Deep learning (9:05pm) Start.

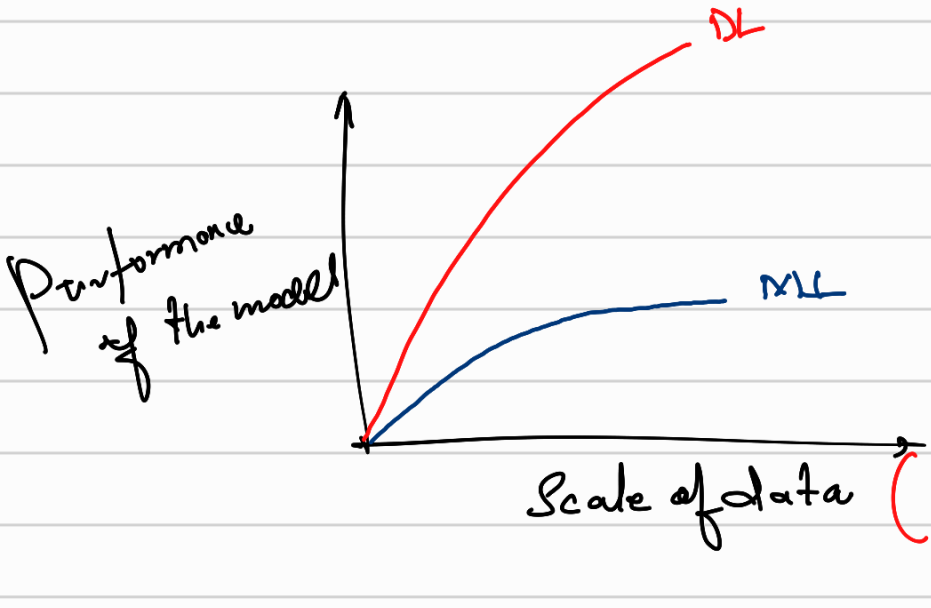
$y \sim f(x) + \varepsilon$

- Reg
- Clas
- Parameters
  - Linear
  - Log
  - SVM
- non parameters.

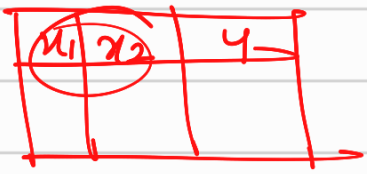
Parametric form $y = f(x)$

f — function

Technique → f



ML →



DL → automate the feature engineering.

