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Machine learning and serving of discrete field theories – when artificial intelligence meets the discrete universe[1] HONG QIN, Princeton Plasma Physics Laboratory, Princeton University — In 1601, Kepler inherited the observational data of planetary orbits meticulously collected by Tycho Brahe. It took Kepler 5 years to discover his laws of planetary motion, and another 78 years for Newton to solve the Kepler problem using his laws of motion and gravitation. Recently I developed a machine learning and serving algorithm for discrete field theories that applies to a wide range of physics problems [arXiv:1910.10147]. The algorithm learns a discrete field theory from observational data and then directly predicts new observations without laws of physics. In particular, the algorithm solves the Kepler problem without learning or knowing Newton's laws of motion and gravitation. The learning algorithm learns a discrete field theory from a set of planetary orbit data similar to what Kepler inherited, and the serving algorithm correctly predicts other planetary orbits, including parabolic and hyperbolic escaping orbits, of the solar system. The proposed algorithm is also applicable when relativistic effects are important without knowing or learning Einstein's theory. The illustrated advantages of discrete field theories for machine learning are consistent with Bostrom's simulation hypothesis. I will also show how this algorithm can help to achieve fusion energy.

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