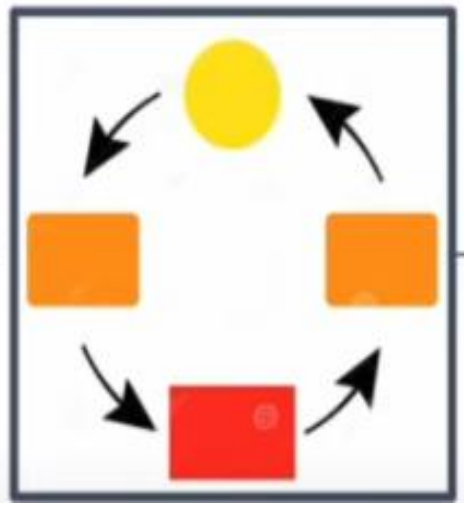
ML: Пример

Сбор данных

	A	B
1	Площадь м2	Цена млн. руб.
2	100	198.3
3	123	243.61
4	412	812.94
5	90	178.6
6	81	160.87
7	73	145.11
8	200	395.3
9	141	279.07
10	55	109.65

Преобразование

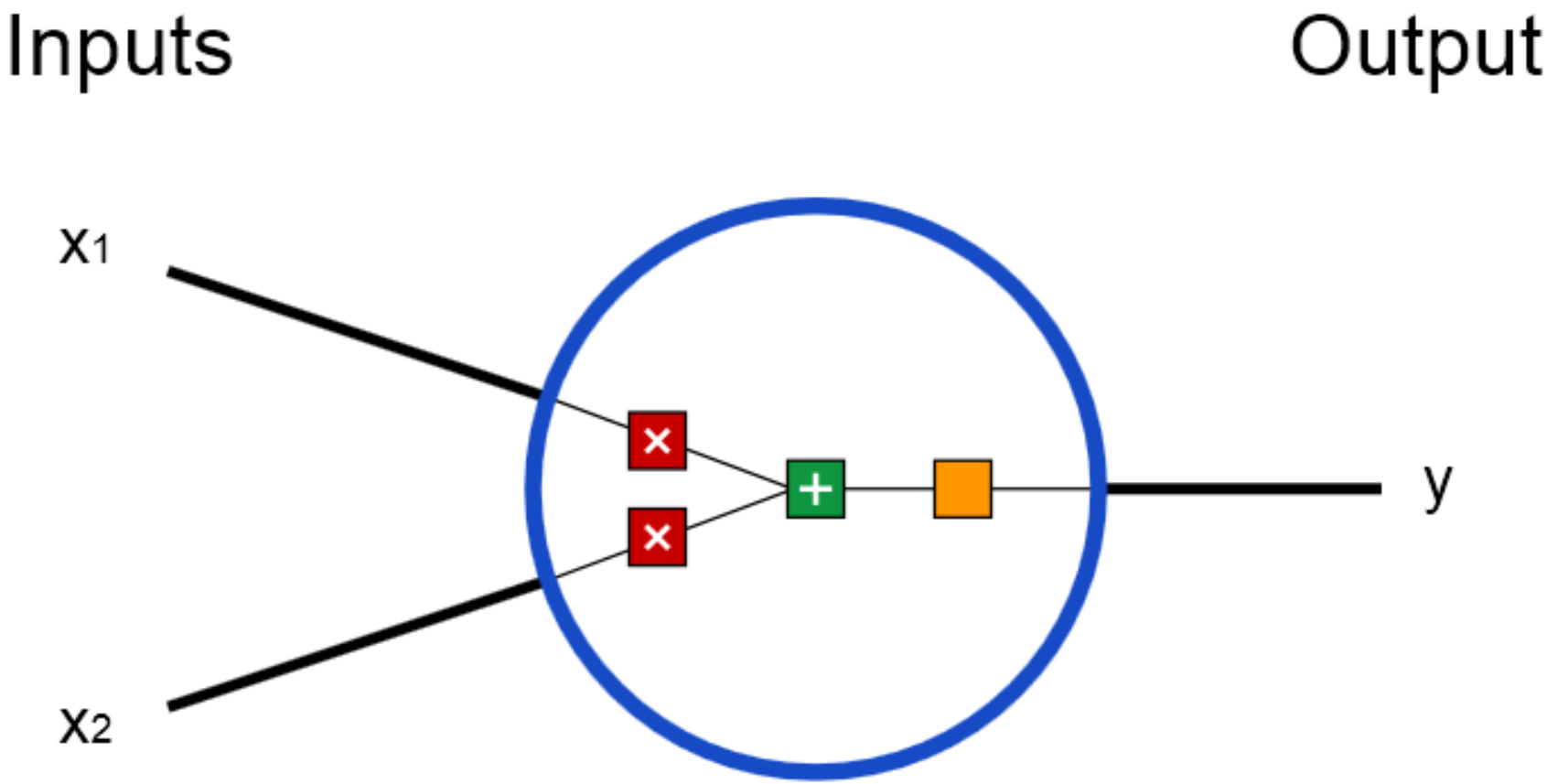


Обучение

ML

Предсказания

?!


