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Hydra: Computer Vision for Data Quality Monitoring

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Hydra is an extensible framework for training, managing, and deploying machine learning models for near real-time data quality monitoring. It is designed to take some of the burden off of shift crews by providing 'round-the-clock' monitoring of plots representing the data being collected. The Hydra system is backed by a database which is leveraged for near push button training and is primarily controlled and viewed through a set of web interfaces. This web interface contains a simple-to-use web based GUI for labeling of the datasets used in training; making it possible to label thousands of images quickly and efficiently. To aid in the analysis of Hydra inferences gradCAM, a method of interpretability, is performed and overlaid on the target image, highlighting regions of interest, making diagnosis of problems much faster.

Development began in 2019 for the GlueX Experiment in Hall-D, the Hydra system has grown to encompass all of the experimental halls at Jefferson Laboratory. This talk will focus on the features of Hydra as well as provide details of the challenges present with deploying to disparate experimental halls. With a roadmap of development established, Hydra aims to continue to grow in richness of feature set and expand to encompass other monitoring tasks in differing communities.

Significance

Hydra represents a successful integration of AI/ML into in-situ data acquisition at Jefferson Laboratory. It is deployed in all of the experimental halls and has quickly become part of the standard operating procedures for shift crews, routinely outperforming its human counterparts in the detection of problems with the acquisition of physics quality data.

References

Chep 2021 https://www.epj-conferences.org/articles/epjconf/pdf/2021/05/epjconf_chep2021_04010.pdf

Acat 2022 https://indico.cern.ch/event/1106990/contributions/4991255/

Experiment context, if any

All experimental halls at Jefferson Laboratory

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