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JupyterPIC: Linking plasma simulation codes with Juptyer notebooks (and JupyterHub) to teach students fundamental plasma physics[1]

B. J. WINJUM, R. LEE, F. S. TSUNG, W. B. MORI, UCLA — Computer simulations offer tremendous opportunities for studying plasmas, and for students approaching this field, illustrative plots or movies of plasma behavior can be very helpful for conceptualizing difficult topics. Nevertheless, there is a significant hurdle to using simulation tools. Users must navigate codes and software libraries, determine how to wrangle output into meaningful plots, and sometimes confront a significant cyberinfrastructure that is intended for research. We have configured a JupyterHub and written educational Jupyter Notebooks for students to run kinetic plasma software and analyze results inside a Web-based environment without needing to learn or manage the underlying software and computing cyberinfrastructure. Inside the notebooks, we have interleaved educational text and equations on a particular topic with simulation sections that students can run as-is or tinker with as they desire. We envision that this work could not only be beneficial to budding plasma physicists but also to students in other classroom environments that would benefit from computationally enabled instruction and data/visualization tools.

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