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SULI Deliverable
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Graham Chambers Peer Review

Graham's presentation was informative and had a clear-cut focus on obtaining these transparency plots through simulation and comparing with observational data. Indeed, the entire project was well researched, he and his mentor's efforts shine brightly in his style of presentation. The organization of the poster, visually, was great: each section or subtopic were clearly labeled. He followed the design well through his speech and had clear introductions and conclusions. The visuals provided, the image design, layout, all expertly came together to deliver a fantastic oral presentation. It was obvious that Graham had prepared to speak before that day: he was in control of the sequence, pacing, and overall flow of the conversation. Notes were not used beyond the contents of the poster itself. He did not rely on the text to present; rather, he used the visuals and bulleted points as reminders of where to steer the flow of the talk. The speaker maintained eye contact with members of the audience (through the camera online), made pauses, and was effective in his rhetorical skills to teach the audience. As for the project itself, allow me to recount what Graham Chambers was studying in his project as far as I understood: we want to better understand neutrino physics and subsequently neutrino oscillations and scattering events. However, obtaining data for this can be difficult, so, as a proxy, we attempt to constrain neutrino data using electron scattering at lower energy levels (such that quasi-elastic scattering comes into play). Specifically, neutrino nucleus interactions are of particular interest. Realistically, we cannot create a monochromatic beam, so it's impossible to completely separate the QE regime from other reaction mechanisms. Instead, Graham looked at data from CLAS (fixed target) and compared it to monte carlo event generated data. MC transparencies range from zero to one in value: this represents the probability that a hadron produced in a nucleus escapes without re-scattering. As such, the closer one is to 0 means the harder it would be to escape, which matches our intuition when we look at Fig. 3 of the poster. Graham and collaborators implemented a more detailed sample selection by applying different cuts to the data to reduce background from MEC and rescattered protons. A portion of the detector with good efficiency will lead to cuts biased towards those detectors; likewise, they implement momentum cuts to ensure the correct portion of events fall under QE scattering. Transparency is similar to cross-section in that it yields similar information: they do parameter tuning to validate MC models with the data. Preliminary results didn't match exactly, but they seem very promising! Graham utilized C++ and root, which was a great experience for him (he already had some experience with them too, so working with them was easier). He met with his mentors on a regular basis (every day, leading to every other day by the end), anc connected with them quite well. He says it was a great job despite the remote working environment. His mentor, graduate student, faculty member, and Graham are hoping to publish a paper in association with this project by the end of next summer, ideally!