Project suggestions from Dr Damon Wischik

1. GANs for text, using particle filters.

It is a widespread belief that GANs cannot be used to train RNNs for text. See for example [https://arxiv.org/abs/1905.01976](https://arxiv.org/abs/1905.01976) which asserts the problem is “the argmax operator which is not differentiable and blocks the gradient flow from the discriminator to the generator.” See also [https://becominghuman.ai/generative-adversarial-networks-for-text-generation-part-1-2b886c8cab10](https://becominghuman.ai/generative-adversarial-networks-for-text-generation-part-1-2b886c8cab10)

However, if we interpret RNNs as probabilistic models, then it’s clear that the likelihood of an output is a differentiable function of the neural network weights, and so GAN training should work. In this project, you will train a GAN to generate text from a RNN. This requires Monte Carlo probability estimation, and for this you will use a particle filter.

PREREQUISITES: this project requires familiarity with probability modeling, e.g. the probabilistic interpretation of NN classifiers.

2. ML for process mining

There is an area of modelling called "process mining" that consists of making sense of event logs for business processes, for example the sequence of processing steps that happen to an order in a business (place order, send invoice, receive payment, prepare delivery, make delivery). The goal of process mining is to understand commonalities between the processing of different orders, and to discover discrepancies.

Train a neural-network sequence generator to generate event logs. Can your probabilistic model be used to answer ‘commonalities and discrepancies’ type questions?


PREREQUISITES: this project requires practical experience with neural networks for sequence modeling, e.g. transformers, as well as practical experience in data science.