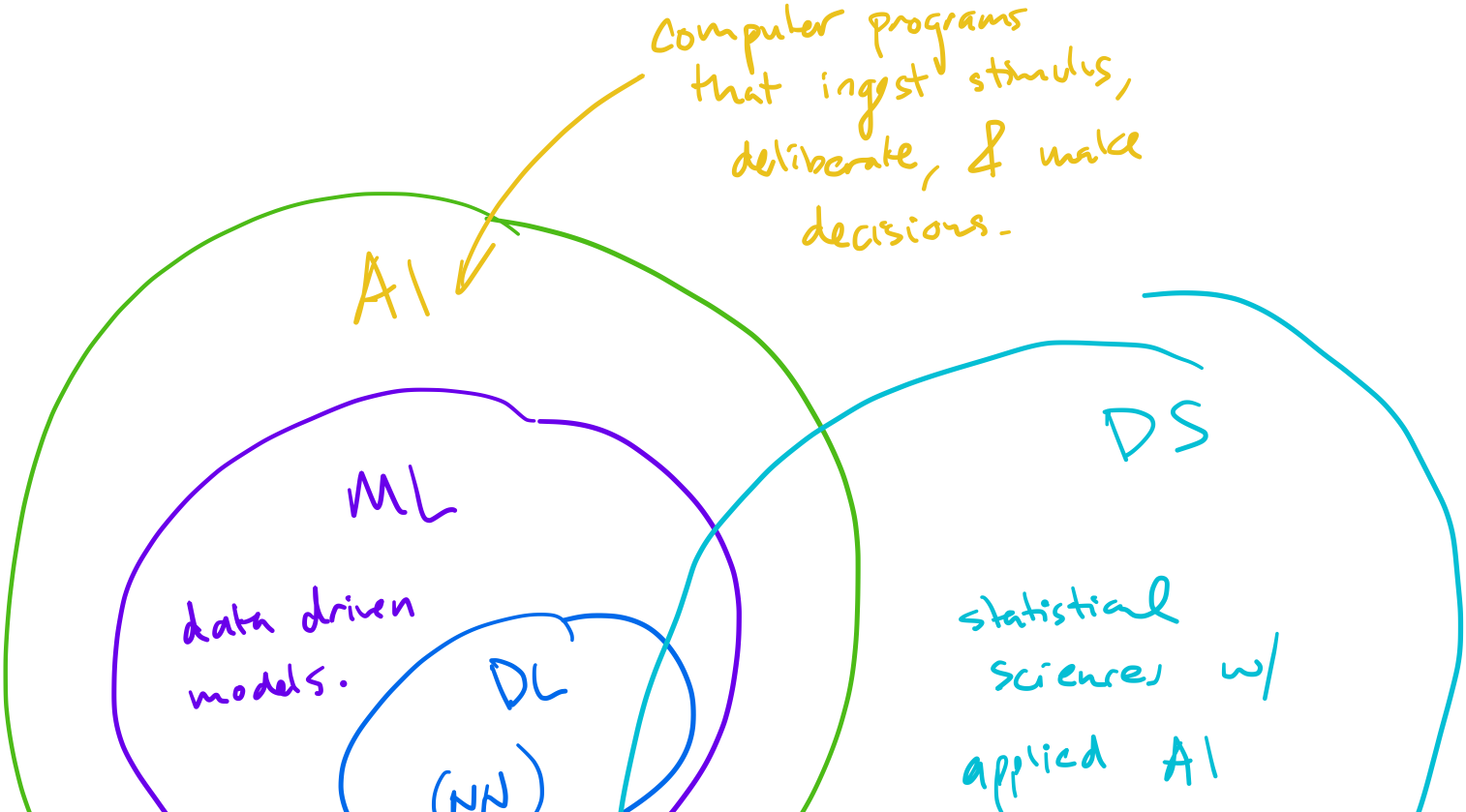
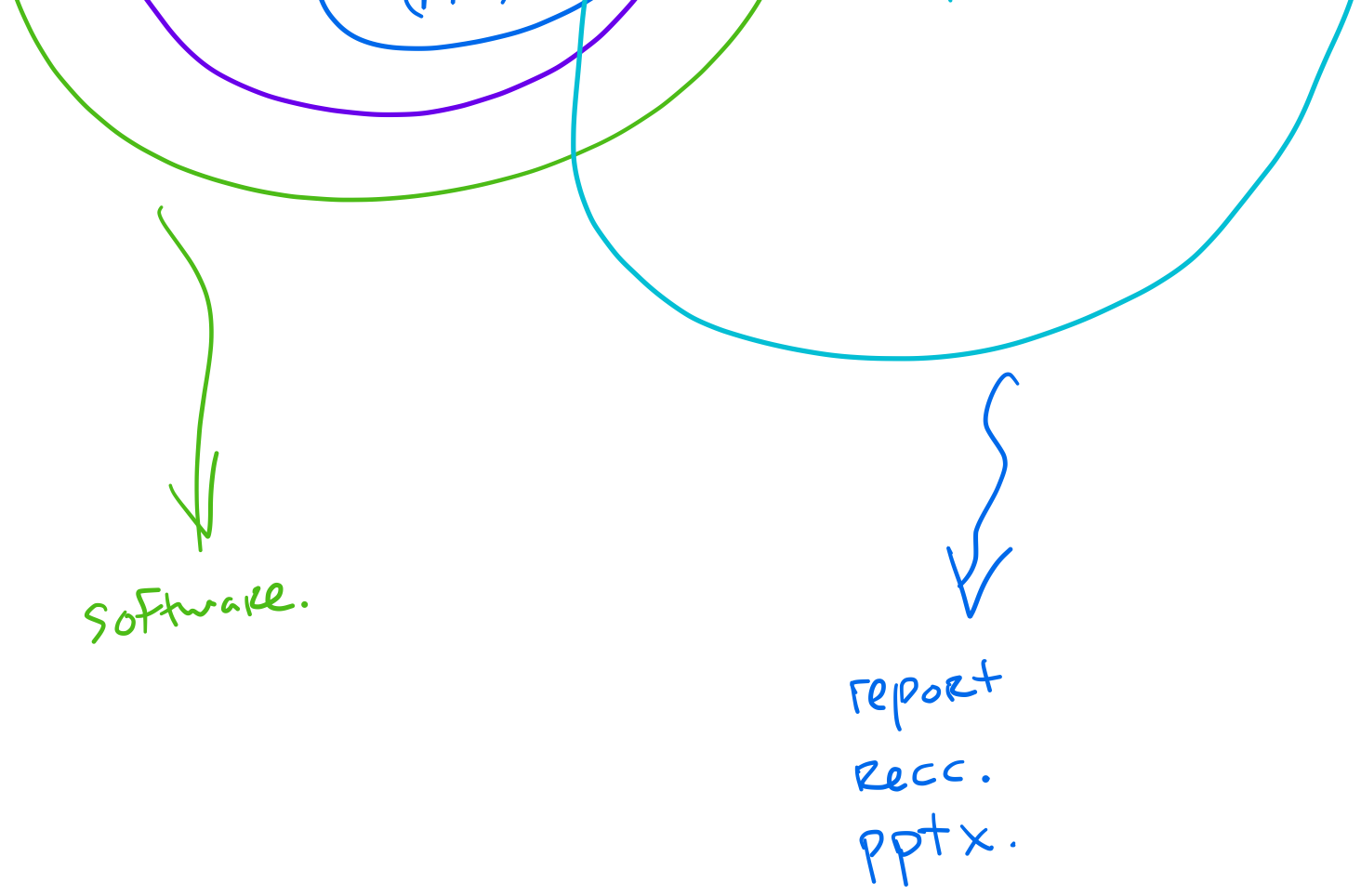
2021-04-14, 1300-1430