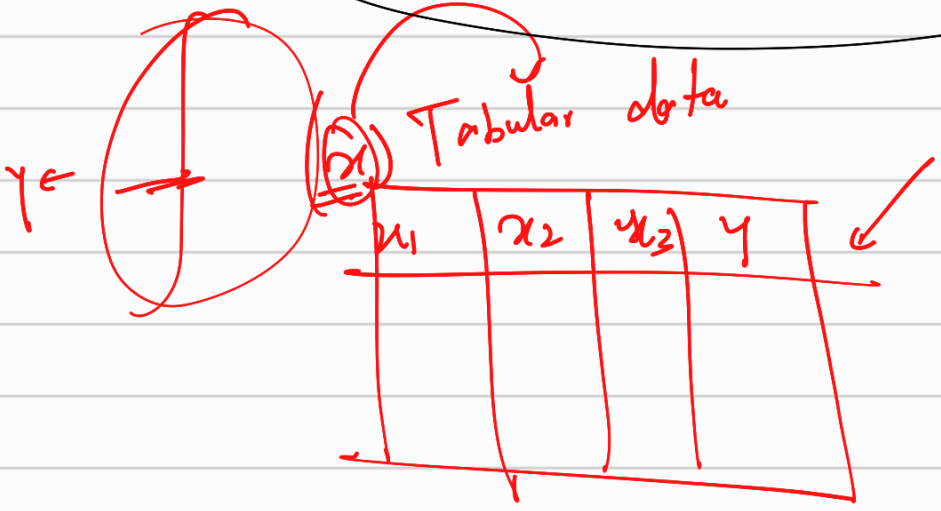


image data

$y \leftarrow f(\text{image})$ → Convolution neural

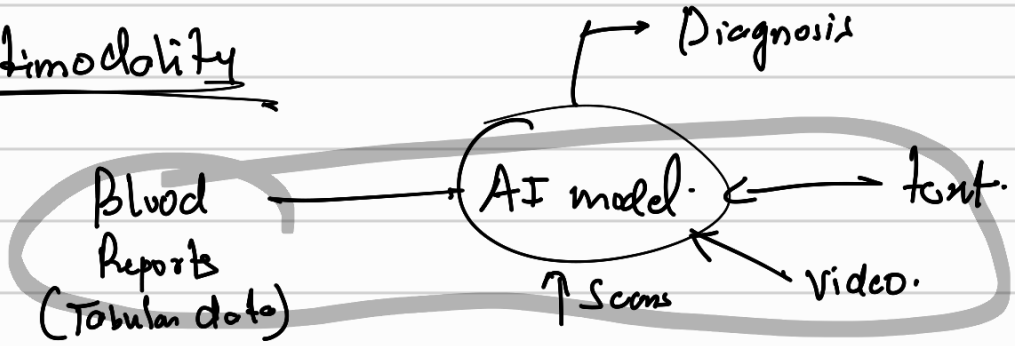
$y \leftarrow f(\text{text})$ → RNN, LSTM, Transformers

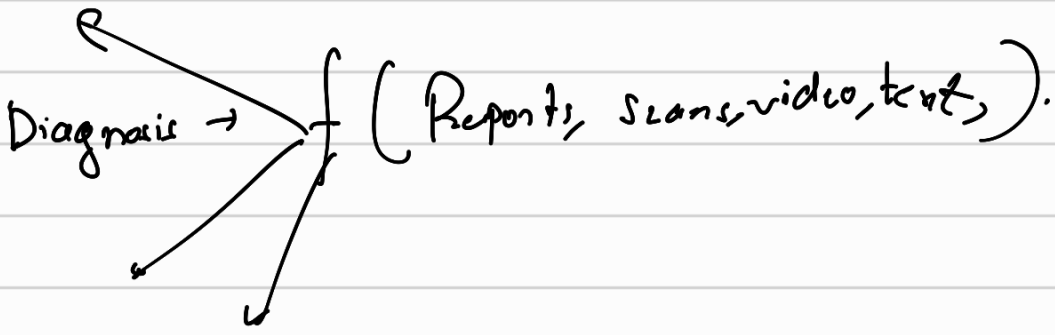
$y \leftarrow f(\text{audio})$

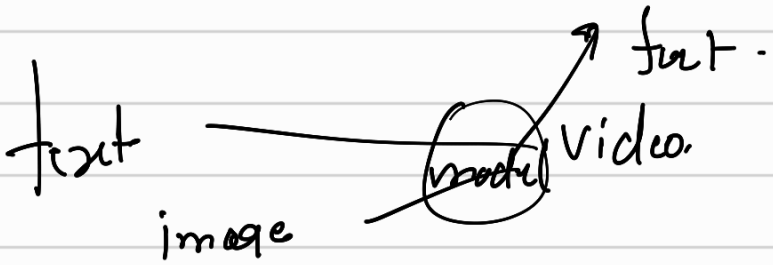
$y \leftarrow f(\text{video})$ → Sequences

