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The solar wind plasma is in perpetual motion and underlies the majority of heliophysics questions and space weather predictions that will be central to the PUNCH mission. In the heliosphere, imagery data and MHD simulations have offered complementary views of the solar wind. Imagery can give global estimates of the solar wind flows at relatively low resolution, while MHD simulations are able to emulate synthetic observations associated with physically realistic in-situ parameters. In recent years, Deep Learning Neural Networks have been trained using MHD simulations to reconstruct the plasma flows from imagery data at multiple scales. Although such attempts have been done mostly for photospheric flows, their frameworks are applicable to solar wind measurements. However, Deep Learning methods can propagate many biases that are often overlooked. In this presentation I will review the current limitations of the traditional and Deep Learning methods for measuring the solar wind flows, with concrete examples of how we can circumvent some of them to better harness the power of AI that will propel the PUNCH mission farther on the path of scientific discoveries.

Presentation file

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