# Supervised learning for Neural Network

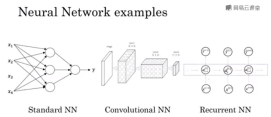
In supervised learning, we are given a data set and already know what our correct output should look like, having the idea that there is a relationship between the input and the output.

Supervised learning problems are categorized into "regression" and "classification" problems. In a regression problem, we are trying to predict results within a continuous output, meaning that we are trying to map input variables to some continuous function. In a classification problem, we are instead trying to predict results in a discrete output. In other words, we are trying to map input variables into discrete categories.

Here are some examples of supervised learning

| | Input(x) | Output (y) | Application |
|---|---|---|---|
| standard NN | Home features | Price | Real Estate |
| | Ad, user info | Click on ad? (0/1) | Online Advertising |
| CNN | Image | Object (1,...,1000) | Photo tagging |
| RNN | Audio | Text transcript | Speech recognition |
| | English | Chinese | Machine translation |
| Custom hybrid | Image, Radar info | Position of other cars | Autonomous driving |

cleverly selecting what should be x and what should be y for your problems and then fitting this supervised learning component into often a bigger system such as an autonomous vehicle




There are different types of neural network, for example Convolution Neural Network (CNN) used often for image application and Recurrent Neural Network (RNN) used for one-dimensional sequence data such as translating English to Chinses or a temporal component such as text transcript. As for the autonomous driving, it is a hybrid neural network architecture.

Recurrent neural networks are very good for this type of one-dimensional sequence data that maybe a temporal component

## Structured vs unstructured data

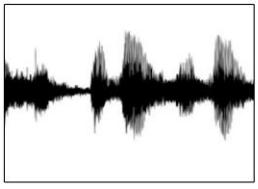
Structured data refers to things that has a defined meaning such as price, age whereas unstructured data refers to thing like pixel, raw audio, text.

### Structured Data

| Size | #bedrooms | ... | Price (1000$s) |
|---|---|---|---|
| 2104 | 3 | | 400 |
| 1600 | 3 | | 330 |
| 2400 | 3 | | 369 |
| ⋮ | ⋮ | | ⋮ |
| 3000 | 4 | | 540 |

| User Age | Ad Id | ... | Click |
|---|---|---|---|
| 41 | 93242 | | 1 |
| 80 | 93287 | | 0 |
| 18 | 87312 | | 1 |
| ⋮ | ⋮ | | ⋮ |
| 27 | 71244 | | 1 |

### Unstructured Data



Audio

Image

Four scores and seven years ago...

Text

Each of features, such as size of house, the number of bedrooms or the age of a user, has a very well defined meaning.