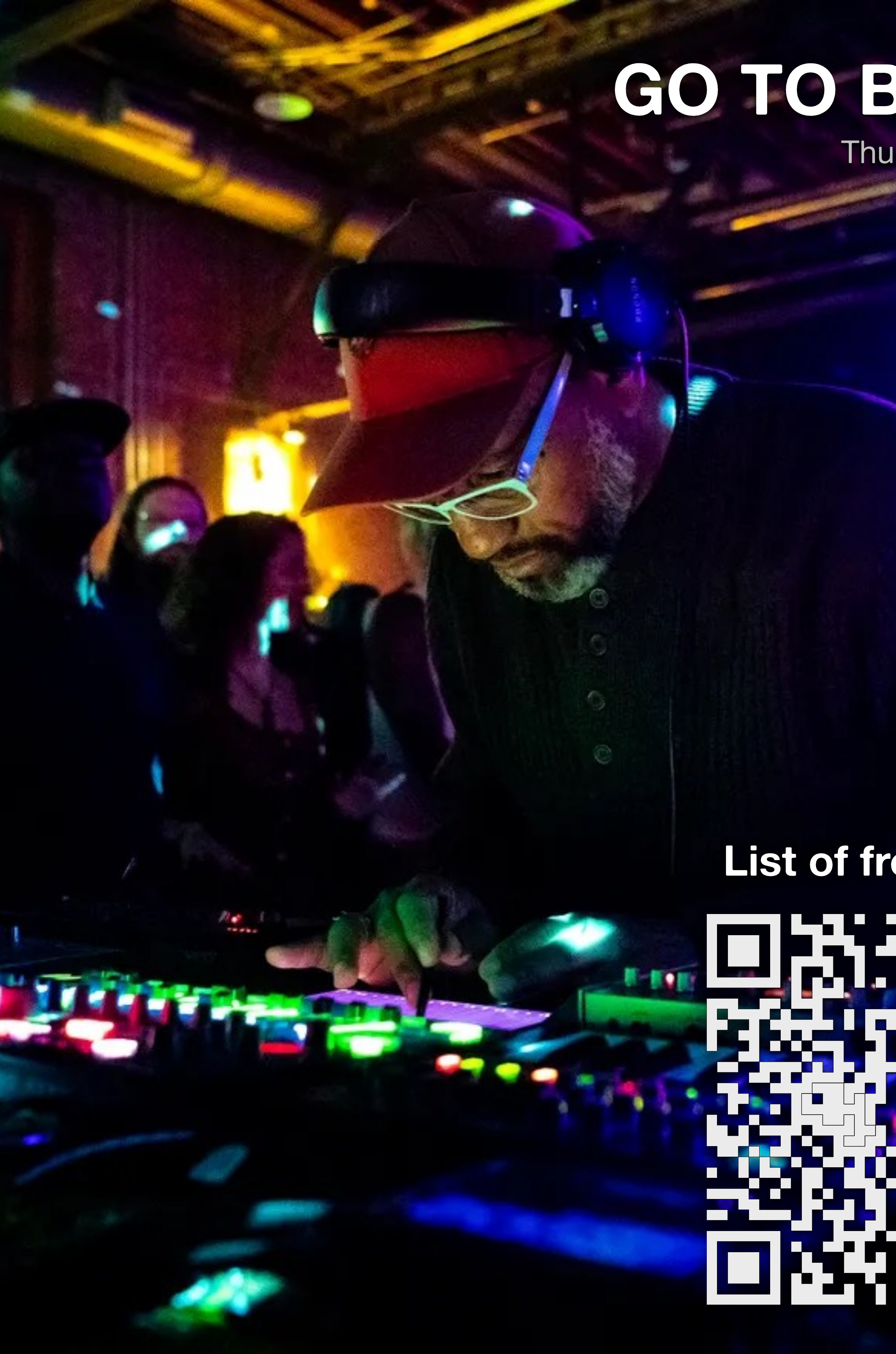
How to Poster Session

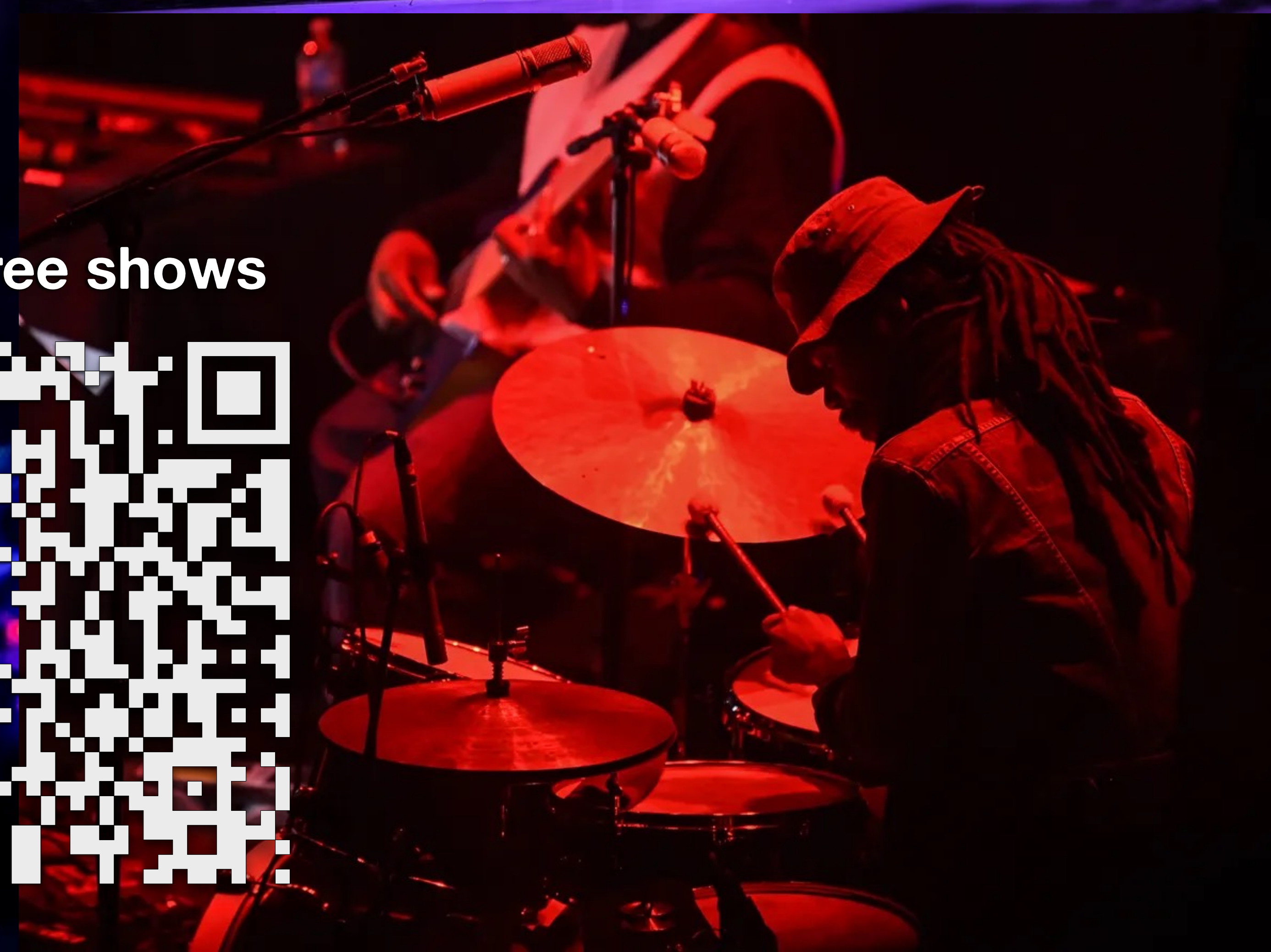
Prof L Lee

The University of Tennessee
Knoxville

GO TO BIG EARS

Thu-Sun





List of free shows

Disclaimers

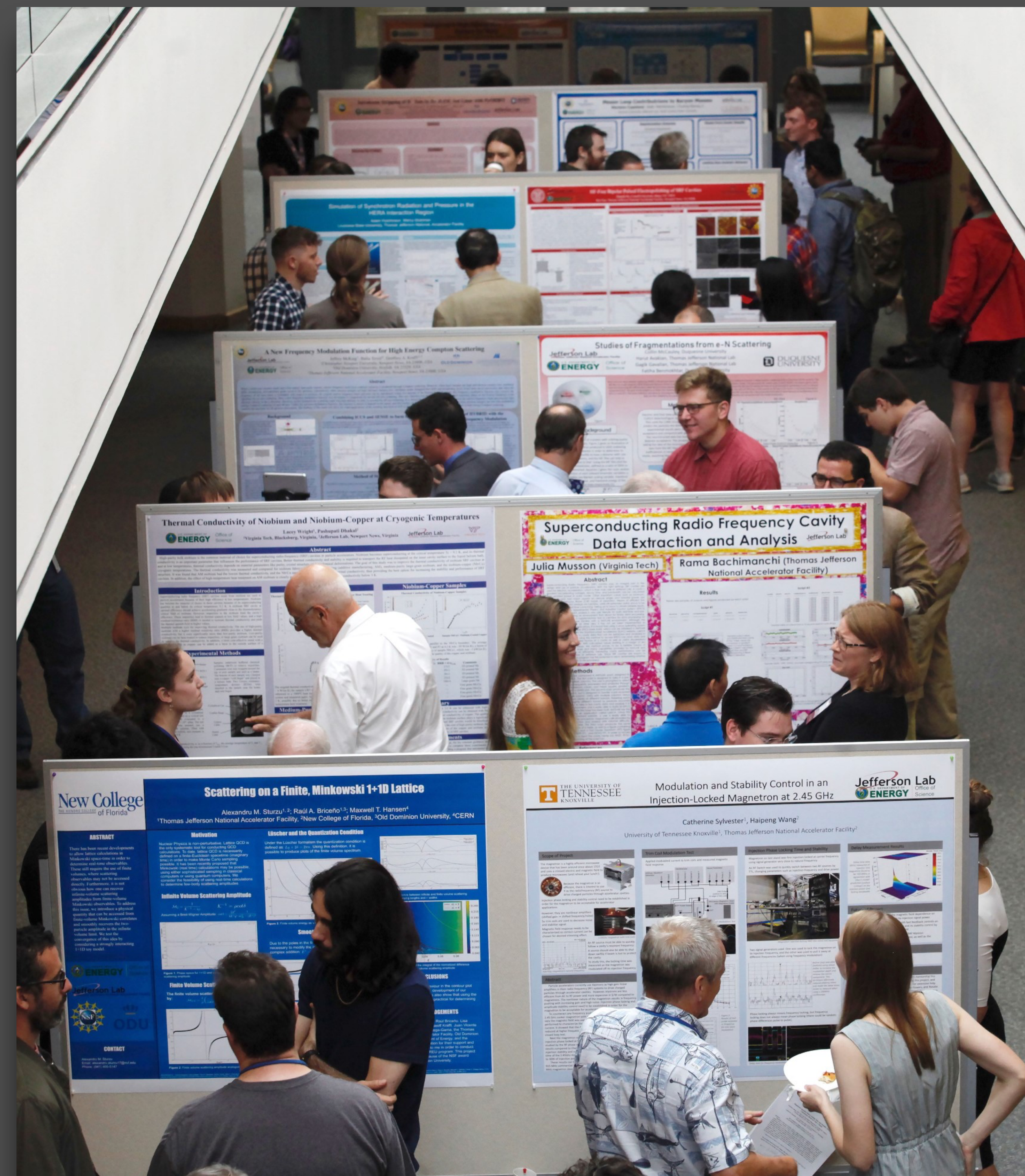
- Only discussing **posters presentations** today
    - (Many of the ideas do translate to other kinds of presentations)
- I’ve been a judge at many poster sessions, designed poster sessions, given posters, advised many students on posters, etc
- Will be a set of **personal opinions** on how to effectively present a poster
    - Can’t guarantee your advisor will agree with me (unless they’re me), but I find these tips and framings to useful
- All of these “rules” can be broken if it serves your communication mission

Presenting Your Work

- **Convey information**
  - Effective communication is everything
- **Don't bore your audience**
  - Know your audience! If you're presenting at a subfield conference, that's really different from EUReCA
  - Present things in an **engaging, relatable** way

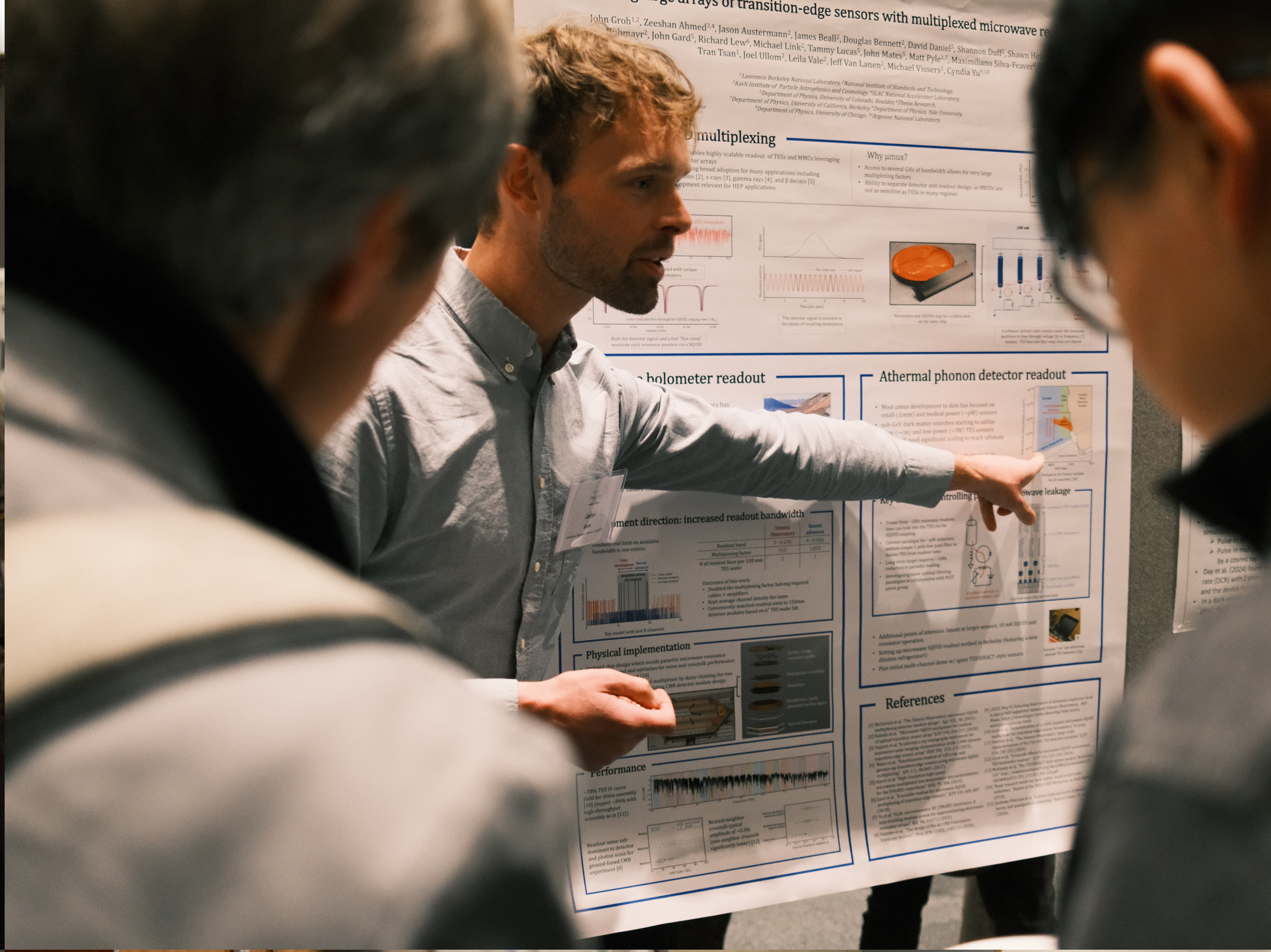
What is a poster session?

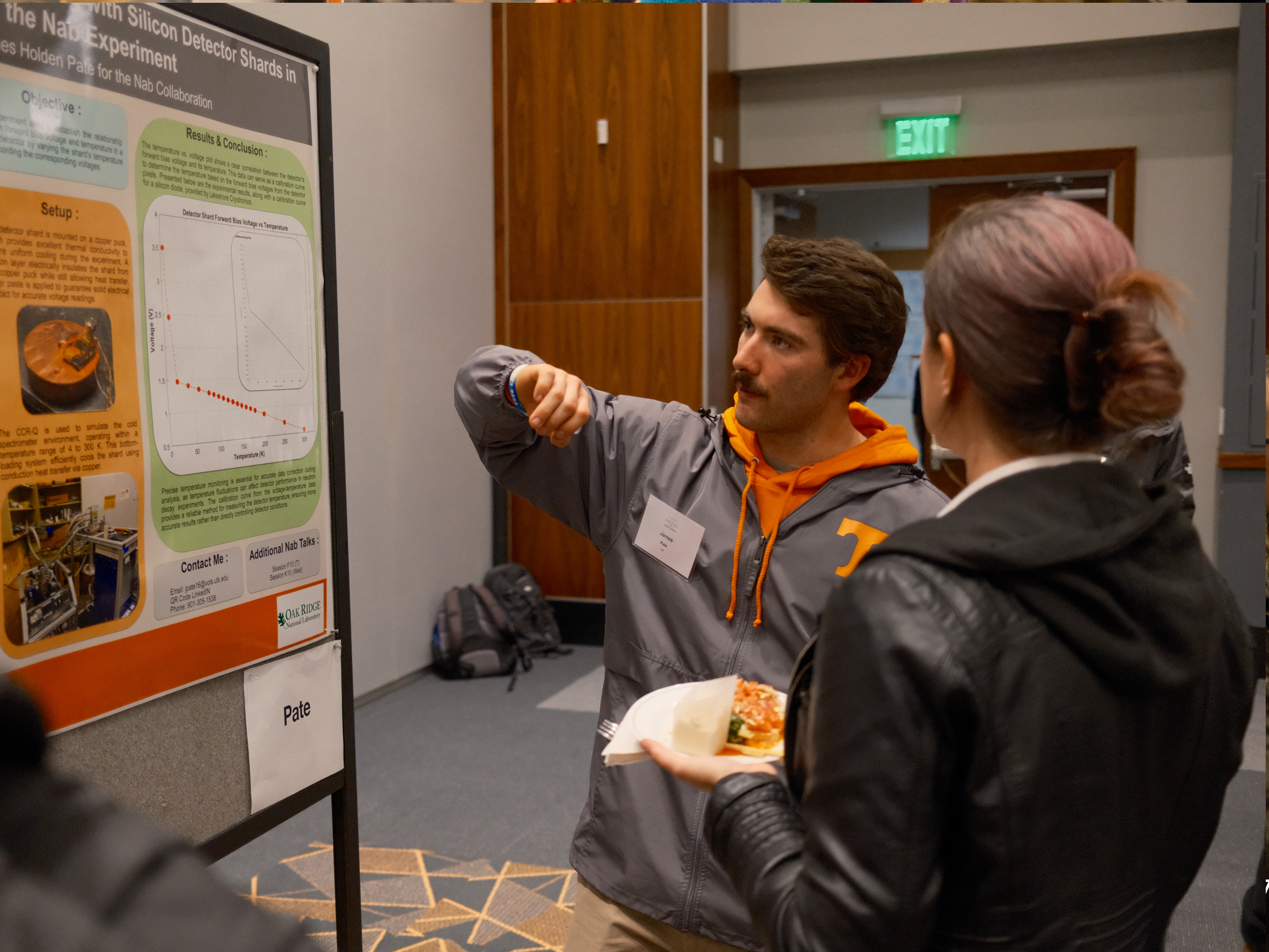
- Presenters print out a poster on their research topic
- They stand in front of the poster
- People walk around, look at the posters, talk to the presenters who give a **quick spiel**
- In physics, these are often aimed at students. In other fields and some physics subfields, they are the main form of presentation.

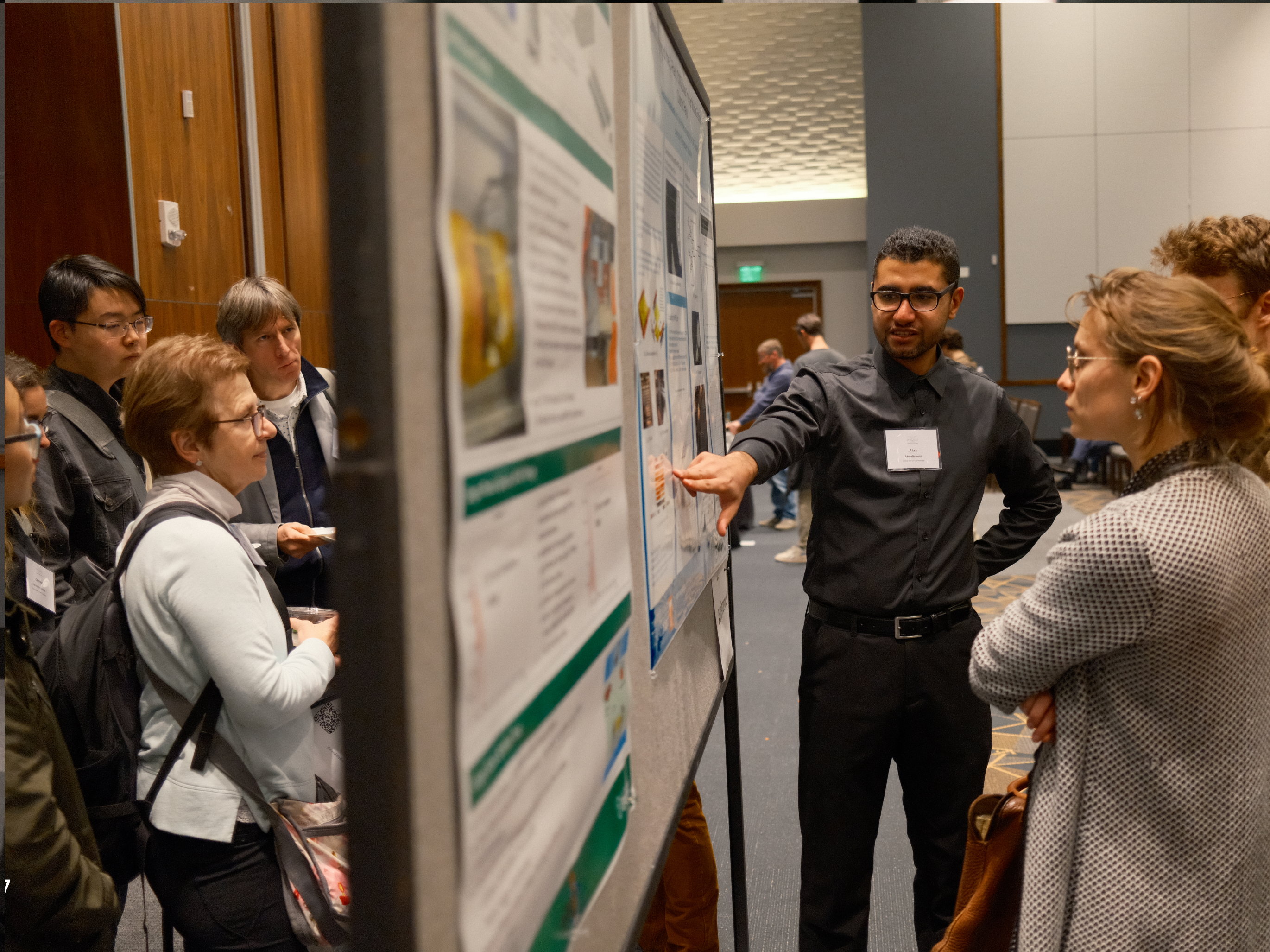


What is a poster session?

