

Understanding TrackML Results with a Visualization System using a PC + HoloLens Hybrid



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Example

I		II		III		IV	
x	y	x	y	x	y	x	y
10.0	8.04	10.0	9.14	10.0	7.46	8.0	6.58
8.0	6.95	8.0	8.14	8.0	6.77	8.0	5.76
13.0	7.58	13.0	8.74	13.0	12.74	8.0	7.71
9.0	8.81	9.0	8.77	9.0	7.11	8.0	8.84
11.0	8.33	11.0	9.26	11.0	7.81	8.0	8.47
14.0	9.96	14.0	8.10	14.0	8.84	8.0	7.04
6.0	7.24	6.0	6.13	6.0	6.08	8.0	5.25
4.0	4.26	4.0	3.10	4.0	5.39	19.0	12.50
12.0	10.84	12.0	9.13	12.0	8.15	8.0	5.56
7.0	4.82	7.0	7.26	7.0	6.42	8.0	7.91
5.0	5.68	5.0	4.74	5.0	5.73	8.0	6.89

Raw Data from Anscombe's Quartet

Statistical analysis

For all four columns, the statistics are identical

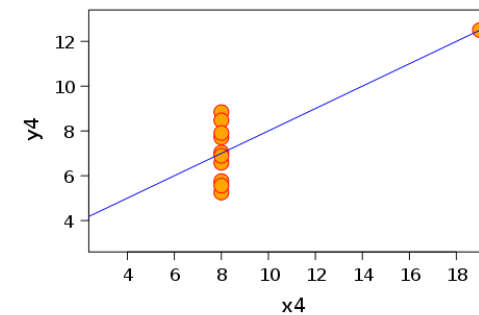
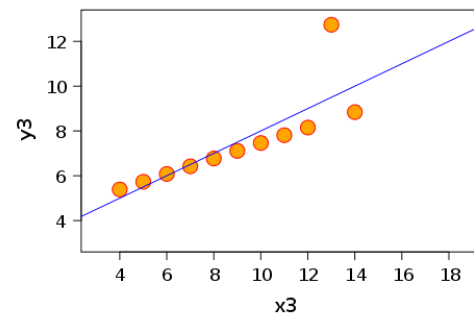
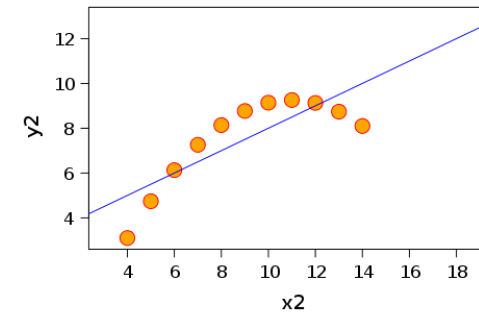
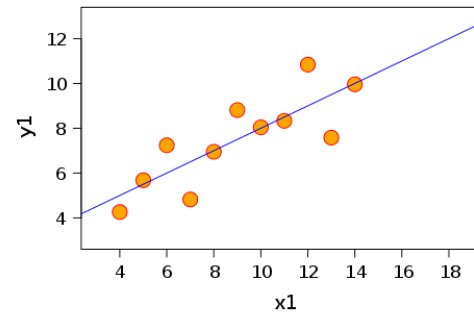
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Mean of x	9.0
Variance of x	11.0
Mean of y	7.5
Variance of y	4.12
Correlation between x and y	0.816
Linear regression line	$y = 3 + 0.5x$

