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**Machine learning phases of matter** JUAN CARRASQUILLA , MILES STOUDENMIRE, Perimeter Inst for Theo Phys, ROGER MELKO, Perimeter Inst for Theo Phys and University of Waterloo — We show how the technology that allows automatic teller machines read hand-written digits in cheques can be used to encode and recognize phases of matter and phase transitions in many-body systems. In particular, we analyze the (quasi-)order-disorder transitions in the classical Ising and XY models. Furthermore, we successfully use machine learning to study classical  $Z_2$  gauge theories that have important technological application in the coming wave of quantum information technologies and whose phase transitions have no conventional order parameter.

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