- Often during a conference, or can be a standalone event (e.g. EURēCA)
- There will be **judges** walking around, talking to each presenter
    - Taking notes on the presentation & poster for **awards/prizes/$$$**
- At a conference, these are usually **boozy** events
    - Gets people talking and interacting
    - If legal, it’s ok for you to have, but keep it to 1. You’re there as a professional physicist presenting your work.


multiplexing
Athermal phonon detector readout
Physical implementation
References


Objective :
Setup :
Results & Conclusion :
Contact Me :
Additional Nab Talks :
Pate
EXIT



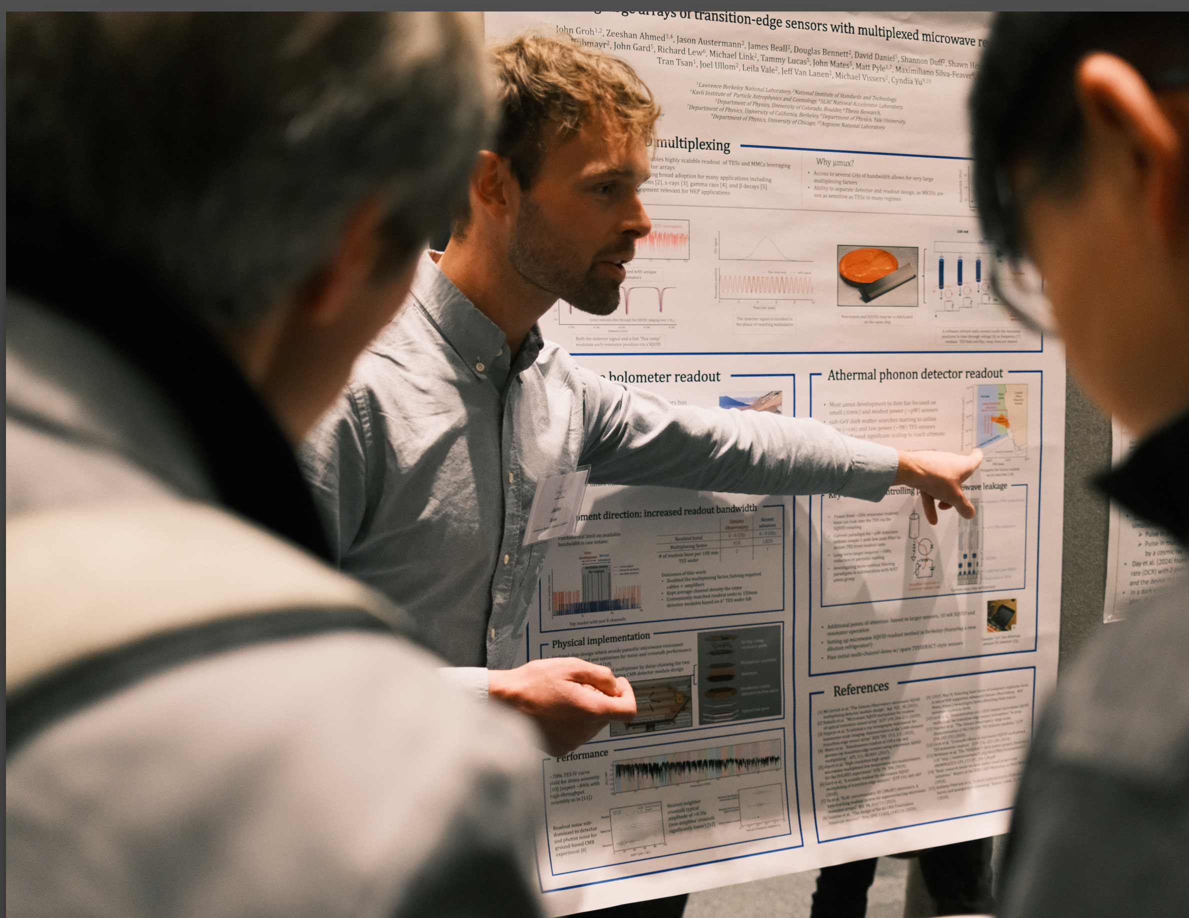
How to present your work…

- Two main parts of a poster presentation

  1. You **present** your work. All about your delivery followup conversations.

  2. **Visual aid** (your actual poster)

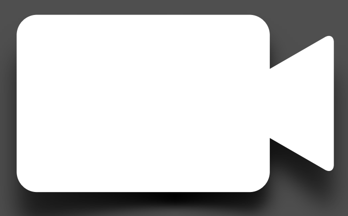
How to present your work… verbally



- Prepare an elevator pitch of your work
  - <5 min
- Know your audience
  - K.I.S.S.
  - People are not impressed with big words or jargon. They’re impressed by your demonstration of your in-depth knowledge and curiosity.
- Make it a conversation with the person/crowd
  - Don’t stare at your poster! **Talk to the people.**
  - **Face your body to the audience**
- **Be proactive. “Hi! Can I tell you about my poster?”**

How to present your work… verbally

- Must be engaging. Be animated.
  - If you’re bored, they’ll be bored.
  - Consider the rhythm and melody of your delivery.
- **Practice & record yourself.** It’s super awkward, but do it.
  - You’ll hate it. Nobody likes the sound of their own voice.
  - **But there is no better way for you to experience your presentation from the other side!**
- Practice by explaining to your peers. **Practice aloud.** You want vocal muscle memory of what it’s like to say the particular technical phrases, etc.

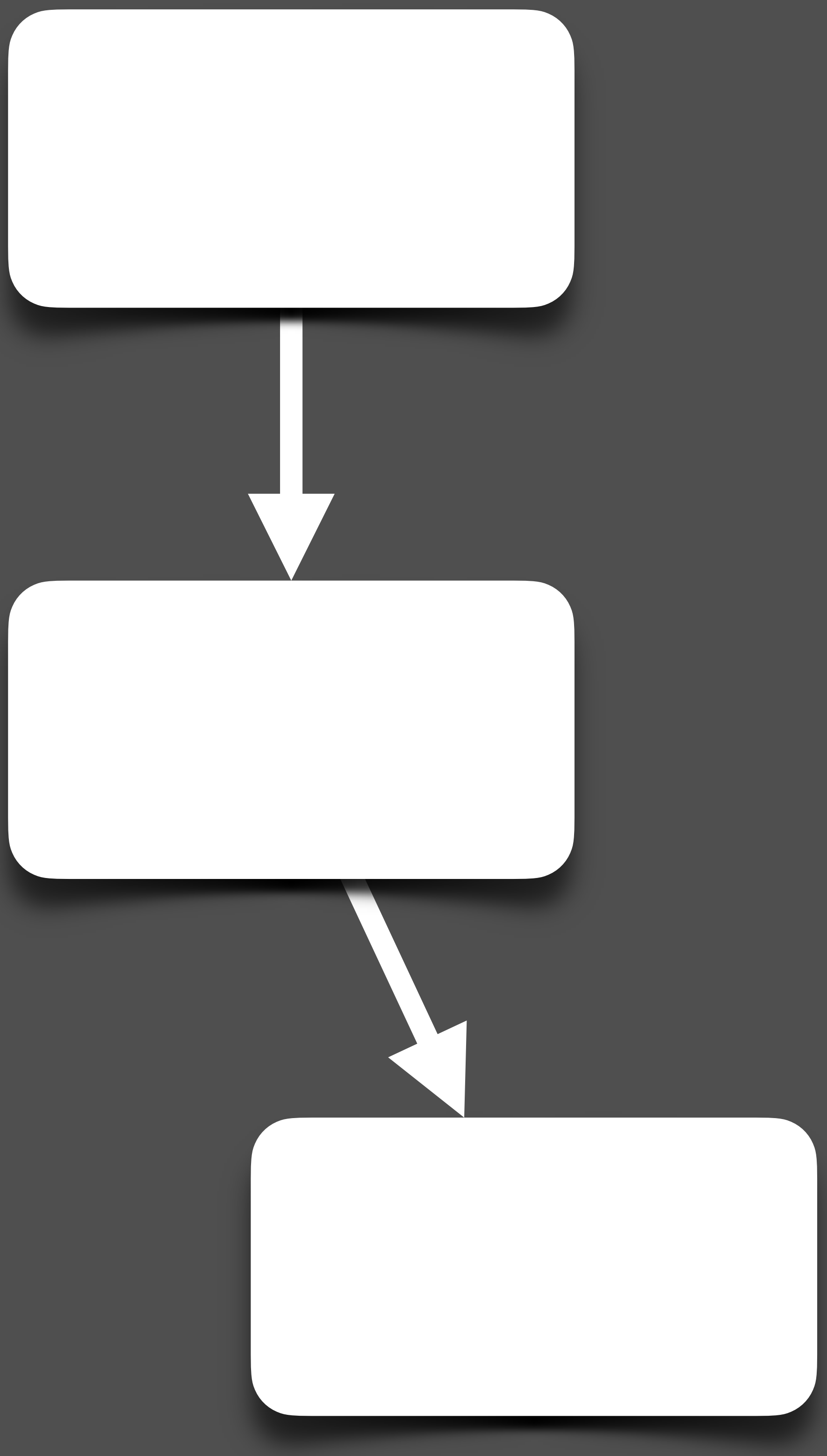


How to present your work… verbally

- Don’t get lost in details. **Keep it pithy. Keep it fun.**
- This is a **high level overview** of your work
- If they look like they’re trying to get away, be graceful about it
    - Finish your thought, thank them, and “let me know if you have any other questions!”
- **You don’t have to go through your whole poster!**
    - Just point out your favorite highlights
    - If there’s an interesting story to tell about your work, do it

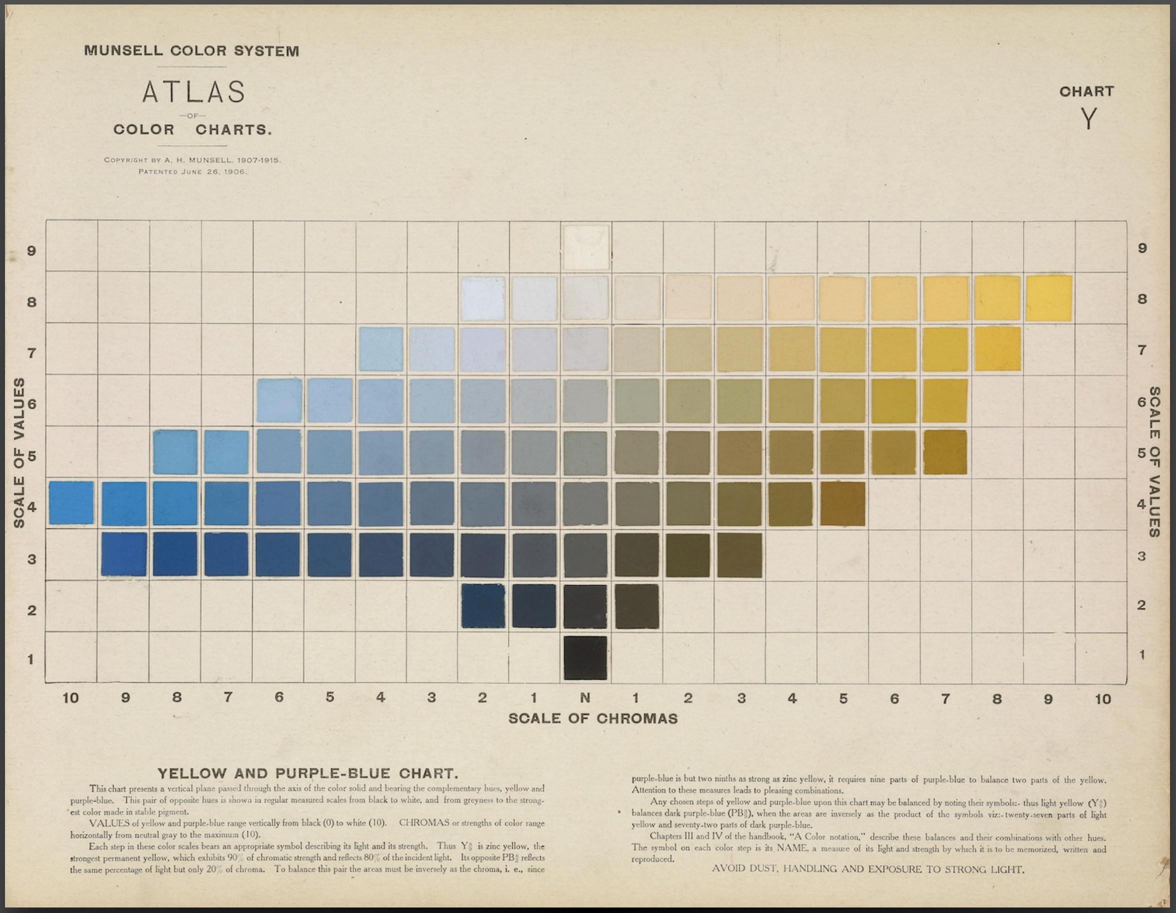
How to present your work… visually

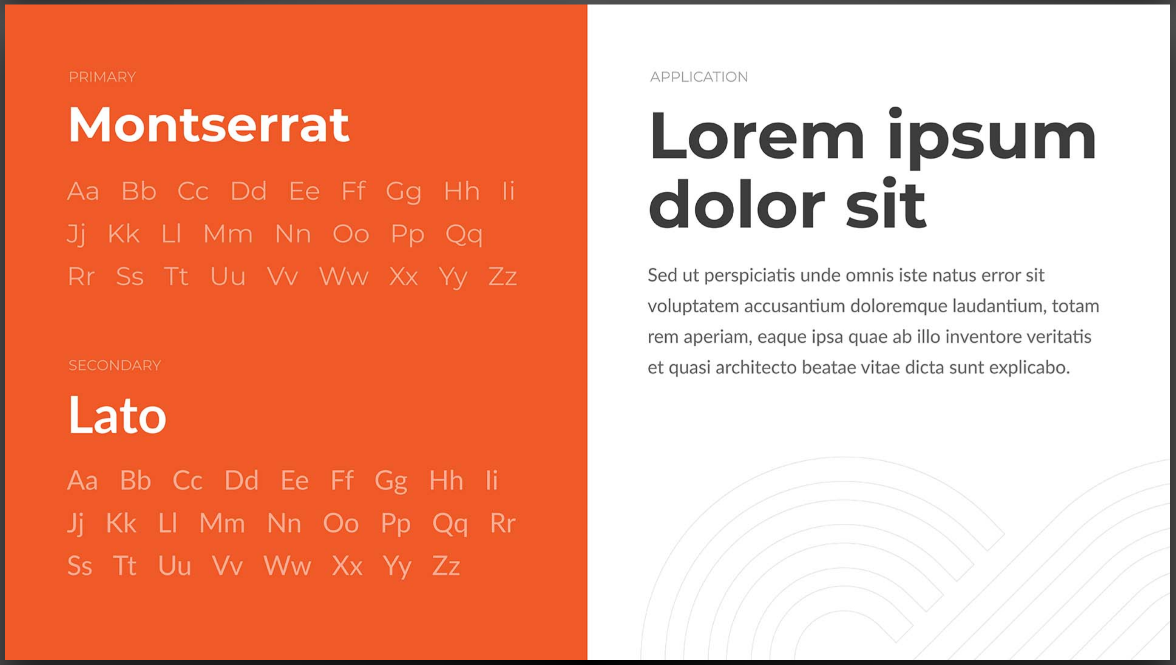
- It’s a **visual medium**. Be visual. Use flow charts. Use diagrams. Use plots.
- Looking for a **captivating visual design**
    - Minimum text. This is a visual aid.
    - Should be read from top-right to bottom-left
- Unless required, don’t use the conference template. **Make the poster uniquely yours.**
- **We’ll go through some examples in a bit**



Advanced Tips: Reaching the Next Level

- Learn some **basics of graphic design**
  - [LinkedIn Learning Course on Graphic Design Basics]
  - Define a **consistent color language**
  - Mind your **fonts**. The free fonts from google fonts are great.
    - Messy: Have a million fonts
    - Basic: Have one carefully chosen font that gives the character you want to convey
    - Advanced: Pairing typefaces





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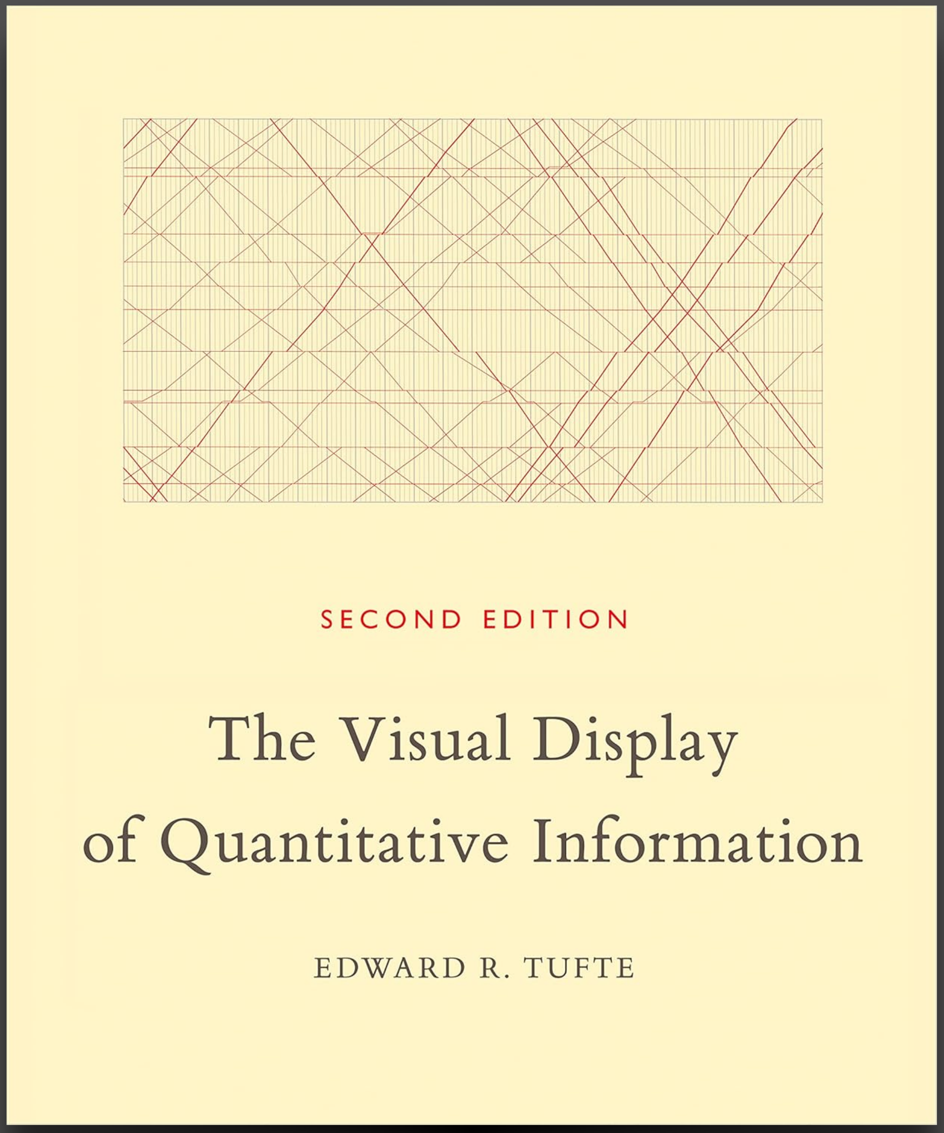

Highly recommended book!