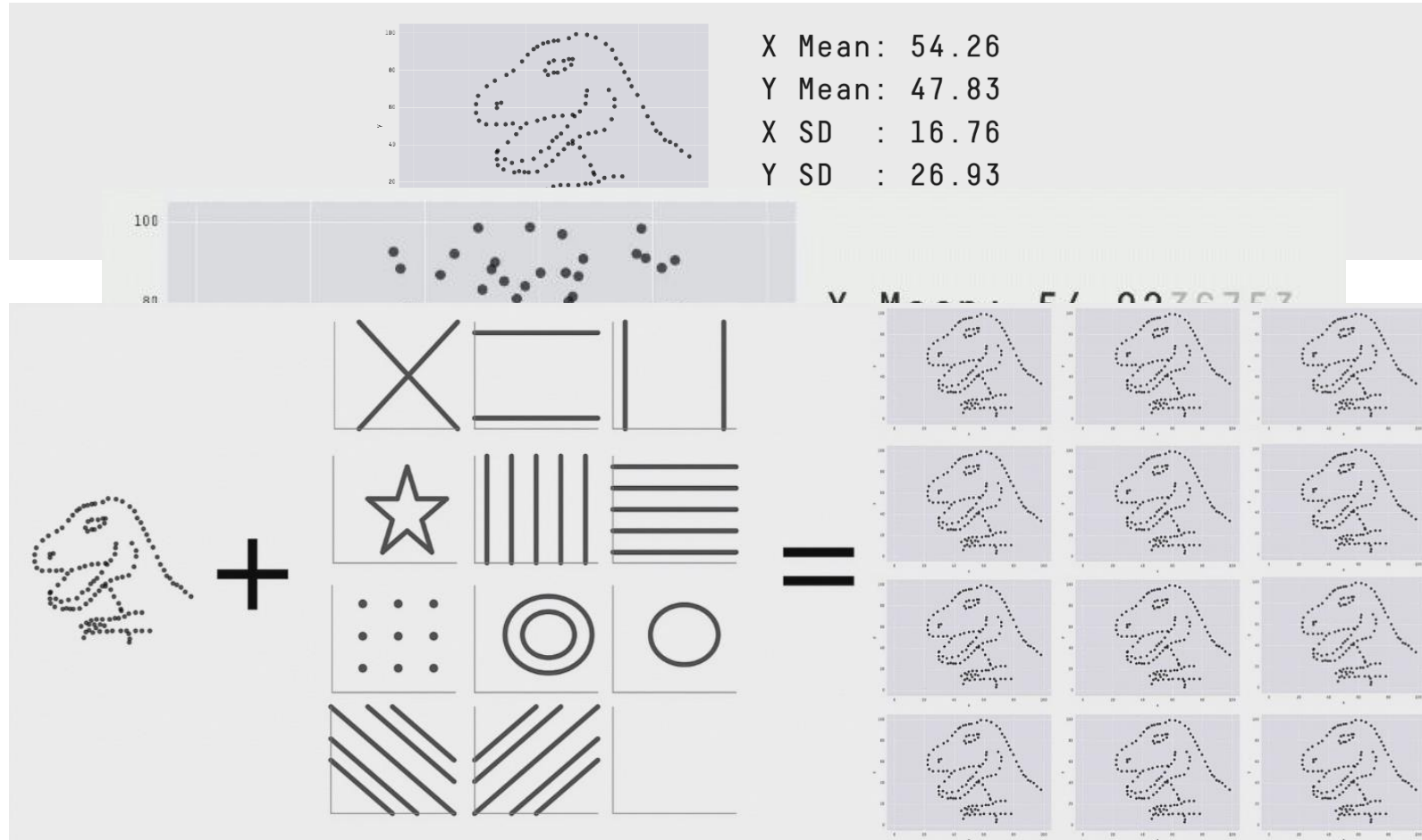
Visual representation of the data

Visual representation reveals a different story

I		II		III		IV	
x	y	x	y	x	y	x	y
10.0	8.04	10.0	9.14	10.0	7.46	8.0	6.58
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We can make data take any shape!

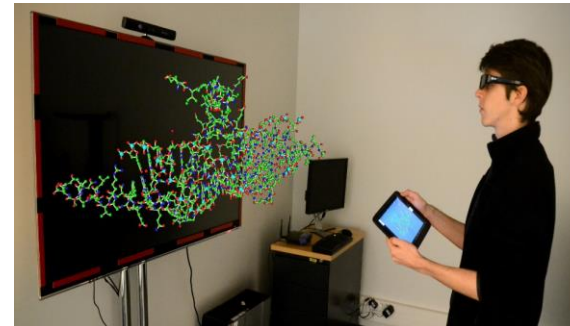
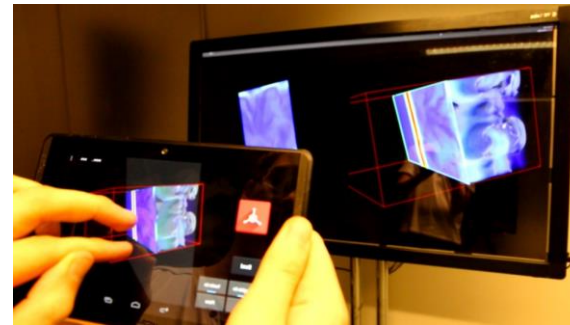
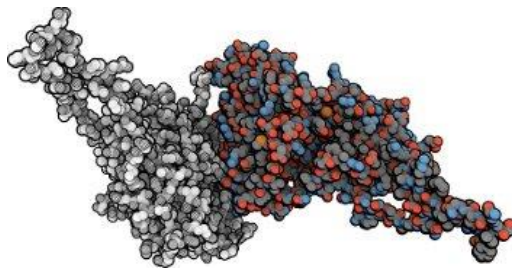
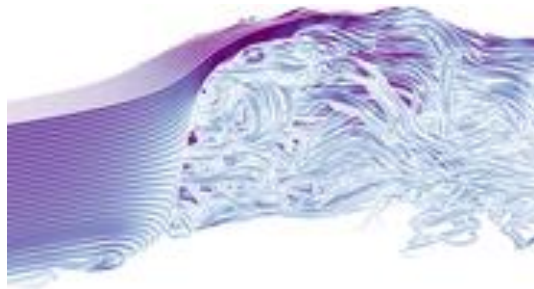
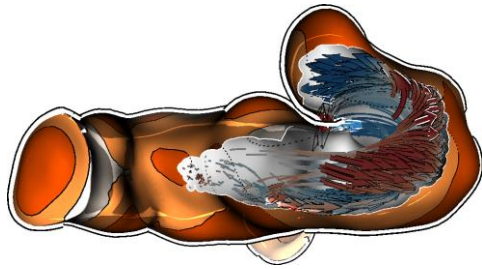