Inputs
Output
x1
x2
y

3 things are happening here. First, each input is multiplied by a weight: ■

$$x_1 \rightarrow x_1 * w_1$$

$$x_2 \rightarrow x_2 * w_2$$

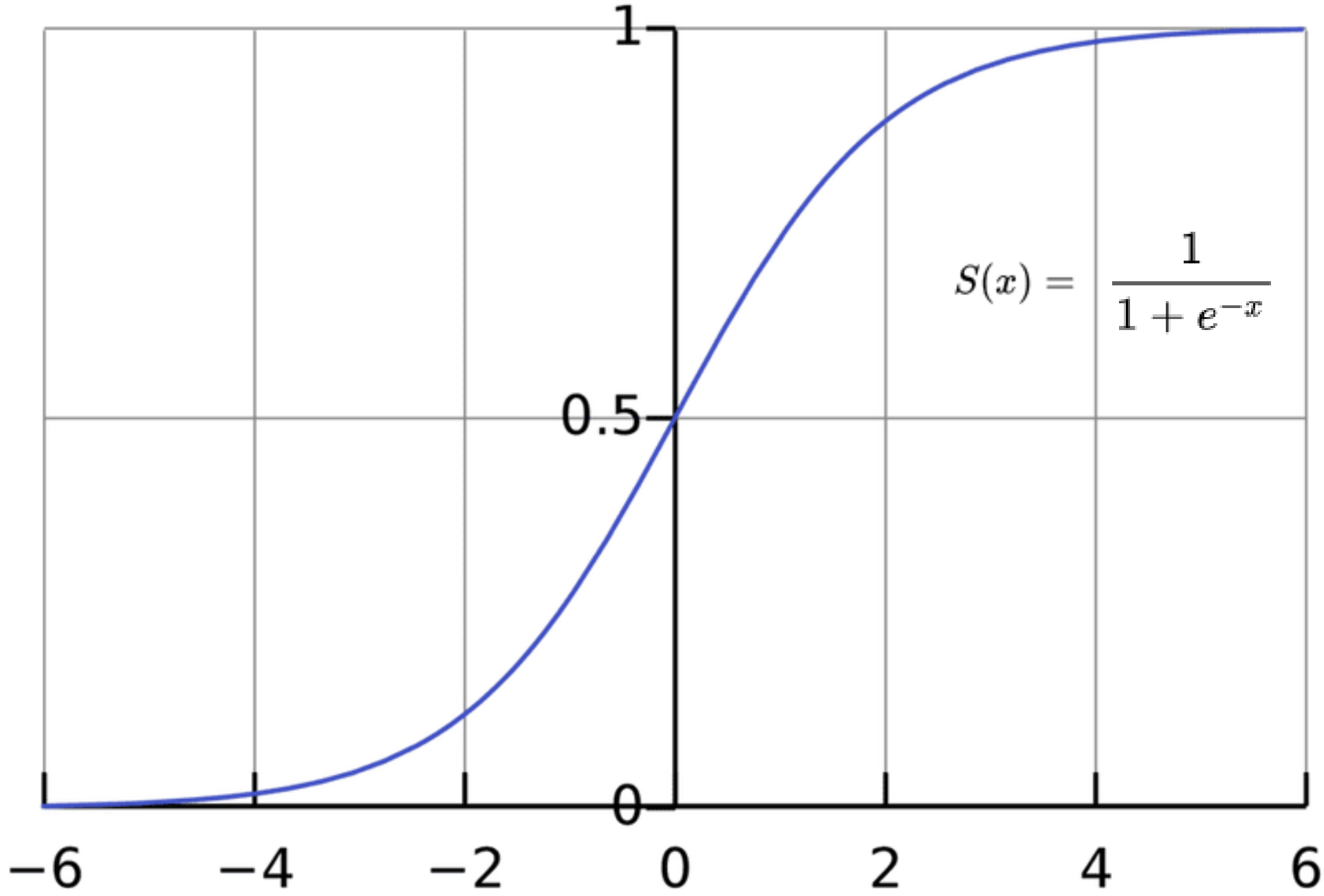
Next, all the weighted inputs are added together with a bias b: ■