- Guide the eyes of the viewer. Use arrows. **Bold stuff.** Highlight regions of plots.
- Play with **depth**
  - There is a z-axis of your poster!
  - Tool for emphasis. Important things placed “in front”

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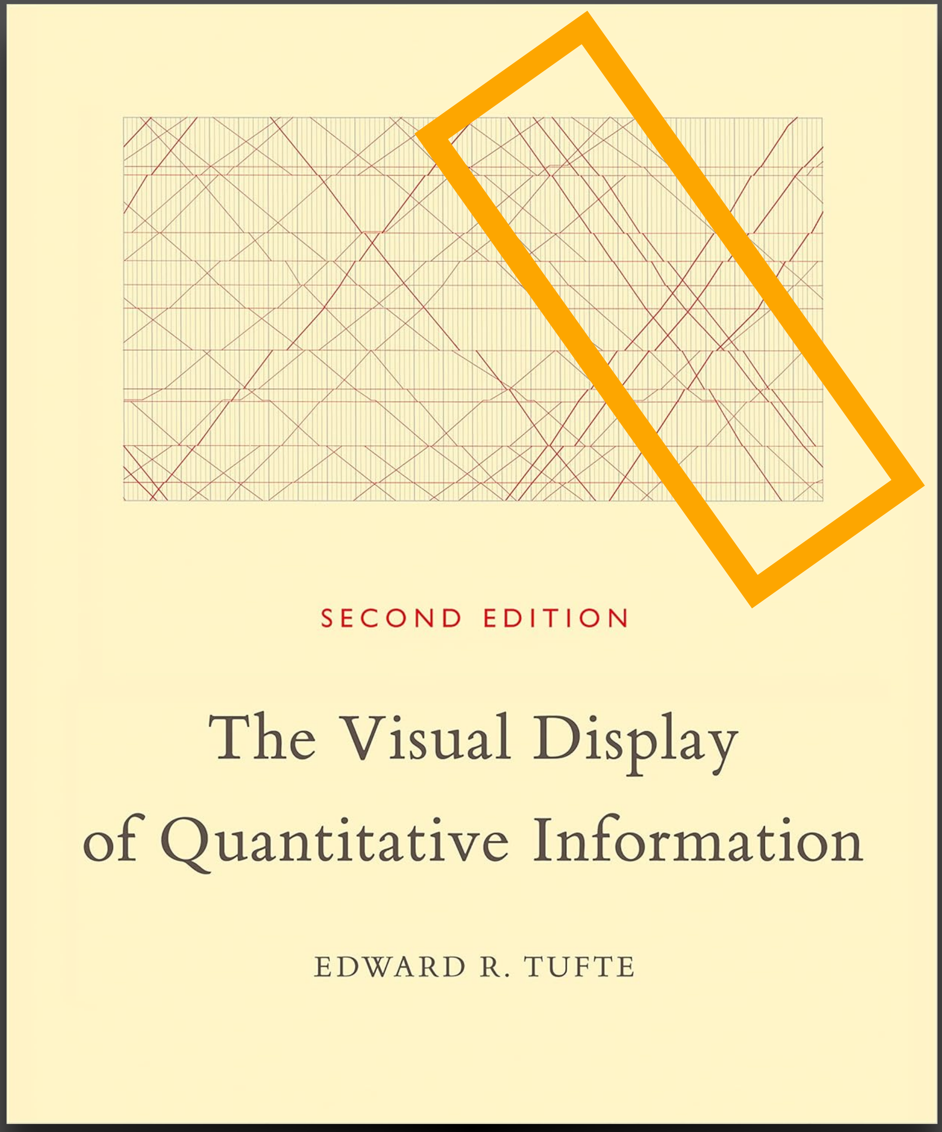

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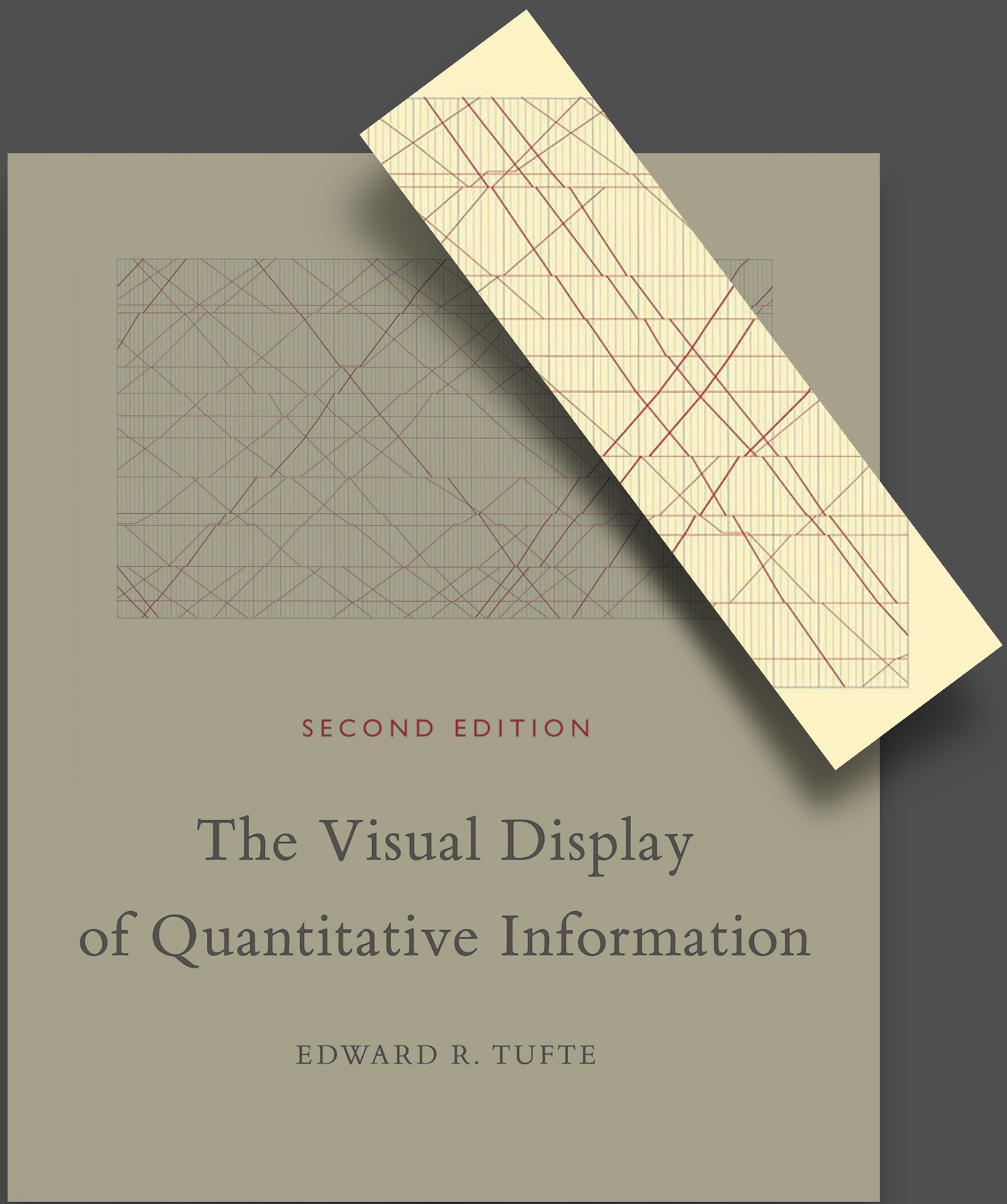

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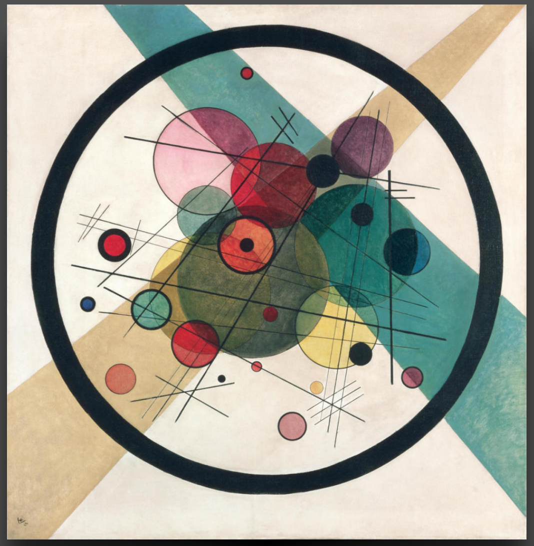
- Mind your **spacing**! Designs with cramped text are stressful to look at. Just because it "fits" doesn't mean it fits. This is one of the biggest problems I see in posters (and in slides for presentations). Ideas need room to **breathe**!
- Make sure stuff is aligned! Learn how to use the align and distribute functions of your apps.
- Design for multiple viewing distances
    - Make it appealing when up close
    - But also: Stand out in crowd
        - If I walk in and scan room, why should I go visit your poster?
- If it makes sense to have a **prop**, do it!
- The poster is your **canvas**!
    - Use it to its fullest and make it yours
    - Give your poster space and context
    - **"Paint" beyond** the edge of the paper



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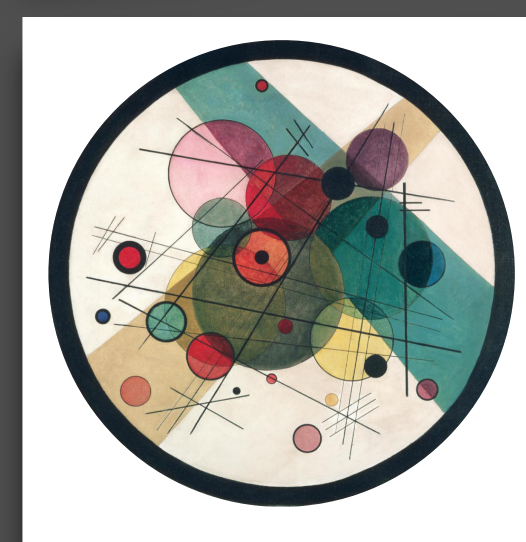

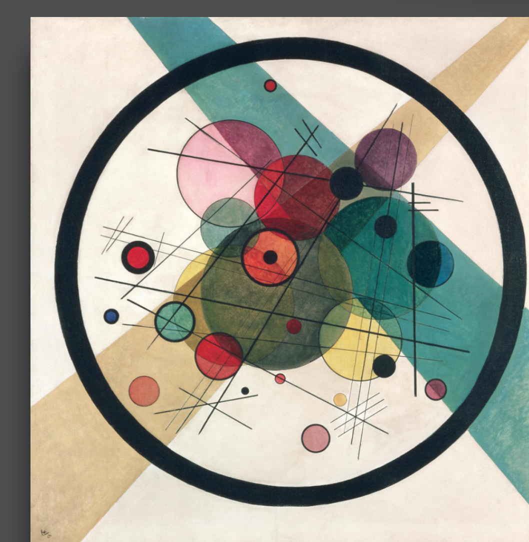

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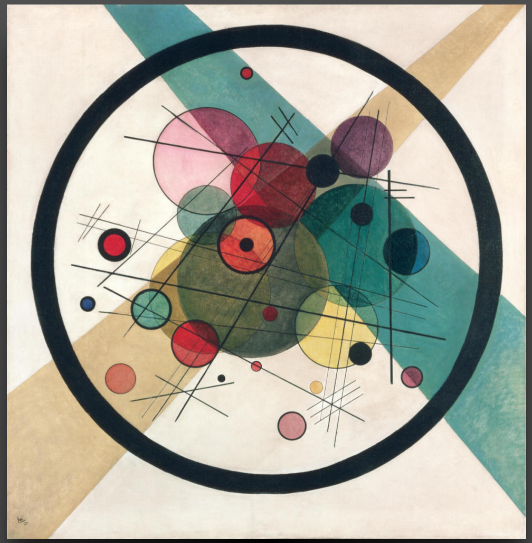

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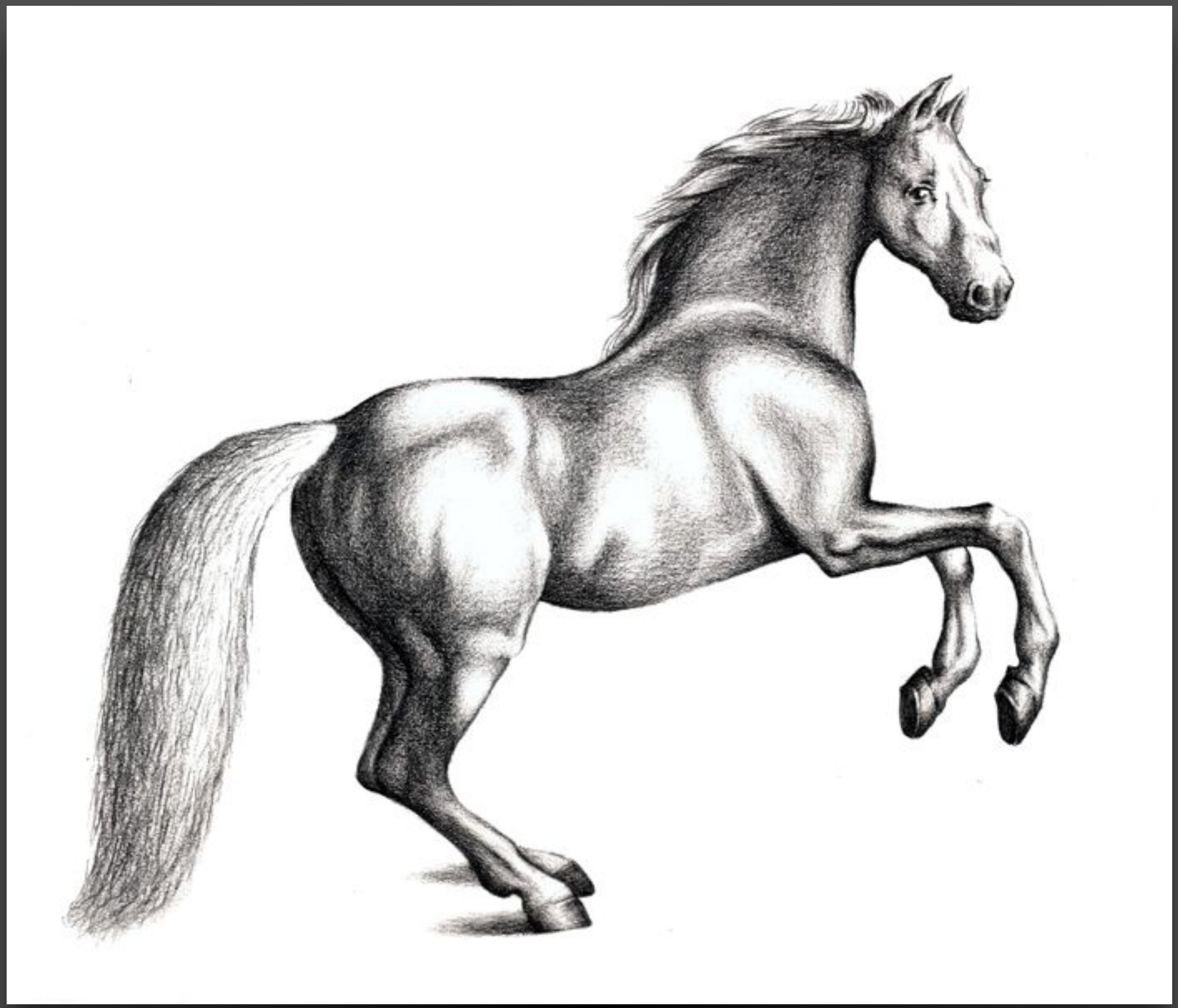


Don’t just place your content on a page…

Give it visual context.
Make it a window into a space.

And finally this one

YOU WILL READ THIS FIRST!

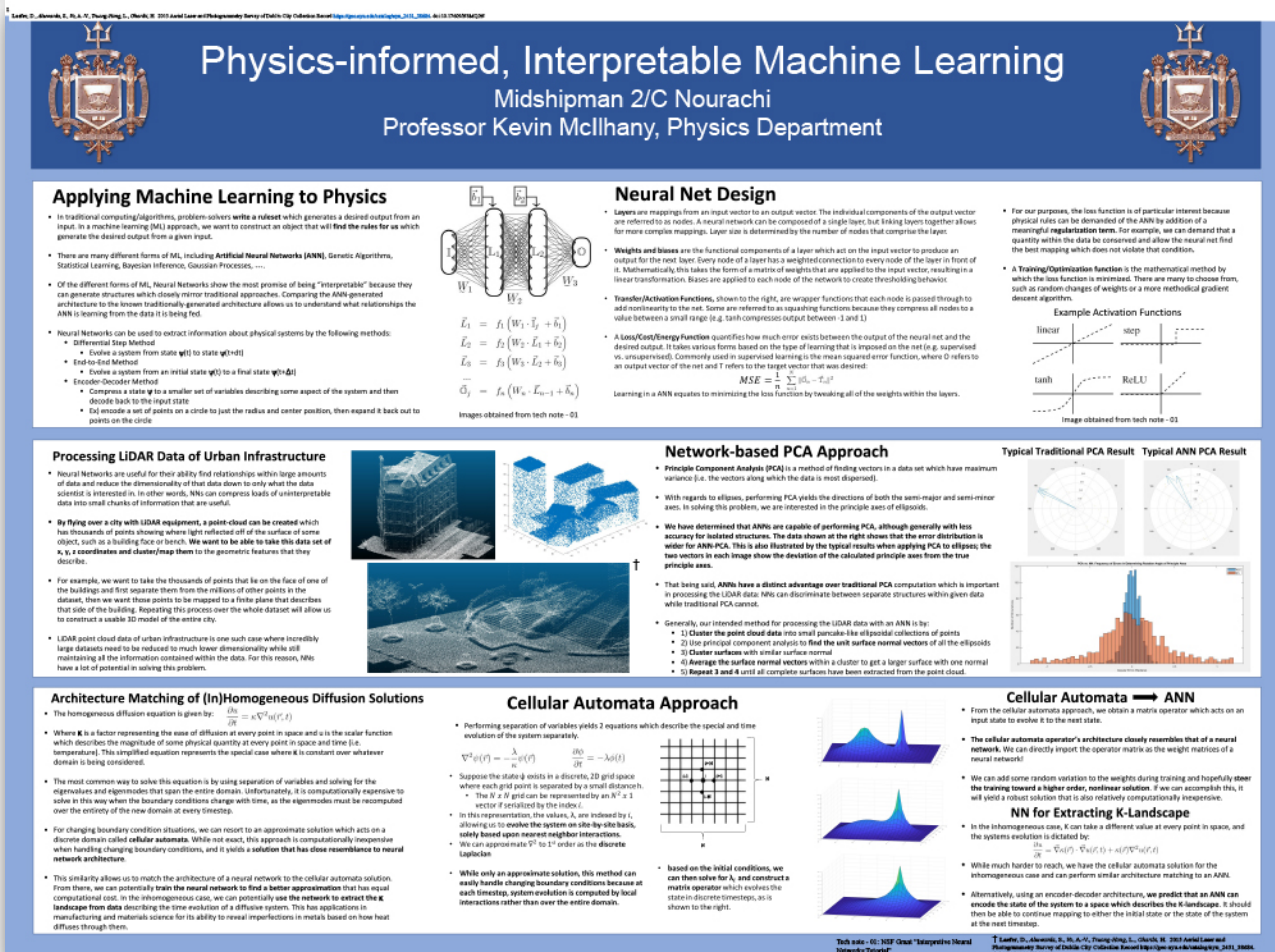
And then you'll read this

Then this one

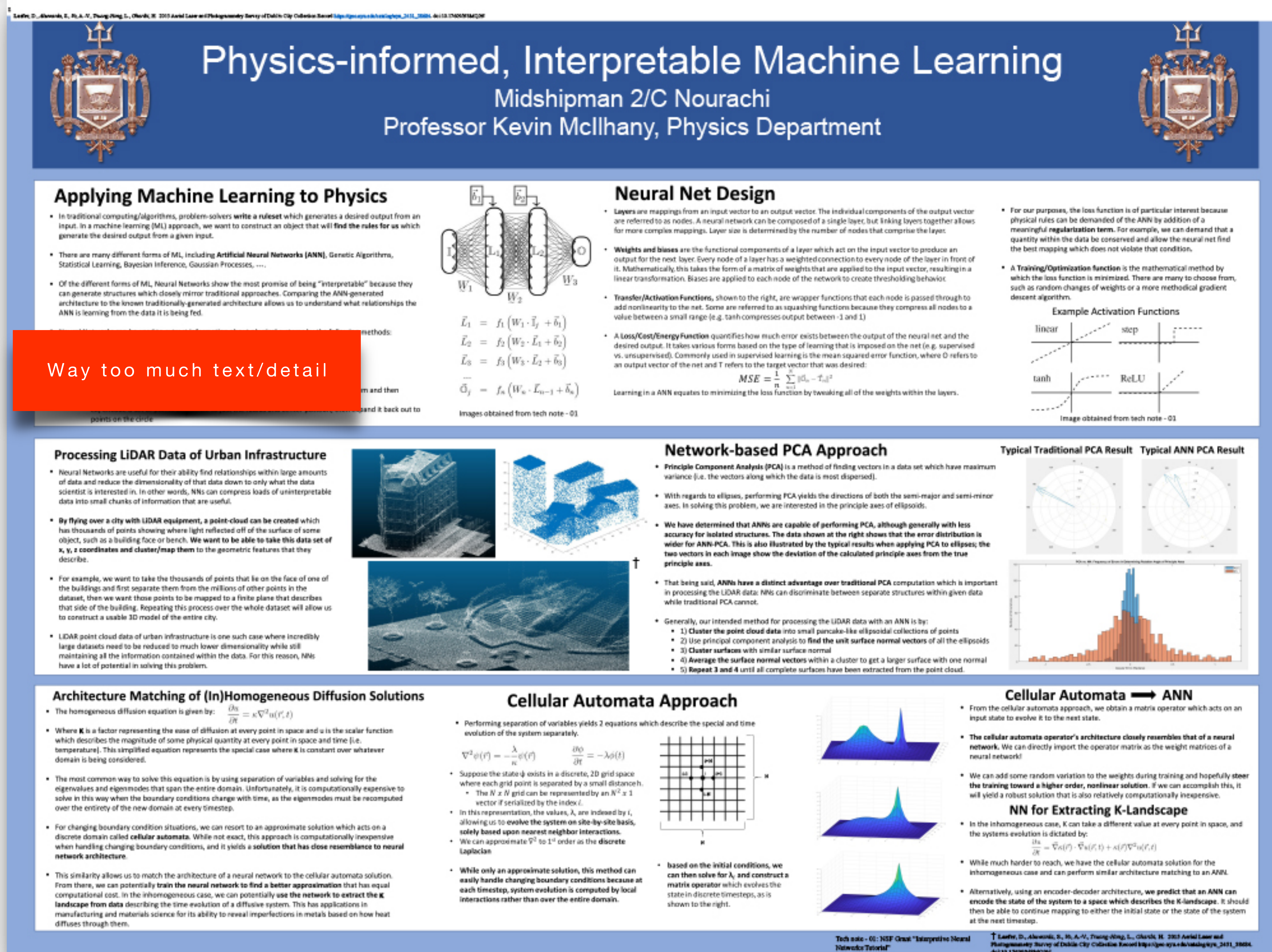
Visual **hierarchy** is key to conducting the viewer’s attention

“Do’s and Don’ts” Using

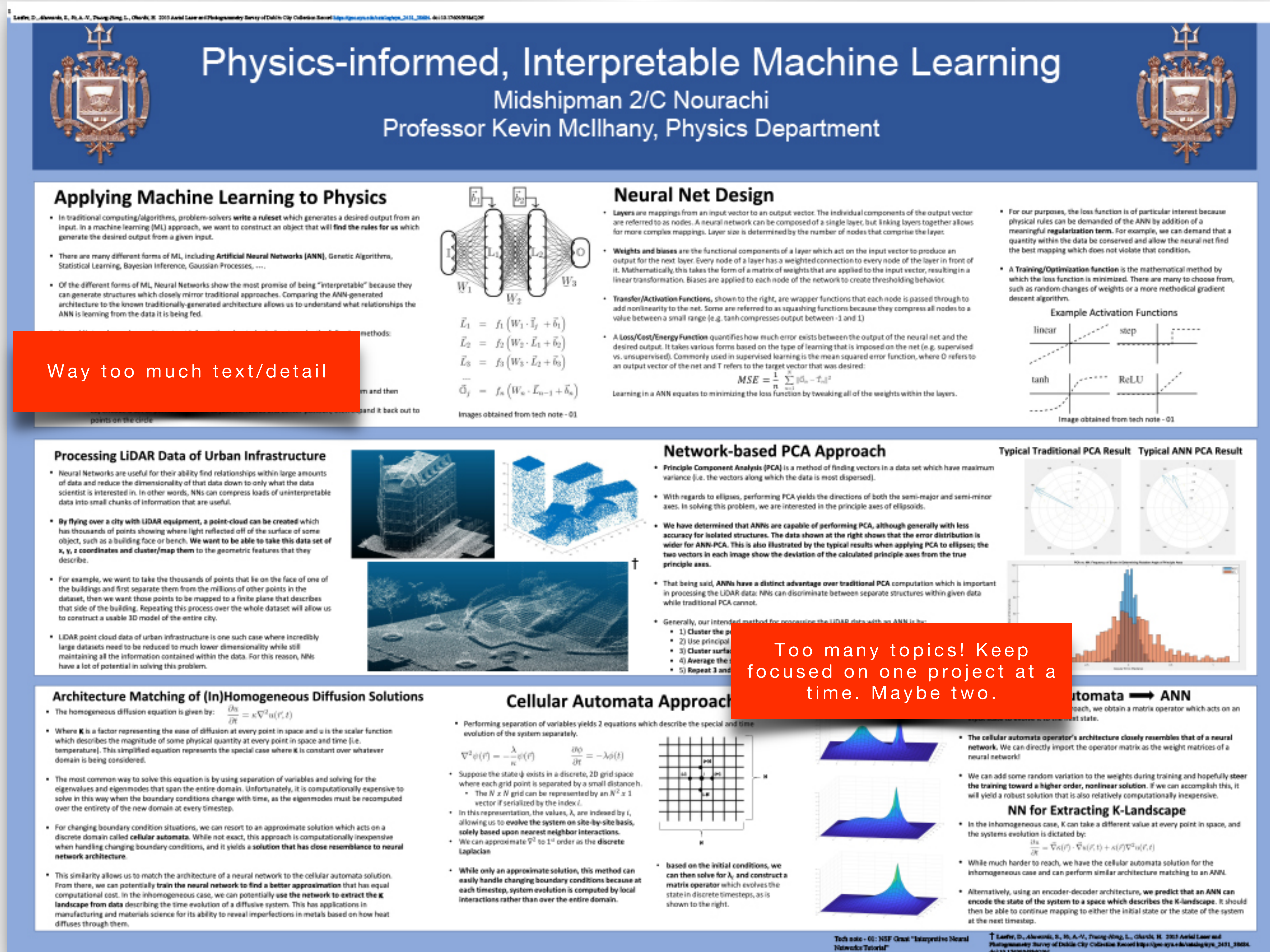
Example Posters



Physics-informed, Interpretable Machine Learning
Midshipman 2/C Nourachi
Professor Kevin McIlhany, Physics Department
Applying Machine Learning to Physics
Images obtained from tech note - 01
Neural Net Design
Example Activation Functions
linear
step
tanh
ReLU
Image obtained from tech note - 01
Processing LiDAR Data of Urban Infrastructure
Network-based PCA Approach
Typical Traditional PCA Result
Typical ANN PCA Result
Architecture Matching of (In)Homogeneous Diffusion Solutions
Cellular Automata Approach
Cellular Automata ➡ ANN
NN for Extracting K-Landscape