Our research questions/approaches

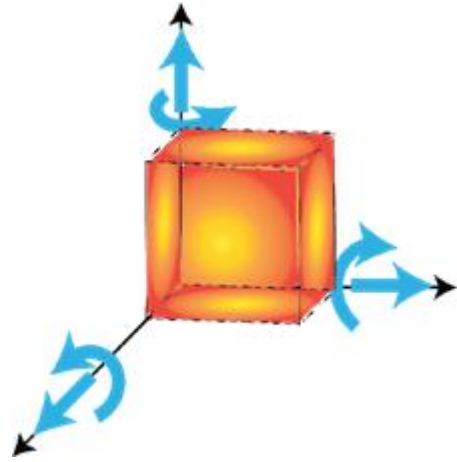
visualization/rendering

+

interaction

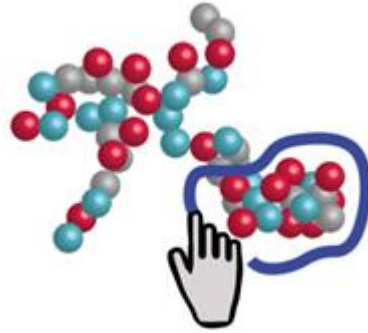
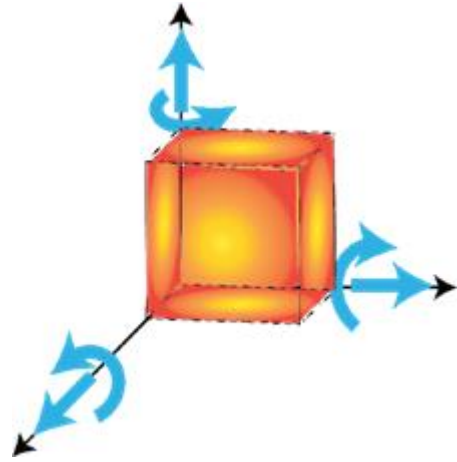


Interaction

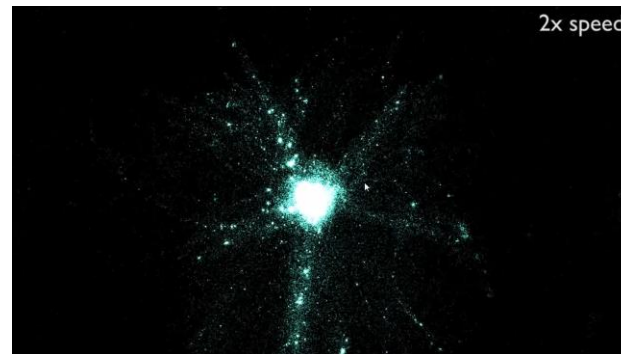


Navigation/Manipulation

Interaction

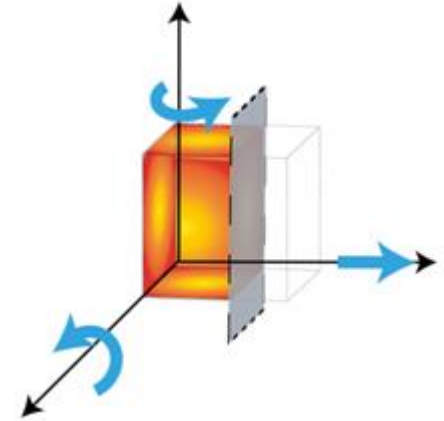
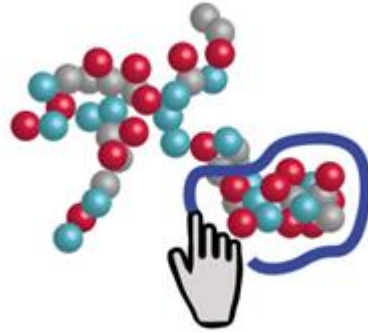
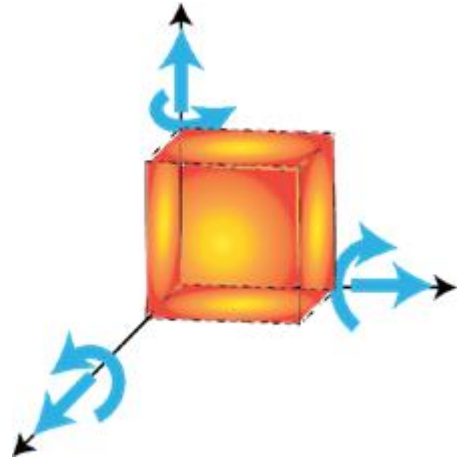