$y \leftarrow f(\text{graph})$ → graph neural network

Multimodality

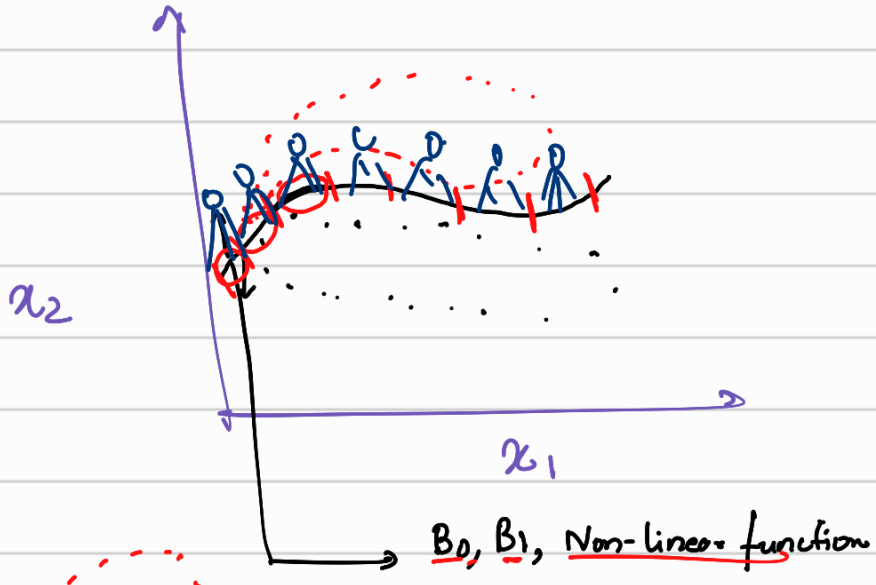


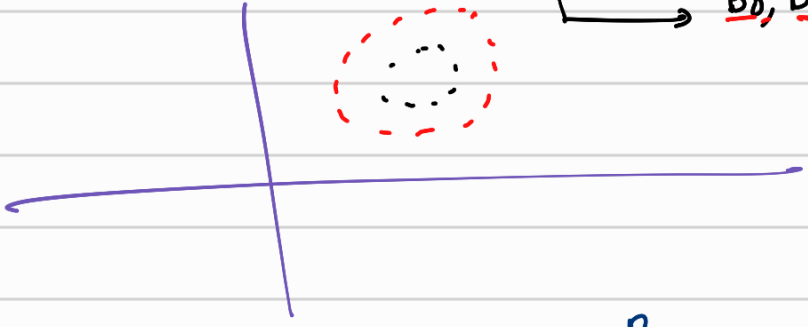


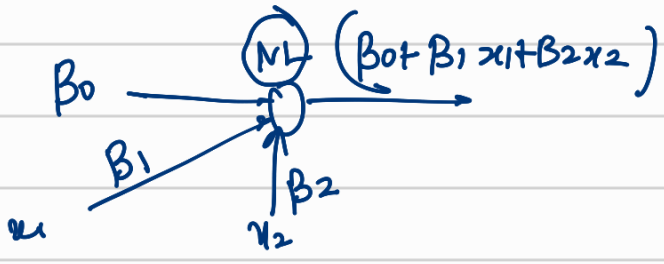


Classification

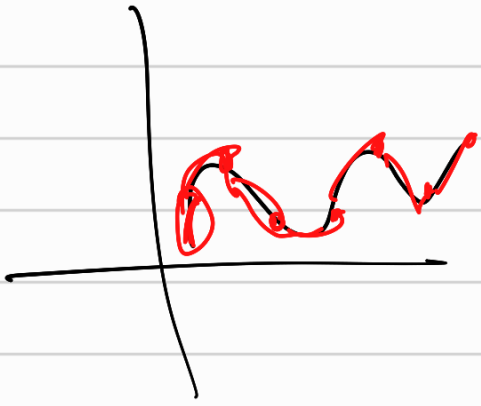
$y \sim f(x)$

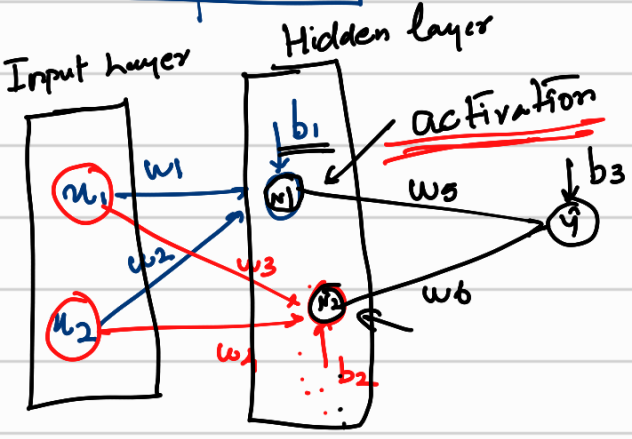






x_1	x_2	Y
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	✓





$$\hat{y} = w_5 N_1 + w_6 N_2 + b_3$$

