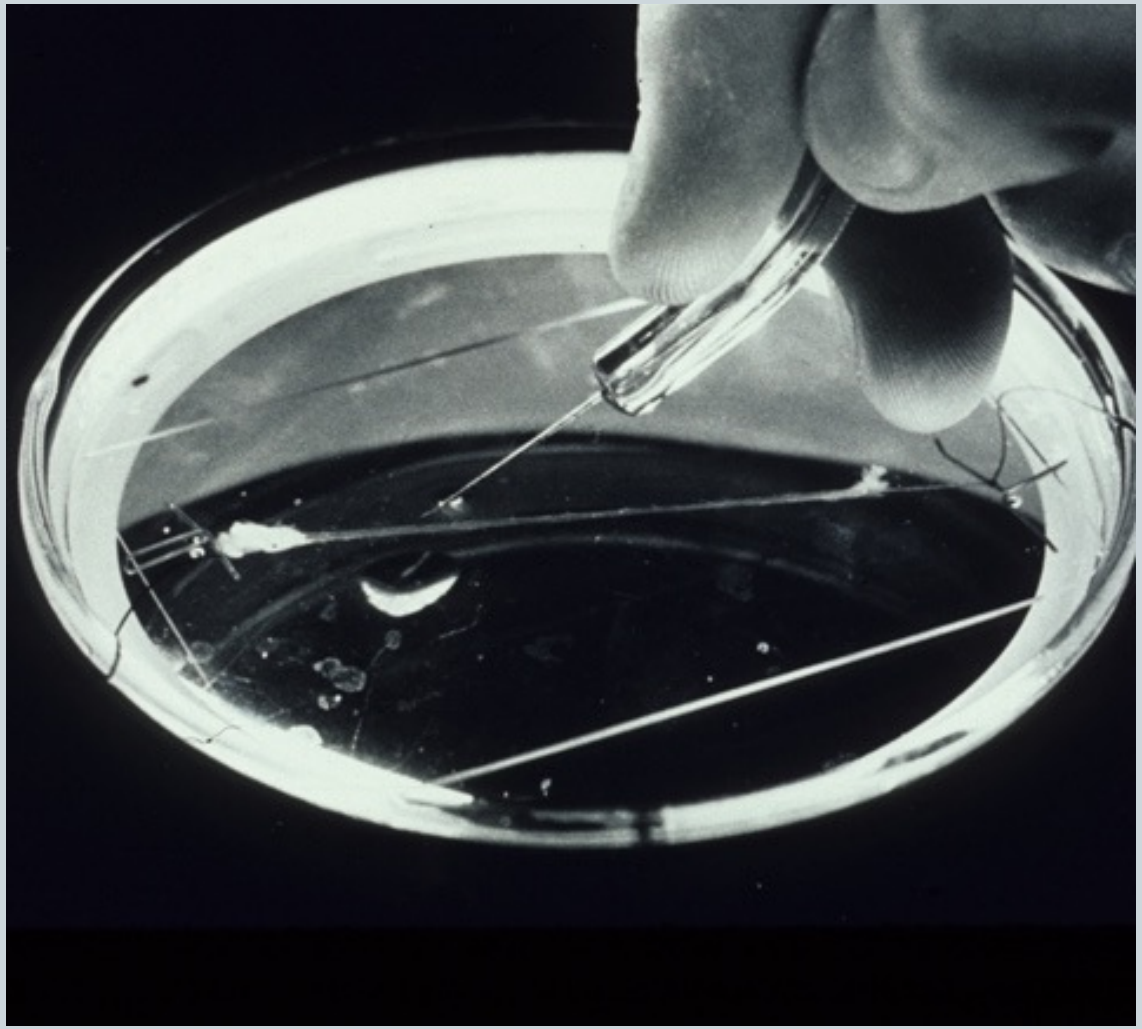
Neural Networks

BHI Youth Awards

KING'S College LONDON