Navigation/Manipulation

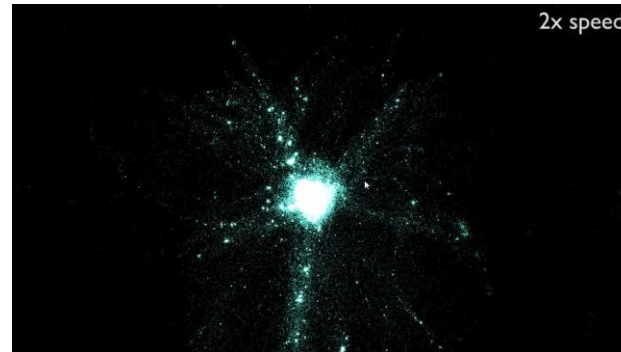


Selection

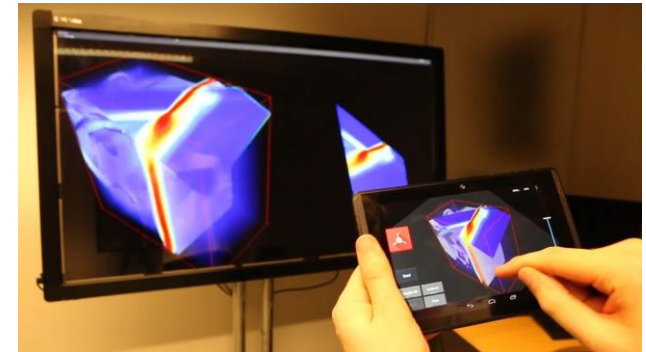
Interaction



Navigation/Manipulation

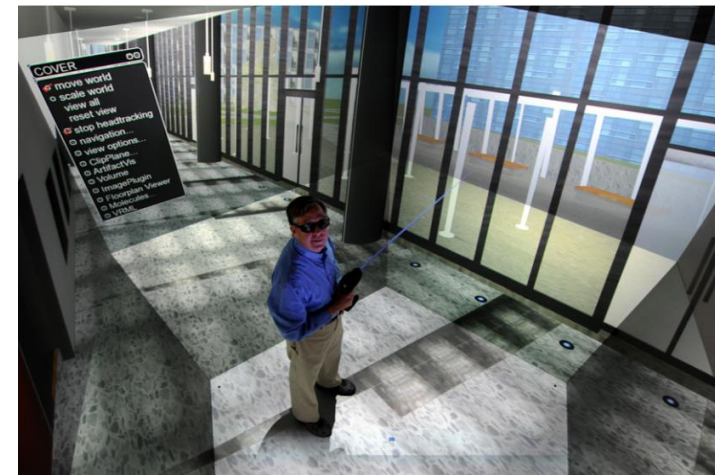


Selection

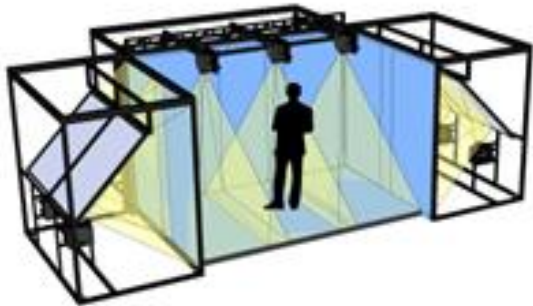
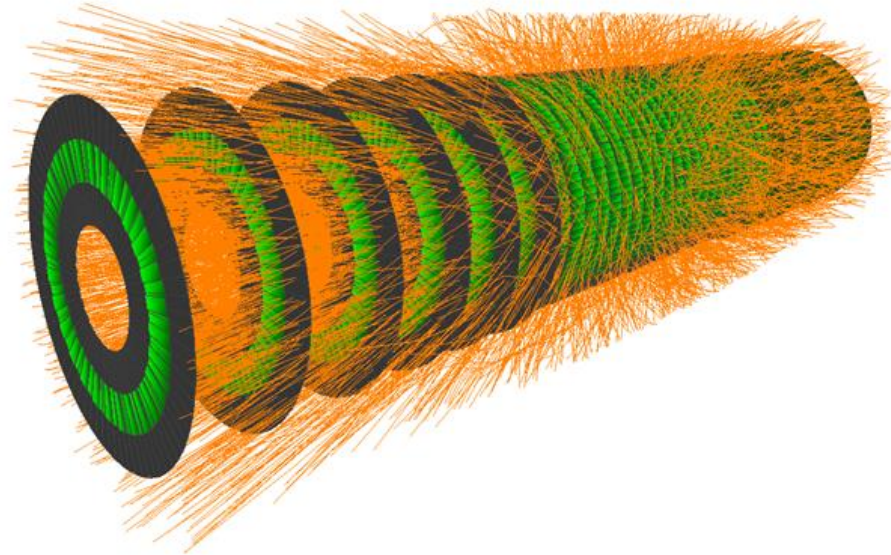


Clipping plane

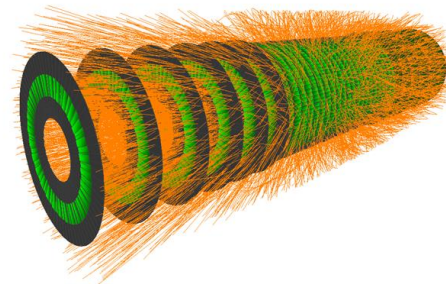
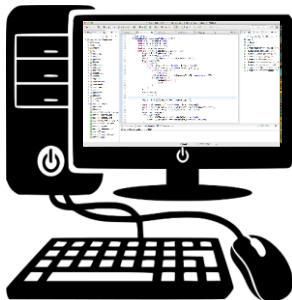
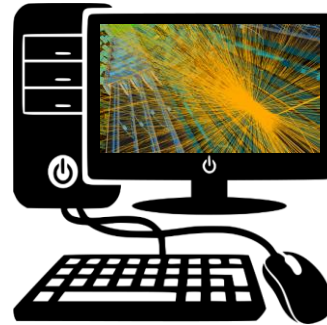
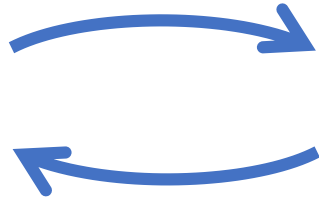
Visualization environments



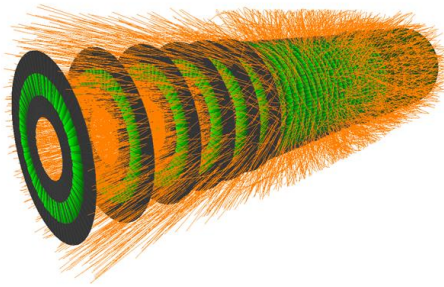
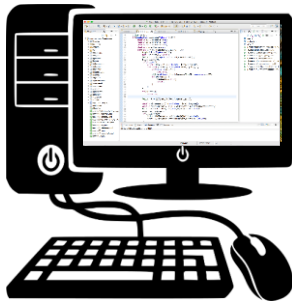
Collaboration with particle physicists