DATAWORKS 2021

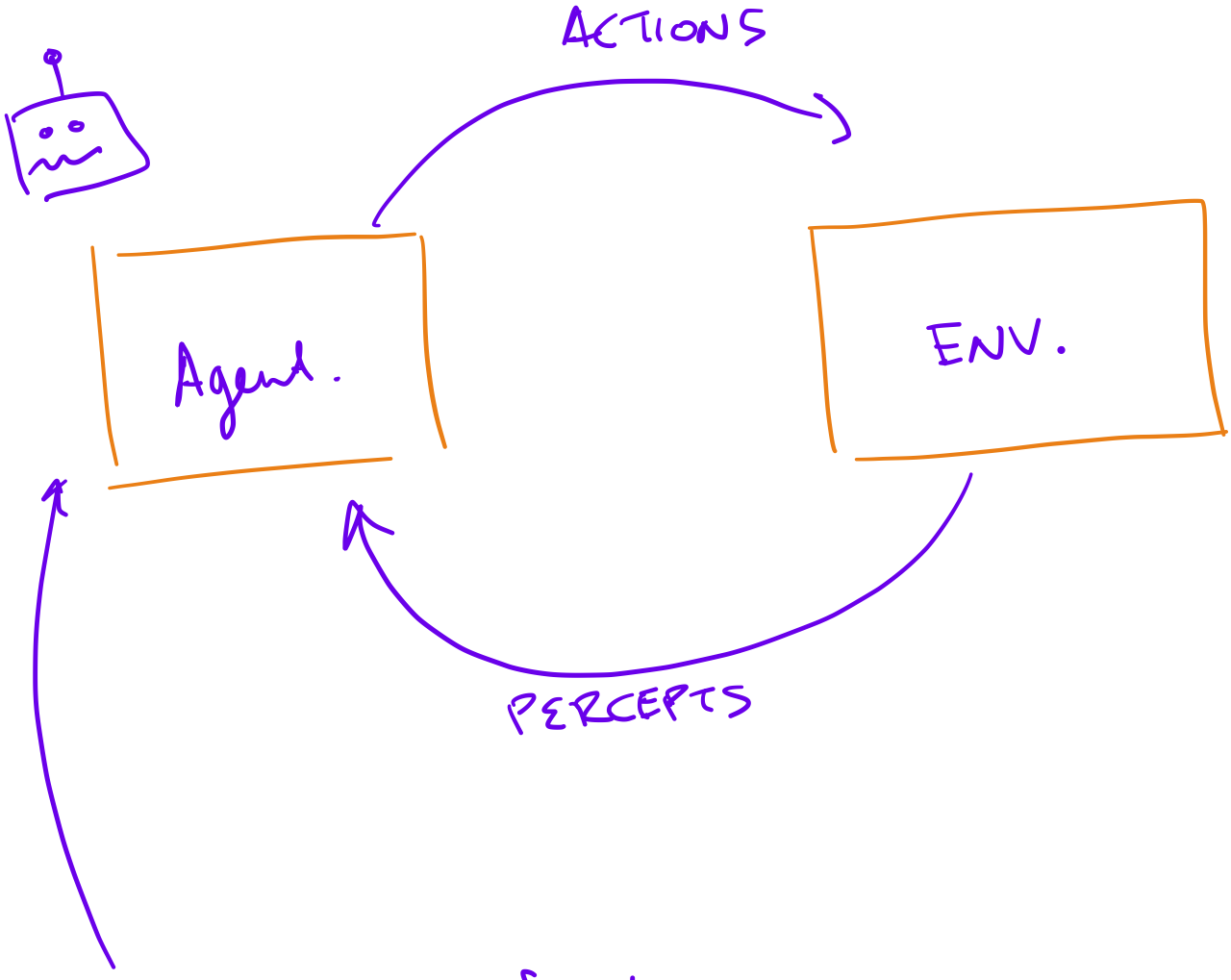
INTRODUCTION TO NEURAL NETWORKS FOR DEEP LEARNING WITH TENSORFLOW

MODULE 0: BACKGROUND & CONTEXT.




software.
report
Recc.
pptx.

AI ~ symbolic Agent.



logical description of ENV.
(SYMBOLIC REP.)

Logical agent goal:

ENCODE RULES & DOMAIN KNOWLEDGE.

"Expert systems"

Consider cats.

"this configuration of pixel values contains a cat."

AI agent... two eyes (color types) not always 2.
whiskers
hat maybe?...

Too difficult to model logically!

