Spin-1/2 kagome antiferromagnet (AFM) is one of the most studied models in frustrated magnetism since it is a promising candidate to host exotic spin liquid states. However, despite numerous studies using both analytical and numerical approaches, the nature of the ground state and low-energy excitations in this system remain elusive. This is related to the difficulty in determining the spin gap in various calculations. We present the results of our investigation of the Kagome AFM using the recently developed group equivariant convolutional neural networks - a novel machine learning technique for studying strongly frustrated models. The approach, combined with variational Monte Carlo, introduces significant improvement of the achievable results accuracy for frustrated spin systems in comparison with approaches based on other neural network architectures. Contrary to the results obtained previously with various methods, that predicted $Z2$ or U(1) Dirac spin liquid states, our results strongly indicate that the ground state of the kagome lattice antiferromagnet is a spinon pair density wave that does not break time-reversal symmetry or any of the lattice symmetries. The found state appears due to the spinon Cooper pairing instability close to two Dirac points in the spinon energy spectrum and resembles the pair density wave state studied previously in the context of underdoped cuprate superconductors in connection with the pseudogap phase. The state has significantly lower energy than the lowest energy states found by the SU(2) symmetric density matrix renormalization group calculations and other methods.