



Prof. R. Wattenhofer

Biomedical Data Generation with GANs

In the last few years Generative Adversarial Networks (GANs) have shown outstanding performance in different generative tasks, most notably in image synthesis. One very relevant problem in which GANs can be applied is sequence generation. Although the problem of sequence generation has typically been approached using Recurrent Neural Networks as the base architecture, recent studies show that Convolutional Neural Networks (CNN) outperform RNNs. However, the limitation of purely convolutional models is that they can only generate sequences of a fixed length.

In this project we are interested in investigating convolutional architectures that can generate sequences of any length. The starting point would be the conception of an autoregressive Convolutional GAN, that is, a model that can generate synthetic samples from previously generated synthetic samples. As the project progresses we may consider other models available in the literature like Temporal Difference VAEs (TD-VAE).

The initial focus of this project is on biomedical data, e.g., ECG or EEG. Generating synthetic biomedical data is a challenging task that has a great interest due to the fact that collecting real data is costly and sharing it has important privacy concerns.

If this sounds interesting to you, do not hesitate to contact us.

Requirements: Knowledge in Deep Learning, or solid background in Machine Learning. Implementation experience with TensorFlow is an advantage. You should be able to read and understand the first 12 chapters of the Deep Learning Book by Goodfellow et al. (available for free online from MIT press). If you are interested in the topic but new to deep learning we expect you to complete an introductory deep learning course before applying for the thesis, such as Andrew Ngs coursera course (use the free trial!)¹ or this Udacity course².

Interested? Please contact us for more details!

Contacts

- Damián Pascual: dpascual@ethz.ch, ETZ G97
- Gino Brunner: brunnegi@ethz.ch, ETZ G63
- Oliver Richter: richtero@ethz.ch, ETZ G63

¹<https://www.coursera.org/specializations/deep-learning>

²<https://classroom.udacity.com/courses/ud730>

