1. WHAT ARE WE PREDICTING?

Output: Wireline Logs:
- An expensive operation, performed by lowering a “logging tool” into a well to “log” petrophysical properties of rocks.
- $2.8 billion is annually spent on wireline logging.

Inputs: Drilling Data:
- The response of the drill bit is recorded in real-time and comes at no cost.
- We trained a model that can generate wireline logs from drilling response.

2. DATA SET & FEATURES

- 24 wells have been drilled in the Volne field in North Sea
- Data Examples:
  - Rate of penetration (RPP), Revolutions per minute (RPM)
  - Outputs: Bulk Density (BD), Neutron Porosity (NP)

3. DATA PROCESSING & AUGMENTATION

Data Processing:
- Conversion to readable ASCII files.
- Interpolating missing and bad data.
- Extracting desired logs from different source files.

Data Augmentation:
- Sliding a window of fixed length and stride.
- Window=32 and Stride=4, yields 29040 training examples.

4. BASELINE MODEL ARCHITECTURE

Clockwork RNN (CW-RNN)

5. RESULTS AND VALIDATION

Clockwork RNN

6. SUMMARY & HYPERPARAMETER TUNING OF CW-RNN

7. DISCUSSION & CONCLUSION

- For the first time a model has been proposed to predict well logs from real-time drilling data.
- CW-RNN outperforms the baseline inception model for predicting wireline logs from drilling data.
- The choice of clocking periods for CW-RNN is data dependent.
- CW-RNN is faster than an equivalent RNN, since not all modules are evaluated at each time step.
- Other variations of RNN (LSTM and Bi-LSTM) suffer from representing the mean of Sequence.
- When using inception to multi channel sequence problems, 1D convolutions are less expensive and less prone to bias from padding than 2D convolutions.

8. FUTURE WORK

- Incorporate more logs in the training.
- Use seismic data along with the drilling data.
- Combine 1D CNN with CW-RNN or other sequence methods.
- Denoise the drilling data using wavelet transform and train a model on approximated wavelets.
- The CW-RNN model should be tested and improved on other field datasets before deployment.

9. REFERENCES