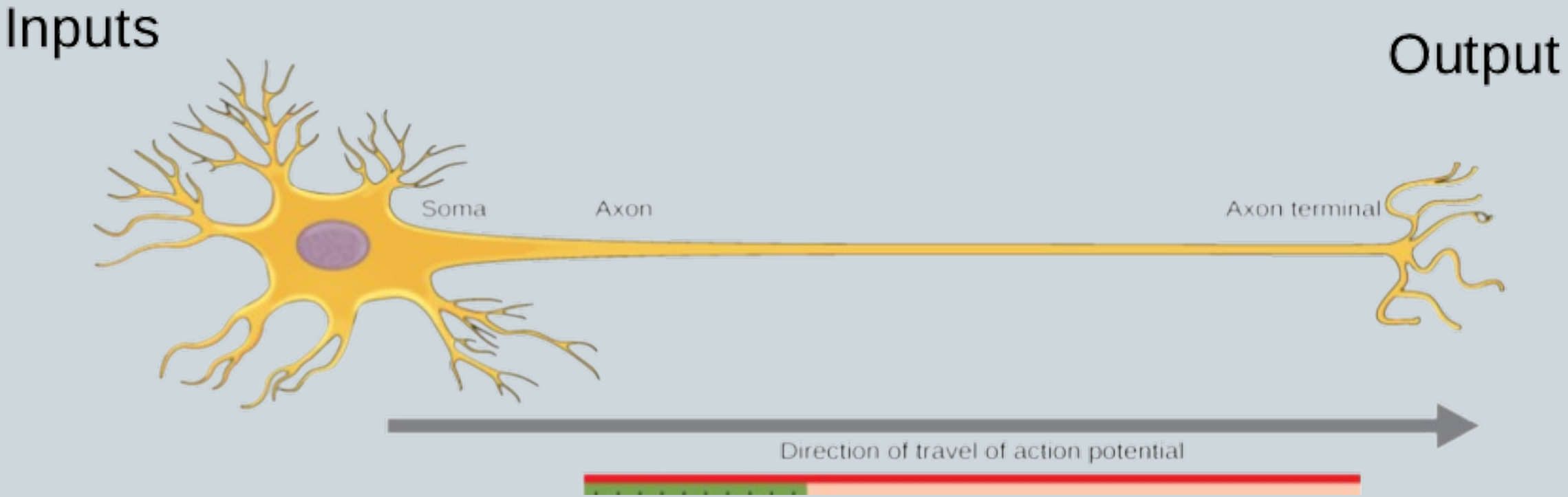
NIHR | Maudsley Biomedical Research Centre