ML

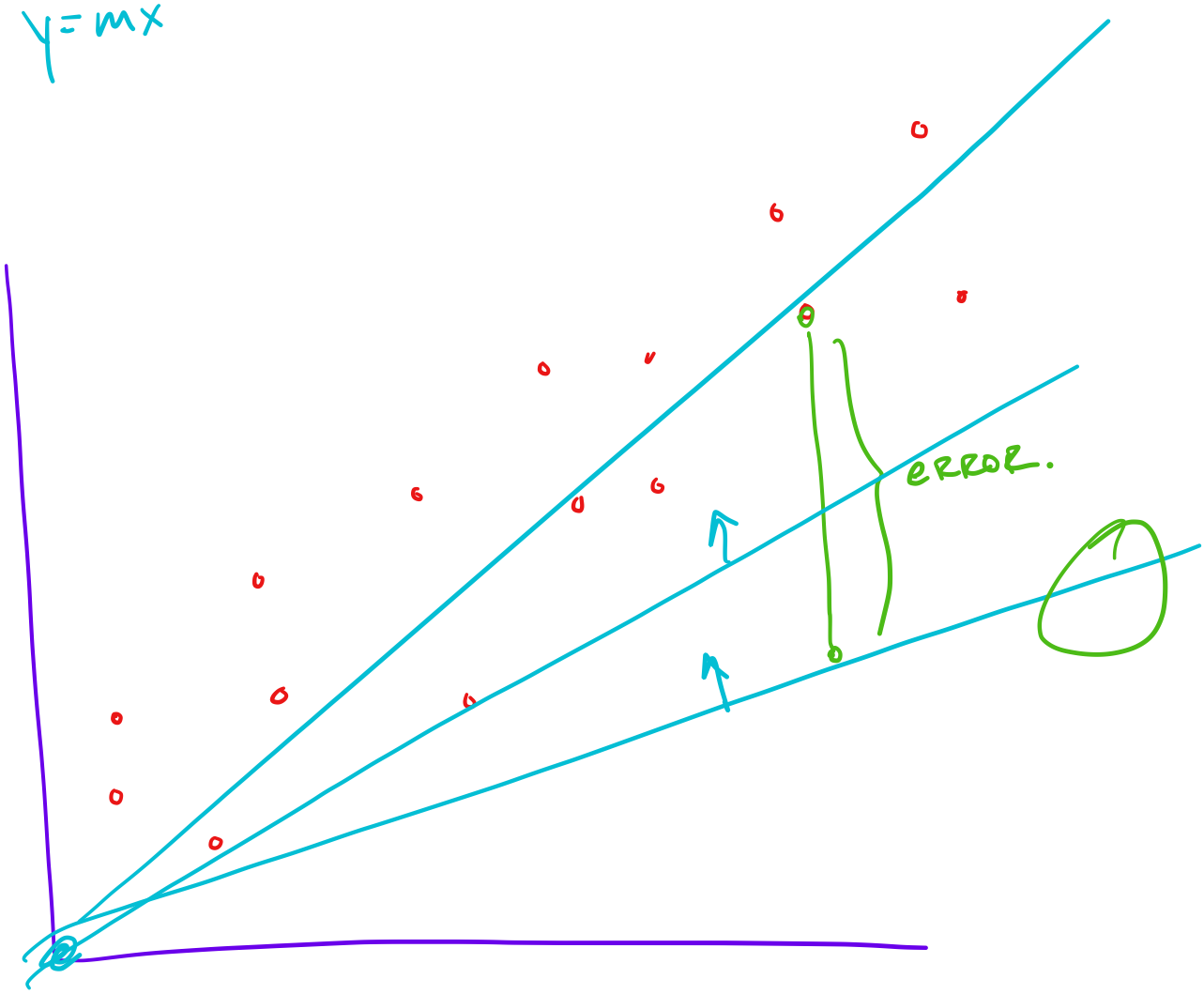
Comparing AI & ML

AI (logical agents)	ML
• logically defined. • agent arch. • search	• Data driven. • model assumed from data.

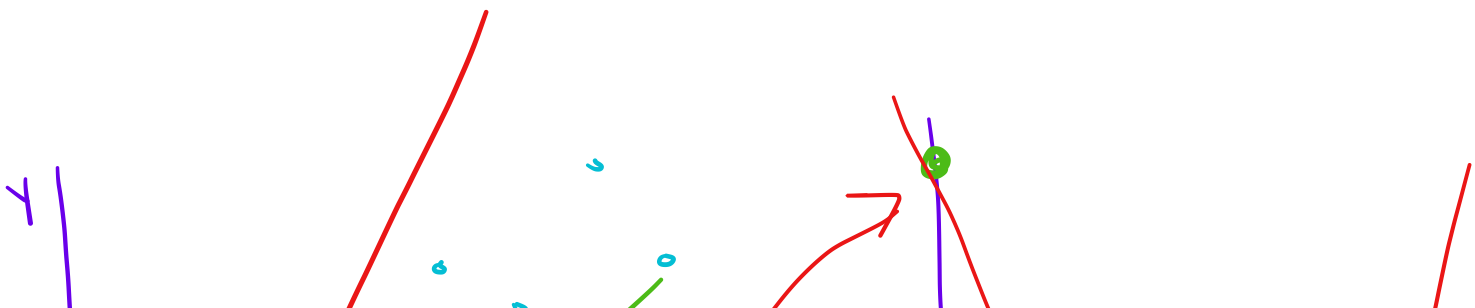
WHAT IS LEARNING?

