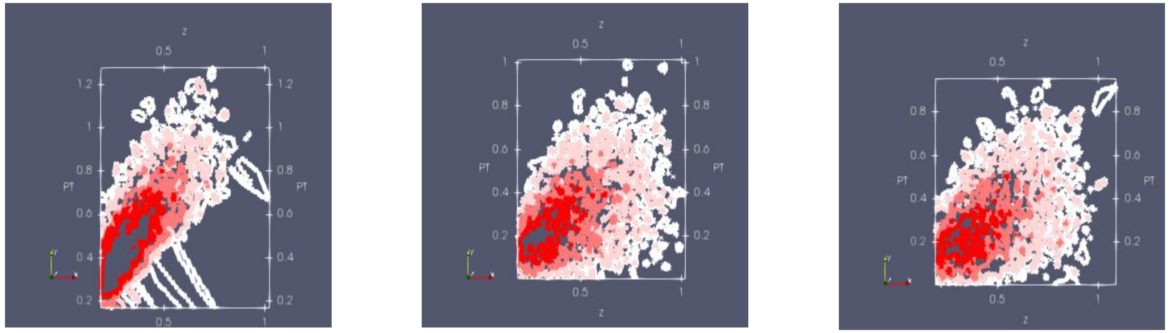
Next-Generation Visual Analysis Workspace for SIDIS

CENTER for NUCLEAR FEMTOGRAPHY

Project by Virginia Tech and Jefferson Lab Explore new visualization methods for Nuclear Physics

First approach Can we use **Semantic Interactions** to explore SIDIS regions?





Exploring SIDIS regions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Mapping the kinematical regimes of semi-inclusive deep inelastic scattering

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Abstract: We construct a language for identifying kinematical regions of transversely differential semi-inclusive deep inelastic scattering (SIDIS) cross sections with particular underlying partonic pictures, especially in the regions of moderate to low Q where sensitivity to kinematical effects becomes non-trivial. These partonic pictures map to power law expansions whose leading contributions ultimately lead to well-known QCD factorization theorems. In order to establish the consistency of a particular observable in SIDIS process with an estimate of the appropriate underlying partonic picture, we introduce new quantitative criteria expressed in terms of various ratios of partonic and hadronic momentum degrees of freedom. We propose how to use these criteria in phenomenology and provide a web tool which allows visualization of these ratios for any chosen kinematic configuration.