$$(x_1 * w_1) + (x_2 * w_2) + b$$

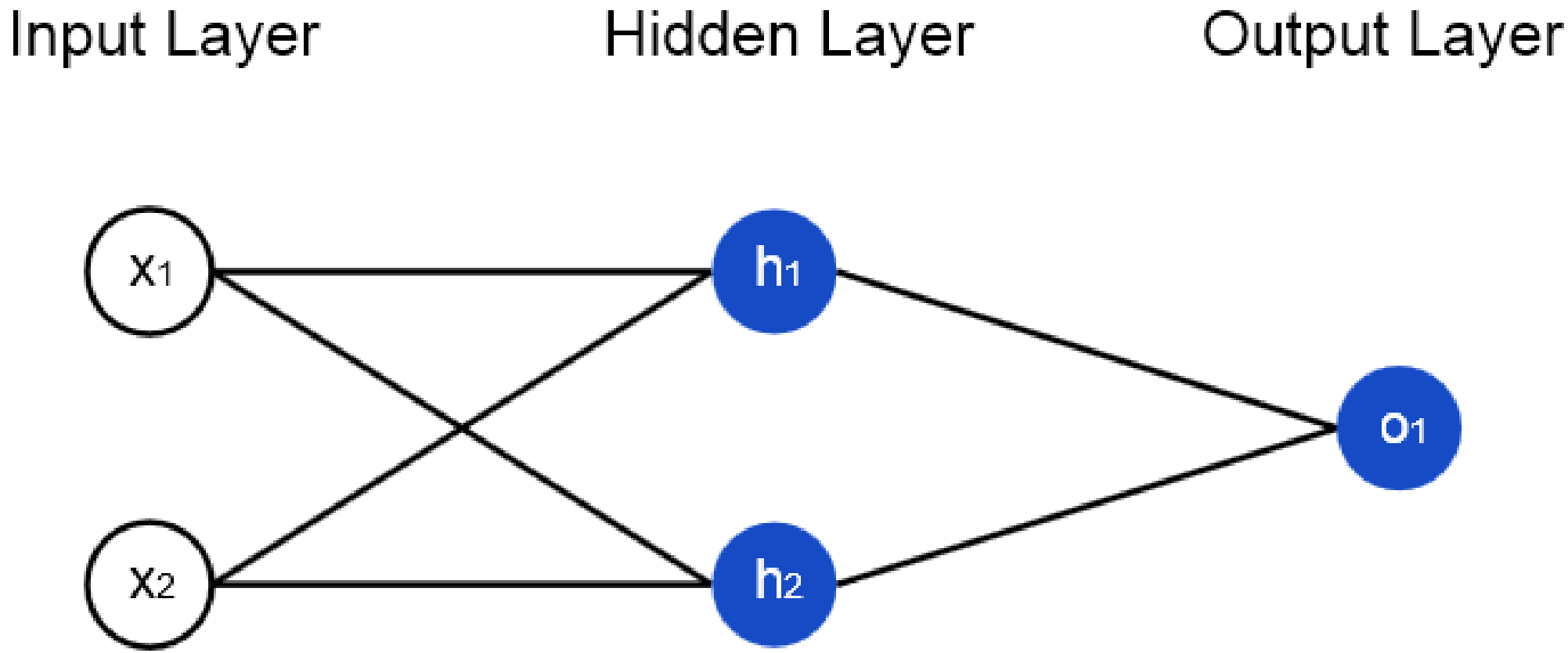
Finally, the sum is passed through an activation function: ■