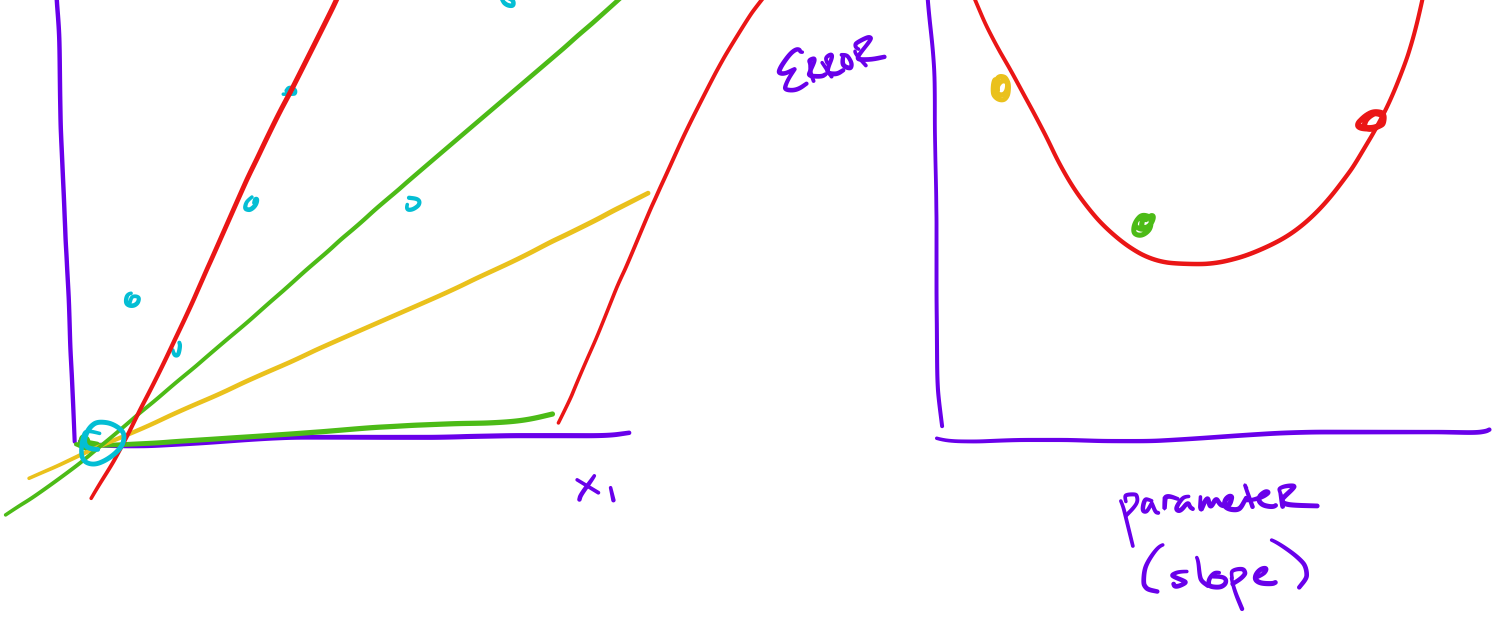
For ML... iterative method for optimizing parameters of a template model to a dataset.

$y = mx$



$$\text{ERROR} = (y_{act.} - y_{pred})^2$$





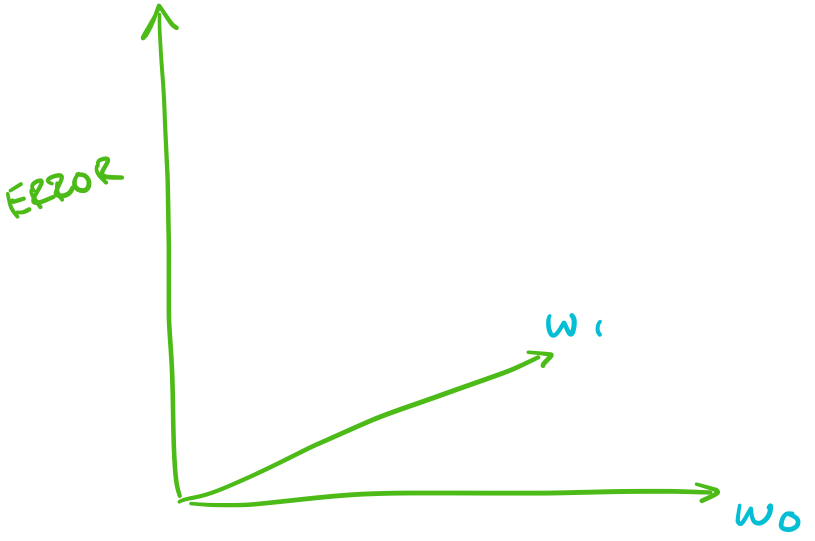
GRADIENT DESCENT.

Add more parameters... increase dimension.

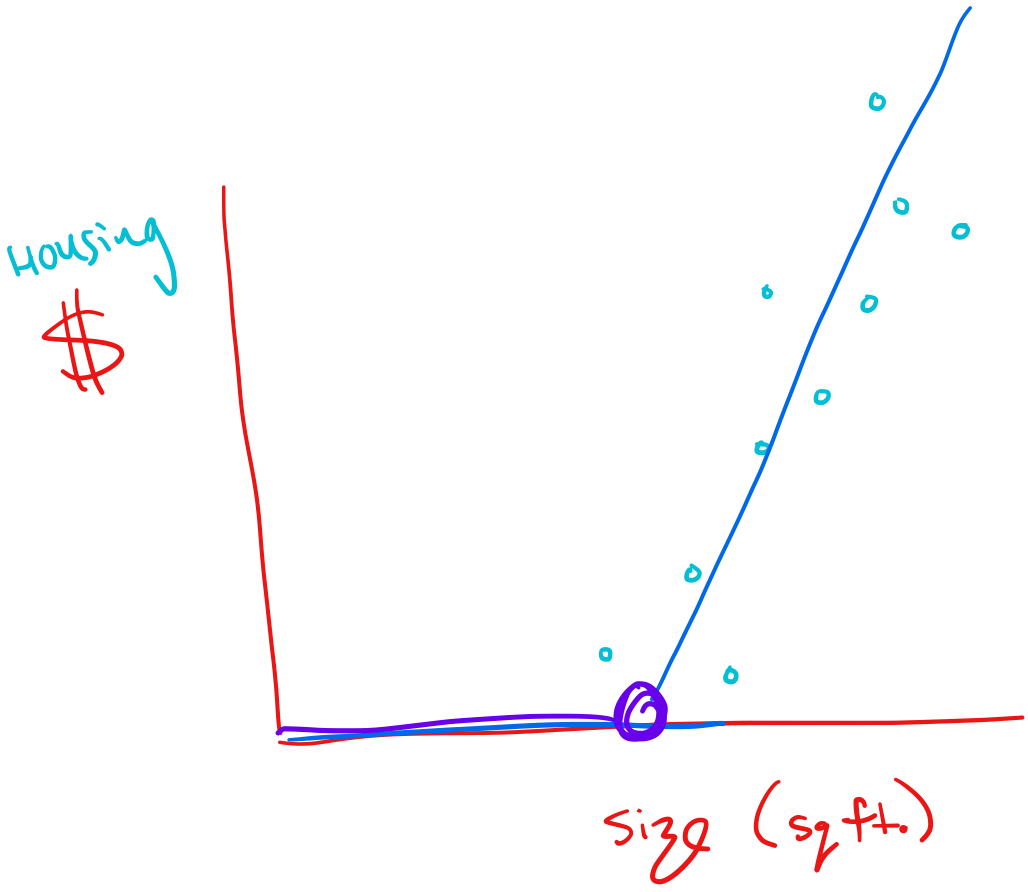
Same process!