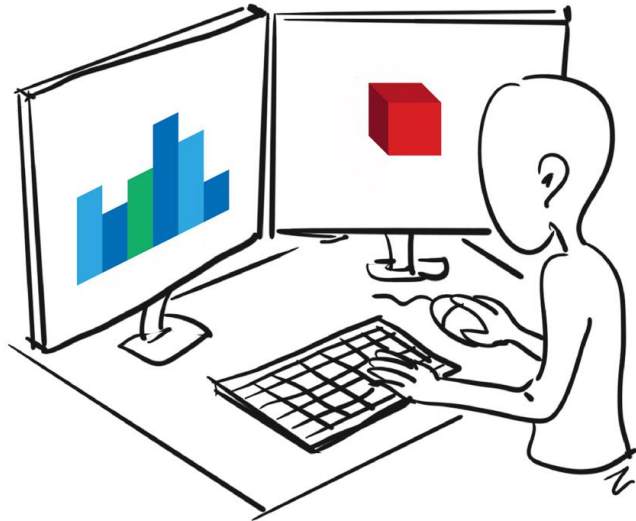
Vision: Hybrid setup



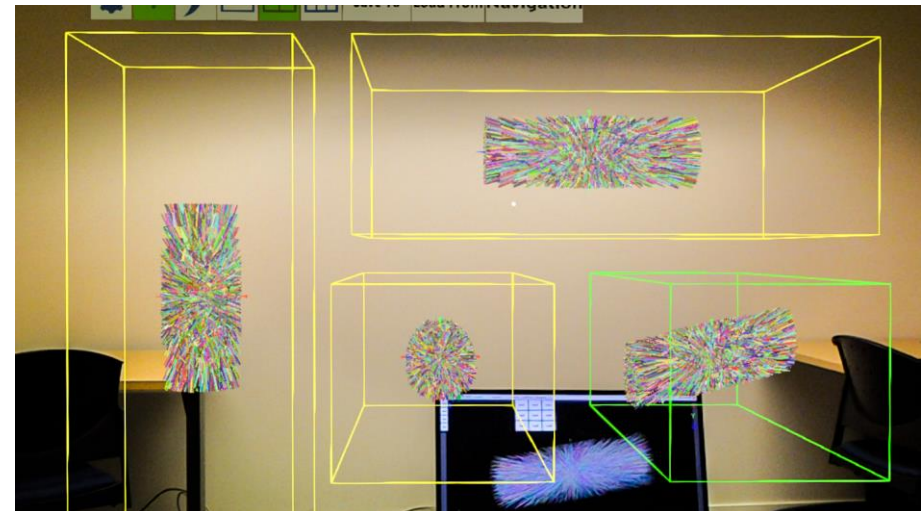
Study



Study design

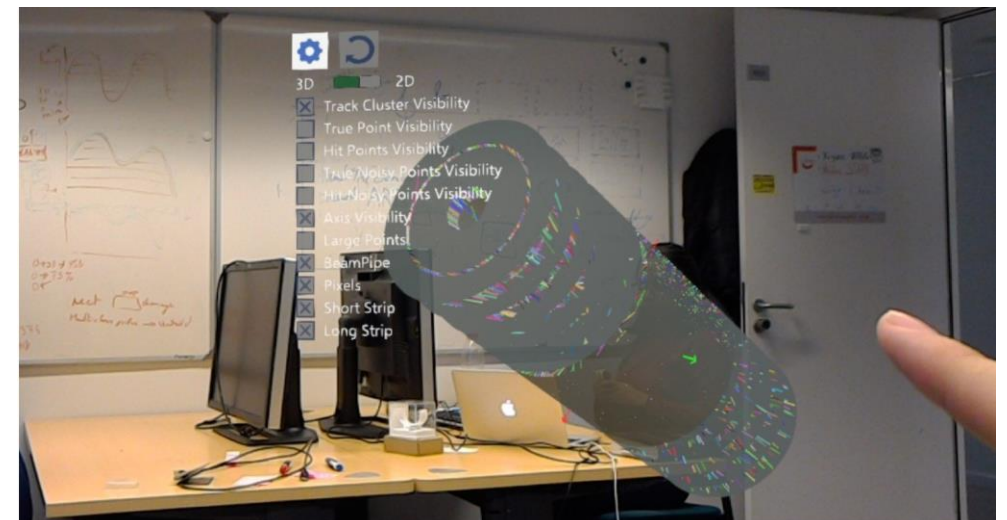
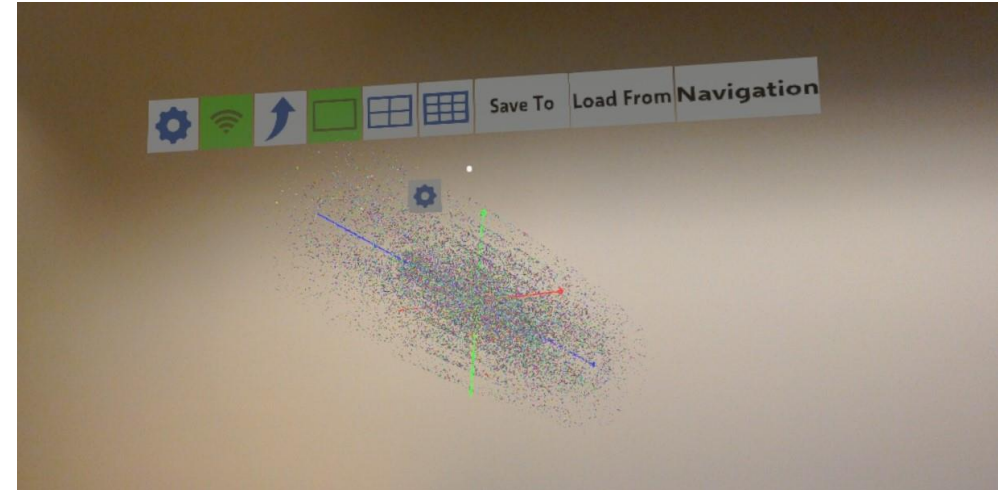
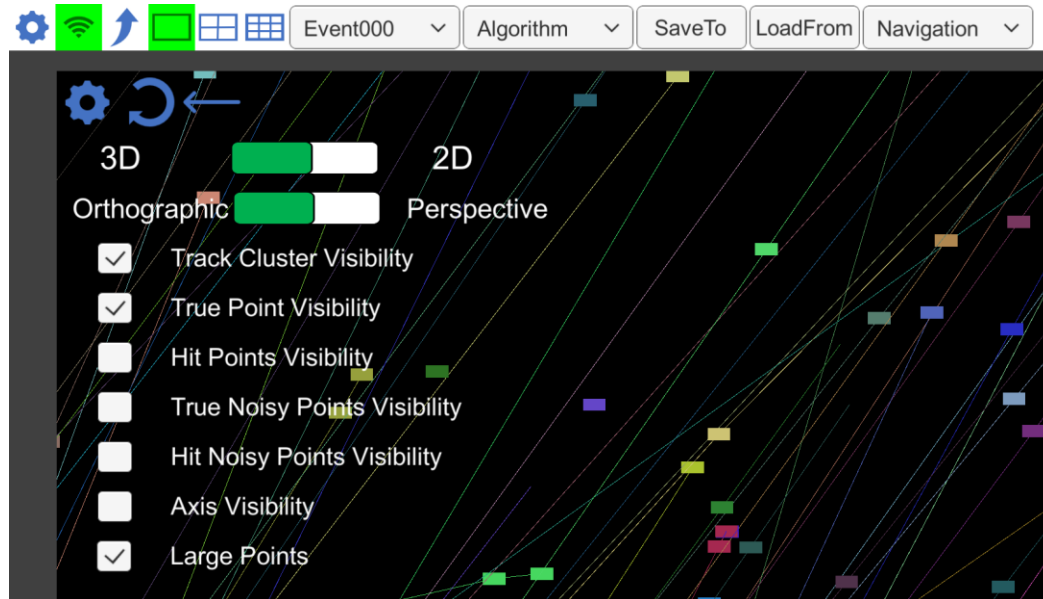


