• Power flow computations are fundamental to many power system studies.
• The solutions serve as a base in performing other power system studies such as transient and voltage stability studies.
• Obtaining a converged power flow case is not a trivial task especially in large power grids due to the non-linear nature of the power flow equations.

Newton-Raphson is very sensitive to the initial conditions (voltage magnitude and angle estimates).

A machine learning initializer based on random forest is designed to provide better initial voltage magnitude and angle guesses towards achieving power flow convergence.

DATA GENERATION

Model Training Setup

Fig 2: Model Training Setup

DATA BREAKDOWN

CONCLUSION

• A machine learning was used to predict the initial voltage/angle guesses to initialize Newton-Raphson power flow.
• The developed Random Forest initializer successfully converged 2,106 power flow cases which did not converge originally due to bad initialization.
• The Random Forest initializer performed better when compared with popular analytical methods like DC Power Flow (DCPF) initialization which is used in industry.

FUTURE WORK

• Retraining the model with more data and varying topology configurations could provide further insights and improve the success rate of the model.
• The capabilities of physics based deep-learning initializers need to be further investigated and compared with already established machine learning methods.