LSTM research

Bernhard Nornes Lotsberg

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LSTM

- RNN with long and short term memory.

- Long term memory not possible in ordinary RNN's because of vanishing gradients.

- Long term memory is very important for runoff modelling, as some features take a long time to impact. Snow for example.

Usage of existing code

- Notebook tutorial for using LSTM used in paper [1] can be found at https://github.com/kratzert/pangeo_lstm_example

  - This repository includes a binder link for running the notebook in browser.
  - Notebook shows easy to understand examples of how to use Pytorch and how to load the CAMELS dataset.

- Code for paper [2] can be found at https://github.com/kratzert/ealstm_regional_modeling

- Code for paper [3] can be found at https://github.com/kratzert/lstm_for_pub

- Spend most time on the first paper in the beginning, it is important to actually understand how an LSTM model works (not to mention RNNs in general!).

References

[1] F. Kratzert, D. Klotz, C. Brenner, K. Schulz, and M. Herrnegger, "Rainfall–runoff modelling using long short-term memory (lstm) networks," *Hydrology and Earth System Sciences*, vol. 22, no. 11, pp. 6005–6022, 2018.

[2] F. Kratzert, D. Klotz, G. Shalev, G. Klambauer, S. Hochreiter, and G. Nearing, "Towards learning universal, regional, and local hydrological behaviors via machine learning applied to large-sample datasets," *Hydrology and Earth System Sciences*, vol. 23, no. 12, pp. 5089–5110, 2019.

[3] F. Kratzert, D. Klotz, M. Herrnegger, A. K. Sampson, S. Hochreiter, and G. S. Nearing, "Toward improved predictions in ungauged basins: Exploiting the power of machine learning," *Water Resources Research*, vol. n/a, no. n/a.