Way too much text/detail



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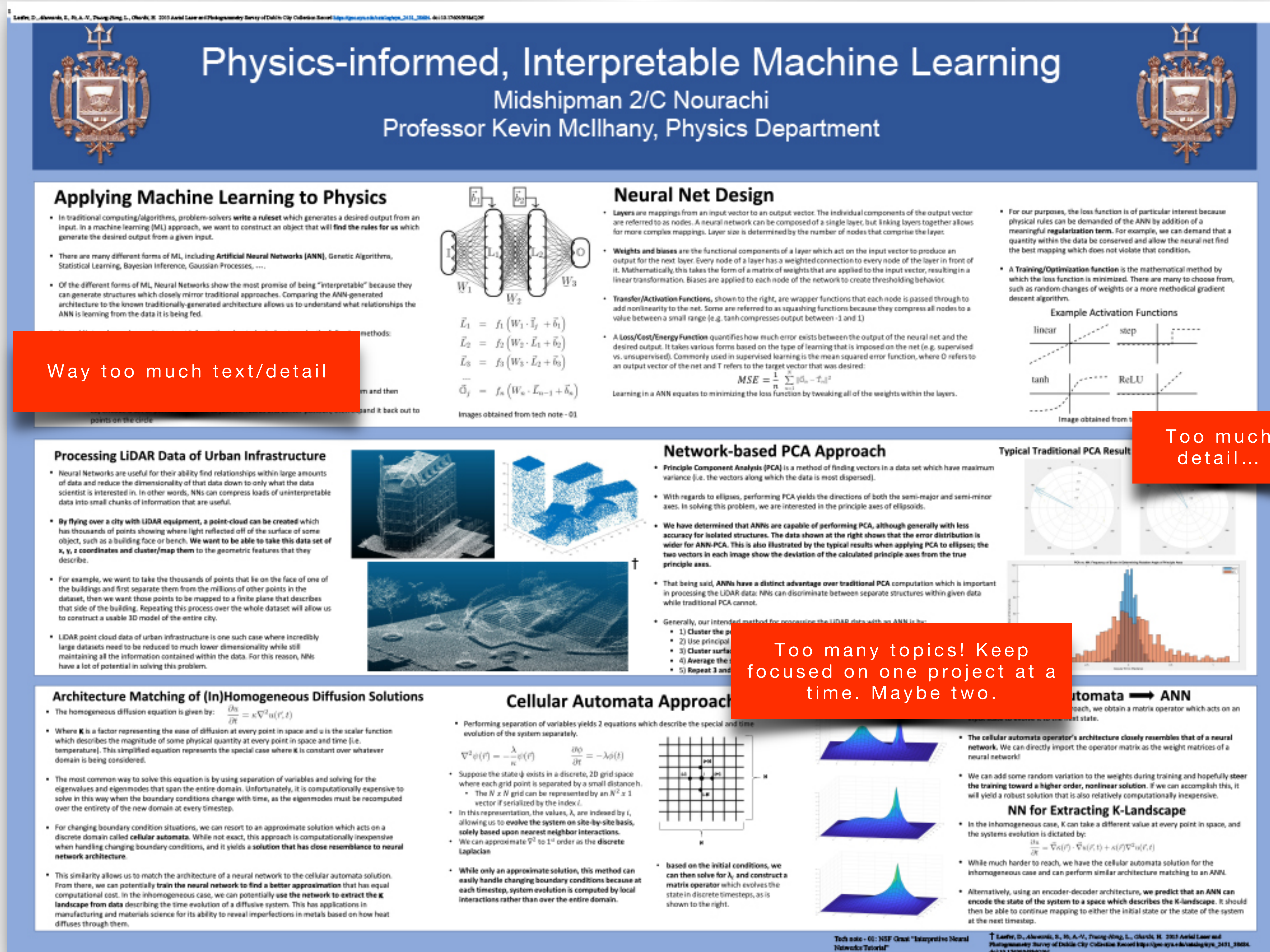
Too many topics! Keep focused on one project at a time. Maybe two.



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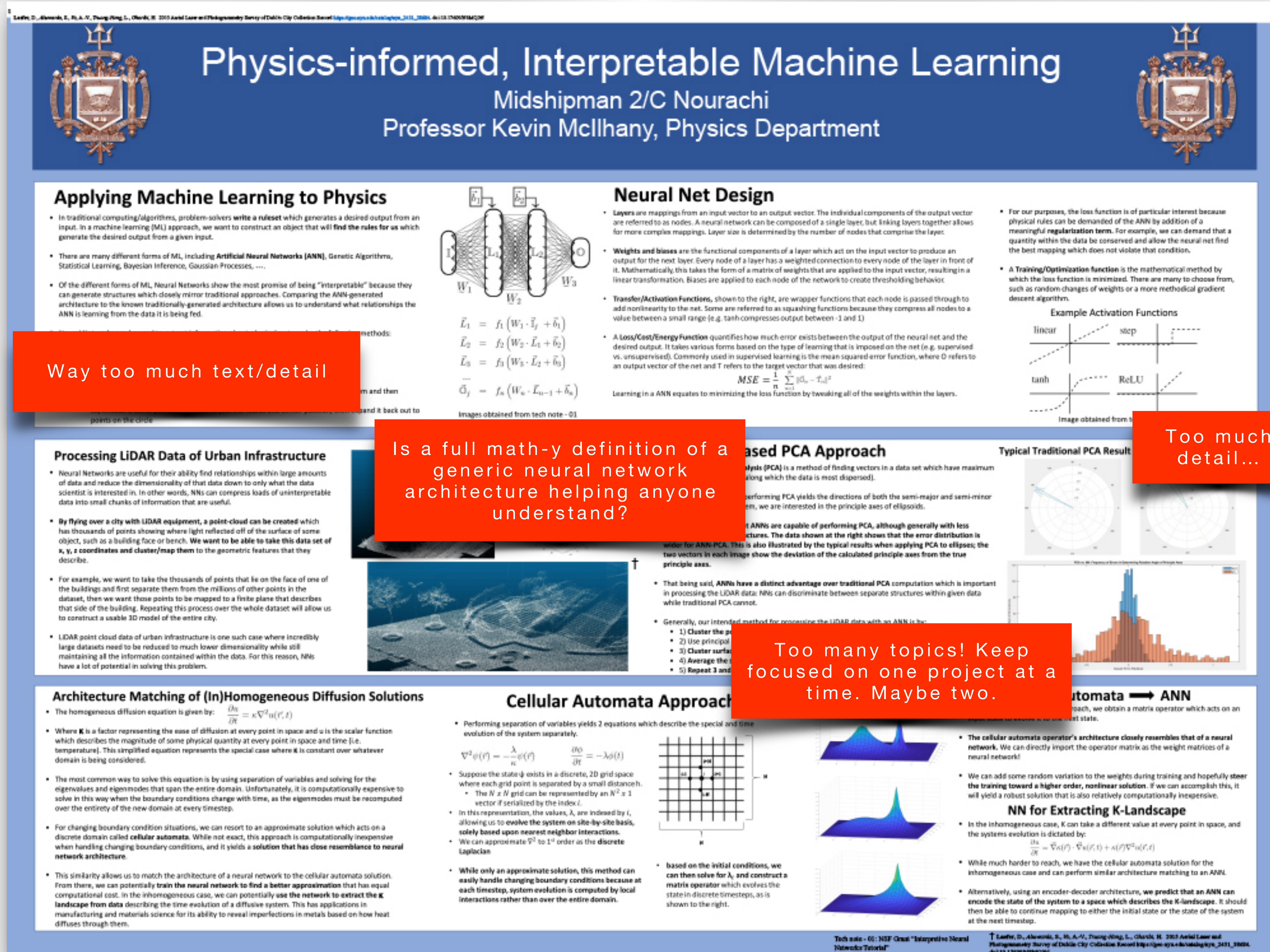

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Is a full math-y definition of a generic neural network architecture helping anyone understand?

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LAWRENCE LEE, CHARLES BELL

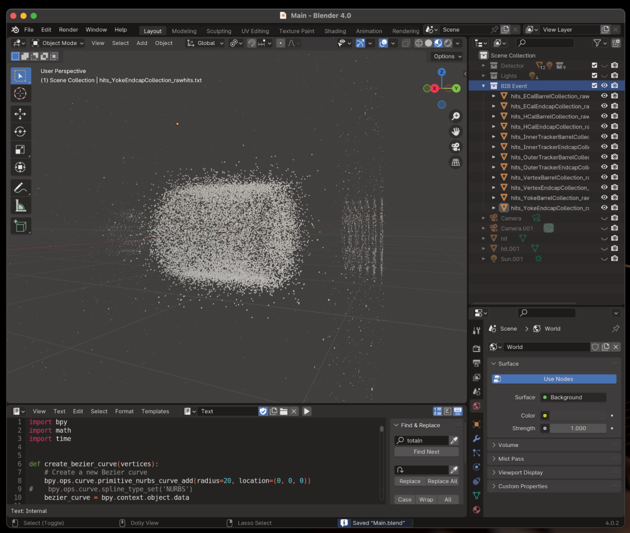
Muon Detector Visualization in Unreal Engine

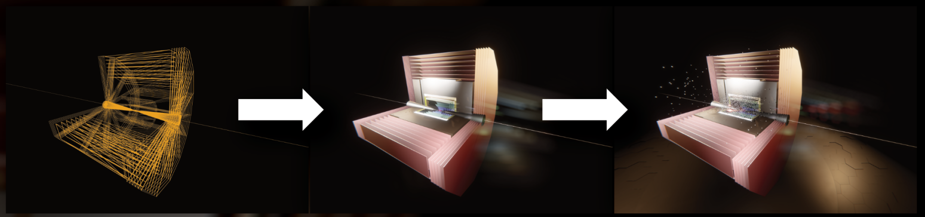
The University of Tennessee Knoxville

Aims

Compelling visuals are central to communicating with collaborators, the public, and for our own understanding. One of our goals is to create beautiful displays of muon collider elements: the detector, the collisions, and the machine.

We wanted to interface our muon collider and HEP tools with **state of the art 3D rendering engines** such as Blender and Unreal Engine 5 using industry standard formats.This gives us the ability to build high quality visuals with the latest techniques built by the $200B video game industry, with built-in rendering and camera effects, such as depth of field, ambient occlusion, chromatic aberration, etc, in a highly performant application. **This gives a uniquely immersive event display framework that has utility for our research and capturing the public's imagination.**





Detector Geometry

The existing software framework defines a detector geometry in DD4hep's "compact" XML format which is converted to a ROOT/GEANT4-compatible format for the simulation workflow. We've built a new workflow that converts this same geometry description into an **industry standard 3D model GLTF format** that can then be edited in Blender as needed.

These 3D models are then imported into **Unreal Engine** for high quality rendering and interactive application development.

The highly intuitive representation of the detector has already led to **multiple bug fixes** in the geometry and allows for a **concrete sense of scale** for the detector that numbers in an XML file were unable to convey.

- DD4hep: Detector Geometry in dd compact XML Format
- Convert to GDML using dd tools
- pyG4ometry: Convert to industry standard GLTF w/ Custom Scripts using pyG4ometry
- Blender: Geometry Editing in Blender (Open Source 3D Modeling Package)
- Unreal Engine: Import Edited GLTF into Unreal Engine For Final Lighting, Rendering, and Interactivity

Event Data Conversion

- HEP 4 (EDM4hep): Muon Collider software stack can write out event info in EDM4HEP format
- uproot: Use uproot-based scripts to extract event data
- Blender: Use Blender Python bindings to create 3d objects representing detector or reconstructed objects, output to GLTF
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Muon Collider software stack supports outputting to the **ROOT-readable EDM4HEP format**. We read in these files using uproot to process collision event information. The locations of hits are turned into 3D mesh objects using Blender's built-in python interface. These meshes can be then **exported into GLTF** for importing into Unreal Engine.

This process is currently manual and improvements are necessary, especially to let this framework scale to more complicated events. Building out an **configurable, automated tool to turn EDM4HEP files into GLTF** meshes remains an open task and will eventually allow for an Unreal Engine application that has the ability to import EDM4HEP files and directly render events for the user.

Current Output

Setup can create **rendered stills** to visualize the detector, detector signals, or physics objects. Still are useful for outreach, talks, posters, etc and can be customized to individual messages.

The **3D models** are even supported in tools like Keynote for engaging animations.

Custom executable contains an **interactive 3D interface** into the virtual detector. Currently implemented as a playable third person game, which has the added benefit of giving a human character for scale.

Recently featured on cover of *Science*, March 20, 2024

Open Tasks

- Polish up current application with **menus and UI**
- Build EDM4hep-reading capabilities into application for **automated event mesh construction**
- Implement **collision animations**
- **Geometry conversion** workflow improvements
- Design **interactive game**
- **VR/AR/XR development** for Quest 3 or Apple Vision Pro

} Initial conversations with Drexel's Entrepreneurial Game Studio

New collaborations very welcome!
Opportunities for work with digital medial programs, etc, and to build out a unique outreach program

This work has been supported by the Department of Energy, Office of Science, under Grant No. DE-SC0023321 and the National Science Foundation, under Award No. 2235028.

FERMILAB-POSTER-24-0228-V, Aug 2024

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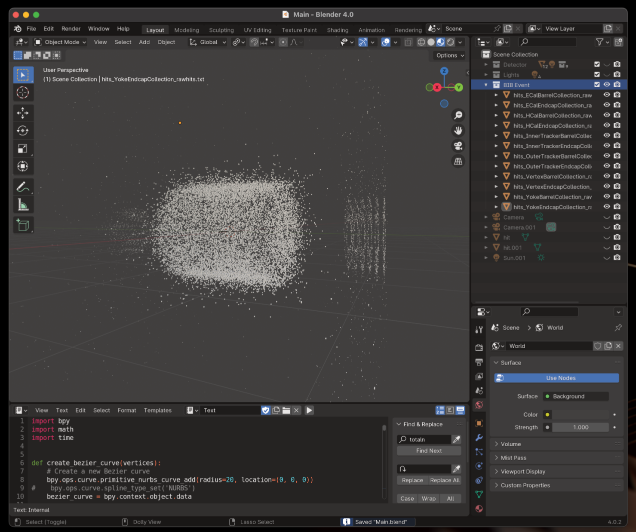

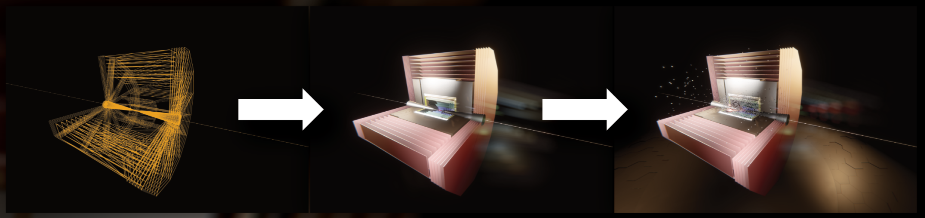

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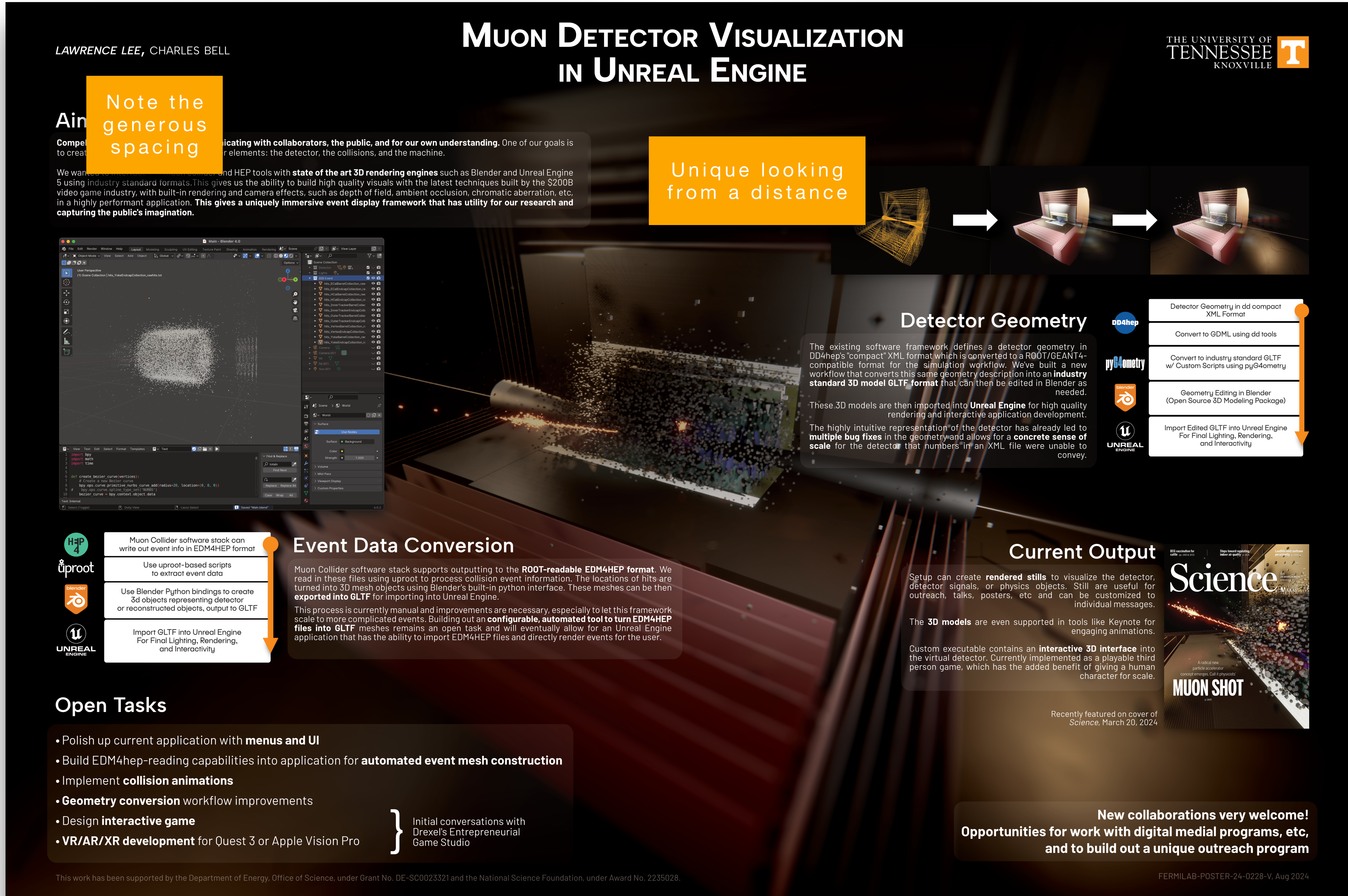