Giant squid axon

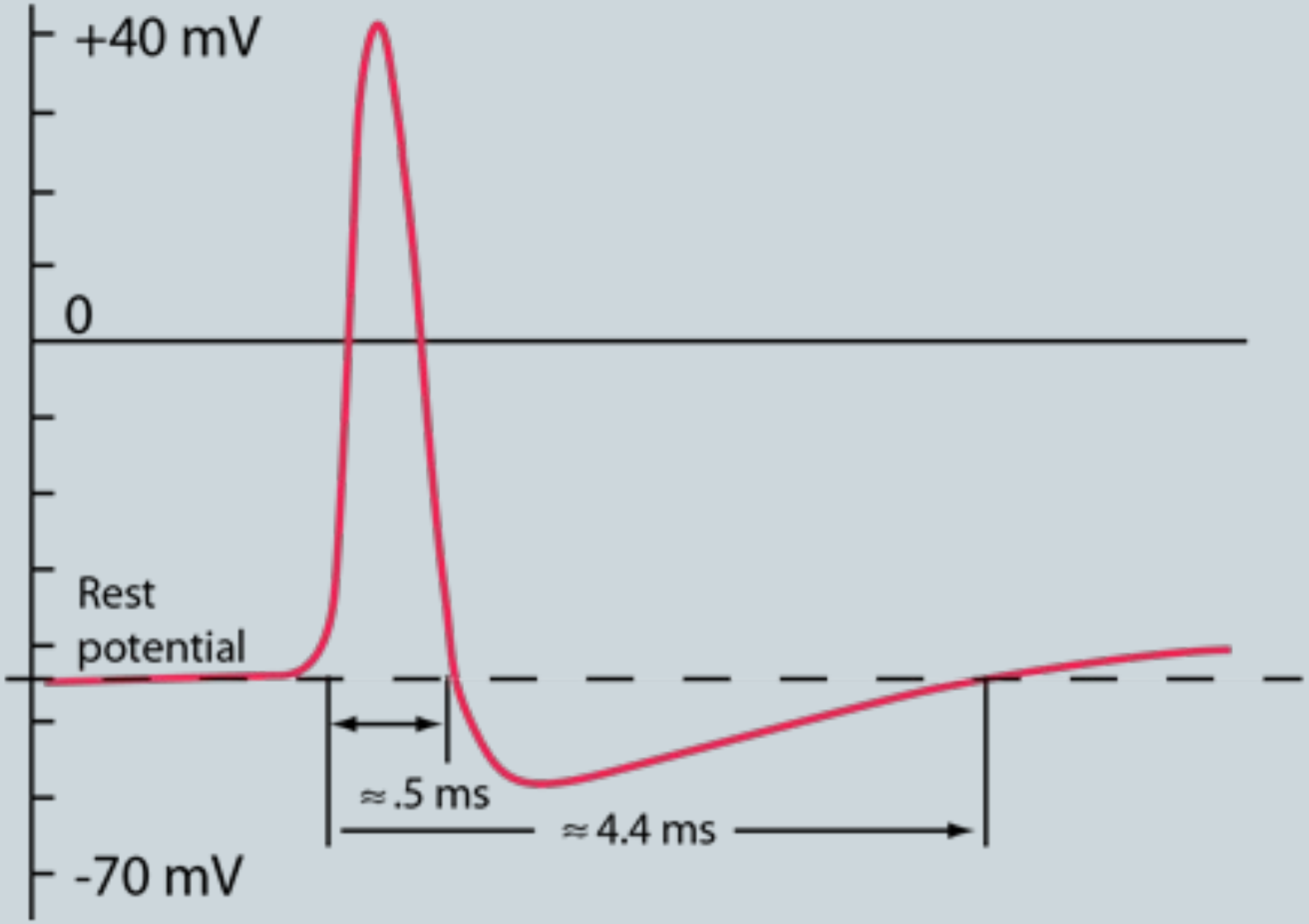


- Large axon used to control squid locomotion
- Electrical properties investigated by Hodgkin and Huxley in 1952