$$y = f(x_1 * w_1 + x_2 * w_2 + b)$$

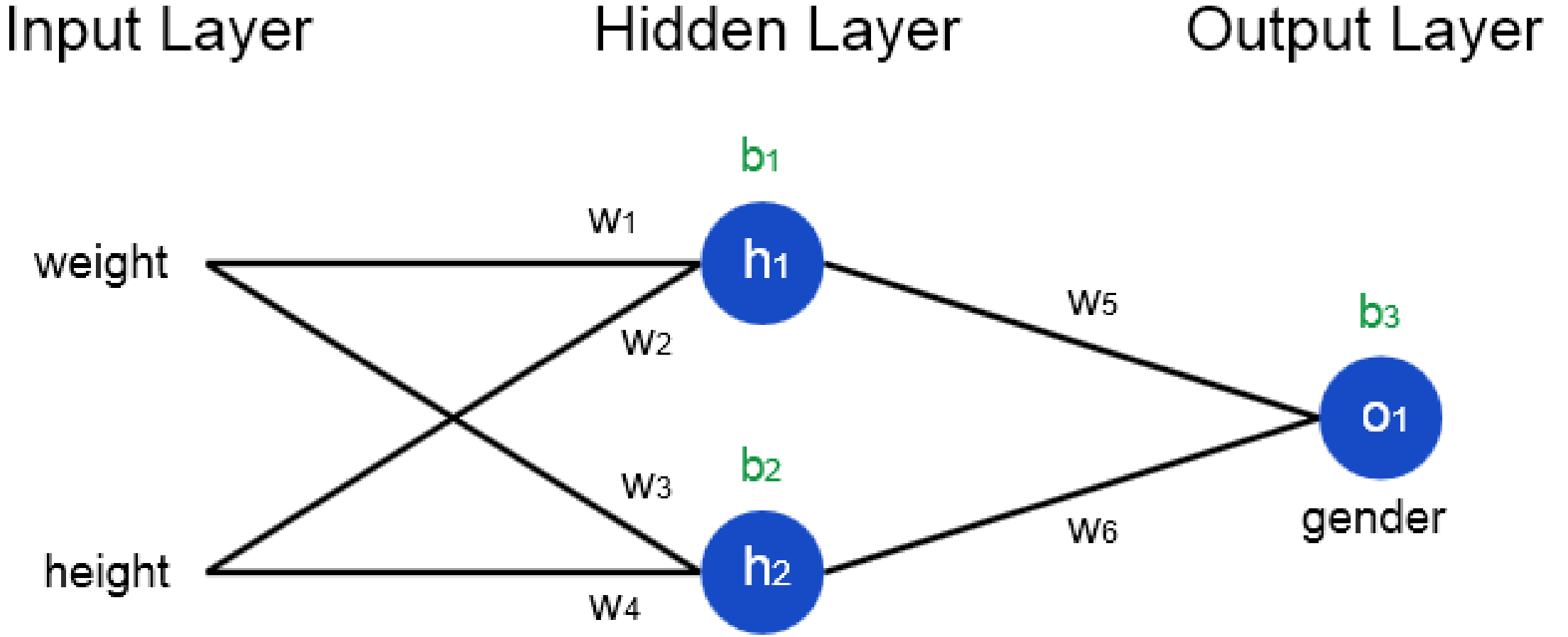
feedforward


1
0.5
0
−6
−4
−2
0
2
4
6
$S(x) = \frac{1}{1 + e^{-x}}$

Combining Neurons into a Neural Network



Name	Weight (lb)	Height (in)	Gender
Anna	133	65	F
Denis	160	72	M
Ivan	152	70	M
Polina	120	60	F


Input Layer
Hidden Layer
Output Layer
b1
w1
weight
h1
w5
b3
w2
o1
b2
w3
gender
w6
height
h2
w4

Loss function

We'll use the **mean squared error** (MSE) loss:

$$\text{MSE} = \frac{1}{n}\sum_{i=1}^{n}(y_{true} - y_{pred})^2$$

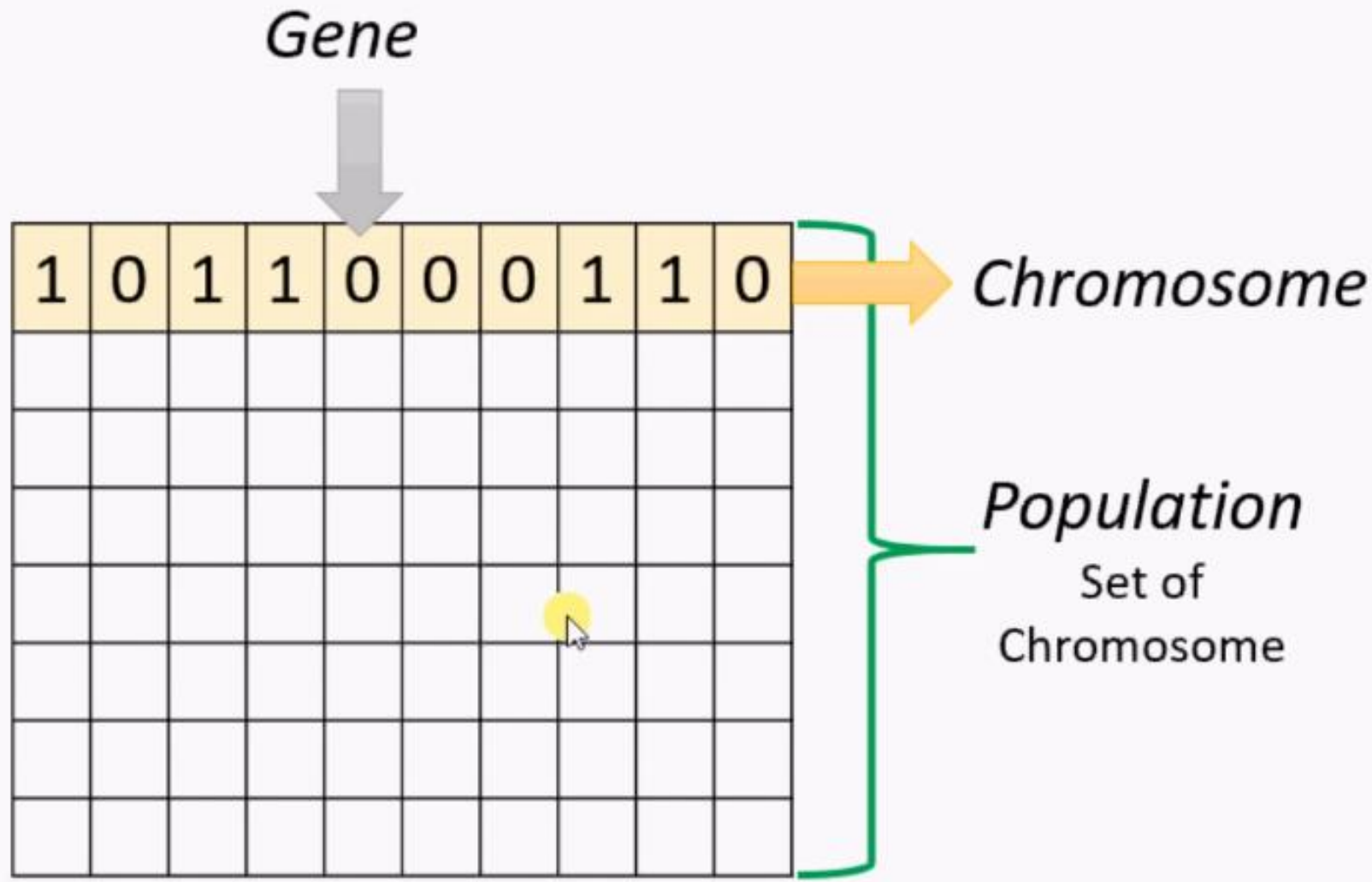
Training a network

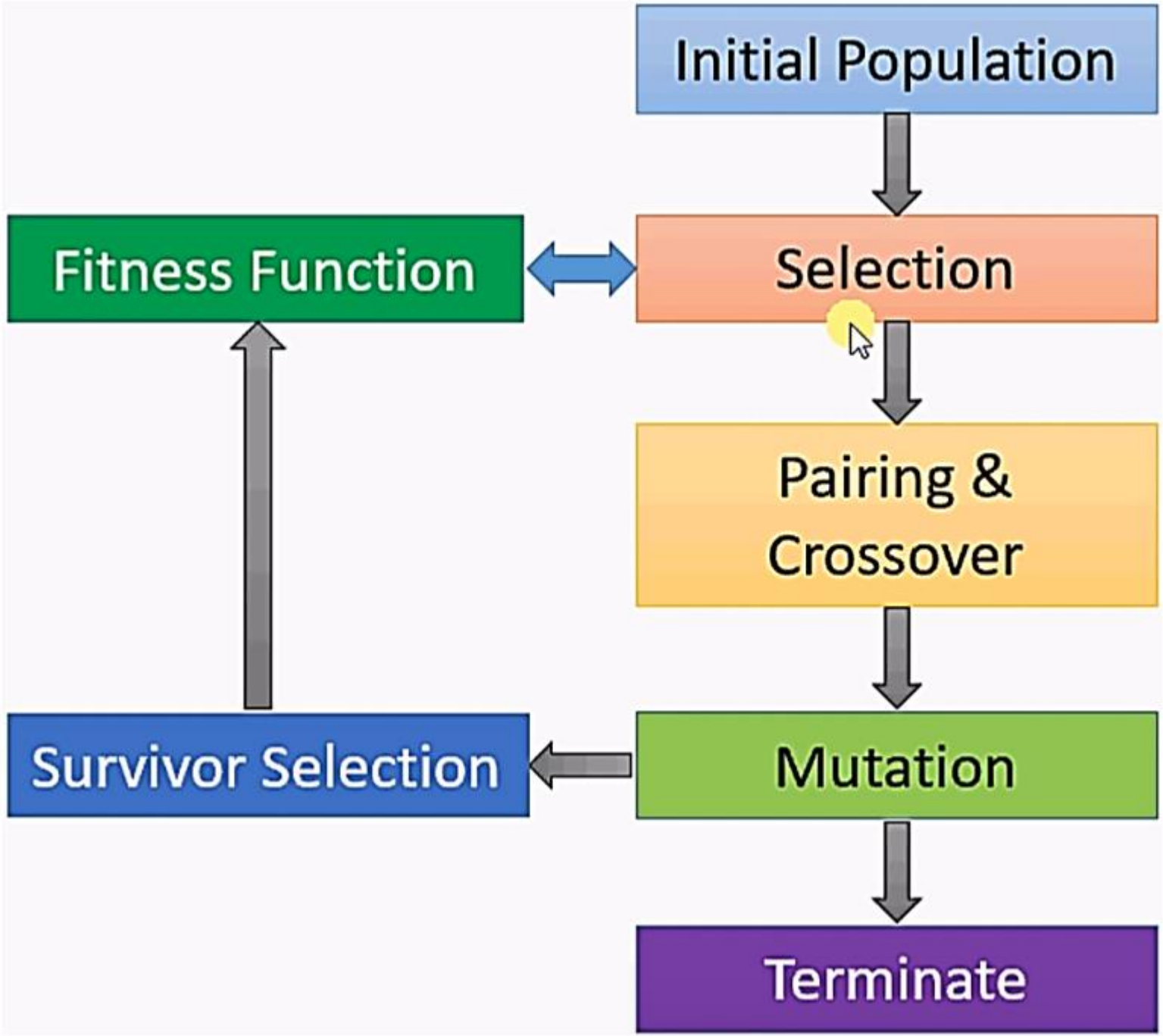
=

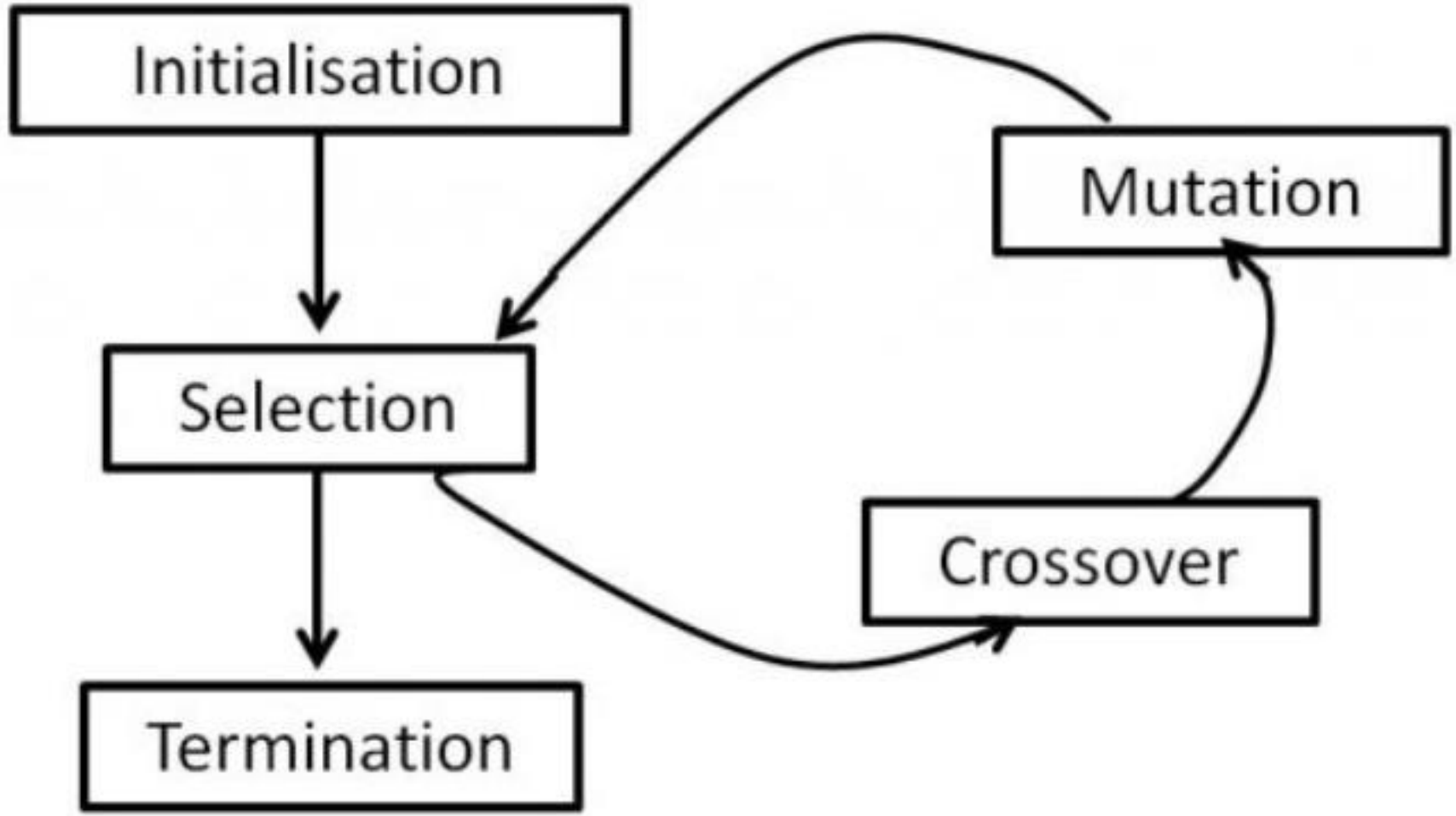
