## 2.2 Artificial Intelligence

So far, the factory is controlled by a PLC software. This software allows the developer to set clear instructions what the factory and each machine does. Instructions are worked through precisely.

However, for a neuronal network that’s not the case. A program receives a set of data that reflect small entities of the factory. The program then needs to find connections and recognize patterns between the entities.

The factory is supposed to be monitored and controlled by Artificial Intelligence. While AI comprehend many ways of implementations, this project is supposed to use neuronal networks. This chapter will review neuronal networks.

### 2.2.1 Neuronal Network in general

When talking about neuronal network it is meant to have an artificial neuronal network. The idea is to create software that works similar like a human brain, a natural neuronal network. But how to build such a system? A computer has an architecture not matching with the brain. It is basically a calculator that can execute software which is based on mathematics.

The attempt is to analyze human brain and to create models that reflect the brain. The network consists of many small entities, that are similar like the neurons. They are working like single information storages. They are powered by electric voltage. As messages reach a neuron, also electrical energy is sent. The voltage level is rising. At some point there is too much energy in a neuron and it will reach out and sends its information. But where to?

**“What fires together, wires together”** (Hebb, 2002) is a quote describing that neurons often reach out to each other will connect. The more often they communicate the stronger their connection will be.

For an artificial neuronal network it should work similar. When raw data is put in a new system, there is no connection between the entities. The computer then need to find connections. Hebb is describing the idea of how it’s done: Data often colliding, will have some kind of link. This is how the computer can derive clusters.

Once this clusters are established it can be used to solve tasks. The more tasks it solves, the more information the system can collect. This information can also lead to a evolvement of the clusters.

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The challenge is to provide the computer with the information. For Human it is often easy to acquire a series of data, not for a computer.

It is required to provide as much raw data as possible, without giving many rule bases.

### 2.2.2 Convolutional Neuronal Network

It is based on the mathematical convolution.

Receives its data through a input layer. Publicizes data through a output layer.

### 2.2.3 Recurrent Neuronal Network