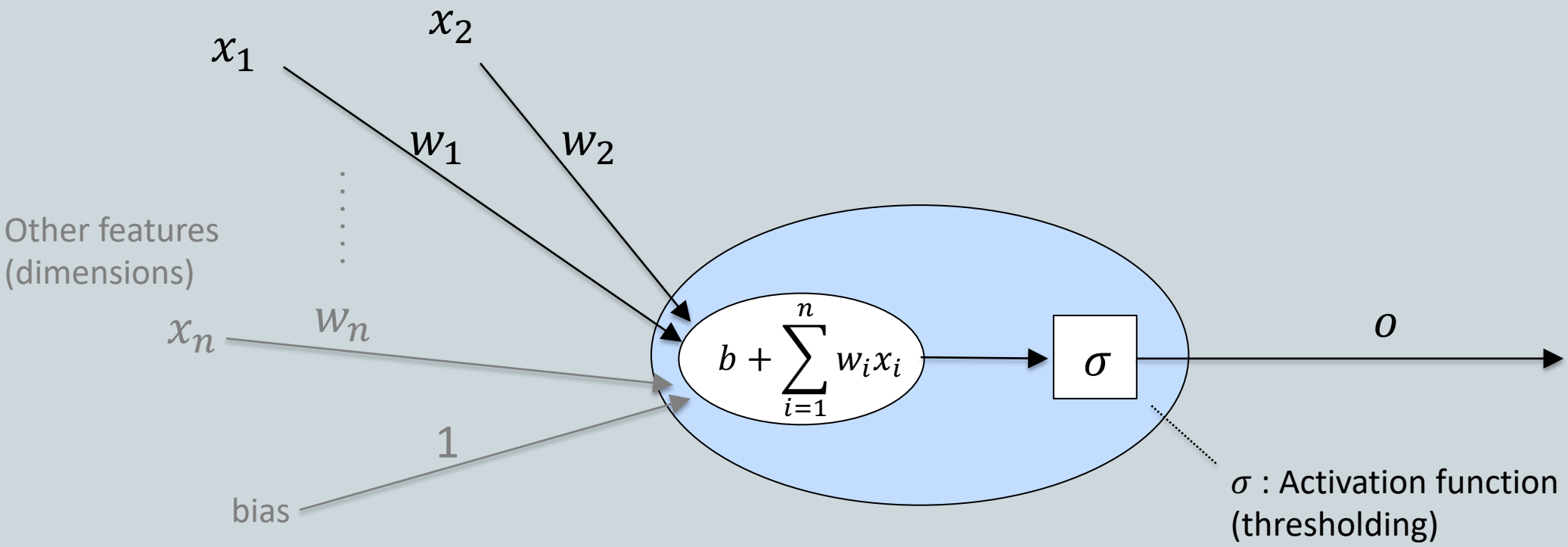
Input and output



Action potential

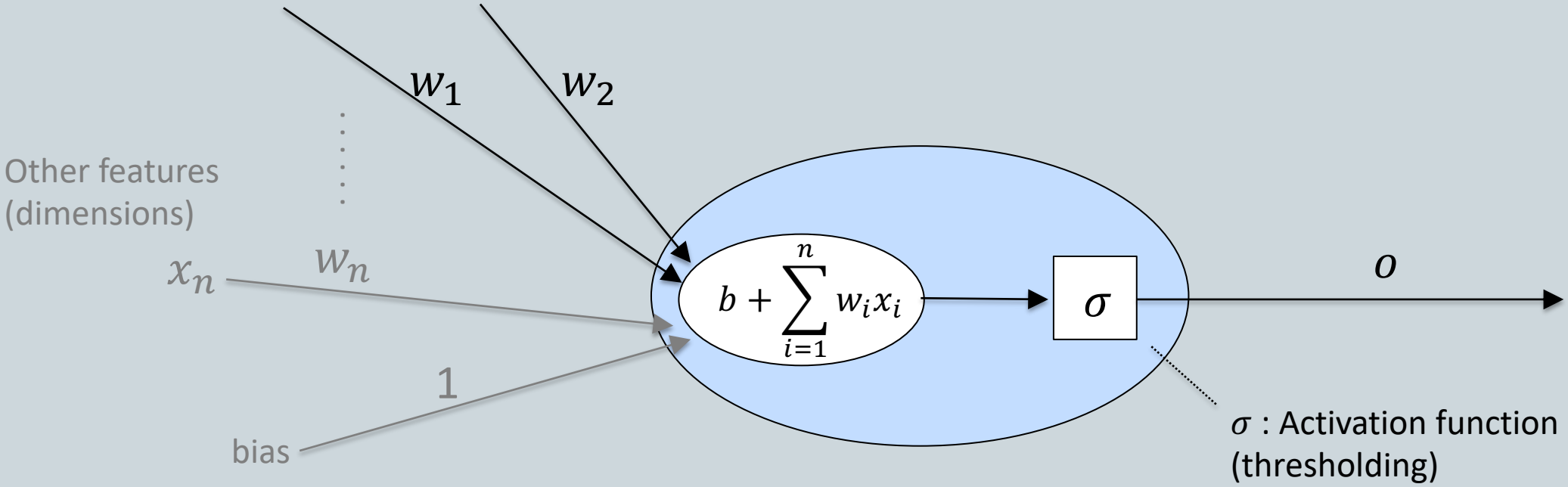


A single perceptron (artificial neuron)



