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smartpixels: on-pixel featurization for single layer silicon tracking

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The combinatorics of track seeding has long been a computational bottleneck for triggering and offline computing in High Energy Physics (HEP), and remain so for the HL-LHC. Next-generation pixel sensors will be sufficiently fine-grained to the point of being able to determine angular information of the charged particle passing through. This detector technology immediately improves the situation for offline tracking but any major improvements in physics reach are unrealized since they are dominated by level-one trigger acceptance. We will demonstrate track angle and hit position prediction, including errors, using a mixture density network within a single layer of silicon as well as the progress towards and challenges of implementing the neural network in hardware as an ASIC.

Primary authors: DICKINSON, Jennet Elizabeth (Fermi National Accelerator Lab. (US)); GRAY, Lindsey (Fermi National Accelerator Lab. (US)); KOVACH-FUENTES, Rachel (University of Chicago)

Presenter: KOVACH-FUENTES, Rachel (University of Chicago)

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