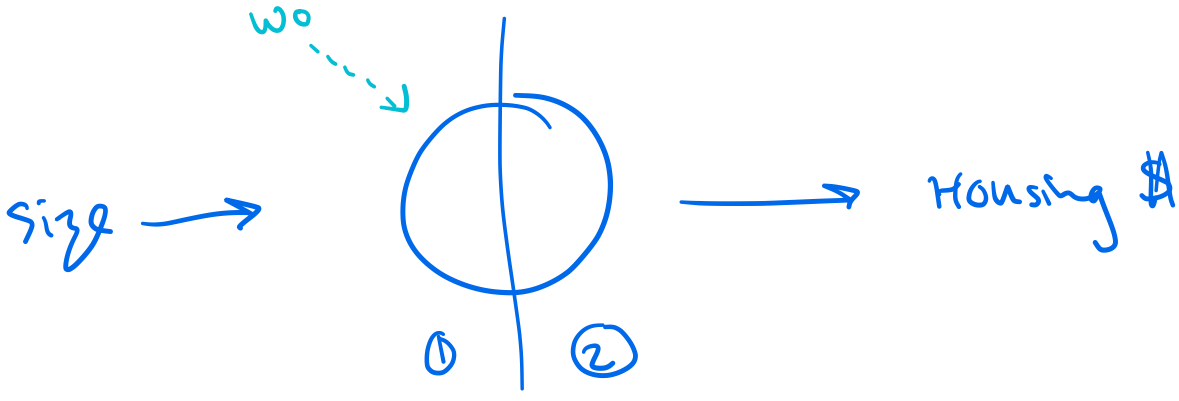
$y = mx + b$

$y = w_1 x + w_0$



MODULE 1: DEEP LEARNING THEORY



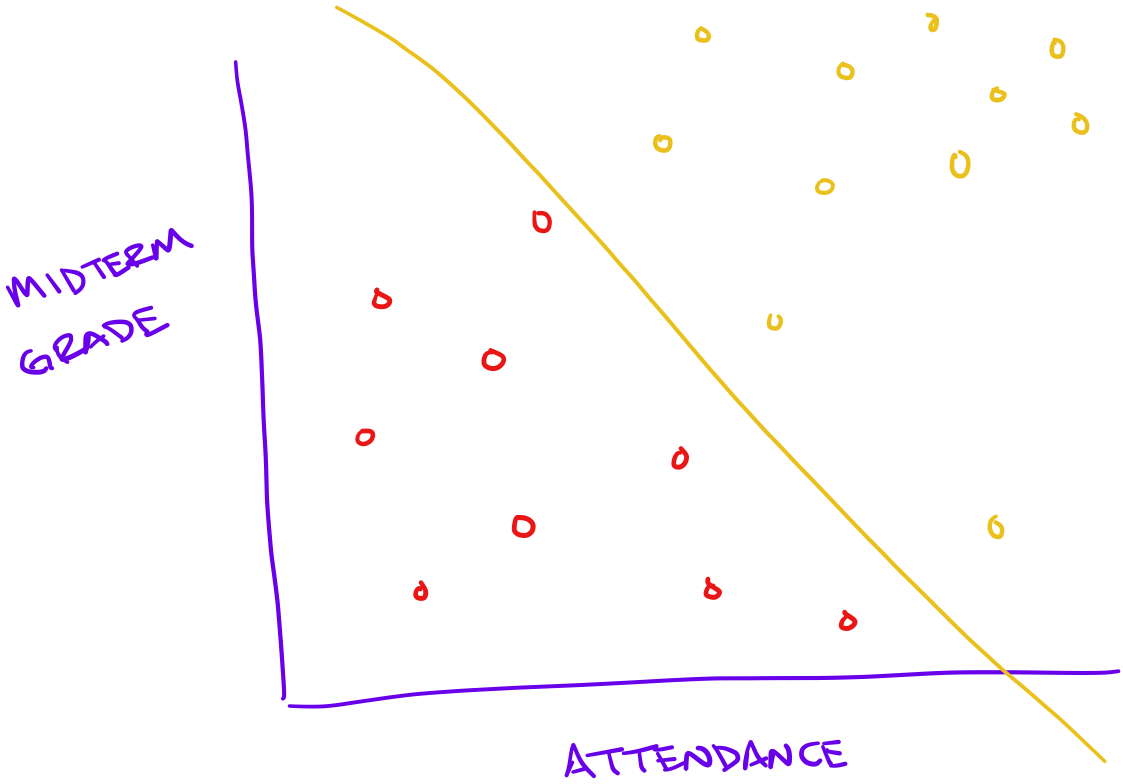


(1) Linear combination

$y' = w_0 + w_1 \cdot size$

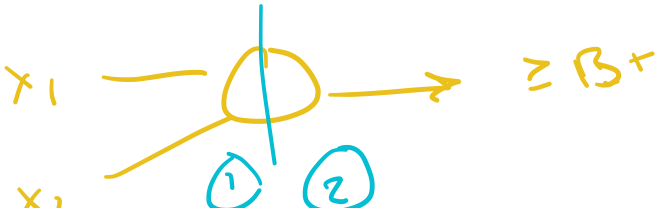
(2) Activation func. $g(x)$

$$g(y') = \begin{cases} x & x \geq 0 \\ 0 & o/w. \end{cases}$$



$\geq B+$

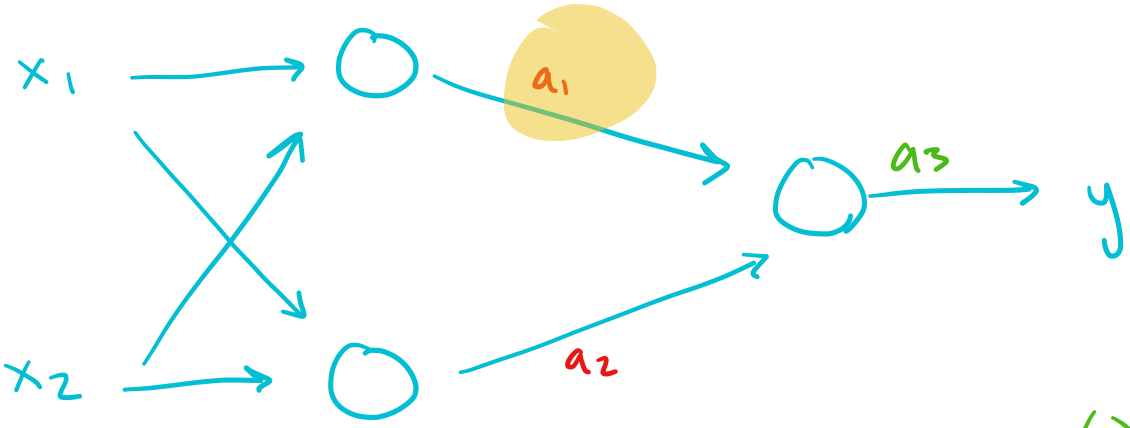
$< B+$



$$w_0 + x_1 w_1 + x_2 w_2 = y'$$

$$\text{out.} = \sigma(y') = \frac{1}{1 + e^{-y'}}$$

STACK MOAR NODES?