A single perceptron (artificial neuron)

	x_1 Placental	x_2 Lactates	y (output) Mammal
Dog	1	1	**1**
Cat	1	1	**1**
Bull shark	1	0	**0**
Pigeon	0	1	**0**
Lizard	0	0	**0**



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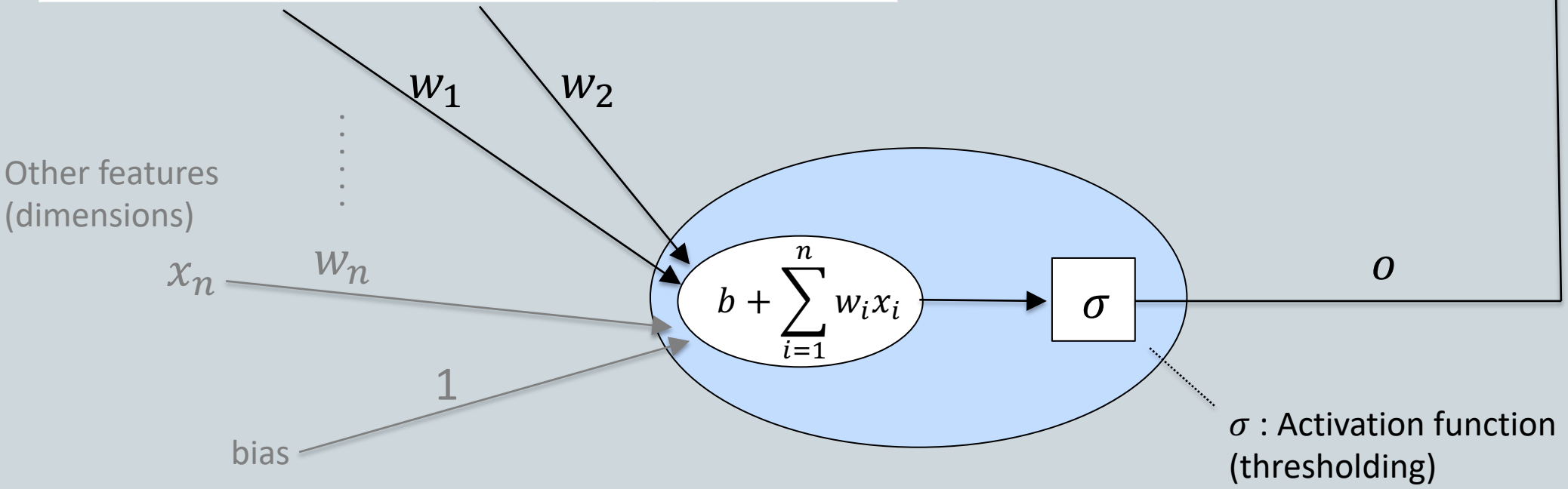
$$\Delta w_i = \eta(y - o)x_i$$