$$\Rightarrow N_1 = w_1 x_1 + w_2 x_2 + b_1$$

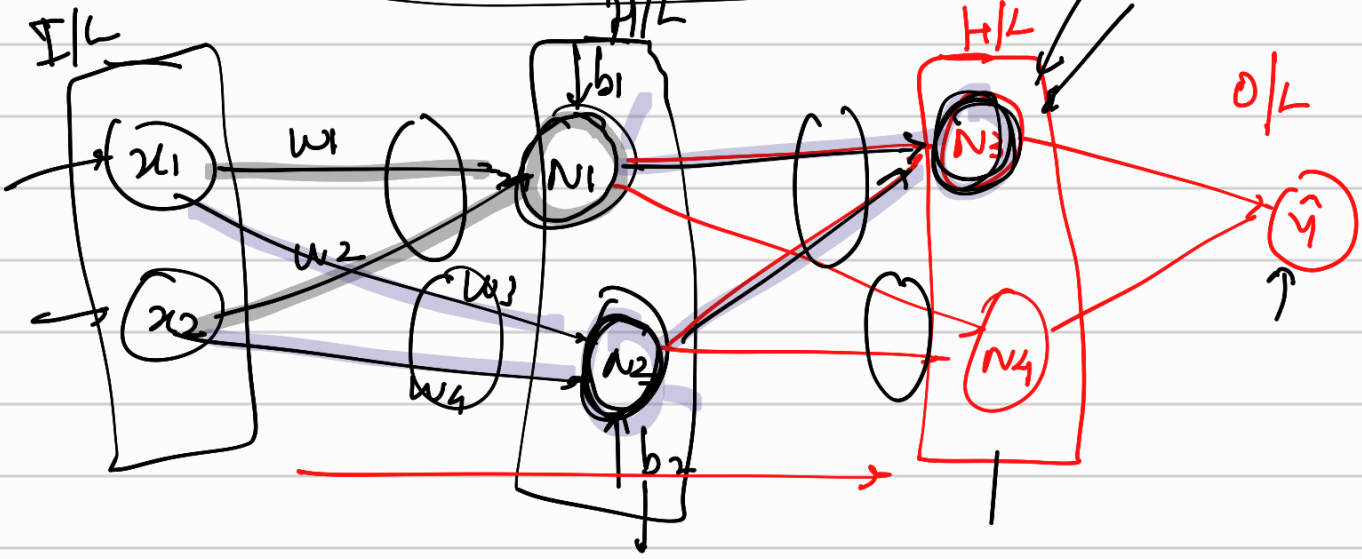
$$N_2 = w_3 x_1 + w_4 x_2 + b_2$$

$$\hat{y} = w_5 (w_1 x_1 + w_2 x_2 + b_1) + w_6 (w_3 x_1 + w_4 x_2 + b_2) + b_3$$

$$\Rightarrow \hat{y} = w_5 w_1 x_1 + w_5 w_2 x_2 + w_5 b_1 + w_6 w_3 x_1 + w_6 w_4 x_2 + w_6 b_2 + b_3$$

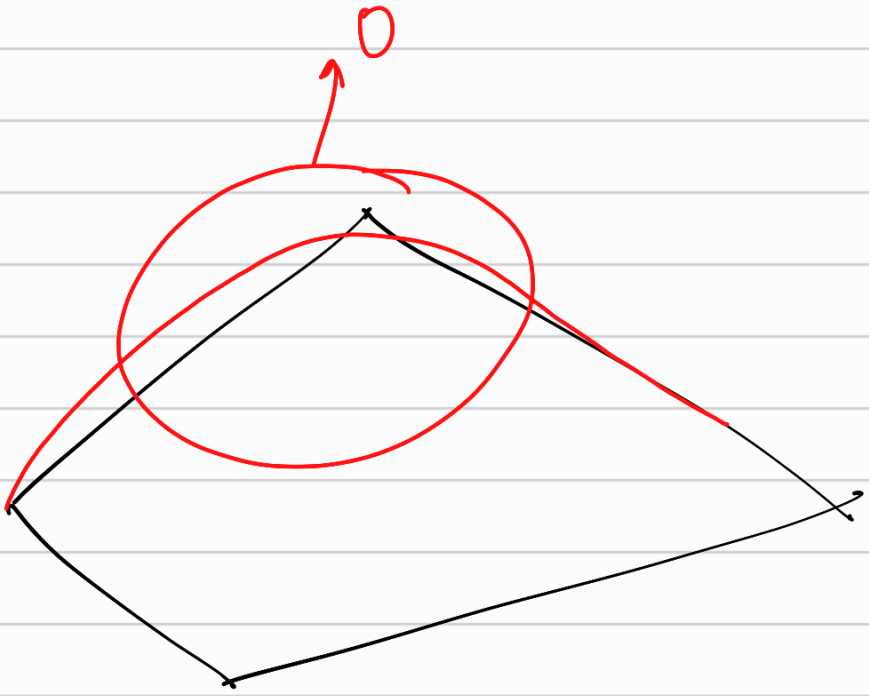
$$\hat{y} = x_1 (w_5 w_1 + w_6 w_3) + x_2 (w_5 w_2 + w_6 w_4) + w_5 b_1 + w_6 b_2 + b_3$$