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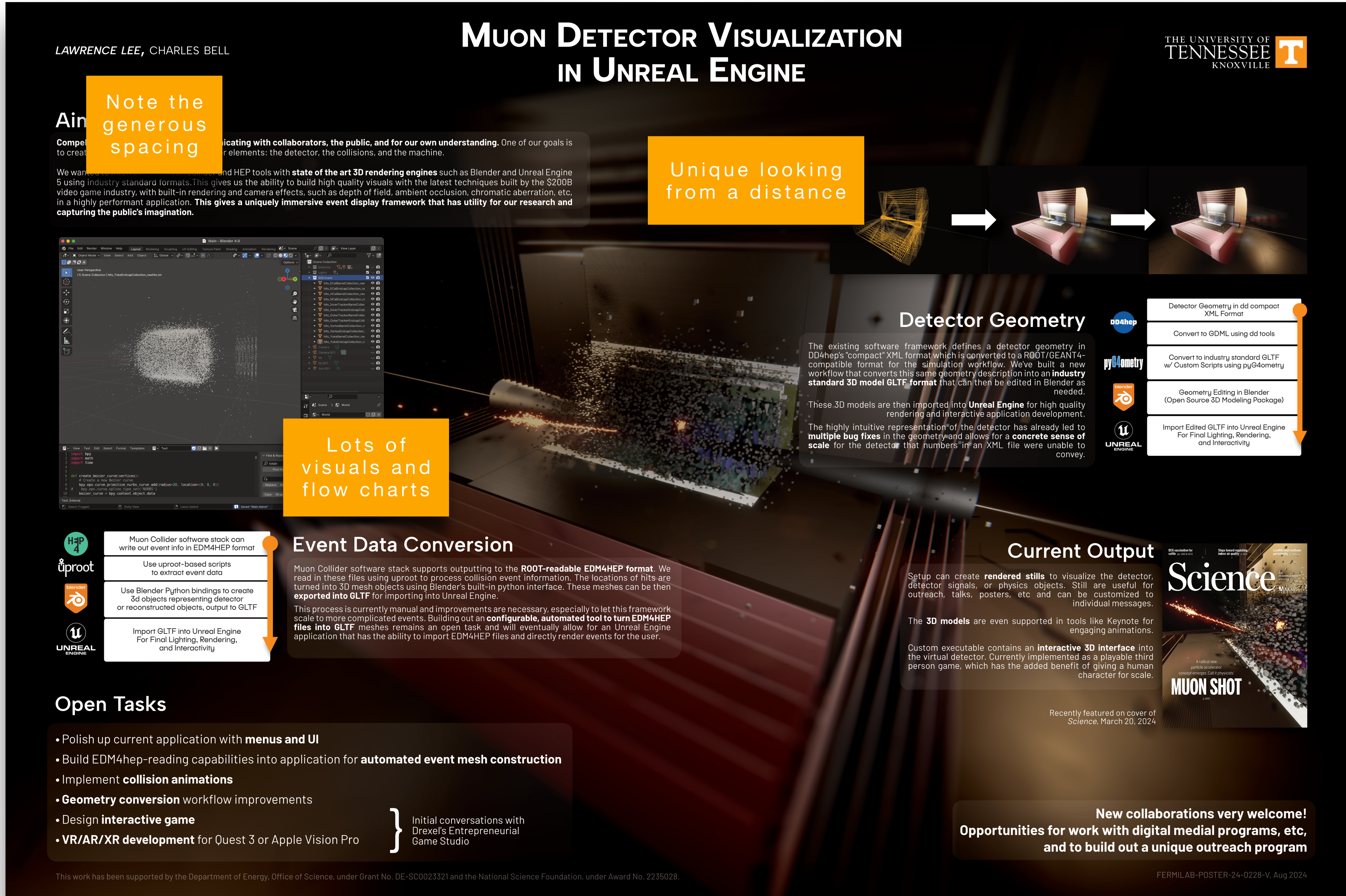
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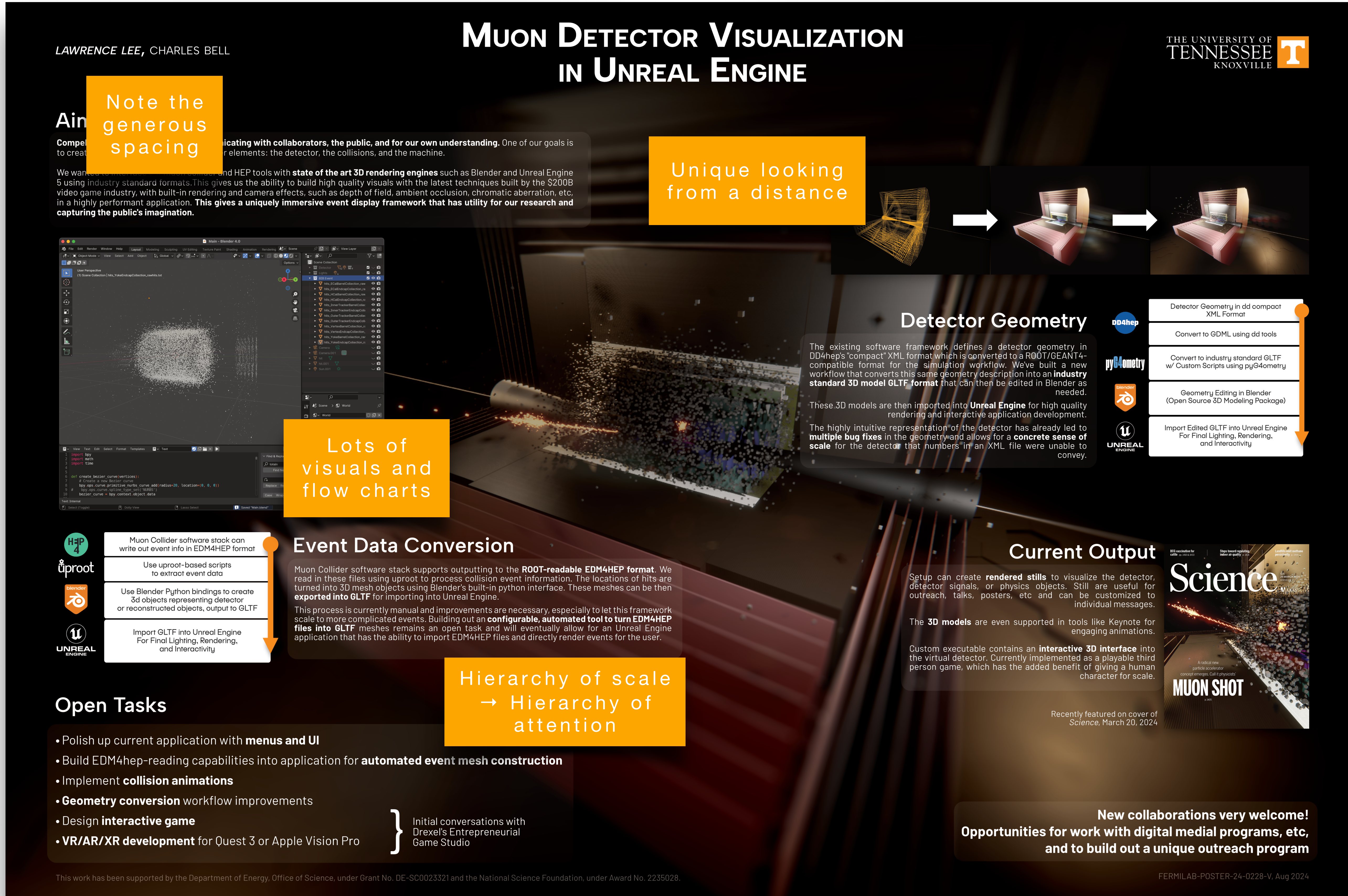

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Muon Detector Visualization in Unreal Engine

THE UNIVERSITY OF TENNESSEE KNOXVILLE

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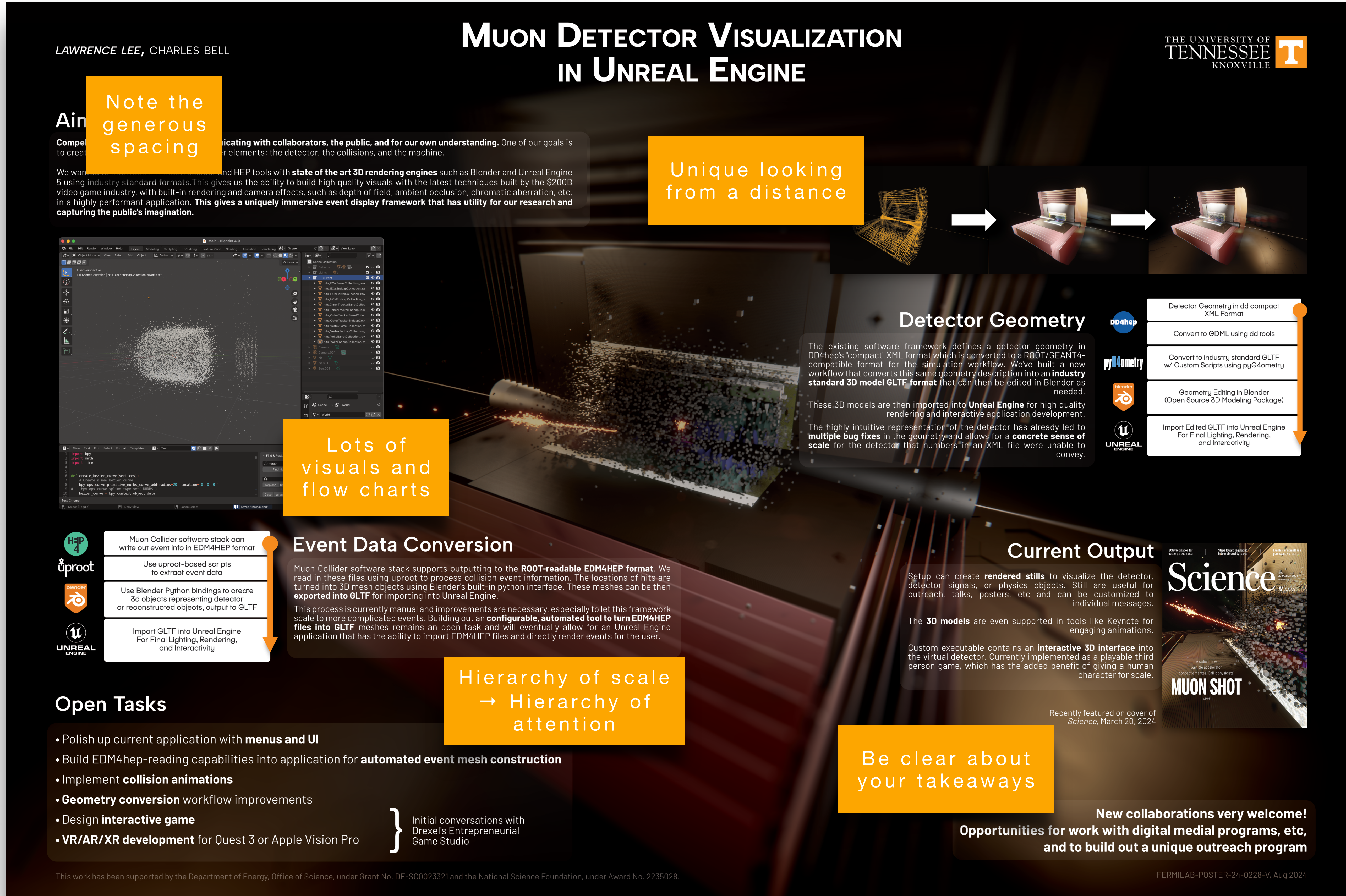
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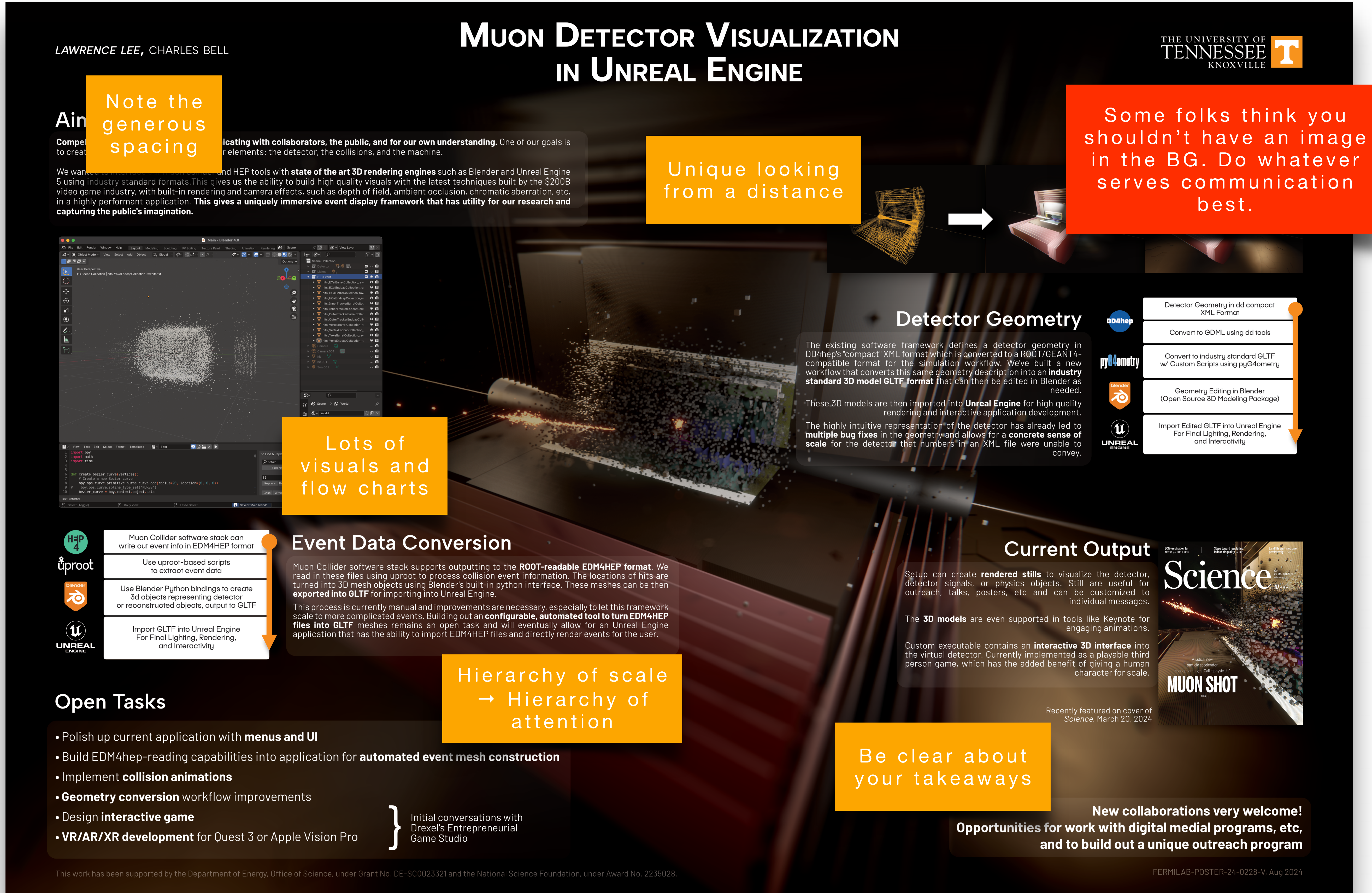

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A Reinterpretation of an LHC Search for Displaced Vertices and Muons in RPV SUSY Models

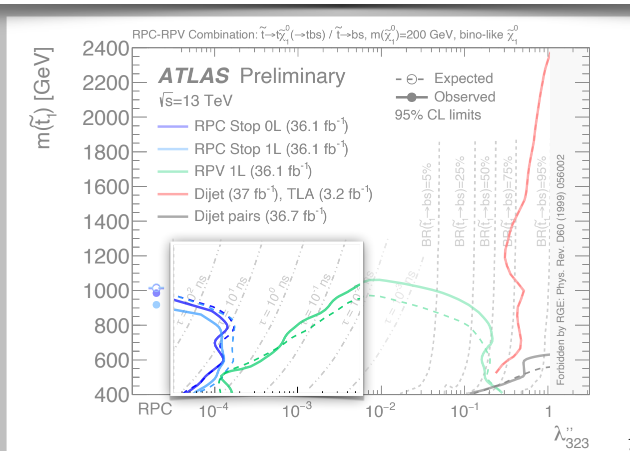
Taylor Sussmane [1], Lawrence Lee [1], Karri Folan DiPetrillo [2]

[1] University of Tennessee, Knoxville TN

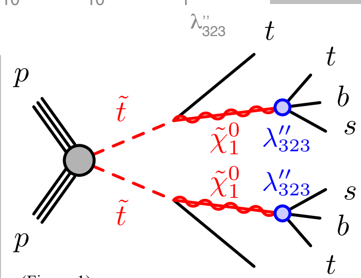
[2] Fermilab, Batavia IL

Motivation

- Supersymmetry (SUSY) is an extension of the Standard Model of Particle Physics (SM) that would solve some of the problems with the SM, by postulating a fermion/boson symmetry.
- Supersymmetry predicts a heavier partner (sparticle) for each of the SM particles.
- RPV SUSY models violate R-parity conservation, meaning that a SUSY particle could decay into SM particles.

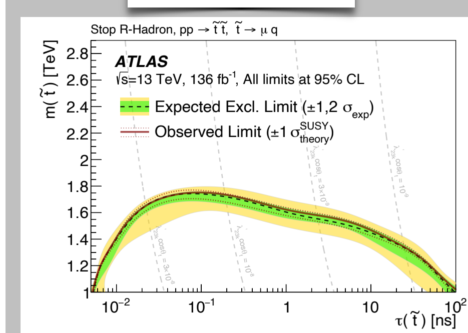


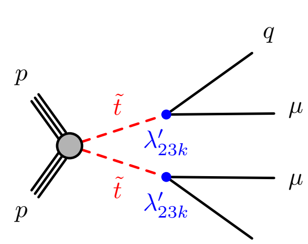
- Previous ATLAS analyses have obtained limits on the RPV SUSY model to the right [1], but there is a noticeable gap in the 10ps to 10ns proper lifetime range that should be explored with a search for long lived particles (LLP).
- We want to see if we have sensitivity to that range using a previous ATLAS search that requires a displaced vertex and muon.



(Figure 1)

ATLAS DV+Mu analysis



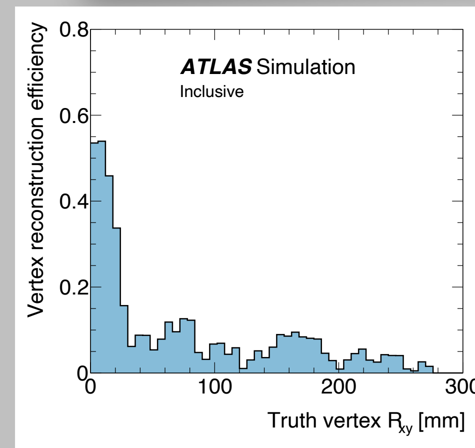


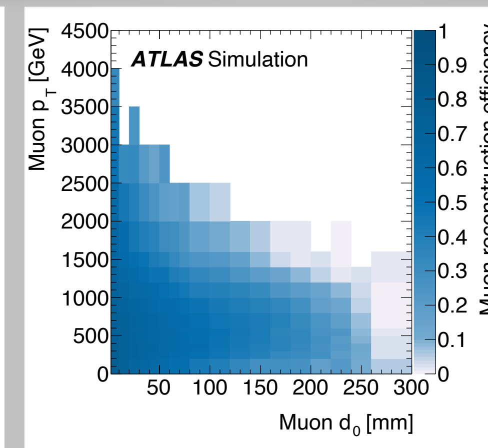
(Figure 2)

The ATLAS DV+Mu analysis [2] searched for the process above. It requires events with a displaced vertex and muon. The diagram in Figure 1 can give a displaced vertex and muon, through the decay of displaced top quarks. Luckily, that search had reinterpretation information that could be used to look for any process giving the same signature, like the one we're interested in!

Reinterpretation Information

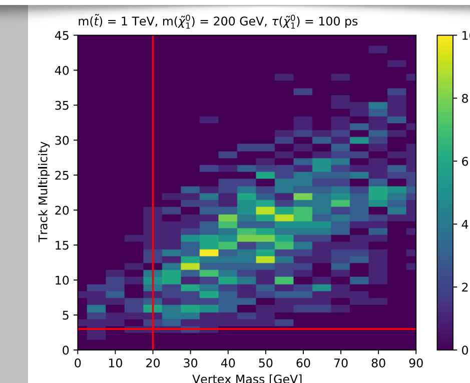
The ATLAS DV+Mu search provided generic reinterpretation information to be used for other models that have a displaced vertex and muon. That information was used on a grid of Monte Carlo simulation samples with various parameters for the target signal model. The material defined event and object acceptances, which would cut any events that do not meet certain truth criteria. For each event that passed the acceptance, efficiencies could be calculated. After the efficiency is calculated, a random number is thrown and the event may be rejected.





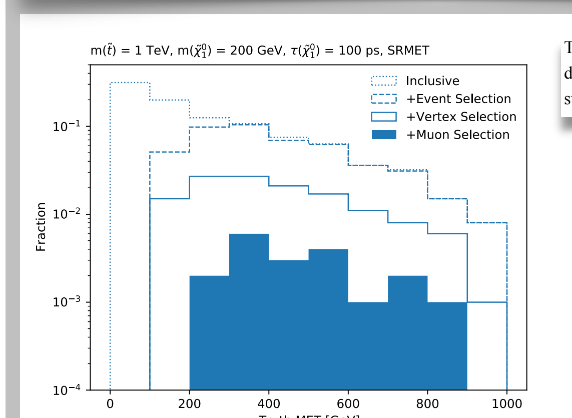
These plots give an example of how the efficiency for each cut was calculated. These histograms are from the reinterpretation information of the DV+Mu search. The application of these efficiencies is supposed to emulate the detection of signal in an LHC collision.

This plot shows the distribution of track multiplicities and vertex masses for a signal model. The signal region (SR) is the region in the top right. As shown, most of the signal resides in the SR, so loosening the cuts would not significantly change the results because the search had very little background.



Results and Conclusions

After all the cuts, the number of surviving events is normalized based on luminosity and cross section, which is a function of stop mass. If the normalized number of surviving events is larger than the published BSM event yields (3 events), then those parameters (stop mass/neutralino lifetime) are excluded. Repeating this process over the entire grid of simulations, the exclusion contour can be traced out in the parameter space, as seen below.



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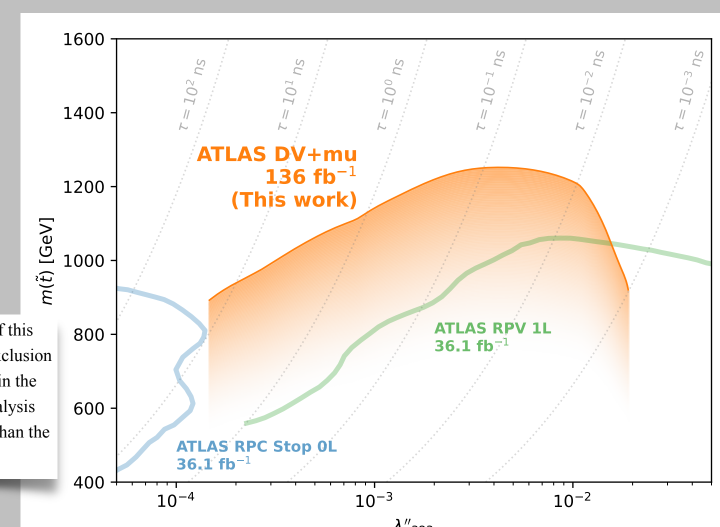

This plot shows the final results of this reinterpretation analysis. The new exclusion contour fills in all of the gap seen in the ATLAS Preliminary. This LLP analysis excludes about 200-350 GeV more than the ATLAS RPV 1L analysis.