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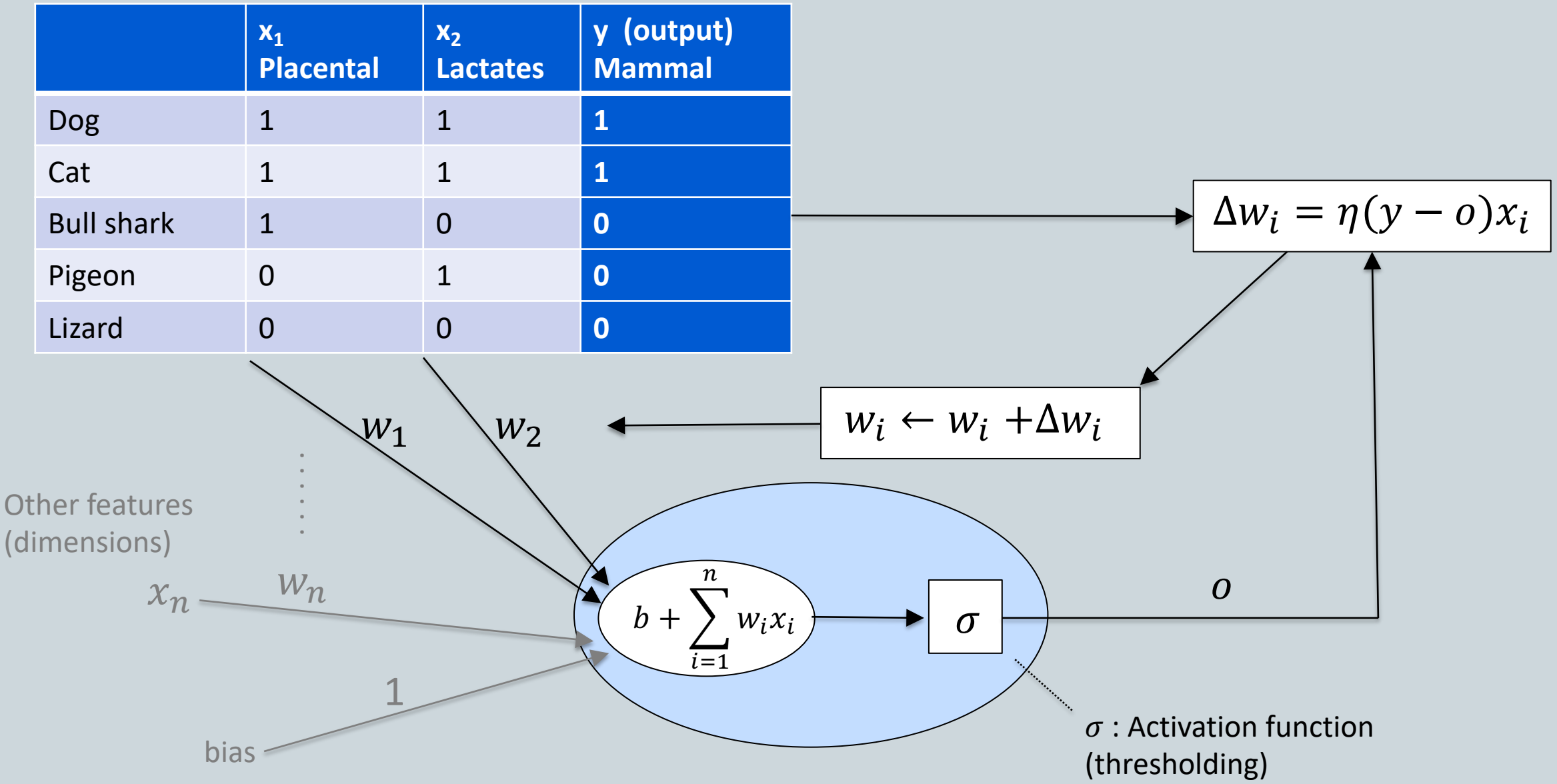