Keywords: Deep Inelastic Scattering (Phenomenology), QCD Phenomenology

ArXiv ePrint: 1904.12882

https://doi.org/10.1007/JHEP10(2019)122

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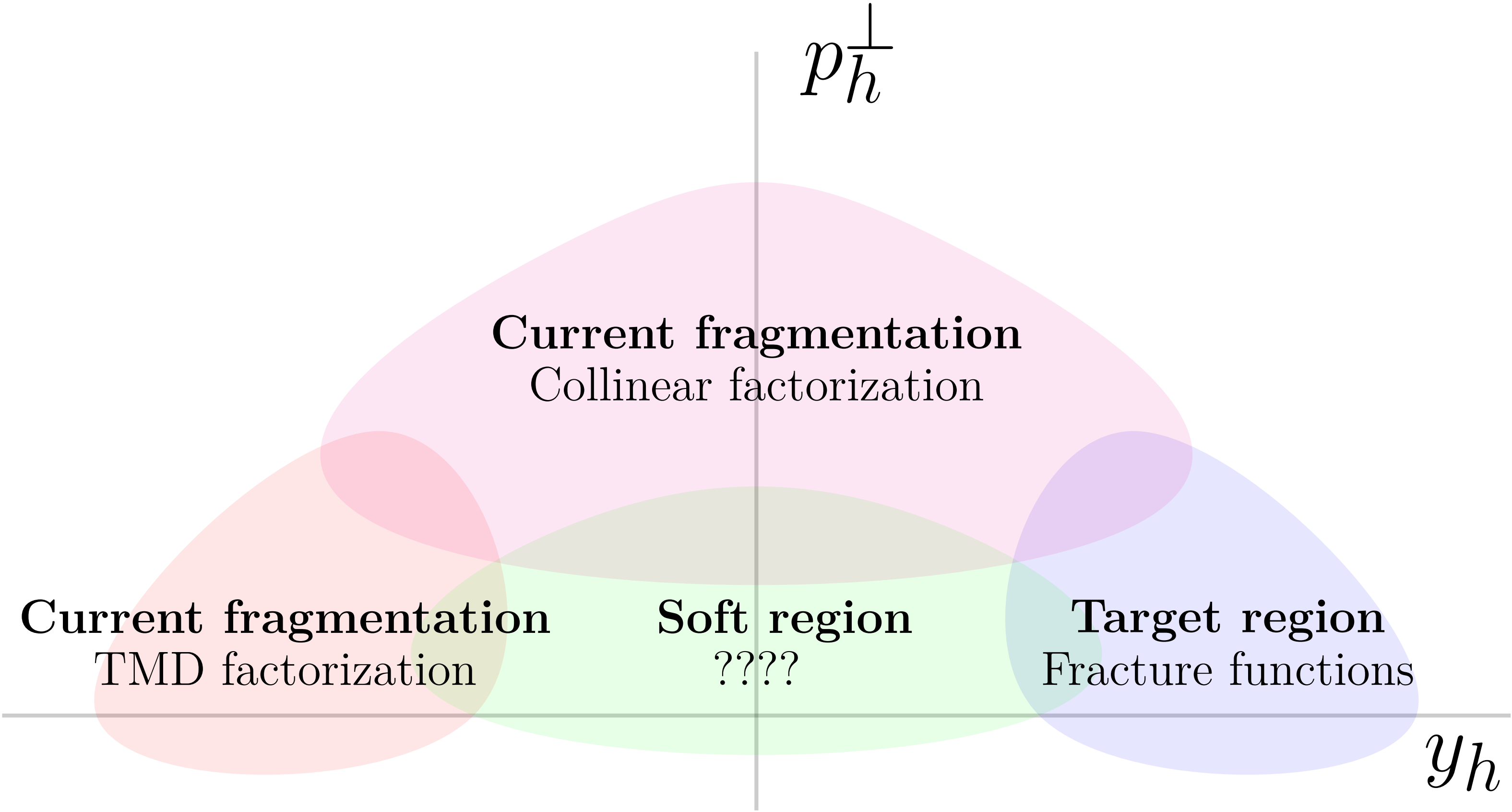
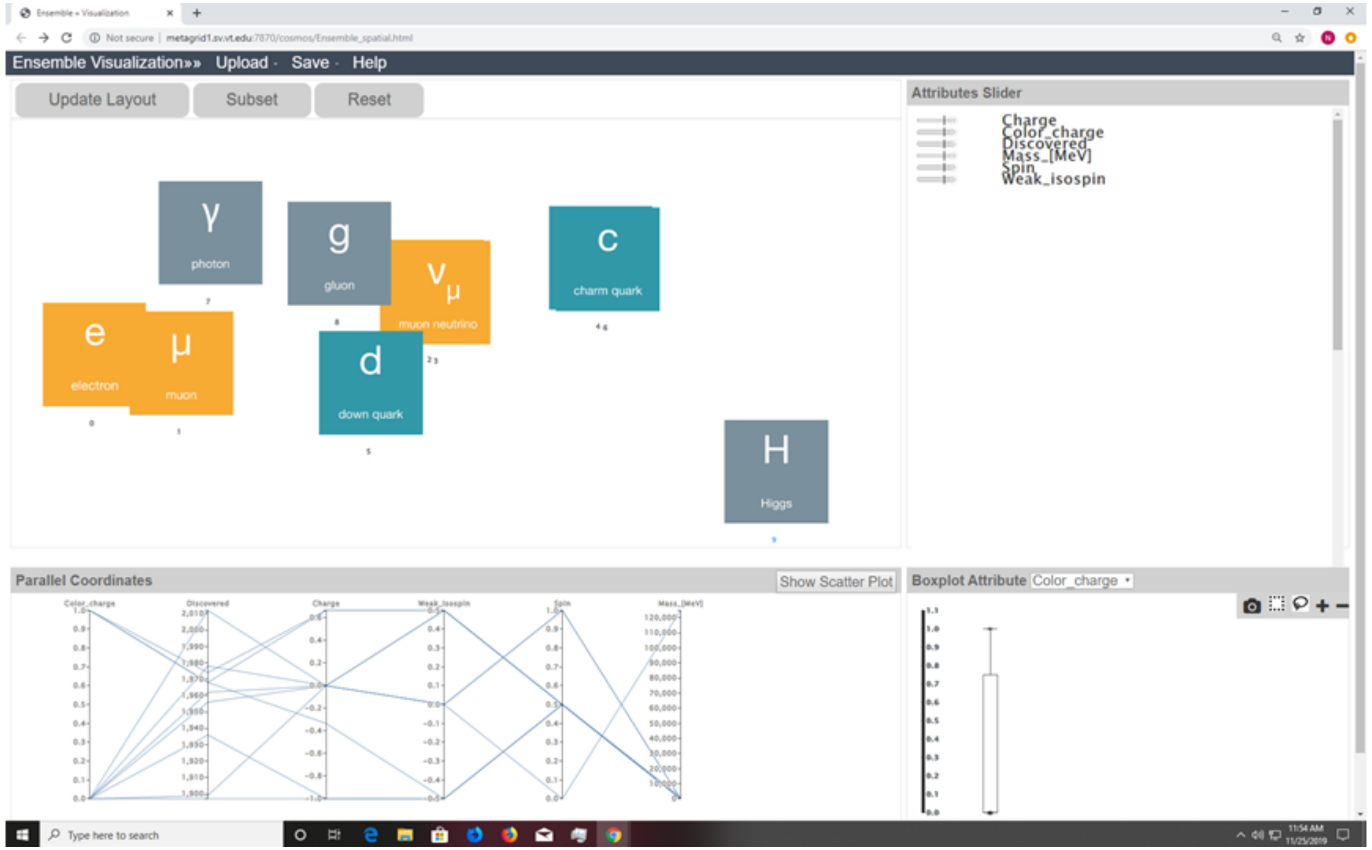
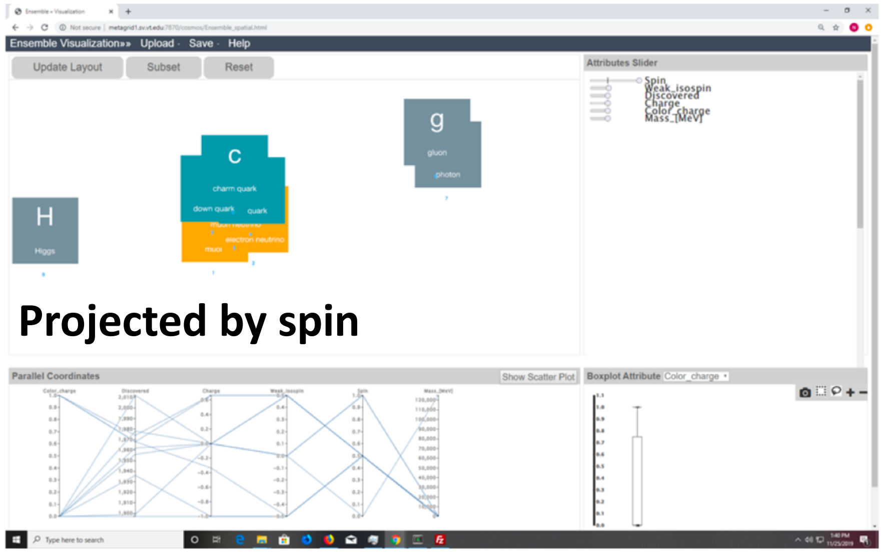
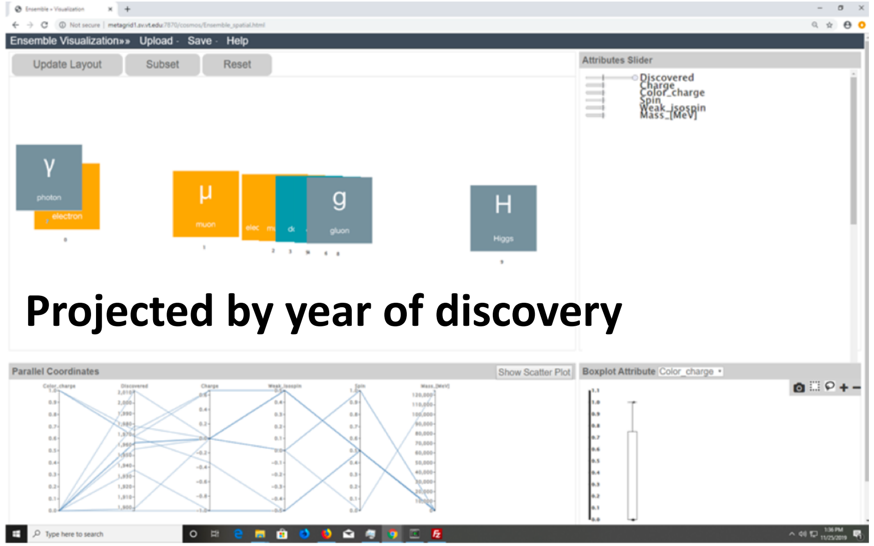