Two linked screens. Mouse can go from one to another.



Study design

- comparable functionalities on both sides
- similar user interfaces on both spaces

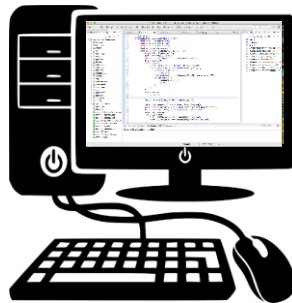


Study design

Our vision is to use an AR extension as a second virtual screen, with the ability to show stereoscopic views of 3D data.

For our initial investigation we explored the interaction with such a hybrid setting using mouse and keyboard.

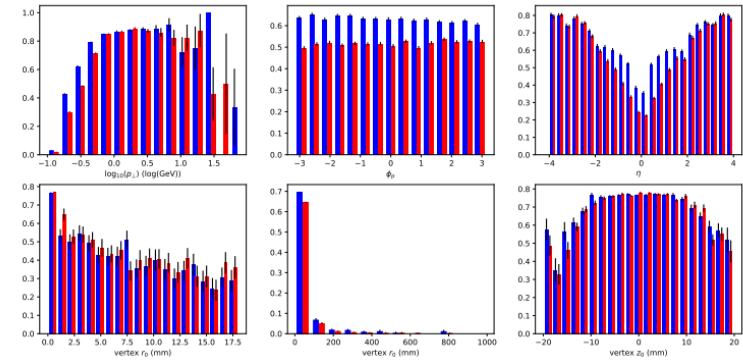
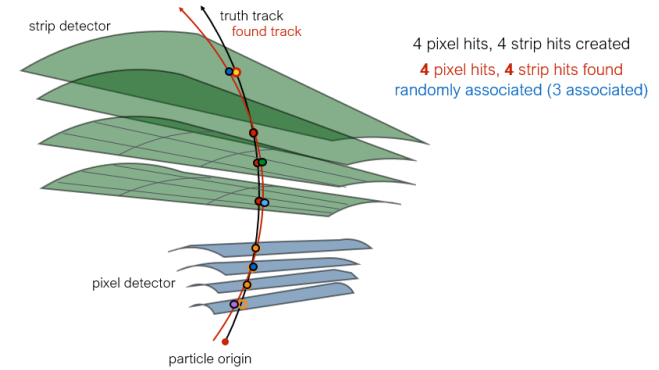
Focus on TrackML results exploration