$g(x) = x$

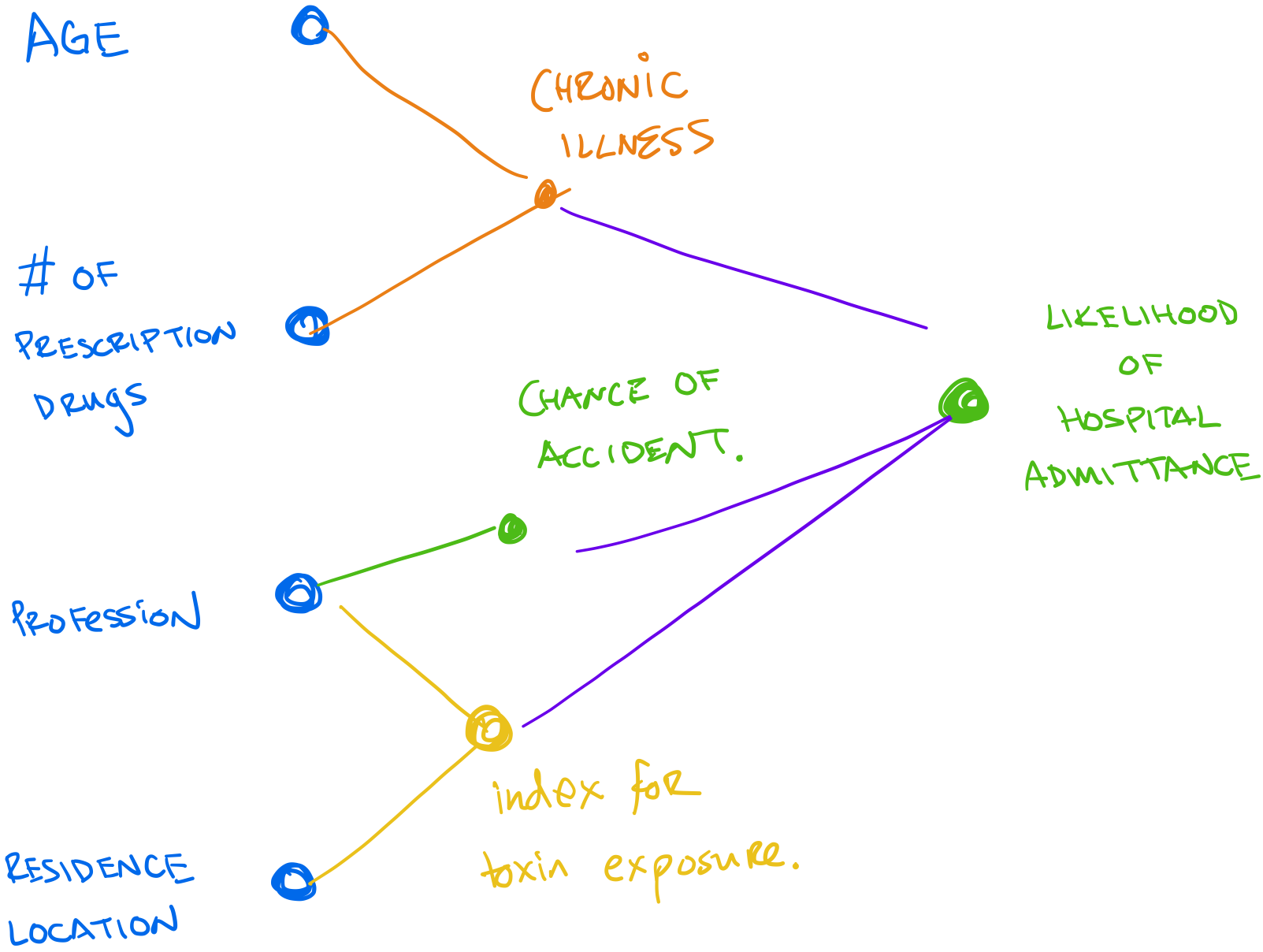
$$a_1 = g_1(w_0 + w_1 x_1 + w_2 x_2)$$

$$a_3 = g_3(w_0 + w_1 a_1 + w_2 a_3)$$

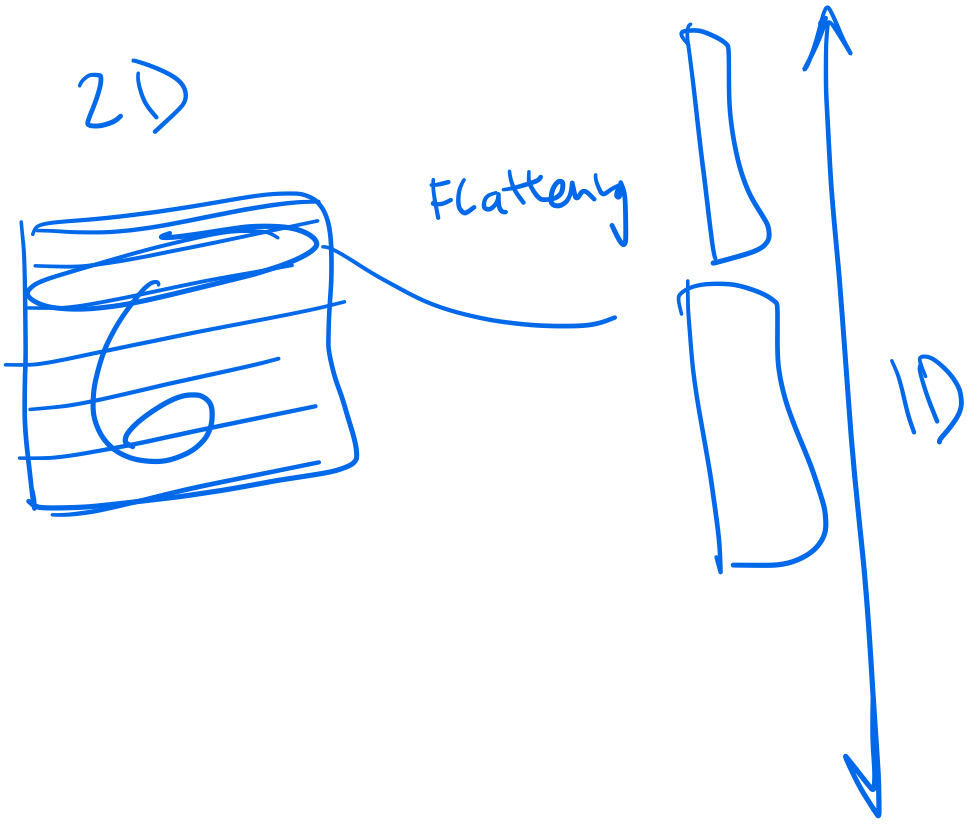
THE ABILITY FOR NN'S TO MODEL COMPLEX PATTERNS COMES FROM:

