Project Automatic Music Generation of Folk songs for the Eurovision AI Song contest

The Eurovision Songcontest 2020 is going to take place in the Netherlands in April. The Dutch Public Broadcaster VPRO is therefore planning to organise the very first AI Song Contest in The Netherlands: a Eurovision Song Contest-inspired show for AI generated songs and performances. Five teams from all over Europe will compete against each other to answer the question: which algorithm writes the best Song Contest-song? The audience gets to determine the winner.

With this project we invite you to potentially become part of the Dutch team for the AI Song Contest, by generating new songs based on a collection of Dutch Folk Songs, since we collaborate with VPRO and plan to submit an AI generated song for the contest. In the SMT course you learn about different approaches to automatically compose music with the help of computational models in Module C. In this project you will use a successful recurrent neural network approach, the so-called *folk-rnn* model, which has been developed to automatically compose Irish Folk Tunes, using a long short-term memory (LSTM) network trained to model textual sequences of music transcriptions (Sturm, Santos, Ben-Tal, & Korshunova (2016).

The *folk-rnn* model has been trained on over 23.000 traditional tunes from the online crowd-sourced repository, http://thesession.org., which contains mostly music from Ireland and the UK. These tunes are encoded in the so-called ABC transcription. The *folk-rnn* model generates new ABC sequences by iteratively sampling from and updating the posterior distribution over the transcription vocabulary at its output layer. For more details on the training, please consider in addition to the scientific papers listed in the reference section also Bob Sturm's blogposts
https://highnoongmt.wordpress.com/2018/01/21/making-sense-of-the-folk-rnn-v2-model-part-8/

In this project you will train the model on a collection of 18.000 tunes from the Netherlands, consisting of 9.000 Dutch folk songs (from the collection *Onder de groene linde*) from the 20th century, and of 9.000 instrumental tunes from Dutch sources of the 18th century. These tunes have been collected by the Meertens Institute, Amsterdam. After training the network and generating new tunes, you will then find ways of evaluating the newly generated tunes, in how far they differ stylistically from the generated tunes of the model trained on the Irish folk songs. The paper by Sturm & Ben-Tal (2017) provides you with different options on how to evaluate the generated songs. Please specifically consider training an automatic classifier on the original tunes, and then testing whether the generated tunes can be classified into "Irish" or "Dutch". For extracting features from the tunes you can use the jSymbolic 2.2 tool box (McKay et al, 2018).

The code of the *folk-rnn* model is available here: https://github.com/IraKorshunova/folk-rnn along with examples of songs generated and relevant references.

You can download the collection of Dutch folk tunes in the so-called *ABC encoding* (see http://abcnotation.com/) from the Google drive of the course (Folder "Project options" and "DataSets"). Please consider different ways to tokenize the songs, in order to determine WHAT the RNN model is learning about the songs. Please also check out http://karpathy.github.io/2015/05/21/rnn-effectiveness/ on RNNs and the influence of the input on what is learned through RNNs. For the Dutch tunes in ABC code, you should consider tokenization on note level, with or without phrase information, bar lines and time signature etc. You can use this parser made for Irish tunes (https://github.com/ztime/polska) and adapting it to the Dutch folk tunes.
To listen to the ABC files generated, you can use abc2midi (http://abc.sourceforge.net/abcMIDI/).

If you do not have the computational power to train your model from scratch, you can take this model trained on Irish tunes (https://github.com/IraKorshunova/folk-rnn/tree/master/metadata).
Then your task would be to fine-tune the model to smaller subsets of Dutch folk song dataset and comparing the variants.

For more computational power:

After you have successfully run a smaller-scale model on your own device, but looking for more computational power, we can give you access to a High Performance Computing Unit.

Alternatively, Google Cloud offers $300 free credits for people using it for the first time.
Feel free to take advantage of it.

Warning:

- You will need to create a virtual environment and figure out different versions of python packages
- You might need to battle with a lack of computational power
- There will be lots of work

Some advice:

- When got stuck, error messages are your friend.
- Ask people, make pull requests, open issues, communicate!
- Fast iterations (examinations of the results <-> modification of the model/code) at the beginning; only run the full model when you are not using the laptop and when you are absolutely sure that your program does what you want it to do!

Remark 1: As this project is rather complex and ambitious, you may work with 3 students in one team.

Remark 2: If you have a completely different idea on how to contribute to the AI song contest by using other methods, we are open to this as well.

References

Cory McKay, Julie Cumming and Ichiro Fujinaga (2018), JSYMBOLIC 2.2: Extracting Features from Symbolic Music for use in Musicological and MIR Research, Proceedings of ISMIR, Paris, France, p. 348-354. (download link: http://ismir2018.ircam.fr/doc/pdfs/26_Paper.pdf

Sturm, B. L., & Ben-Tal, O. (2017). Taking the models back to music practice: Evaluating generative transcription models built using deep learning. *Journal of Creative Music Systems*, *2*(1), 1–29. doi: 10.5920/JCMS.2017.09. (download: http://jcms.org.uk/issues/Vol2Issue1/taking-models-back-to-music-practice/article.html)

Sturm, B. L., Santos, J. F., Ben-Tal, O., & Korshunova, I. (2016). Music transcription modelling and composition using deep learning. In *Proc. conf. computer simulation of musical creativity*, Huddersfield, UK. (download: https://arxiv.org/pdf/1604.08723.pdf)

Sturm, Ben-Tal, Monaghan, Collins, Herremans, Chew, Hadjeres, Deruty and Pachet (2018), "Machine learning research that matters for music creation: A case study," J. New Music Research, 2018. (download link: https://www.tandfonline.com/doi/full/10.1080/09298215.2018.1515233)