trying to minimize its loss

Terminology

- Population
- Chromosomes
- Gene



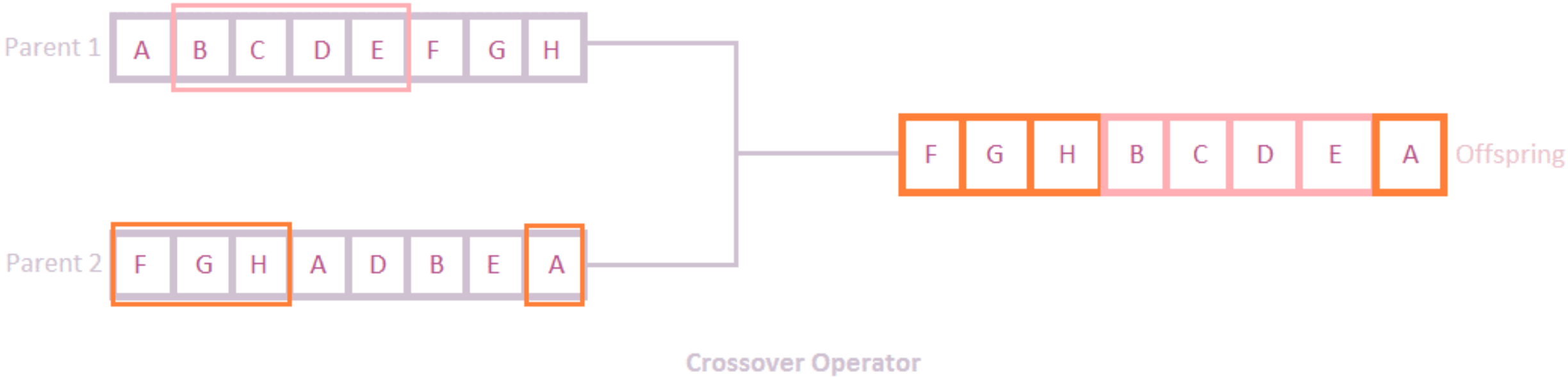

Initial Population
Selection
Pairing &
Crossover
Mutation
Terminate
Survivor Selection
Fitness Function


