

Using Recurrent Neural Networks to drastically decrease the time spent matching signals

When giving this neural network a collection of names and time series data of different kind of sensors it could accurately predict the sensors type over 99% of the time.

This is achieved using a recurrent neural network, some smart data pre processing and the online database for building sensor data mortardata.org. The network was trained with data coming from hundreds of sensors of 17 different types. During training the network analyzes tens of thousands of time series data and names of the sensors. After the training, it could accurately predict the type of the sensor that a previously unseen time series data and name pair originated from.

Many people might think of buildings as kind of old fashioned things for the most part. Like, you know, humans have been building these for thousands of years how much technology can there be in one? But as Humans and Society have evolved, so have the places we work and sleep. For more than 50 years it has been standard to equip buildings with a so called Building Management System, BMS. A BMS is a central hub that monitors and manages the electrical and mechanical systems, such as the ventilation-, power- and security systems.

Now it is time to bring the BMS into the 21st century and connect it, like all other things in our life, to the internet. The goal is to connect BMSs from multiple building to a cloud service where one universal program can monitor all the BMSs and analyze their data and see if something is not performing as expected. Here we are in a bit of a pickle though. You see, the engineers who installed the system 20 or 30 years ago didn't have the foresight to think of connecting different BMSs. What I mean, is that there are no universal rules for naming the sensors. So someone has to match all signals in a building to the corresponding inputs to the cloud system. Modern buildings can have thousands of sensors, so this process can take someone weeks to do and the risk for errors is high. Imagine every building as being a book written in its own language and the cloud only speaking English. If we want to analyze all these different books, we will need a translator. Translating takes a lot of time by hand and it is hard to perfectly translate all intricacies, meaning mistakes are to be expected. Luckily languages can be translated with great accuracy by machines. This speeds up the process significantly and decreases the number of errors. That is where the project that is the subject of this article comes in. We want to translate the different "building books" with the help of the magical world of machine learning. A multimodular neural network is used for this. Multimodular meaning a collection of neural networks that work on different kinds of input data are combined to predict the class of sensor. It does this by comparing the unseen sensor name and time series data to the data used

for training of the network. And boy did this work better than expected. As mentioned above, the project ended with a near perfect result, but it didn't come without caveats. The biggest one being, that the data that was used was sourced from a database that does preprocessing of the data. Sensor names were already quite homogenized before I even got my hands on them, so it is hard to say how close to a real life example my dataset was. Even a none perfect classification can be helpful, as the network could suggest likely candidates, with a human overseeing it and choosing the right class from the selection. While this project does not solve the problem completely, it definitely shows the potential of using Neural Networks to help speed up the connecting process.