Contribution ID: **55** Type: **Talk in workshop 2: "AI & ML in nuclear science: starting with design, optimization, and operation of the machine and detectors, to data analysis"**

Role of AI and ML in Medical Physics

Medical Physics has grown out of nuclear physics from the very beginning and today the nuclear physics detectors, data acquisition systems, simulations, and particle accelerator systems that make up the backbone of medical imaging and cancer treatment systems in the clinic have integrated artificial intelligence and machine learning (AI/ML) deeply into their research and development cycles and clinical workflows. From early detection of cancer in screening images trained on labeled global datasets to anatomical feature identification and automated contouring, AI/ML has stepped into the clinic and vastly streamlined the workload of clinicians. Next generation medical physics applications, such as photon counting computed tomography (PCCT) and in-beam positron emission tomography (PET) radiotherapy activation washout modeling, are enabled by the deployment of AI/ML based detector and functional nuclear imaging physiological physics models. I will give an overview of the recent advances in medical physics that take advantage of AI/ML tools. I will highlight the synergies and areas of mutual benefit where nuclear physics and medical physics can learn from each other, tracing the arc of AI/ML advances in medical physics from cancer treatment workflow improvements through next-generation imaging modalities. I will finish by describing several AI/ML detector and imaging projects currently in progress in the Radiation Detector and Imaging Group as part of the Biomedical Research and Innovation Center (BRIC) at the Thomas Jefferson National Accelerator Facility (JLab).

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