Given $X$, the output from a pseudo-RNG (PRNG), and $X'$, the output from a Quantum-RNG, is there a way to differentiate $X$ from $X'$ without the use of a fixed set of test statistics derived from the samples?

We investigate the use of machine learning (ML) as a potential tool for this purpose.

We observe that our ML model is able to pinpoint the deviations from randomness that is present in PRNGs for the cases where the period is relatively small.

In our experiment, we have used 960 Mbits of data for each RNG to train and test our ML model. With a PC setup with 32 GB of RAM and an Nvidia Quadro P4000 GPU processor, the total run time is around 3 hours (training 2 hours, testing 1 hour).

We provided the training data is sufficiently large, our ML model is sensitive to imperfect randomness (deterministic sequence, bias & correlation).

Compared to the NIST statistical test suite [3] and Dieharder [4], ML-based approach can evaluate the quality of the randomness using only a single model.