- stacking nodes 
- Activation FNS!

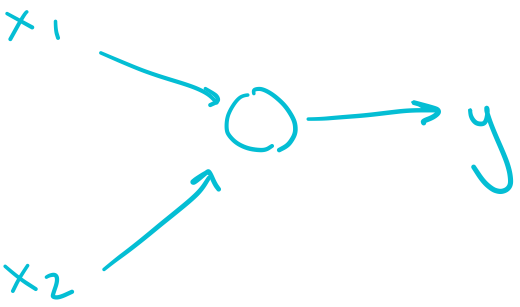
NN INTUITION

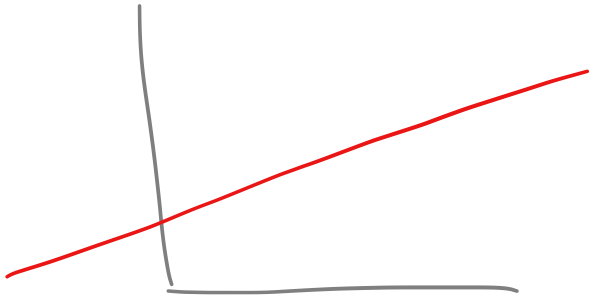


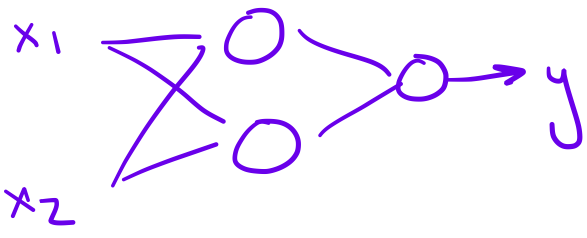
FEATURE ENG.

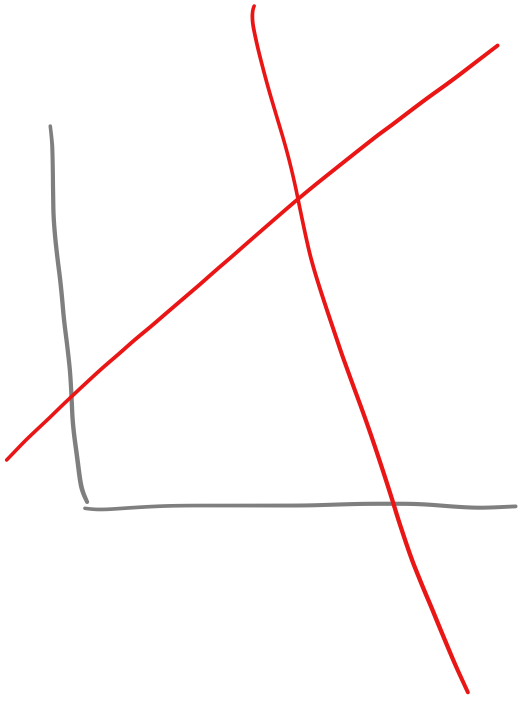

2D
Flattening
1D

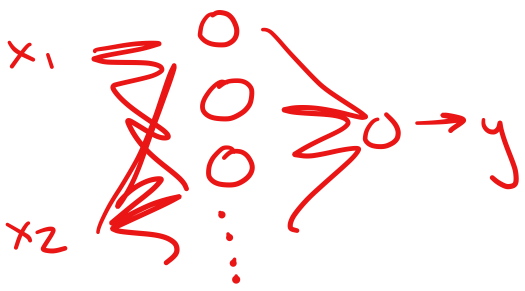
ANN'S AS UNIVERSAL FUNCTION APPROXIMATORS