References

[1] ATLAS Collaboration, *Reinterpretation of searches for supersymmetry in models with variable R-parity-violating coupling strength and long-lived R-hadrons*, (2018) ATLAS-CONF-2018-003

[2] ATLAS Collaboration, *Search for long-lived, massive particles in events with a displaced vertex and a muon with large impact parameter in pp collisions at $\sqrt{s}$=13 TeV with the ATLAS detector*, Phys. Rev. D 102, 032006 (2020), arXiv:2003.11956

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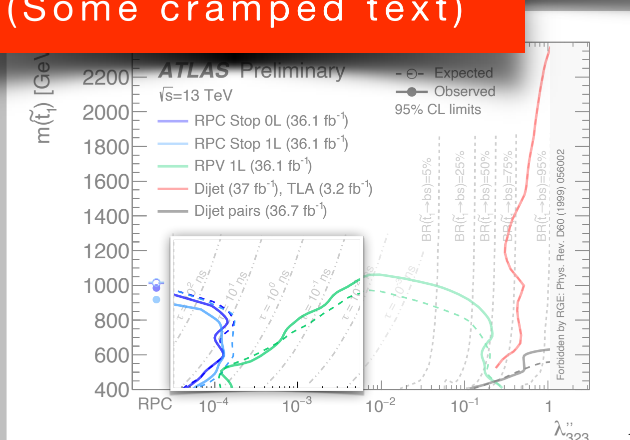

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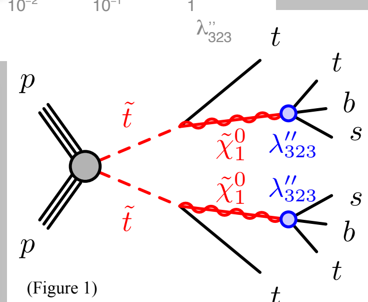

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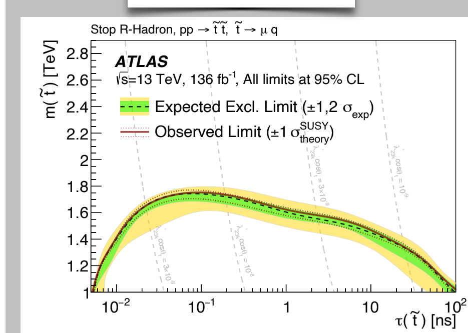

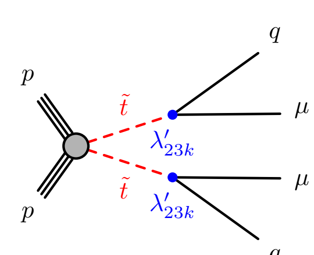

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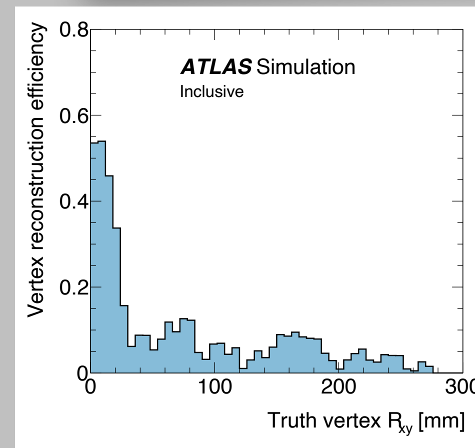

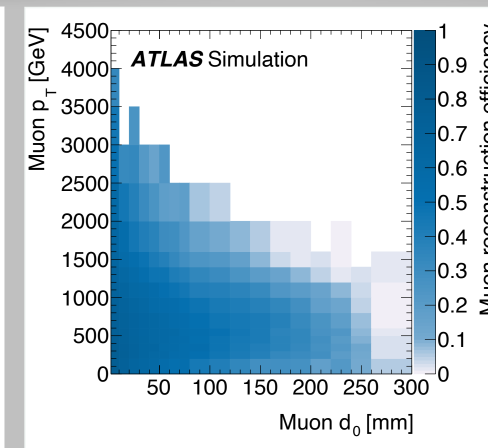

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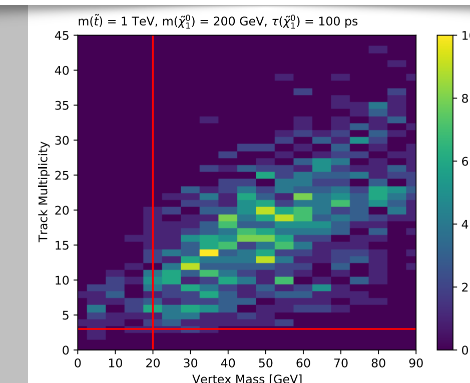

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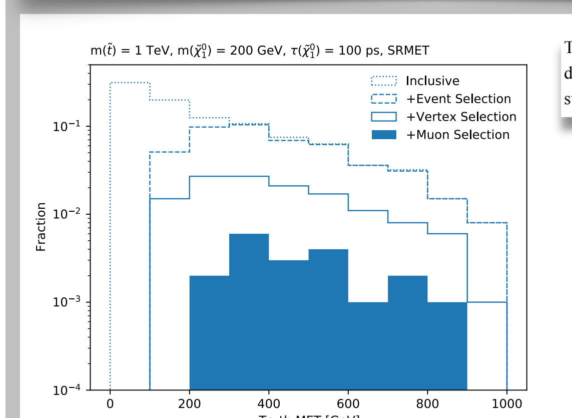

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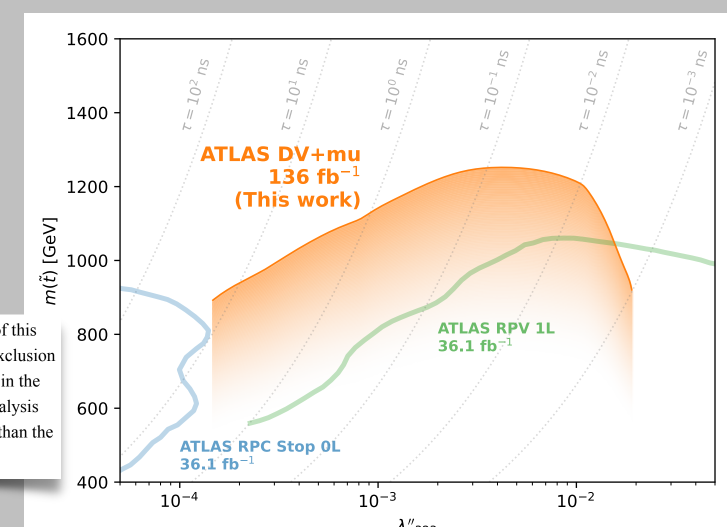

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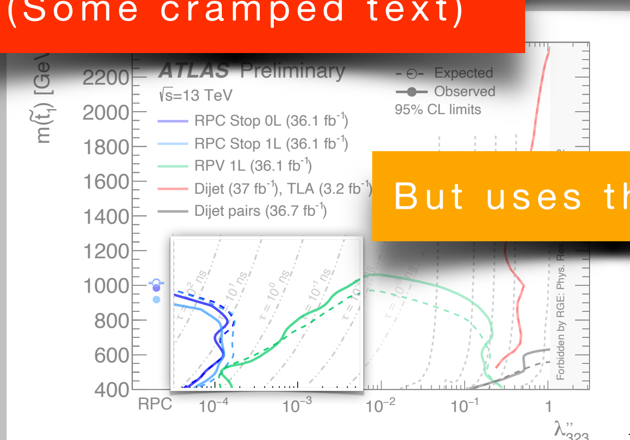

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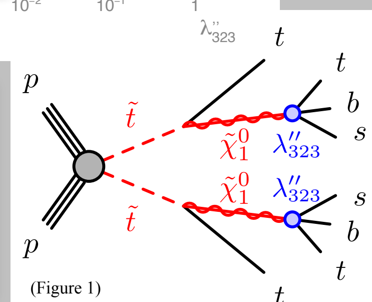

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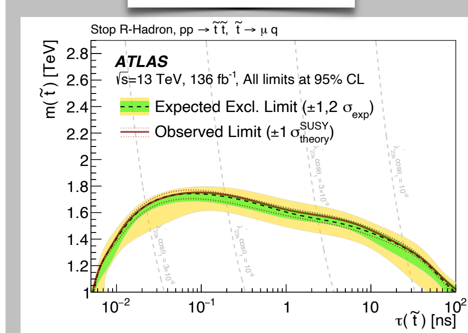

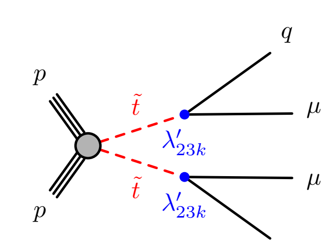

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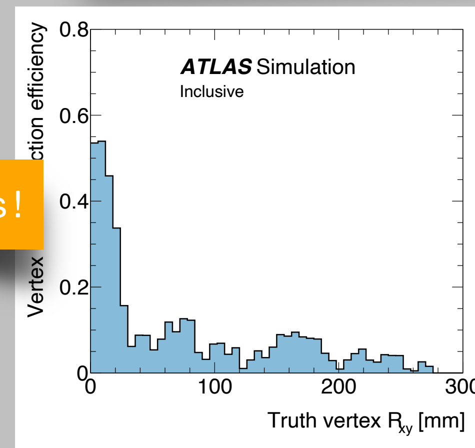

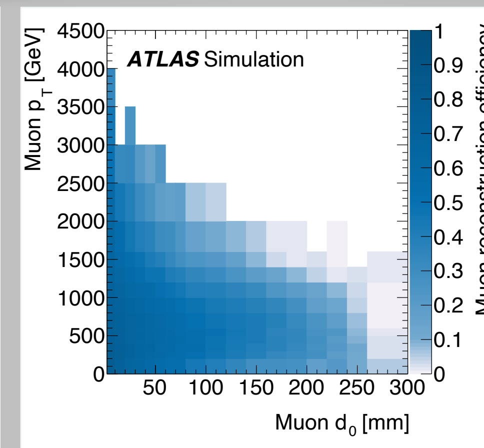

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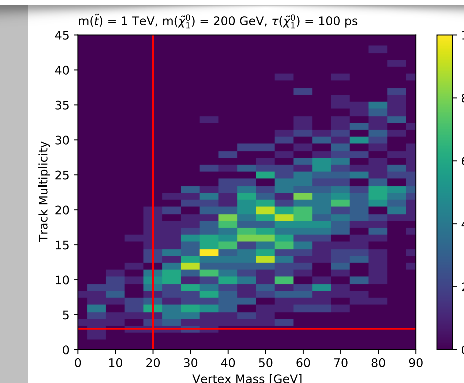

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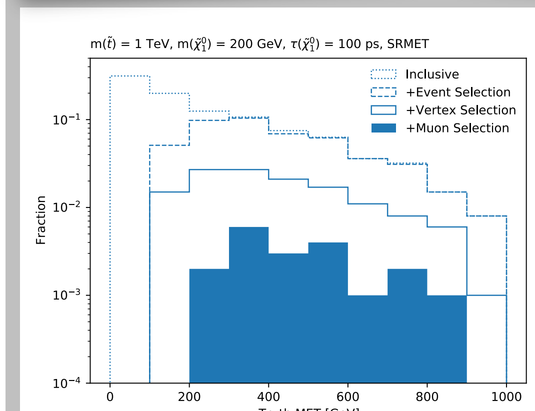

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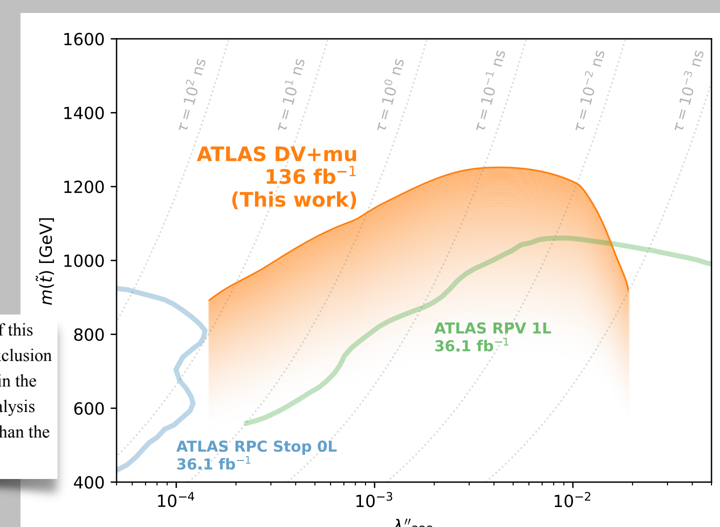

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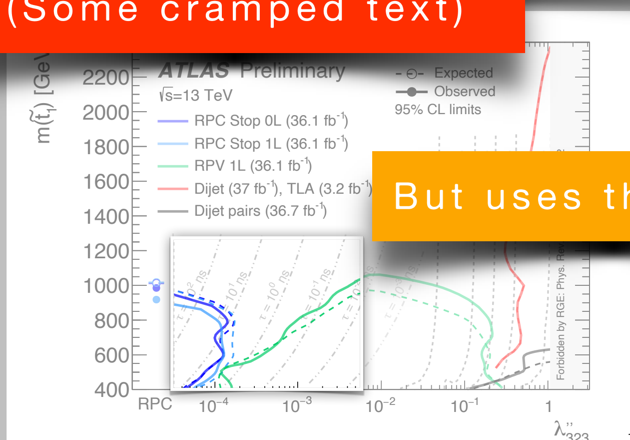

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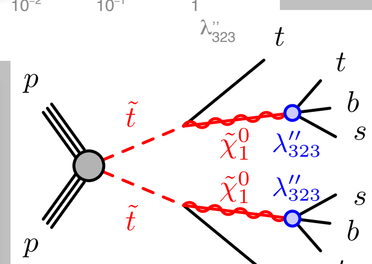

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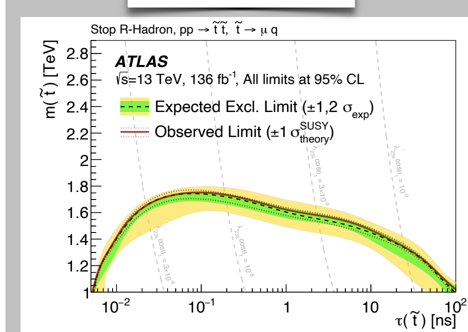

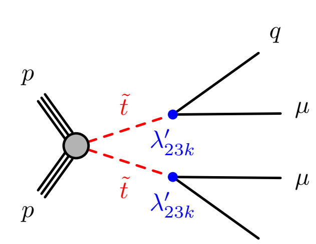

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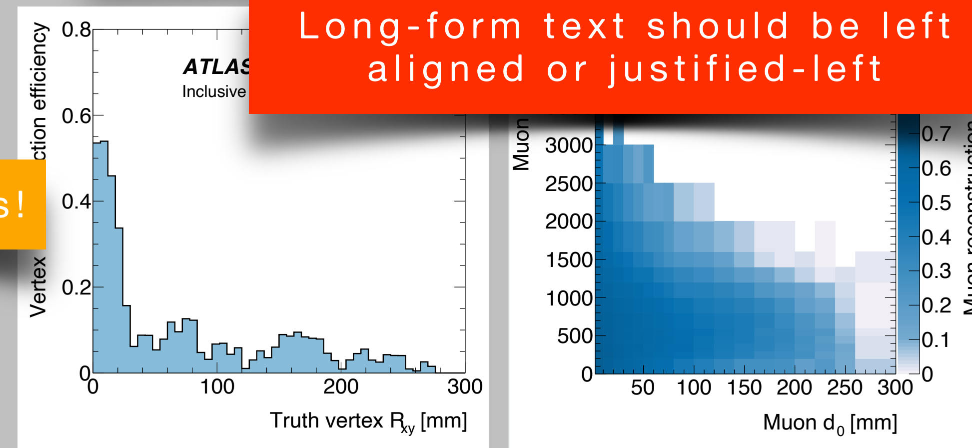

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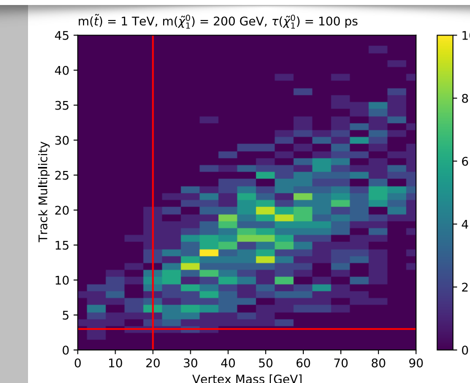

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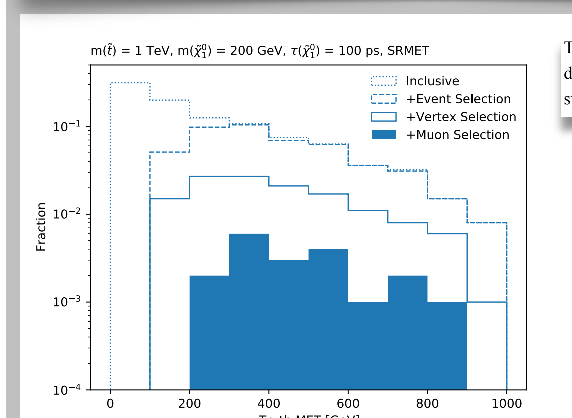

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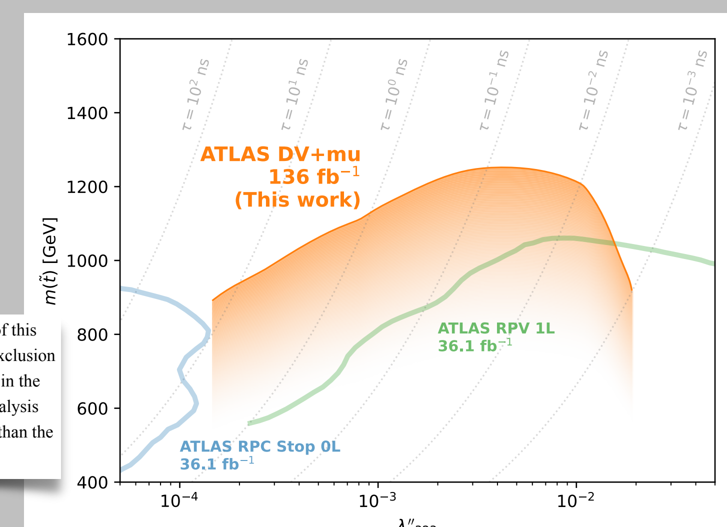

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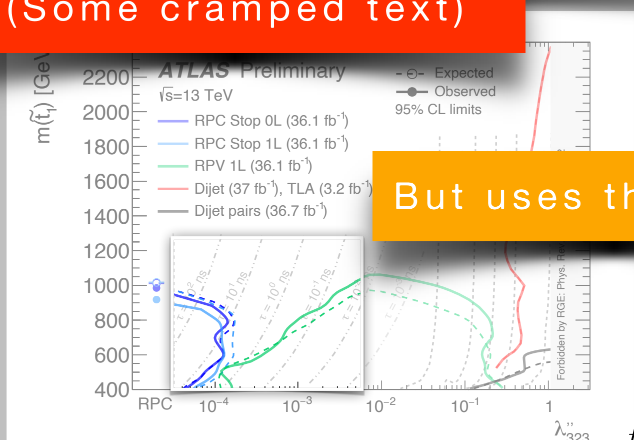

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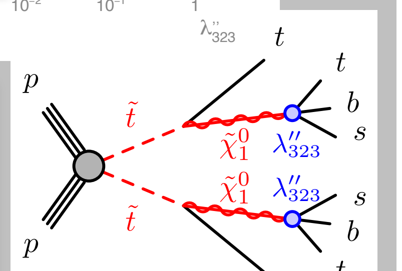

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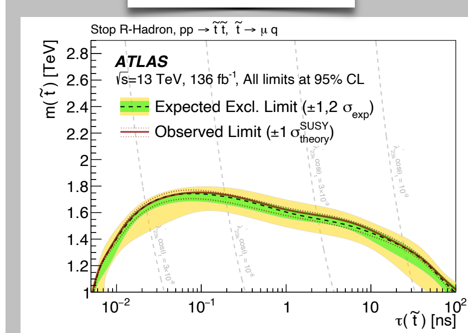

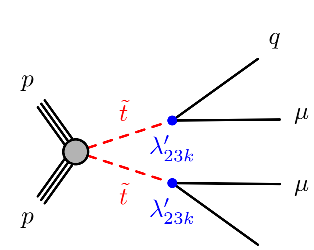

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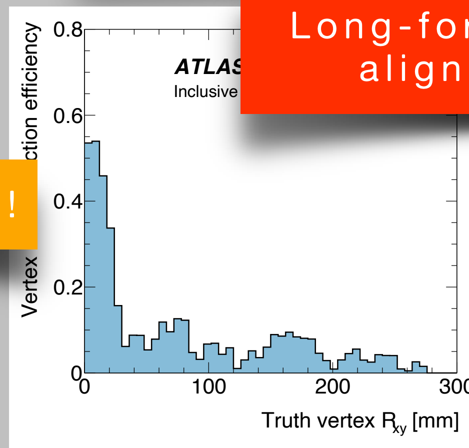

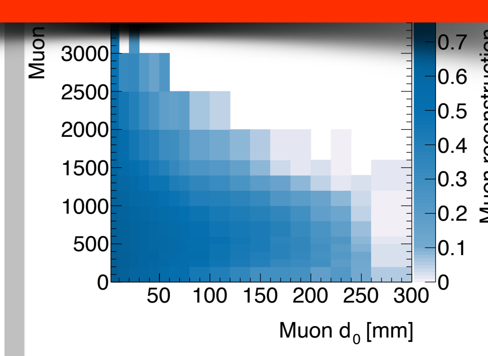

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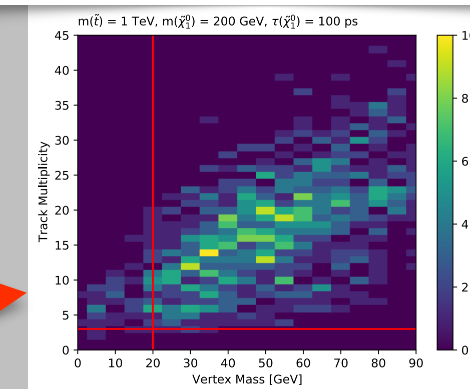

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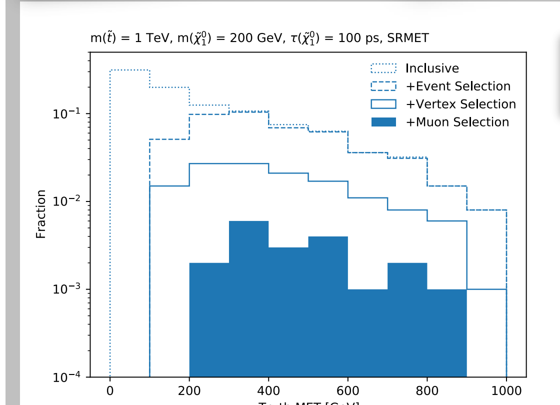

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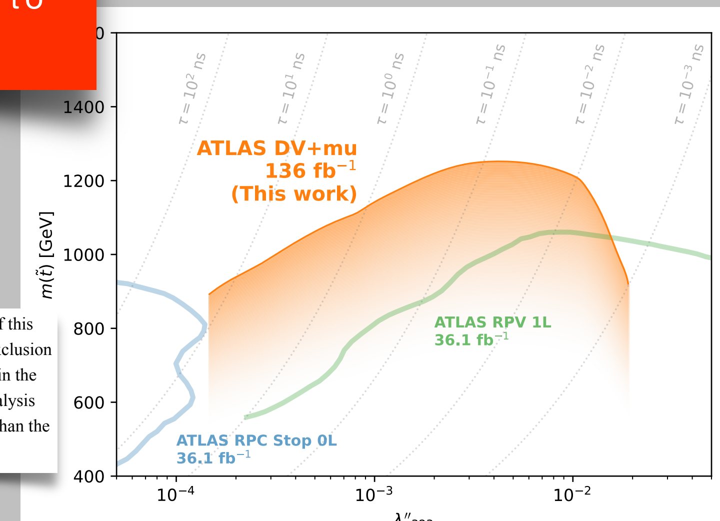

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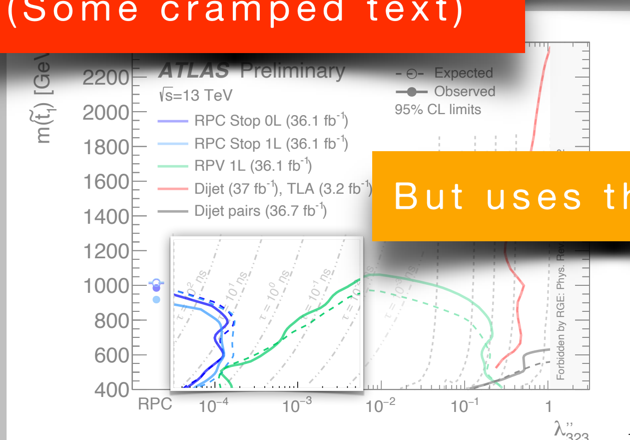

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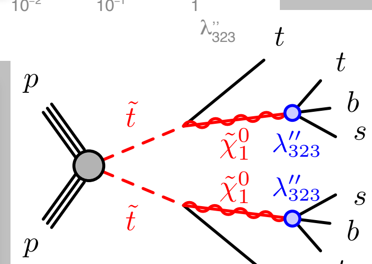

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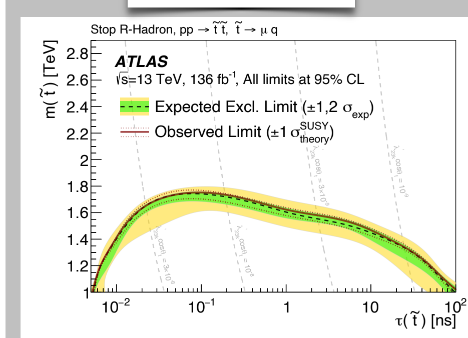

