

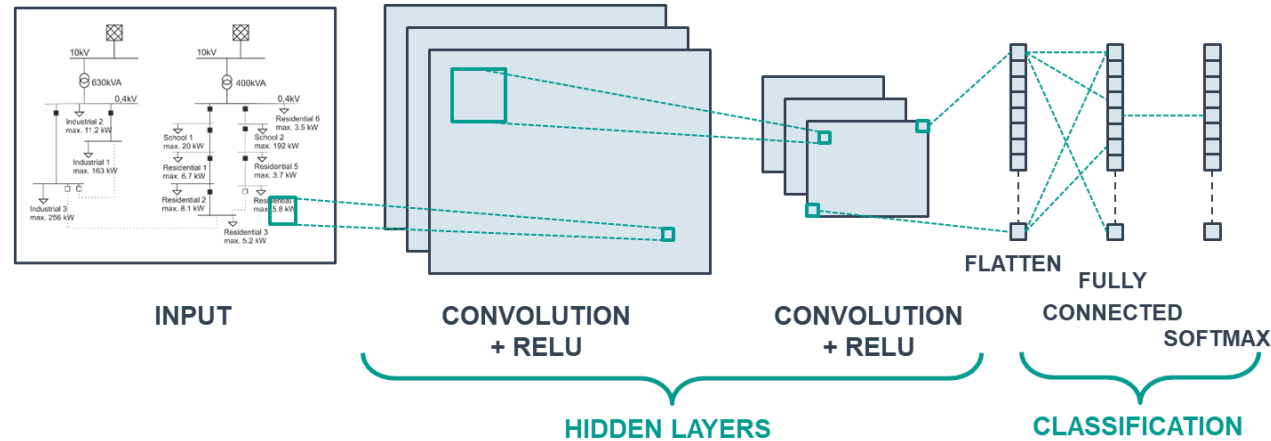
Power Grid Operation in Distribution Grids with Convolutional Neural Networks

INTRO

The expansion of renewable energies leads to a need for active grid operation in the distribution grid. Conventional methods are too slow to react to short term disturbances.

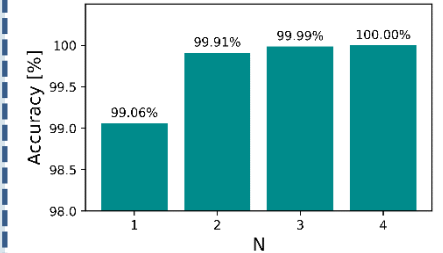
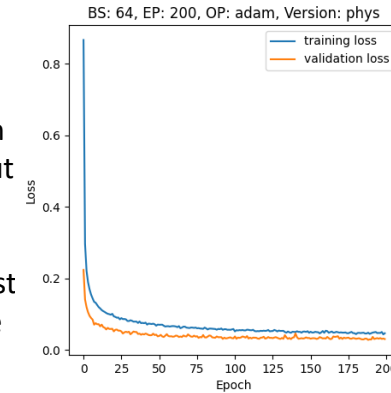
Therefore a **grid optimization tool based on convolutional neural networks (CNNs)** is developed and investigated with the aim of avoiding supply bottlenecks through intelligent use of the existing grid infrastructure and thus minimizing the need for grid expansion measures.

CNN-MODEL



RESULTS

The load and generation data were arranged in six different input matrices. The resulting loss curves of the best arrangement are shown here.



Accuracy values of the CNN when including the N highest ranked solutions.

CONCLUSION

Distribution grid operation with CNNs is possible with an accuracy of 99.06 %. The application is illustrated on real world scenario with a virtual grid. An easily transferable and automated image generation was created that works for any power grid. The performance is not strongly depending on the arrangement of the input data. This approach is paving the way for further integration of renewable energy sources as well as heat pumps and electrical cars into the existing grid without grid expansion.