

Fribourg, 7. Dezember 2018

Time series prediction using latent space

BSc Thesis:

Work overview:

Forest fires are a major environmental issue with severe consequences on human and ecological lives. Meteorological conditions such as temperature and wind influence the fire severity and need to be taken into account to control such phenomenon. This thesis aims to use a latent space-based prediction technique [1] to predict the burned areas of forest fires. The thesis will also investigate the use of the Centroid Decomposition (CD) technique [2] instead of the NonNegative Matrix Factorization (NMF) technique to extract the latent space. The implemented prediction technique will extend the revival graphical tool [3]. The implemented prediction component should have (at least) the following features:

- Browse and visualize the forest fire datasets.
- Perform latent space-based time series prediction and visualize the results.
- Display the result of basic statistical methods for prediction such as extrapolation.

The work will mainly cover time series datasets that are publicly available from the following repositories:

- UCI repository: <https://archive.ics.uci.edu/ml/datasets/forest+fires>
- Fire Information for Resource Management System (FIRMS): <https://earthdata.nasa.gov/earth-observation-data/near-real-time/firms/active-fire-data>
- The meteoblue dataset: https://www.meteoblue.com/en/weather/archive/export/basel_switzerland_2661604

References:

1. Deng, D., Shahabi, C., Demiryurek, U., Zhu, L., Yu, R., Liu, Y.,: *Latent space model for road networks to predict time-varying traffic*, SIGKDD, 16
2. Khayati, M., Böhlen, M.H., and Gamper, J. *Memory-efficient Centroid Decomposition for*

Long Time Series, in ICDE, 2014.

3. Revival tool: <http://revival.exascale.info> or <http://134.21.70.74> (access using VPN)
4. Sun, W., and Malioutov, M., *Time series forecasting with shared seasonality patterns using non-negative matrix factorization*, NIPS Time Series Workshop, 2015

Work tasks:

1. Familiarize yourself with the field of prediction in time series.
2. Implement the latent space prediction using NMF and CD techniques.
3. Compare the efficiency and the accuracy of the implemented techniques for forest fire prediction.
4. Extend the revival tool with the implemented prediction technique.
5. Write a thesis that describes the implemented algorithms, the tool and the result of the experiments.
6. Make a presentation of 20 minutes.

Starting date of thesis: TBD

Ending date of thesis: TBD

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