Automated and robust Langmuir sweep analysis using machine learning[1] PHIL TRAVIS, University of California, Los Angeles — Swept Langmuir probes are used to deduce temperature, density, and electric potential in laboratory plasmas. Traces from swept probe measurements can be difficult to interpret using existing hand-tuned heuristics, and are restricted to using only analytical probe models. Using an unsupervised hybrid model of neural networks and analytical theory, I constructed an automated sweep analysis routine that is robust to noise and provides plasma parameters for a semi-infinite planar probe and a Maxwellian plasma. The model was trained on over a million swept Langmuir probe measurements from the Large Plasma Device (LAPD) and the Small Plasma Device (SMPD), and was validated on data from a smaller device. This model can be easily expanded to accommodate any theoretical probe model and an arbitrary velocity distribution function. An overview of the model and a demonstration of its capabilities will be presented. The source code will also be provided.

Phil Travis
University of California, Los Angeles