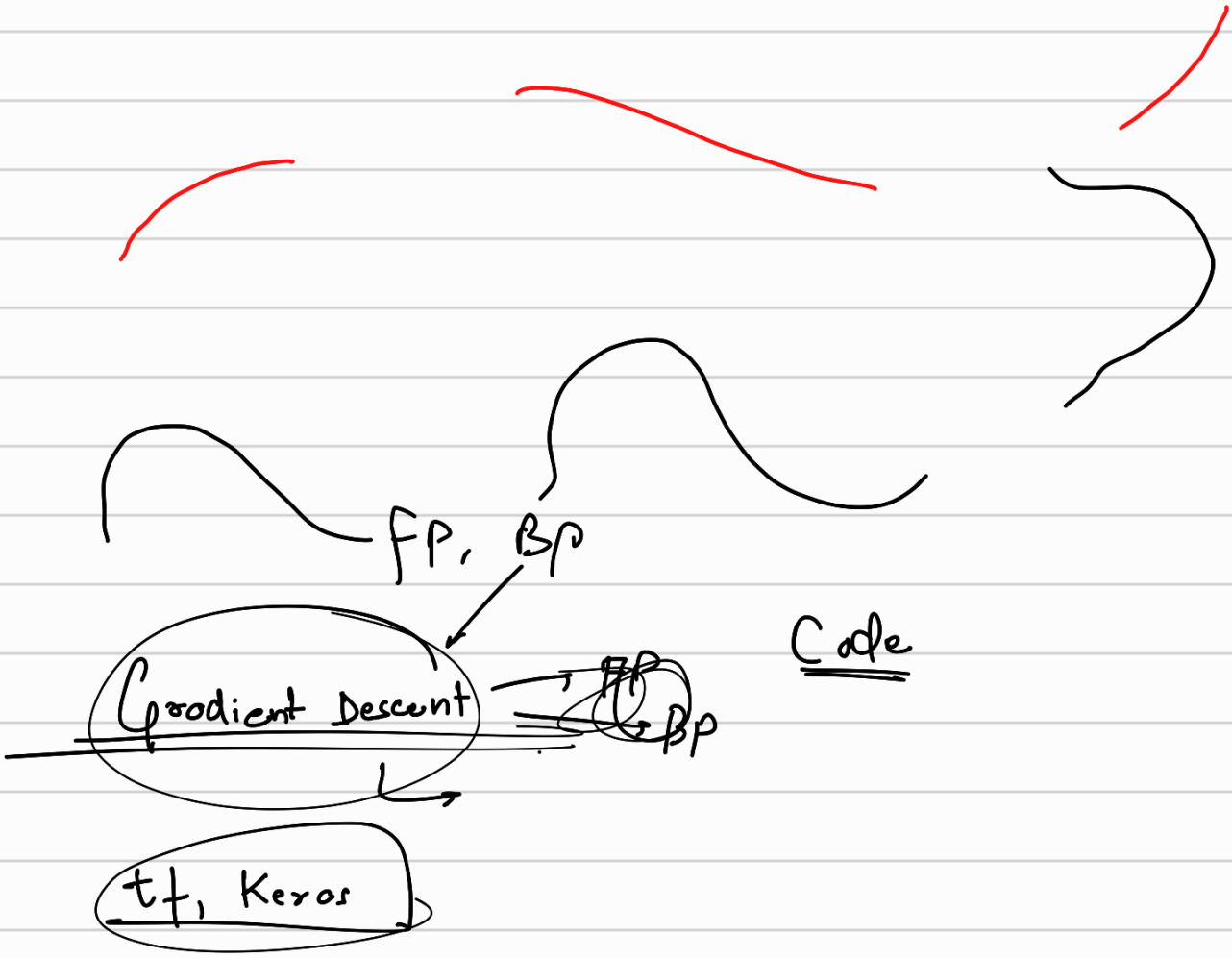
$$\Rightarrow \hat{y} = Ax_1 + Bx_2 + C$$