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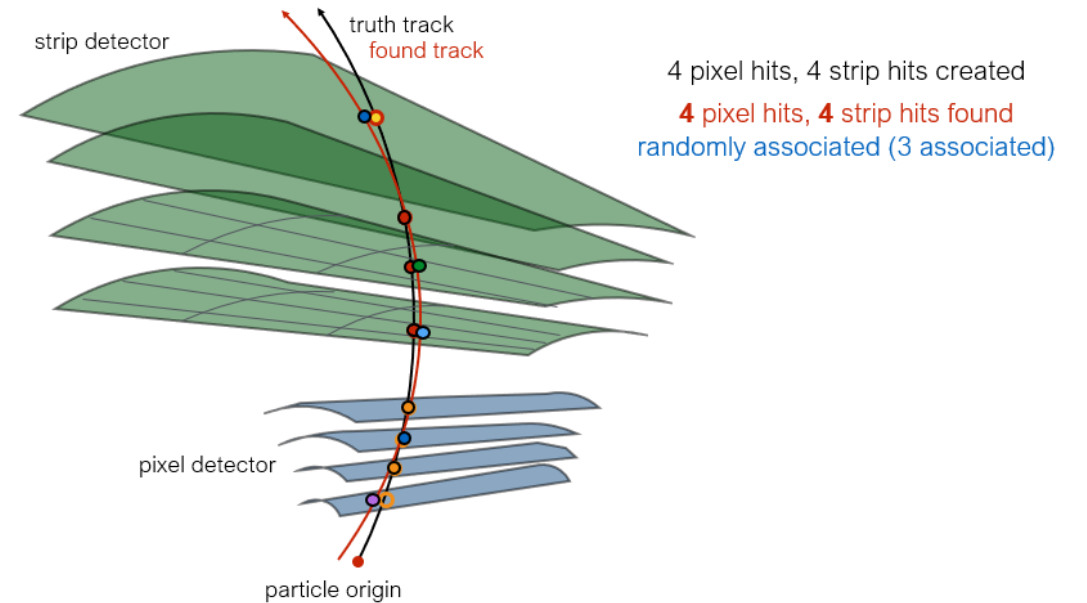
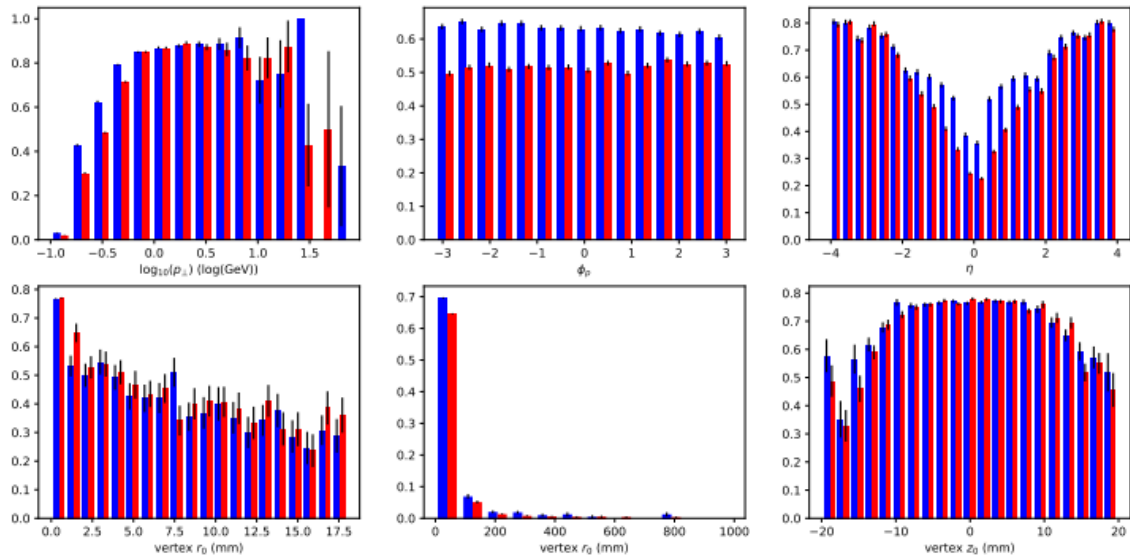


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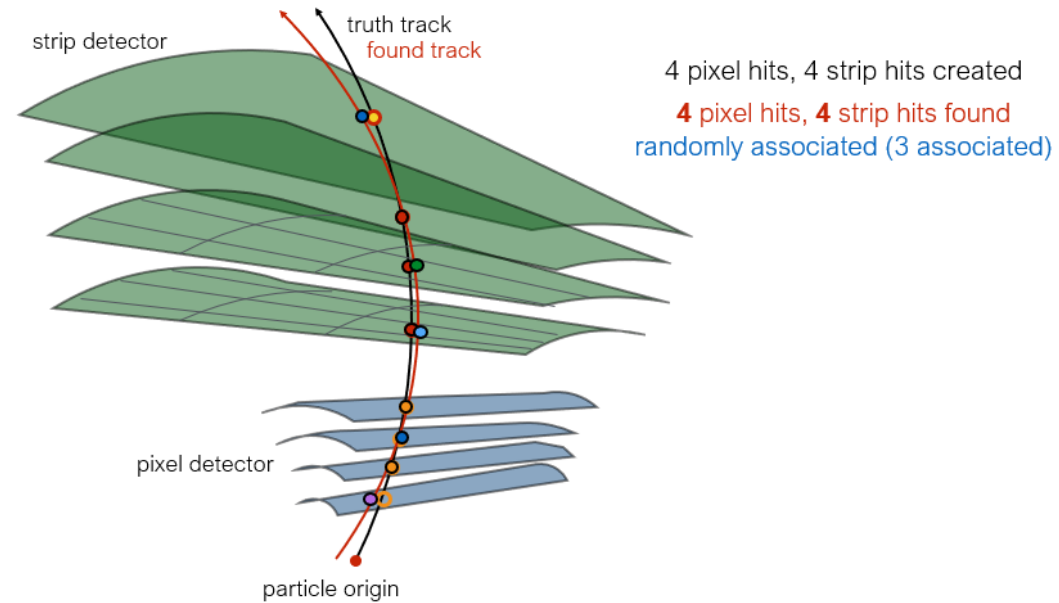
Question

- How do you relate 2D graphs/plots and 3D representations?
 - Do you go back and forth between them?
 - Is one more important than the other, or are all equally important?



