Theory and computation highlights in November, 2022
(Contribution to the Director's Monthly Report to JSABOD)

December 6, 2022

The Joint Physics Analysis Center (JPAC) at JLab Theory Center was formed in fall 2013 as a collaboration between Jefferson Lab and Indiana University with a ten-year agreement to facilitate research in support of the analysis and interpretation of experimental data on hadron spectroscopy from GlueX and Hall B at JLab. The JLab Theory Center just completed an external review with international experts on Nov. 17-18, 2022 to assess the quality and significance of the work performed under the JPAC umbrella in terms of its relevance, importance and impact to the JLab spectroscopy program, as well as to the hadron spectroscopy programs around the world.

The review was very positive, emphasizing that "JPAC has had a pronounced impact on the ongoing JLab spectroscopy program over the last decade supporting the submission of approved experimental proposals in Hall B and Hall D, such as the search for exotic mesons states, Pentaquarks and hybrid Baryons", and "JPAC … to become a recognizable brand worldwide in both the experimental and theoretical communities. It has made significant impacts on hadron spectroscopy programs internationally (including BESIII, COMPASS, LHCb) through its theory support and research leadership developing hadronic amplitude analysis frameworks." The review committee sees the value and potential impact of JPAC on JLab's future physics programs and hadron spectroscopy at large, and encourages JLab to consider extending the JPAC's mandate by another 10 years.

A new paper [arXiv:2210.06450] by Dr. Ringer and collaborators explores the use of machine learning (ML)-based jet and event identification at the future Electron-Ion Collider. The work establishes first benchmarks and proposes applications in key EIC research areas, including enhancing constraints on parton distribution functions and improving experimental access to spin asymmetries. The studies presented are relevant to aspects of the EIC detector design, and provide an outlook for connecting the ML-based methods with first principles calculations in QCD.