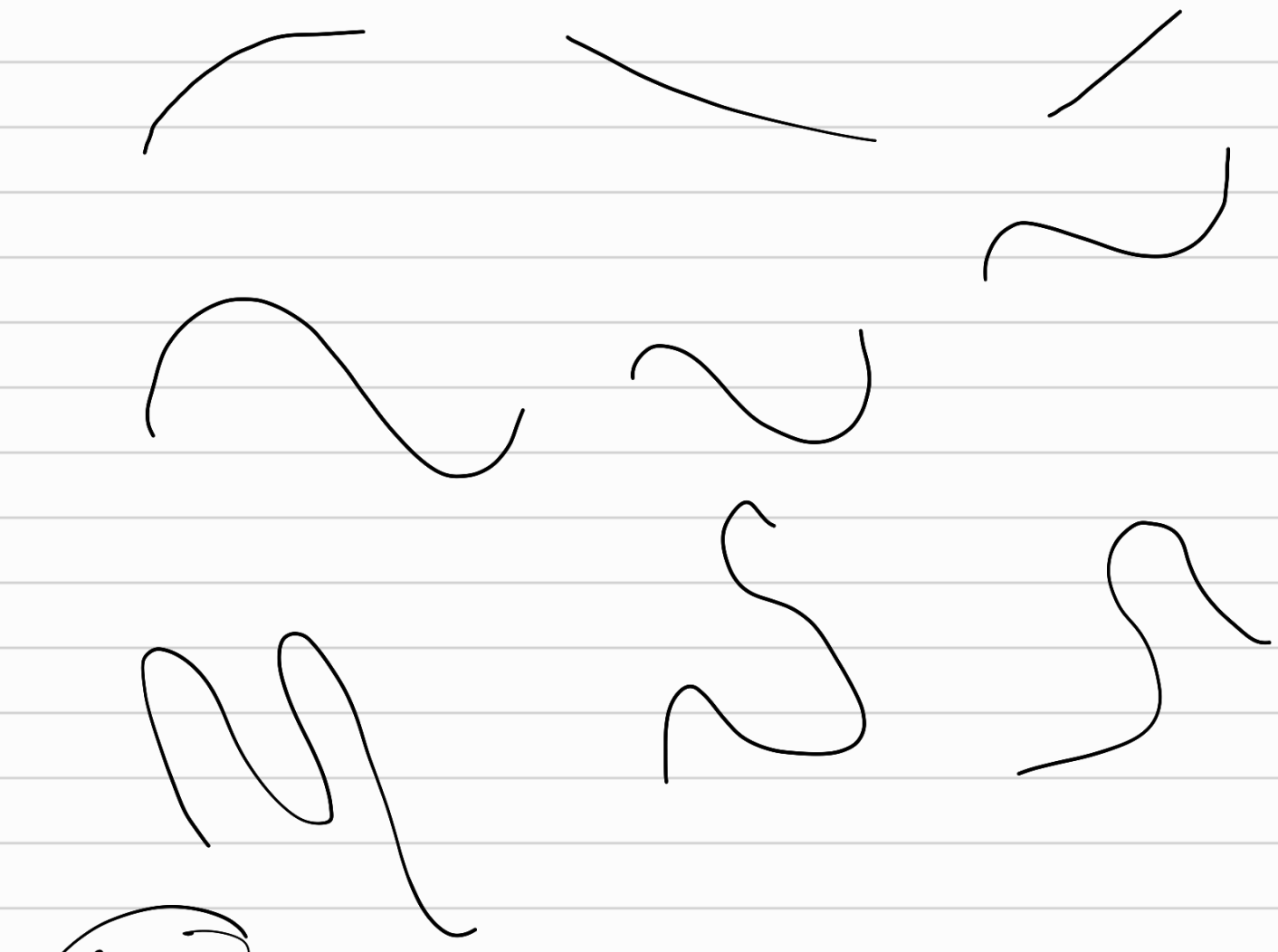


Objective of the NN training:

- Minimization of the loss ($f(y, \hat{y})$) by changing weights, and the biases







Explainability