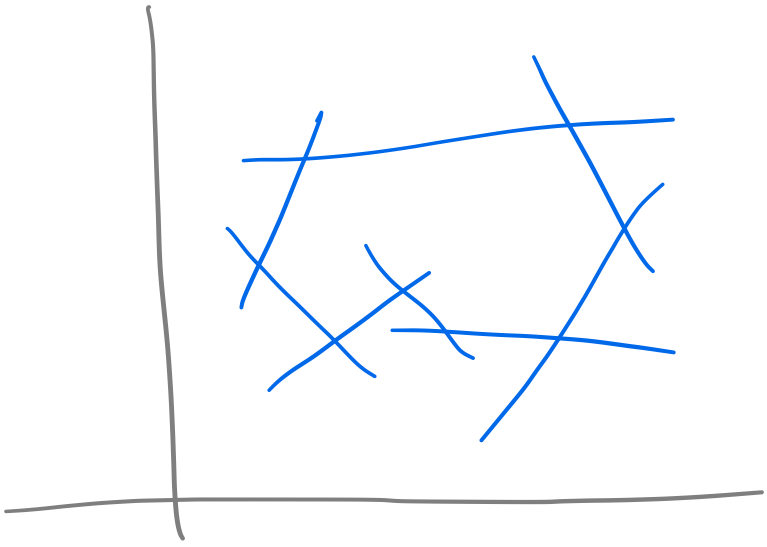


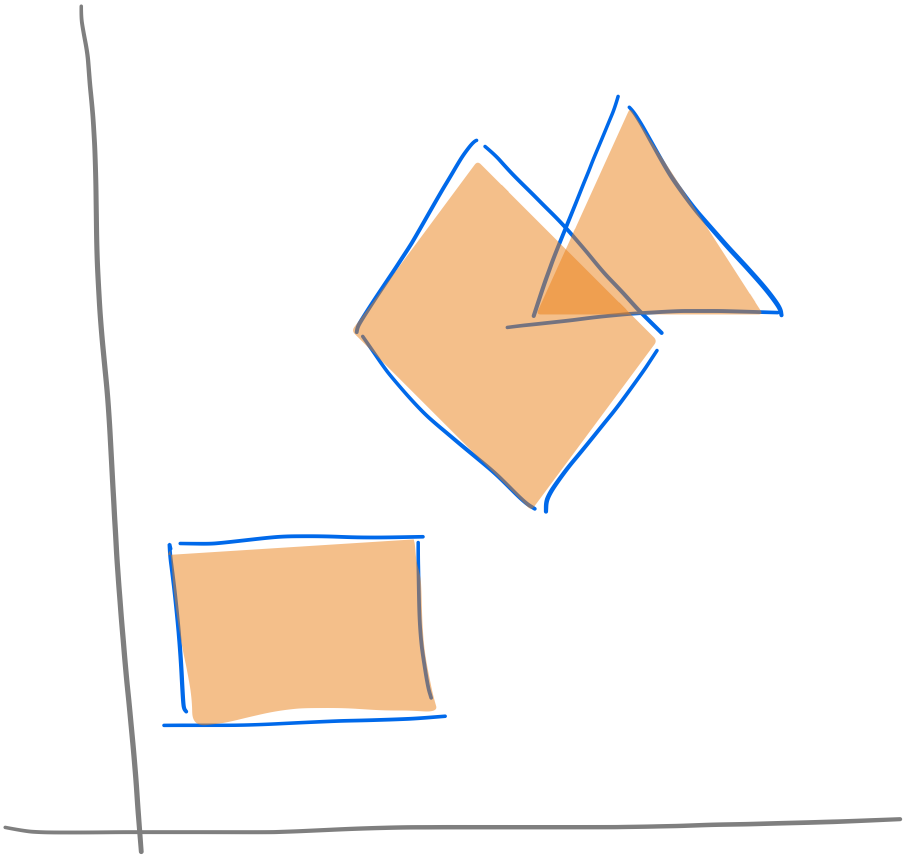




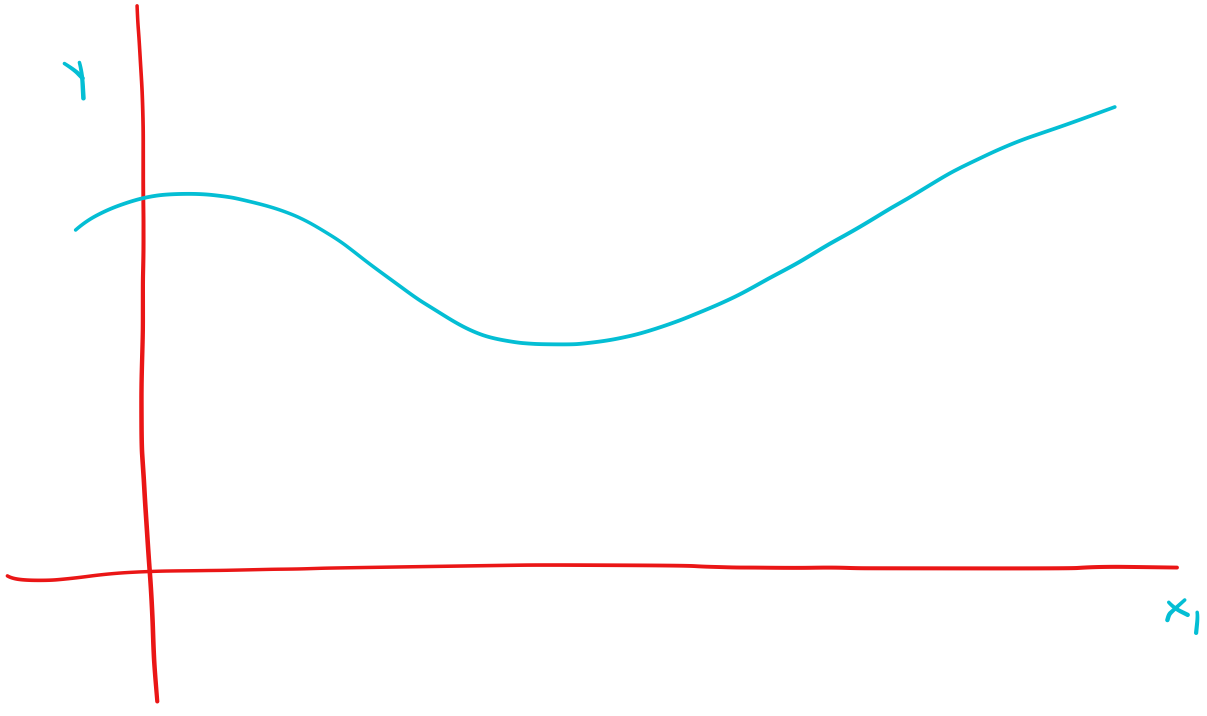


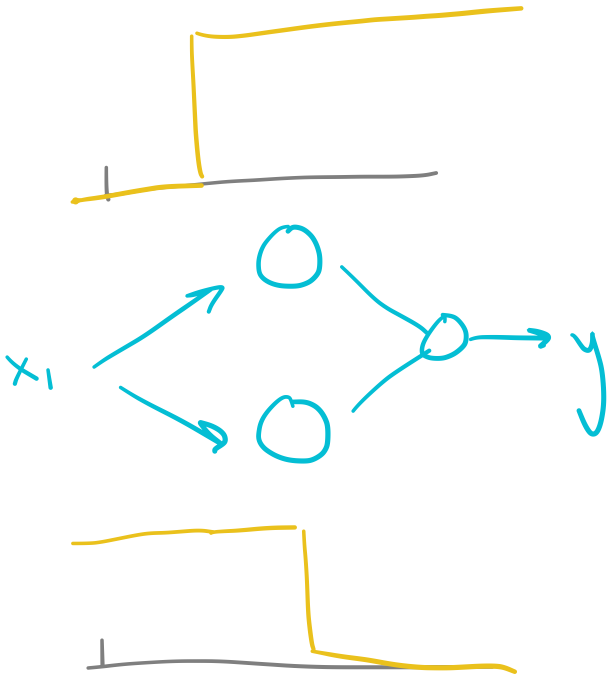

x1
x2
y





Continuous?




x_1
y