Day-ahead operations involves a complex and computationally intensive optimization process to determine the generator commitment schedule and dispatch. The optimization process is a mixed-integer linear program (MILP) also known as security-constrained unit commitment (SCUC). Independent system operators (ISOs) run SCUC daily and require state-of-the-art algorithms to speed up the process. Existing patterns in historical information can be leveraged for model reduction of SCUC, which can provide significant time savings. In this paper, machine learning (ML) based classification approaches, namely logistic regression, neural networks, random forest and K-nearest neighbor, were studied for model reduction of SCUC. The ML was then aided with a feasibility layer (FL) and post-process technique to ensure high-quality solutions. The proposed approach is validated on several test systems namely, IEEE 24-Bus system, IEEE-73 Bus system, IEEE 118-Bus system, 500-Bus system, and Polish 2383-Bus system. Moreover, model reduction of a stochastic SCUC (SSCUC) was demonstrated utilizing a modified IEEE 24-Bus system with renewable generation. Simulation results demonstrate a high training accuracy to identify commitment schedule while FL and post-process ensure ML predictions do not lead to infeasible solutions with minimal loss in solution quality.