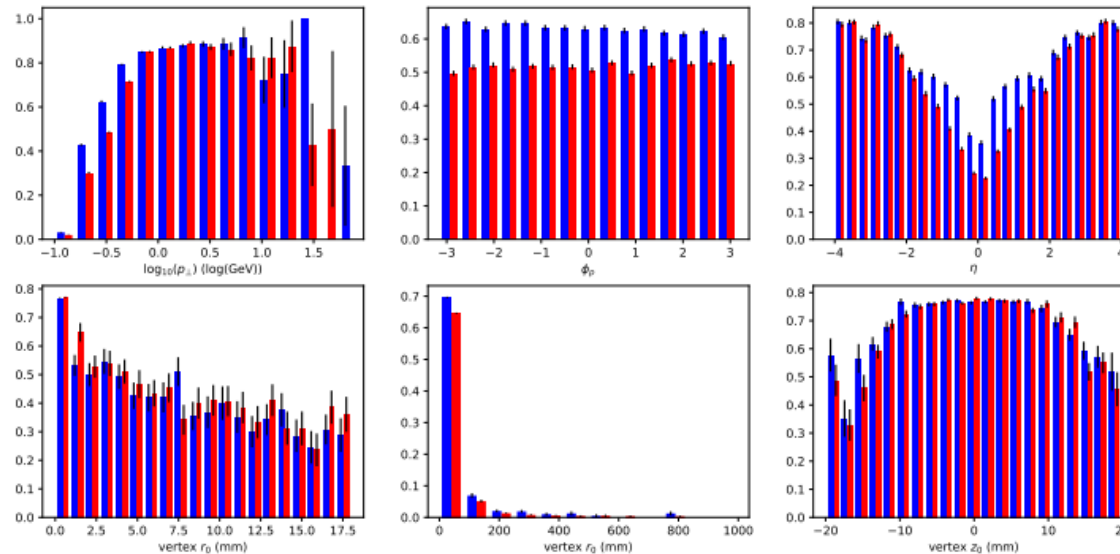
Question

- How do you traditionally work with 3D representations?
 - Lots of interactive rotation? Auto-stereoscopic displays?
 - Or are simple projections sufficient?
 - What kinds of selection of tracks?
 - How to compare two or more ML-based results?



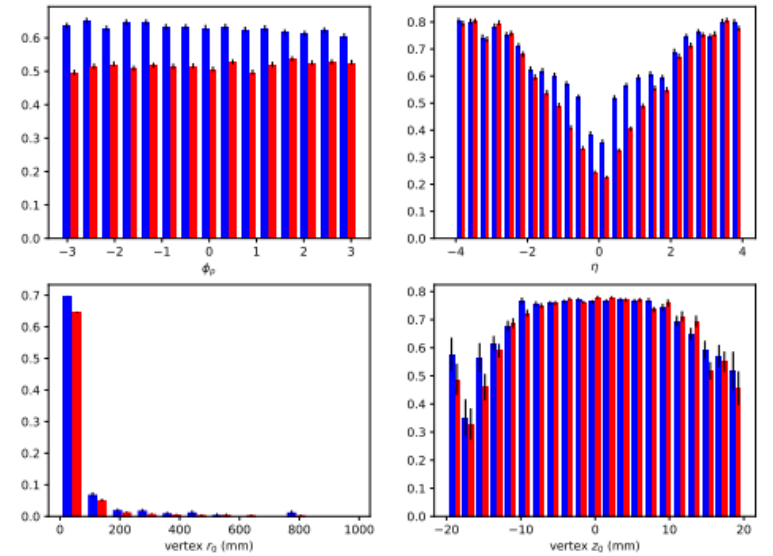
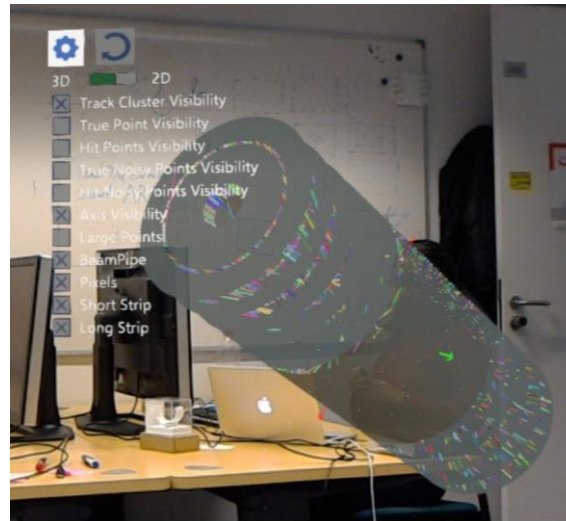
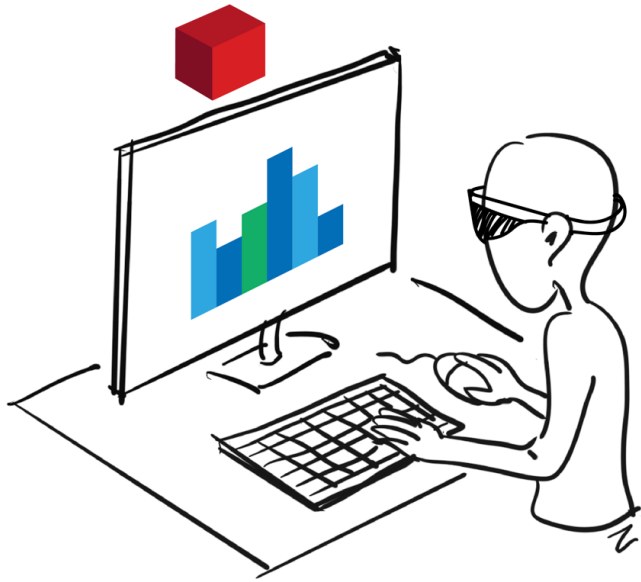
Question

- How do you need to understand besides the final score?
 - Specific parameters or views?
 - Temporal iteration results of the algorithm?
 - Other representations?
 - How to display, how to interact with them?



Main question

- How to create an effective data exploration tool for TrackML?



looking for input, talk to us, try our demo



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