Toy example: Particle zoo







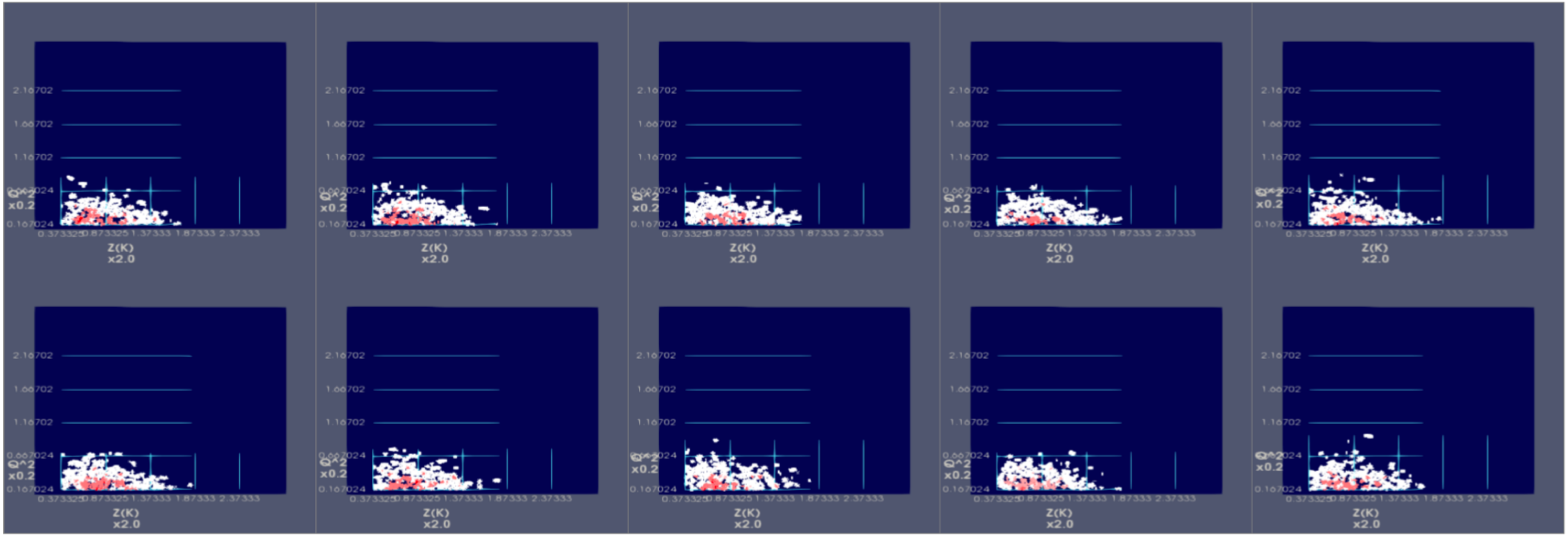
Create thumbnails from SIDIS events

Particle Type:
K+ ▾
QZP Threshold:
Above 1.5 ▾

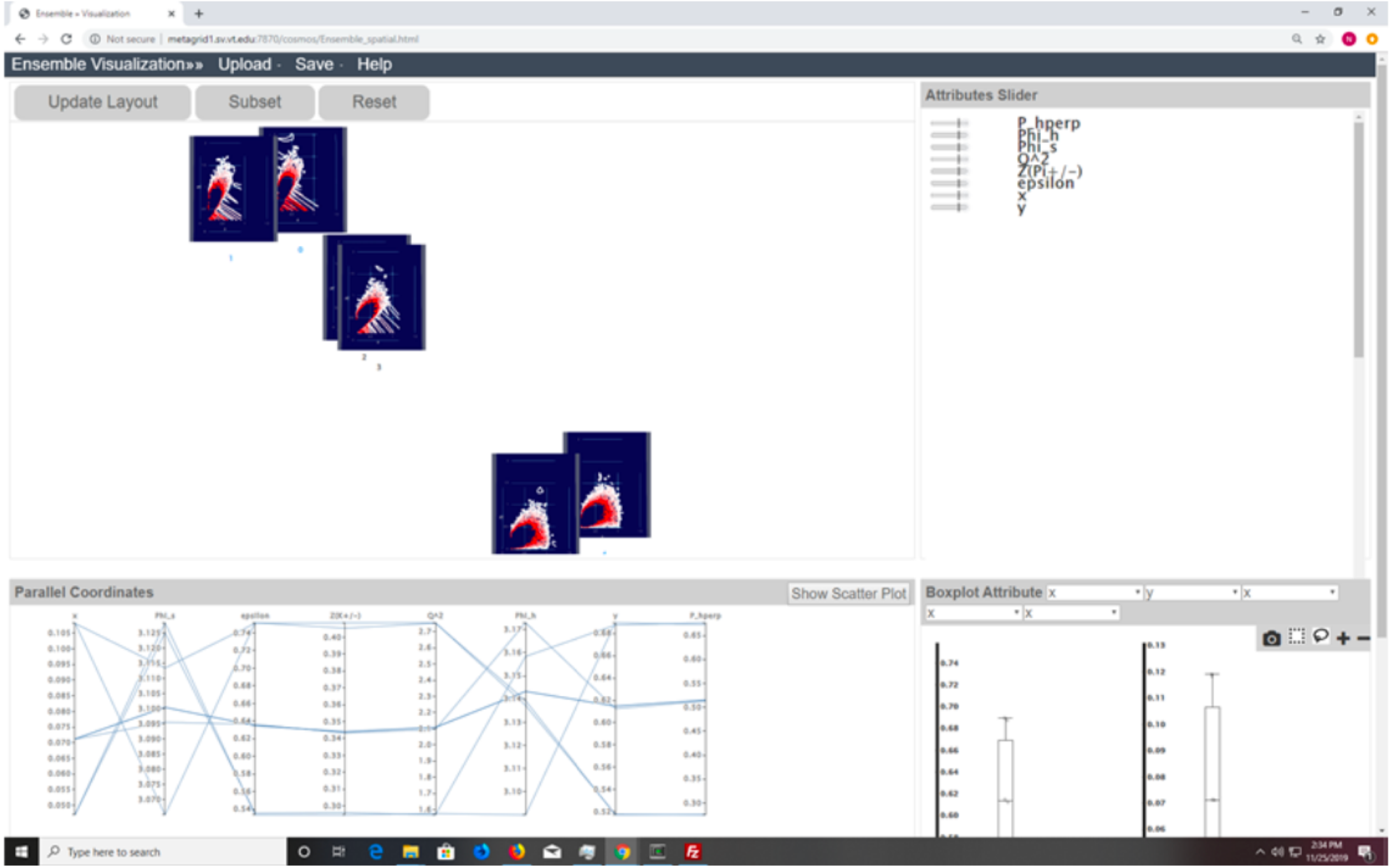
Use the above drop down to choose which particle type to display and which QZP threshold to use, then click on the matrix cells to display thumbnails for that particular combination of variables.
The axis label values are scaled;
divide by the scaled value to get the true value.
QZP = Q^2 / (P_hperp / Z)^2

Thumbnail Matrix

VARIABLES	X	Y	Z(Pi)	Z(K)	P_hperp	Q^2	Epsilon
X							
Y							
Z(Pi)							
Z(K)							
P_hperp							
Q^2							
Epsilon							



Kinematic studies based on semantic interactions



Of interest for YR studies?