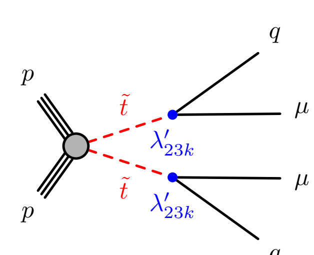

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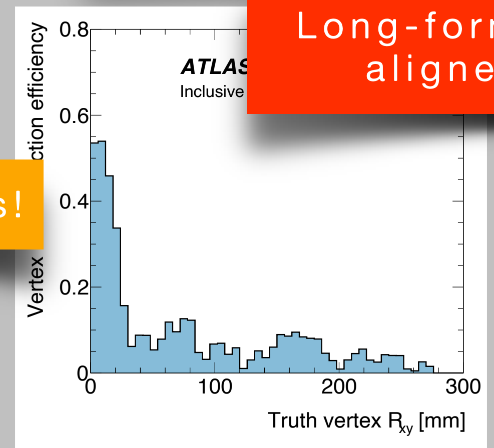

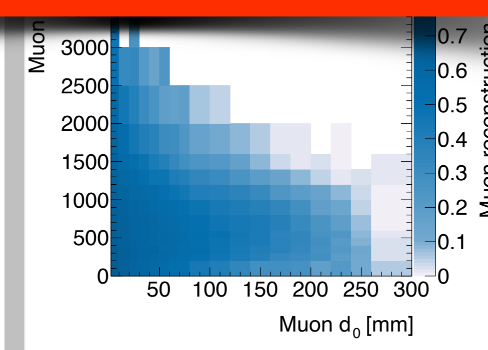

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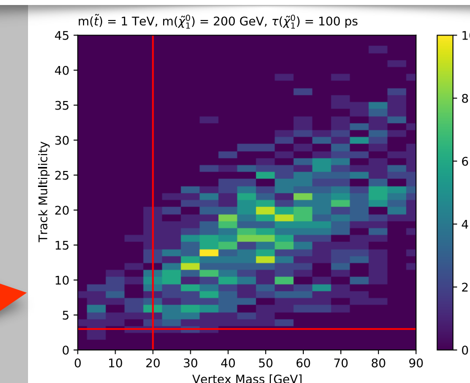

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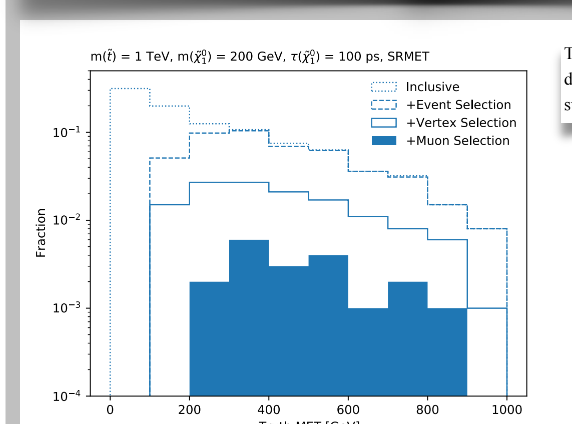

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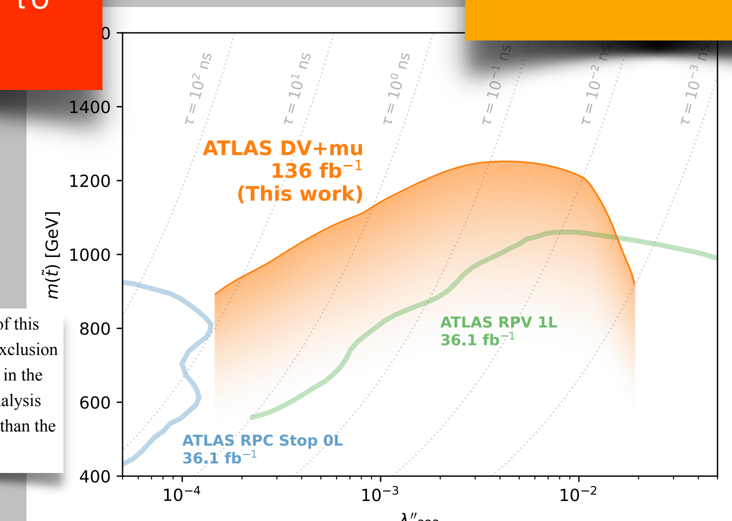

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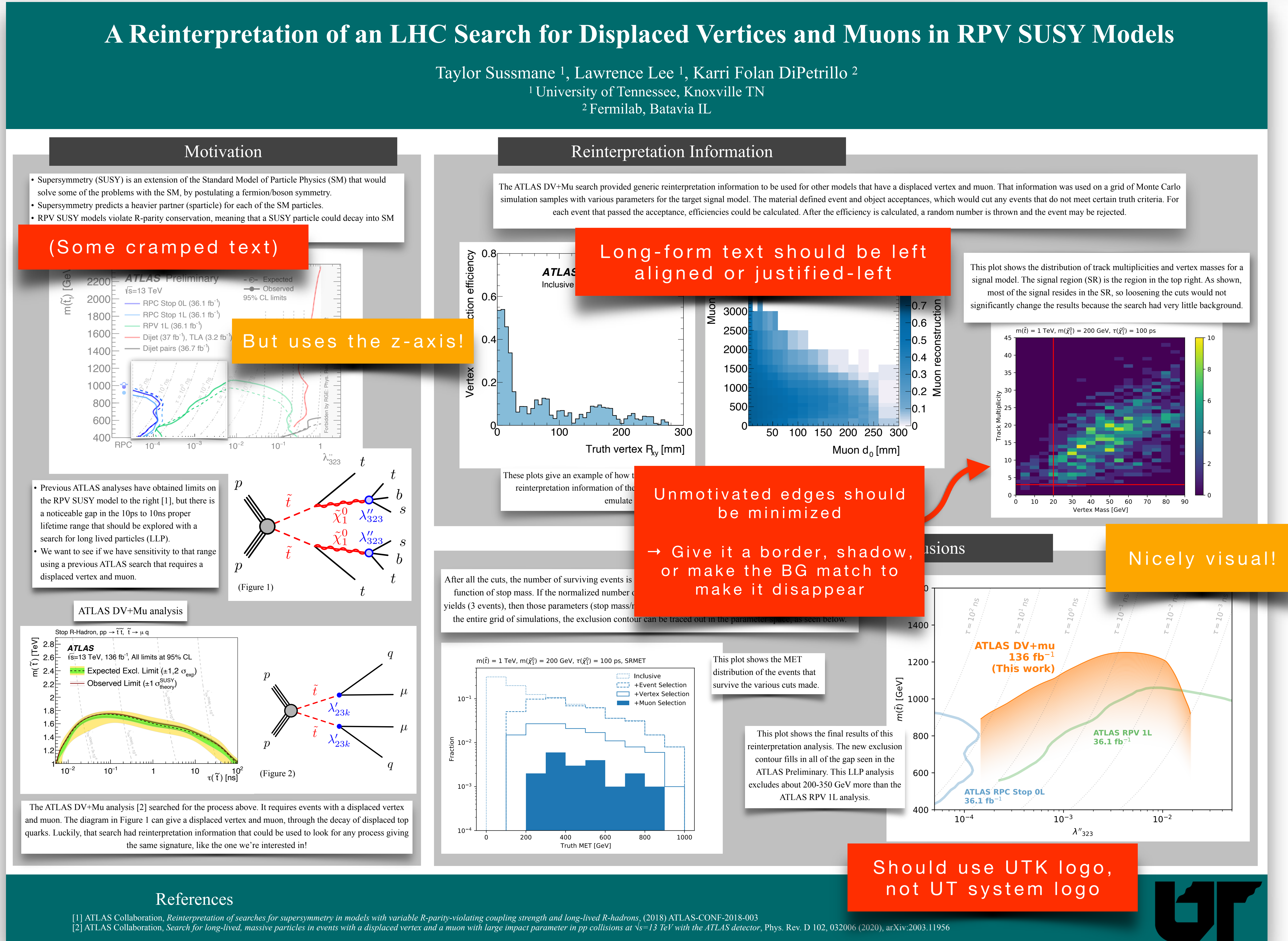
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The ATLAS DV+Mu search provided generic reinterpretation information to be used for other models that have a displaced vertex and muon. That information was used on a grid of Monte Carlo simulation samples with various parameters for the target signal model. The material defined event and object acceptances, which would cut any events that do not meet certain truth criteria. For each event that passed the acceptance, efficiencies could be calculated. After the efficiency is calculated, a random number is thrown and the event may be rejected.
Long-form text should be left aligned or justified-left
This plot shows the distribution of track multiplicities and vertex masses for a signal model. The signal region (SR) is the region in the top right. As shown, most of the signal resides in the SR, so loosening the cuts would not significantly change the results because the search had very little background.
These plots give an example of how t
reinterpretation information of the
emulate
Unmotivated edges should be minimized
→ Give it a border, shadow, or make the BG match to make it disappear
Nicely visual!
After all the cuts, the number of surviving events is
function of stop mass. If the normalized number
yields (3 events), then those parameters (stop mass/
the entire grid of simulations, the exclusion contour can be traced out in the parameter space, as seen below.
This plot shows the MET distribution of the events that survive the various cuts made.
This plot shows the final results of this reinterpretation analysis. The new exclusion contour fills in all of the gap seen in the ATLAS Preliminary. This LLP analysis excludes about 200-350 GeV more than the ATLAS RPV 1L analysis.
ATLAS DV+mu
136 fb⁻¹
(This work)
ATLAS RPV 1L
36.1 fb⁻¹
ATLAS RPC Stop 0L
36.1 fb⁻¹
Should use UTK logo, not UT system logo
References
[1] ATLAS Collaboration, Reinterpretation of searches for supersymmetry in models with variable R-parity-violating coupling strength and long-lived R-hadrons, (2018) ATLAS-CONF-2018-003
[2] ATLAS Collaboration, Search for long-lived, massive particles in events with a displaced vertex and a muon with large impact parameter in pp collisions at √s=13 TeV with the ATLAS detector, Phys. Rev. D 102, 032006 (2020), arXiv:2003.11956

QCD Reference Frames and False Jet Individualism

THE UNIVERSITY OF TENNESSEE KNOXVILLE

Lawrence Lee, **Charles Bell**, John Lawless, and Emery Nibigira
The University of Tennessee, Knoxville

arXiv:2308.10951

Motivation

At particle colliders, collimated sprays of hadrons known as jets are commonly produced.

QCD confinement forbids free particles from carrying color charge, i.e., jets consist of color-singlet hadrons.

Experiments measure the momenta and properties of these hadrons and cluster the reconstructed objects into jets using various algorithms.

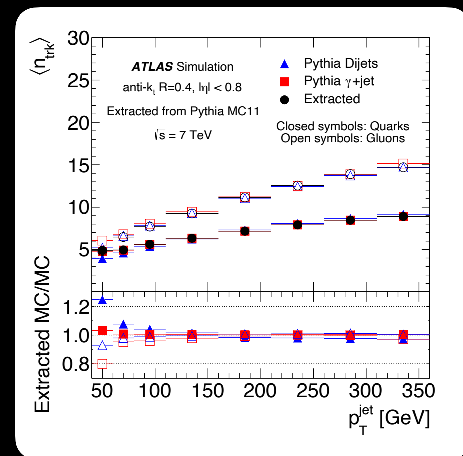
In the jet physics industry, it is common to consider a jet to be defined by its progenitor particle species and its momentum; e.g., a light quark jet of a particular momentum should have a set of properties drawn from the same distributions as every other light quark jet of that momentum scale.

The Problem

Assumption – Kinematically similar jets of similar origin are all produced from the same underlying physics distributions.

This assumption fails when requiring that observers in all frames must have a Lorentz-consistent view of these jets, e.g., all observers should agree on a jet's particle multiplicity.

There must be a special frame in which a parton's fragmentation occurs. The simplest self-consistent frame would be the rest frame of color-connected particles.



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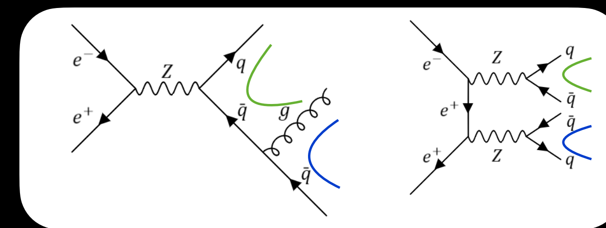
(Eur. Phys. J. C (2014) 74: 3023)



Feynman diagrams of our processes.
Left: ee → jjj Right: ee → ZZ → jjjj

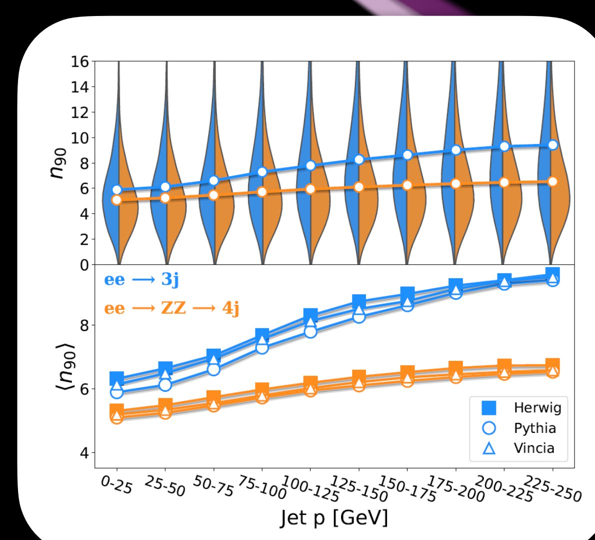
blue

anti-blue

green

anti-green

(Background)
The collision of two leptons (purple) produces two color singlets, each decaying to a quark pair. The color rest frames are the frames where each of the color-connected qq systems are at rest



(Top) Split violin plots showing the normalized n_{90} distributions for two ee collider processes as a function of lab-frame momentum.

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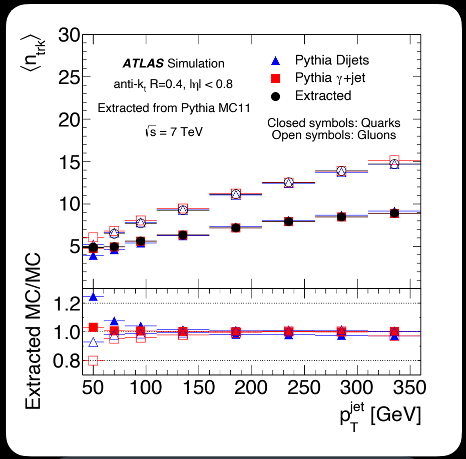

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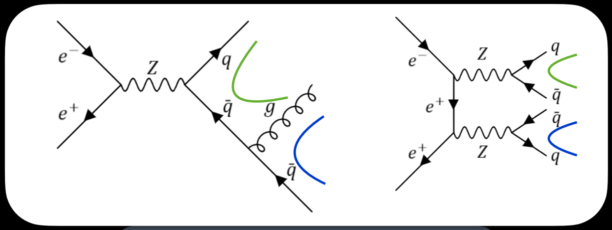

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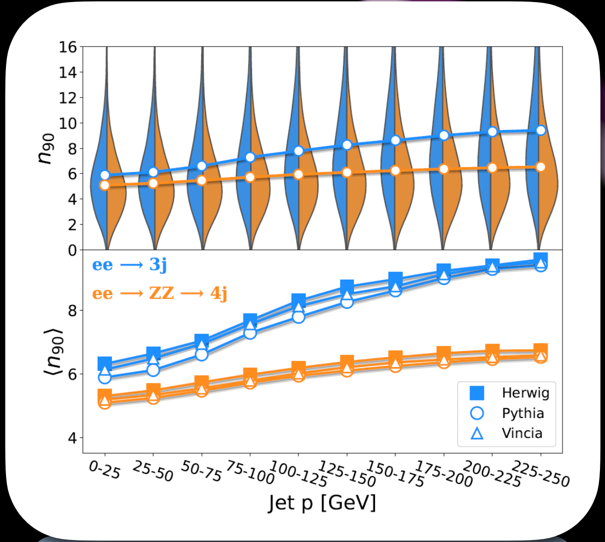

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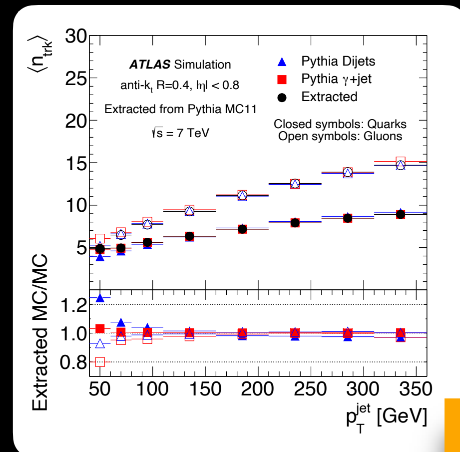

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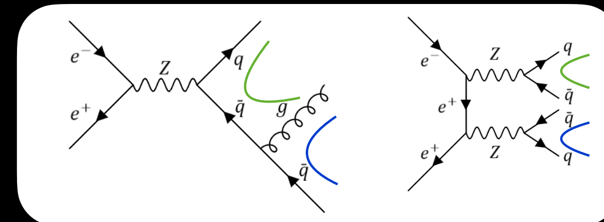

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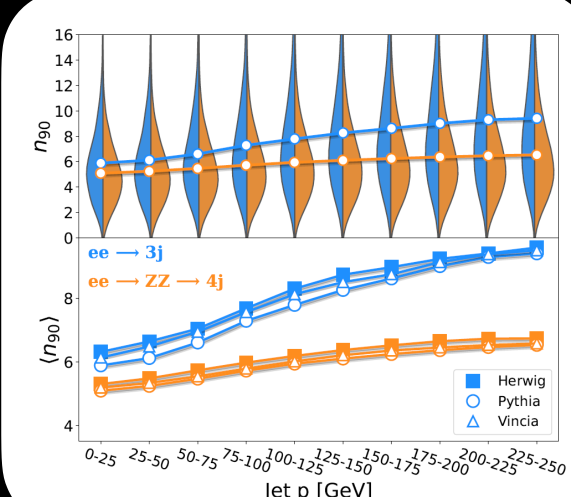

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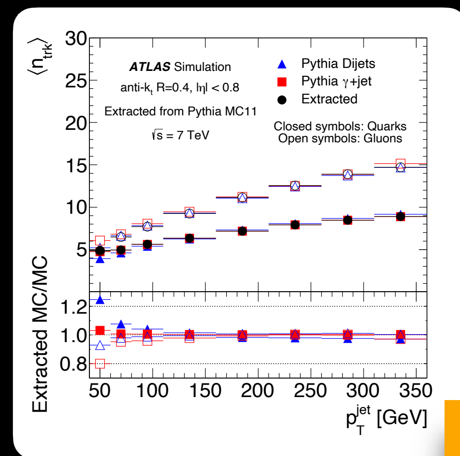

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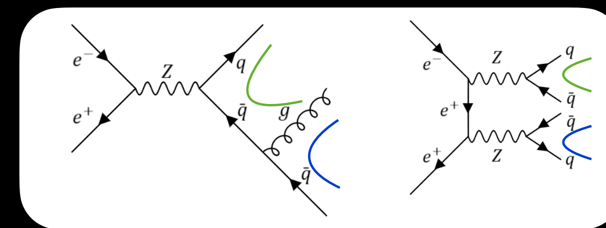

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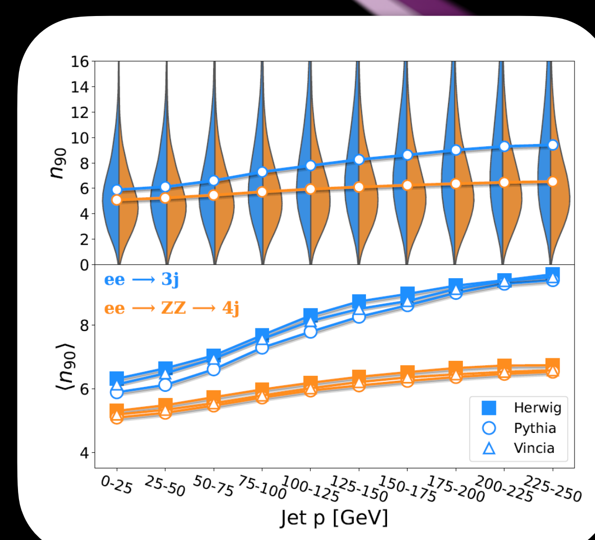

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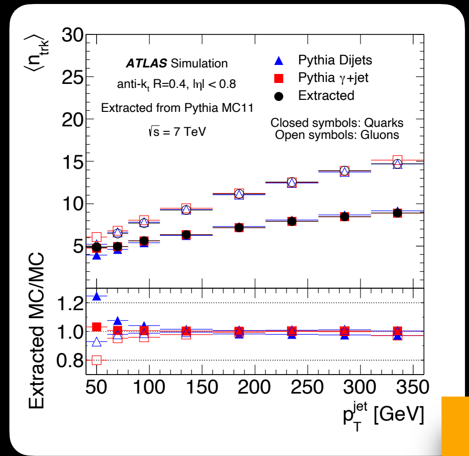

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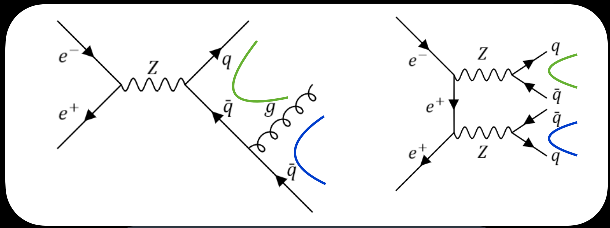

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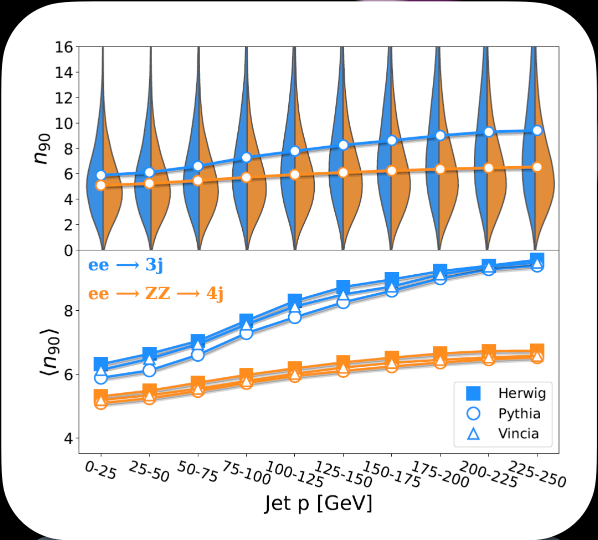

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Stretches **beyond** the canvas