Initialisation
Selection
Termination
Mutation
Crossover

1. Selection Operator

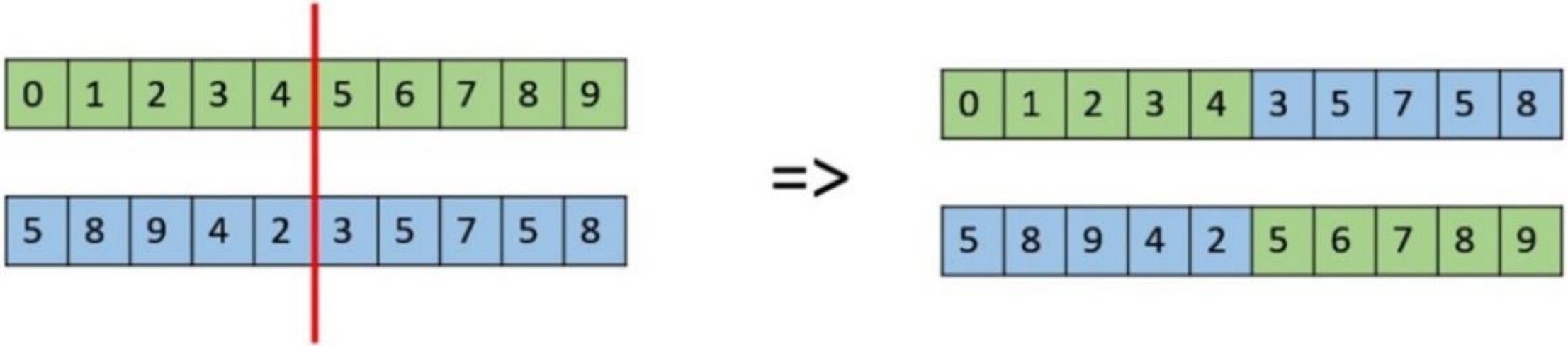
It prefers individuals with better fitness scores and lets them pass genes on to successive generations.