Representational power of a perceptron

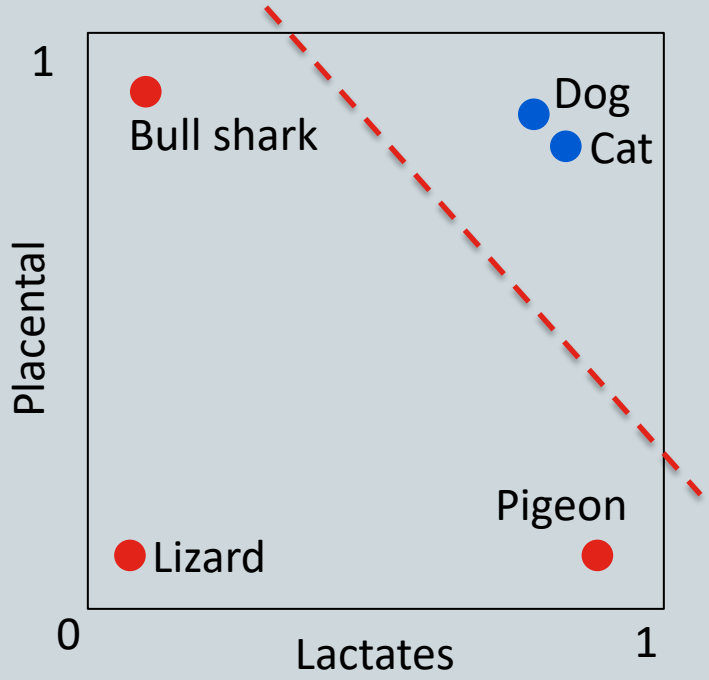
$$O = \begin{cases} 1 \text{ if } b + \sum_{i=1}^{n} w_i x_i \\ 0 \text{ otherwise} \end{cases}$$

For a two parameter problem, the decision boundary is given by:

$$1 \text{ if } b + w_1 x_1 + w_2 x_2 > 0$$

$$w_1 x_1 + w_2 x_2 = -b$$

$$x_2 = -\frac{w_1}{w_2} x_1 - \frac{b}{w_2}$$

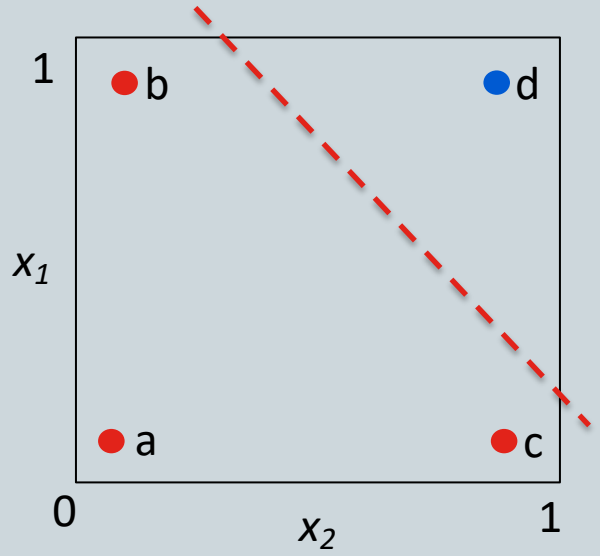


i.e. a perceptron can only represent linearly separable problems.

Some linearly separable problems

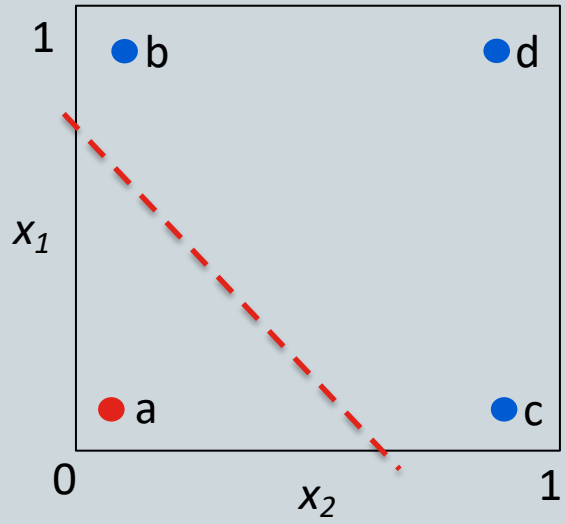
AND

	x_1	x_2	o
a	0	0	0
b	0	1	0
c	1	0	0
d	1	1	1



OR

	x_1	x_2	o
a	0	0	0
b	0	1	1
c	1	0	1
d	1	1	1



Thank you

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