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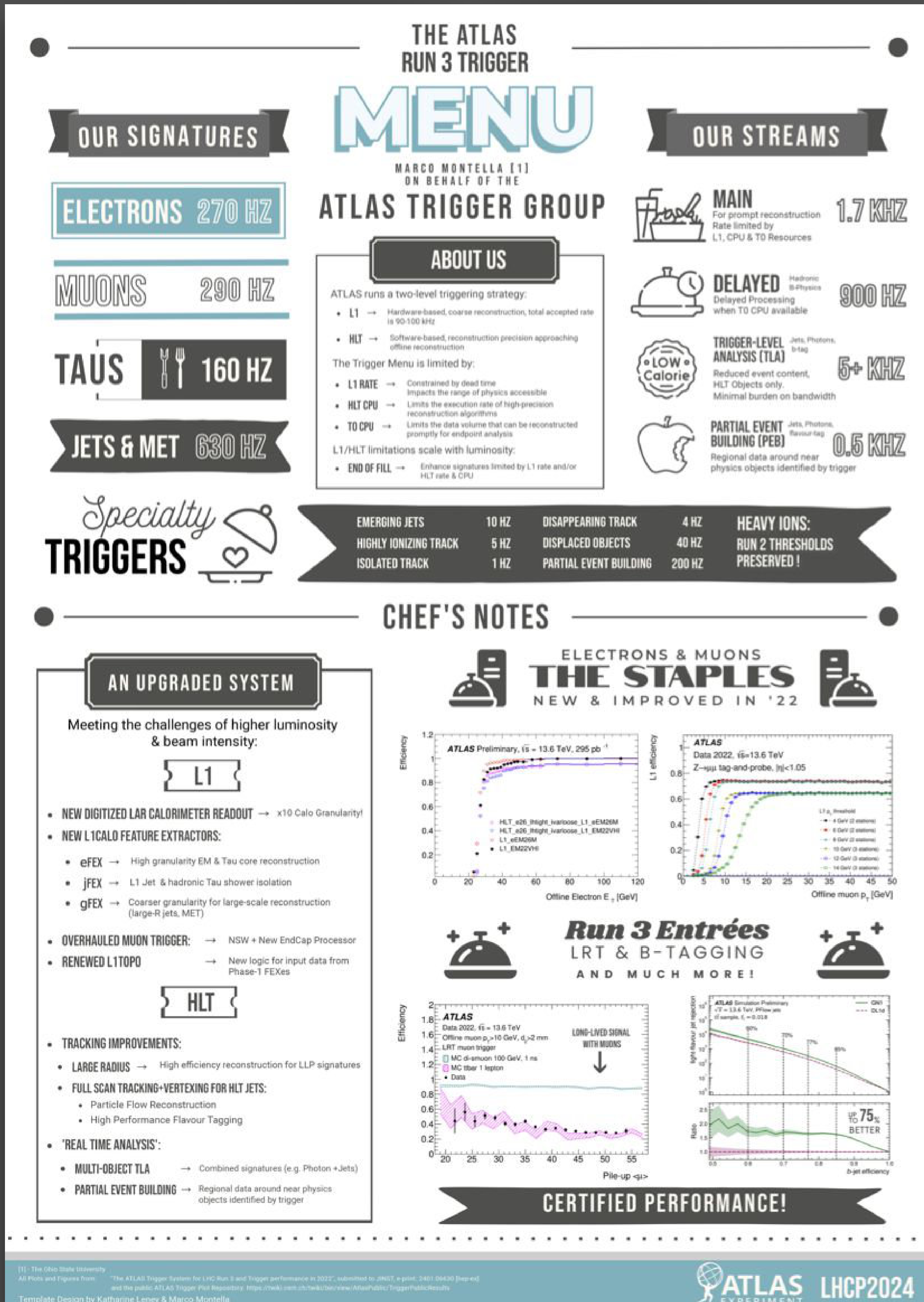
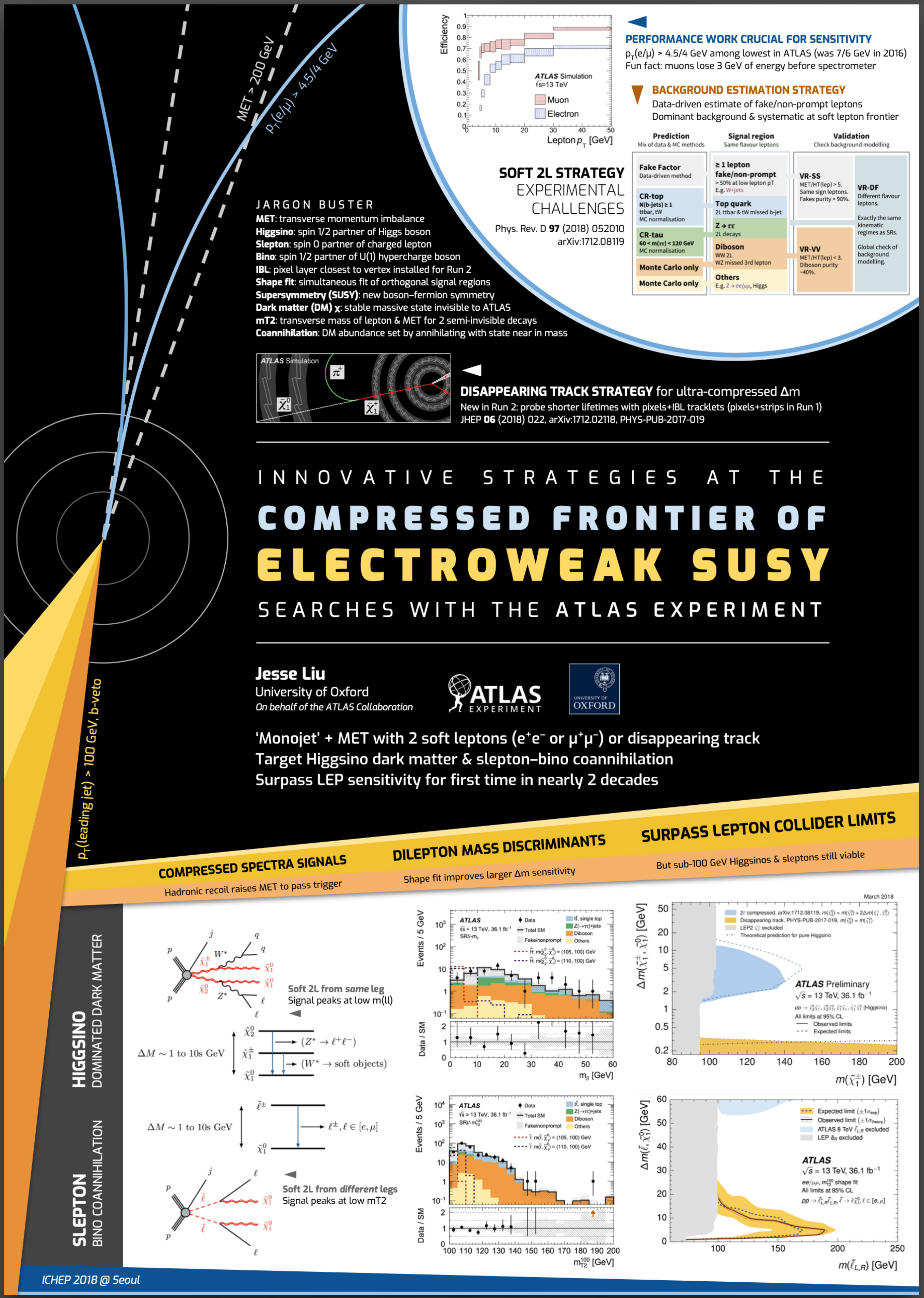


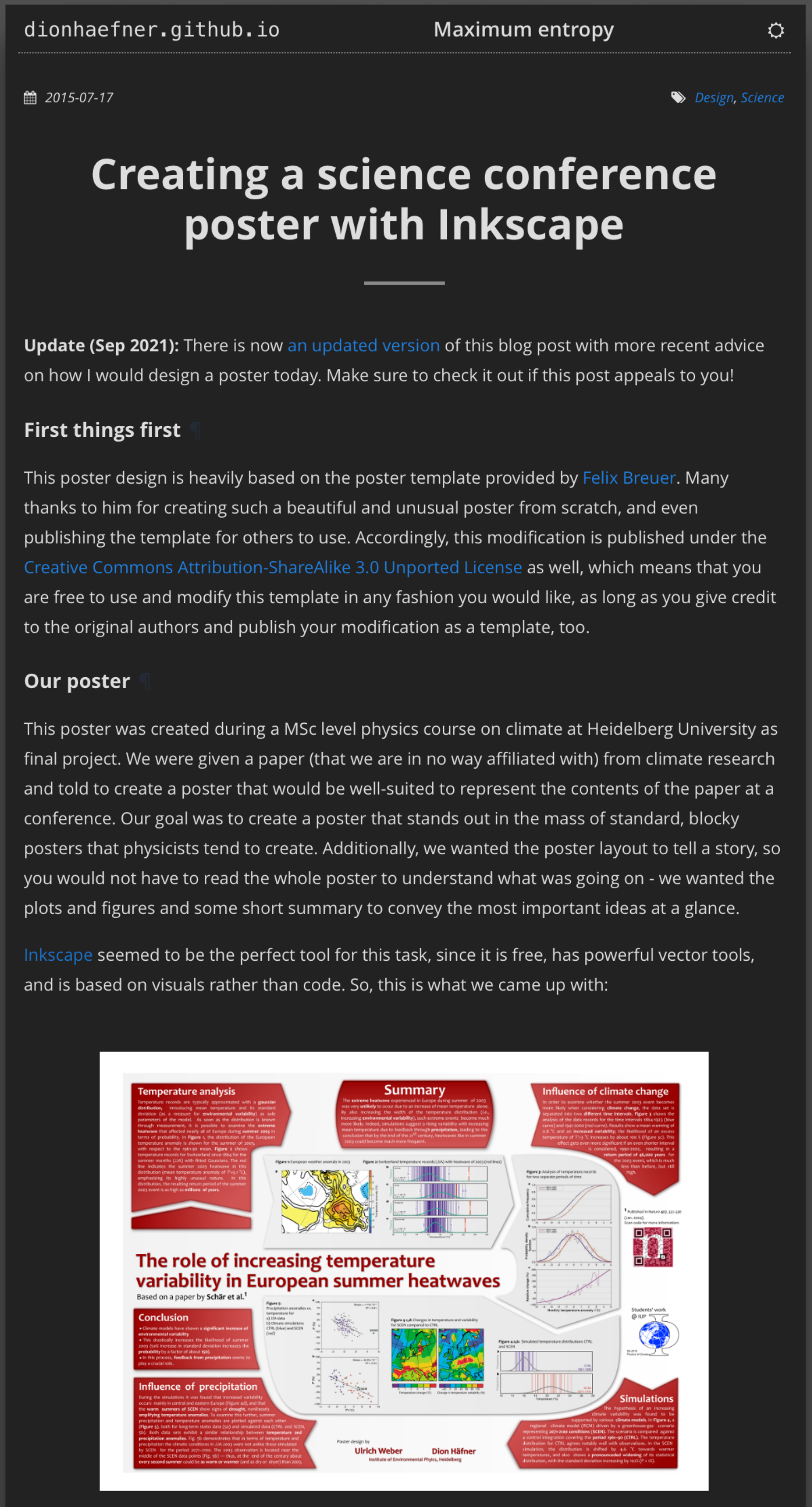
- **Innovative**
- **Funny and Engaging**
- Informative without being wordy!
  - Notice: **No sentences!**
- **Skimmable, visual**
- Engaging presentation
- Judges immediately agreed this would win

- **Beautiful** and attention grabbing from across the room
    - Had a **huge crowd** the whole session!
- All graphics serve to **communicate**
- Surprising, unique, characterful
- Arrows and shapes direct the viewer's attention
- Shadows used to convey depth



Technical Advice

- Most people use **Powerpoint** to create their poster
    - If you're on a Mac, **Keynote** is much better for this
- If you have access to advanced software, I recommend it (w/ learning curve):
    - Adobe Products ($$$)
    - Affinity Products ($$) [LL]
    - GIMP/Inkscape (Free/OS)
- Some people do it in LaTeX — as much as I advocate that you all learn LaTeX, **it's not a good tool for this**
- **Pixelation looks unprofessional**
    - Make sure all images are vector (SVG, EPS, PDF, …)
    - Or if they're raster (JPG, PNG, …) ensure high resolution
    - If you can't find a high quality version, consider making your own vector version!


dionhaefner.github.io Maximum entropy

2015-07-17 Design, Science

Creating a science conference poster with Inkscape

Update (Sep 2021): There is now an updated version of this blog post with more recent advice on how I would design a poster today. Make sure to check it out if this post appeals to you!

First things first

This poster design is heavily based on the poster template provided by Felix Breuer. Many thanks to him for creating such a beautiful and unusual poster from scratch, and even publishing the template for others to use. Accordingly, this modification is published under the Creative Commons Attribution-ShareAlike 3.0 Unported License as well, which means that you are free to use and modify this template in any fashion you would like, as long as you give credit to the original authors and publish your modification as a template, too.

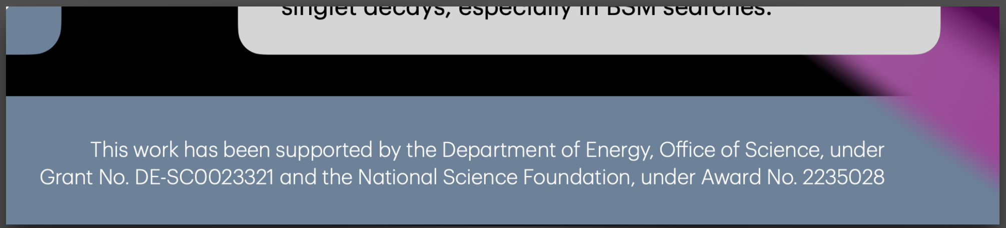
Our poster

This poster was created during a MSc level physics course on climate at Heidelberg University as final project. We were given a paper (that we are in no way affiliated with) from climate research and told to create a poster that would be well-suited to represent the contents of the paper at a conference. Our goal was to create a poster that stands out in the mass of standard, blocky posters that physicists tend to create. Additionally, we wanted the poster layout to tell a story, so you would not have to read the whole poster to understand what was going on - we wanted the plots and figures and some short summary to convey the most important ideas at a glance.

Inkscape seemed to be the perfect tool for this task, since it is free, has powerful vector tools, and is based on visuals rather than code. So, this is what we came up with:

Practical Tips

- Check with your advisor about any needed funding **acknowledgements**!
- Usually: Have a **UTK logo** and any other relevant logos
- Some sessions have visual requirements and some have required templates. Make sure you're compliant.
- They should communicate allowable sizes. In US, common standards:
  - 3' x 4' (sometimes a pain to carry)
  - 2' x 3'
  - Either portrait or landscape
- For our dept business, we have a **free poster printer**. Front office or faculty can show you.
  - External printing is weirdly expensive!



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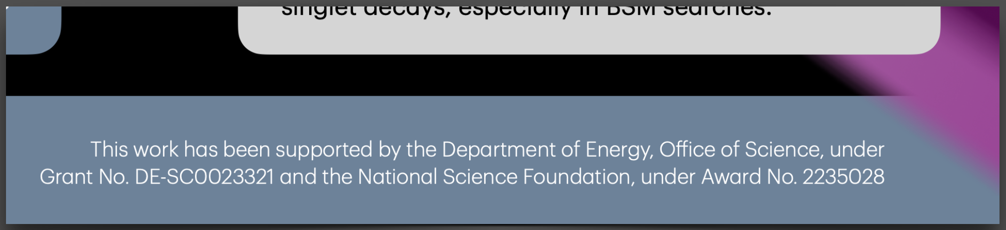
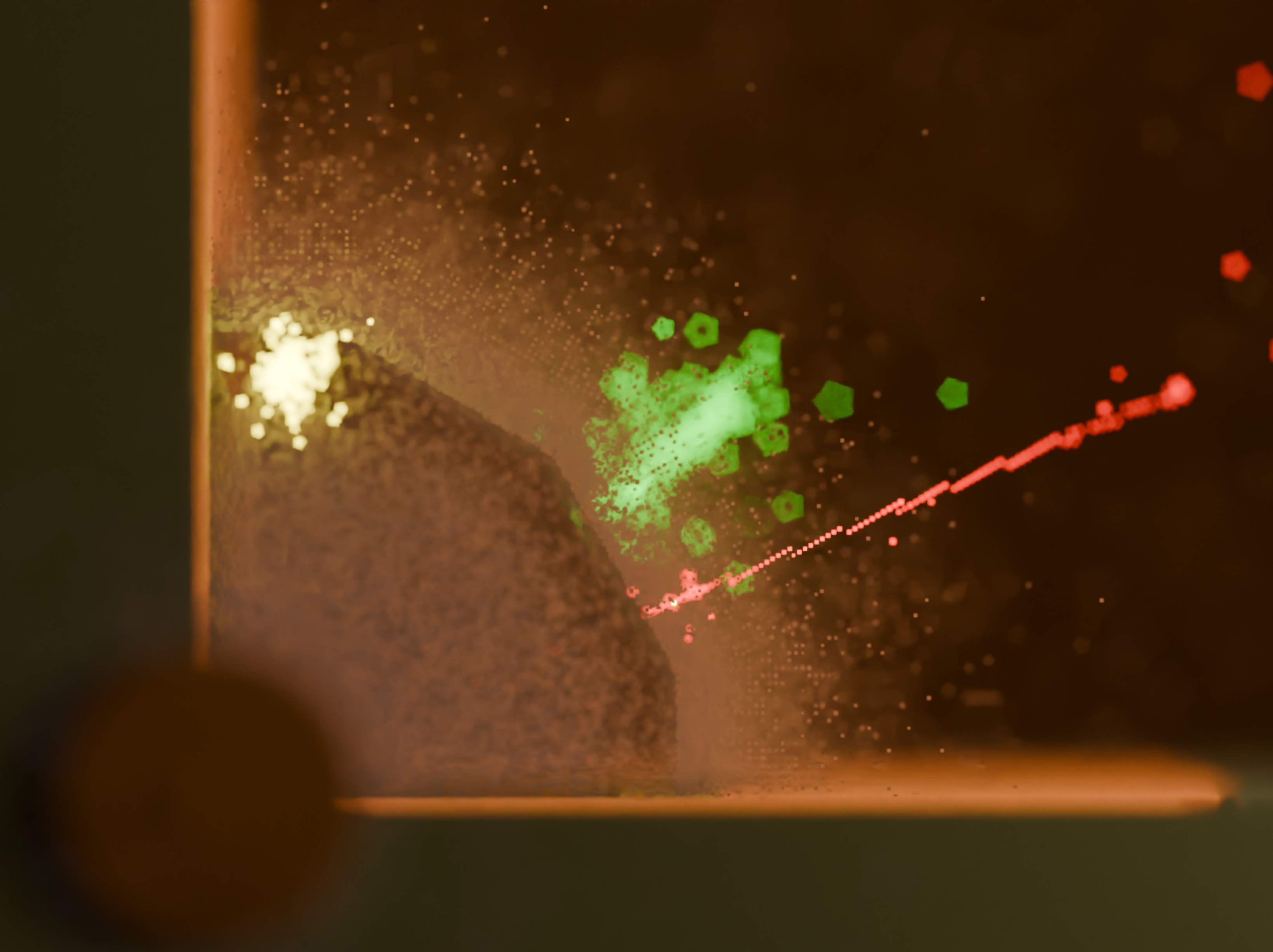


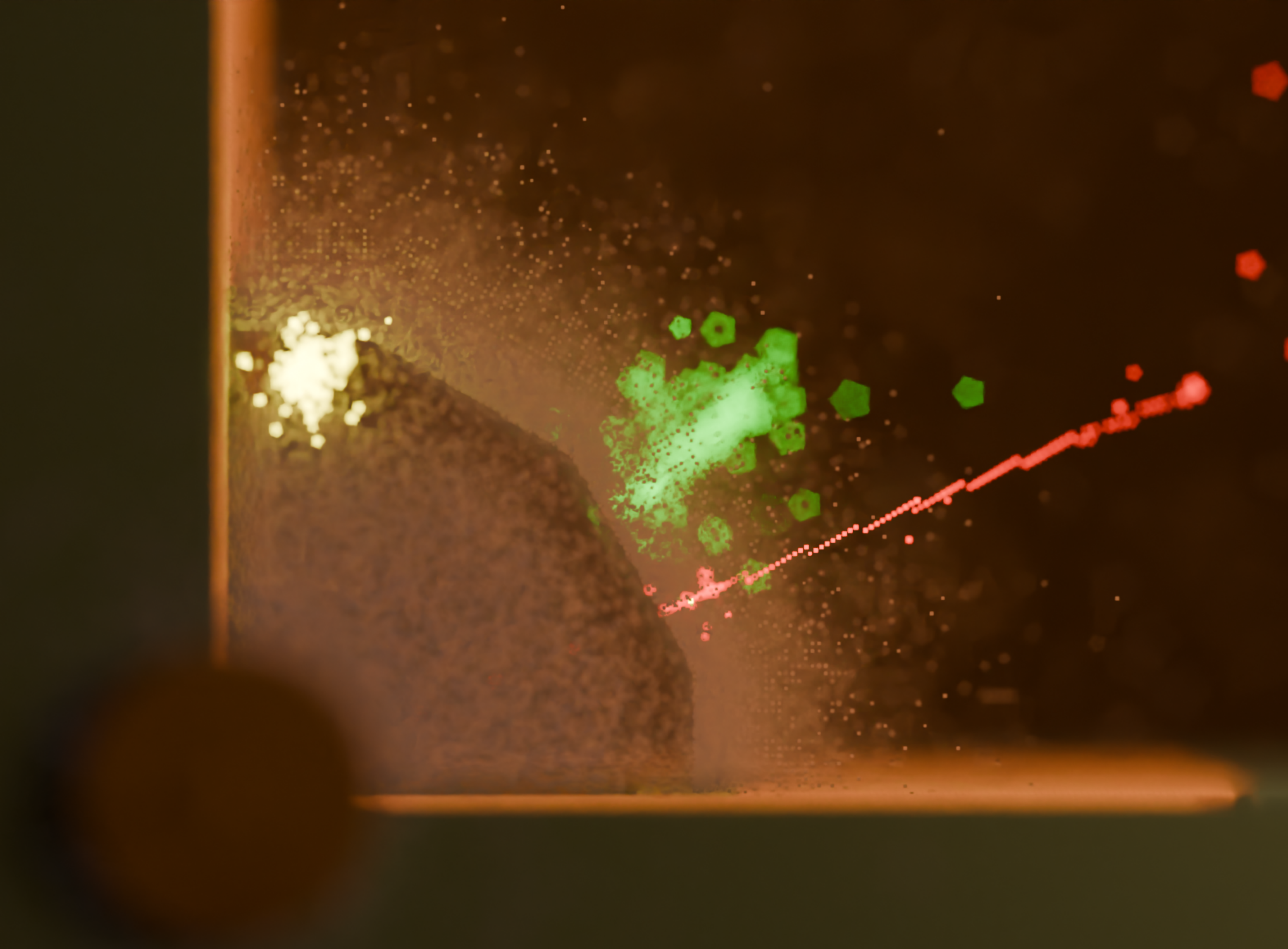
Dept has some loaner poster tubes for transport to conference (Can usually be brought on a plane, maybe as your personal item)

Final Words

- During SPS meetings, I’m happy to skim over poster drafts and give quick feedback
- Focus on the **communication** and practice, practice, practice
  - Remember that scientific communication need not be dry
  - Convey information, but also be emotionally and empathetically mindful of the viewer’s experience
- And good luck with your poster prep!



Thanks for your
attention!



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The New York Times

Big Ears Festival Stars the Avant-Garde

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Laurie Anderson performed with the Kronos Quartet. Jake Giles Netter for The New York Times

By Ben Ratliff

March 30, 2015

KNOXVILLE, Tenn. — The avant-garde is a notion shaped by discomfort, as well as defiance. No music gets that designation