2. Crossover Operator

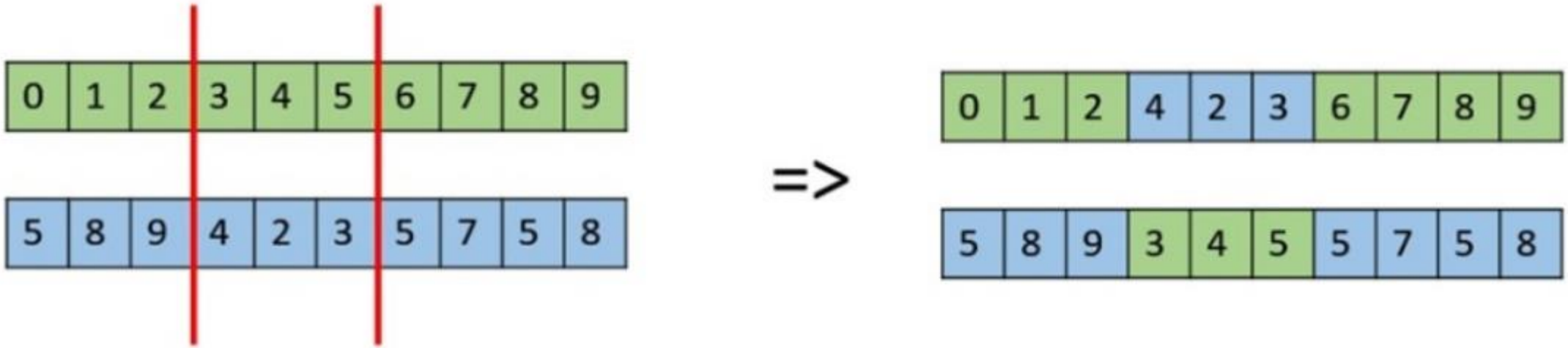


2. Crossover Operator

- **One Point Crossover**



- Multi Point Crossover

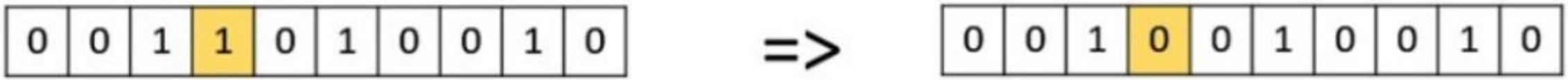


- Uniform Crossover

3. Mutation Operator

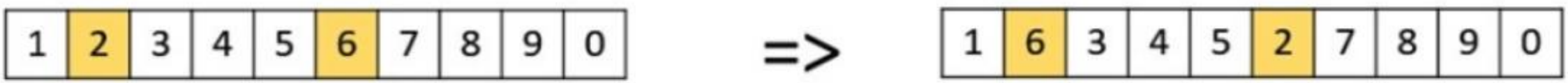
- Mutation Operators:

-Bit Flip Mutation

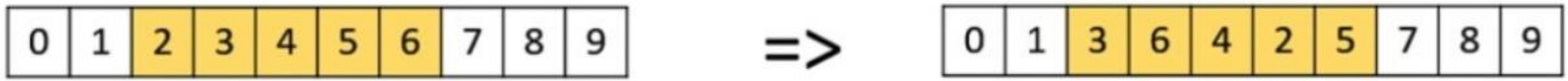


-Random Resetting

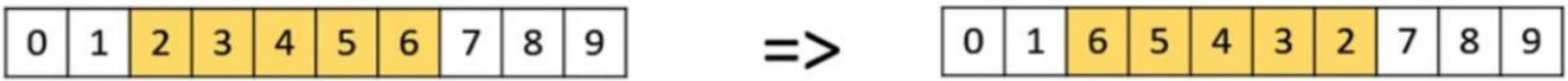
-Swap Mutation



- Scramble Mutation



- Inversion Mutation



GA- TERMINATION CONDITION

- When there has been no improvement in the population for X iterations.
- When we reach an absolute number of generations.
- When the objective function value has reached a certain pre-defined value