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# 神经网络

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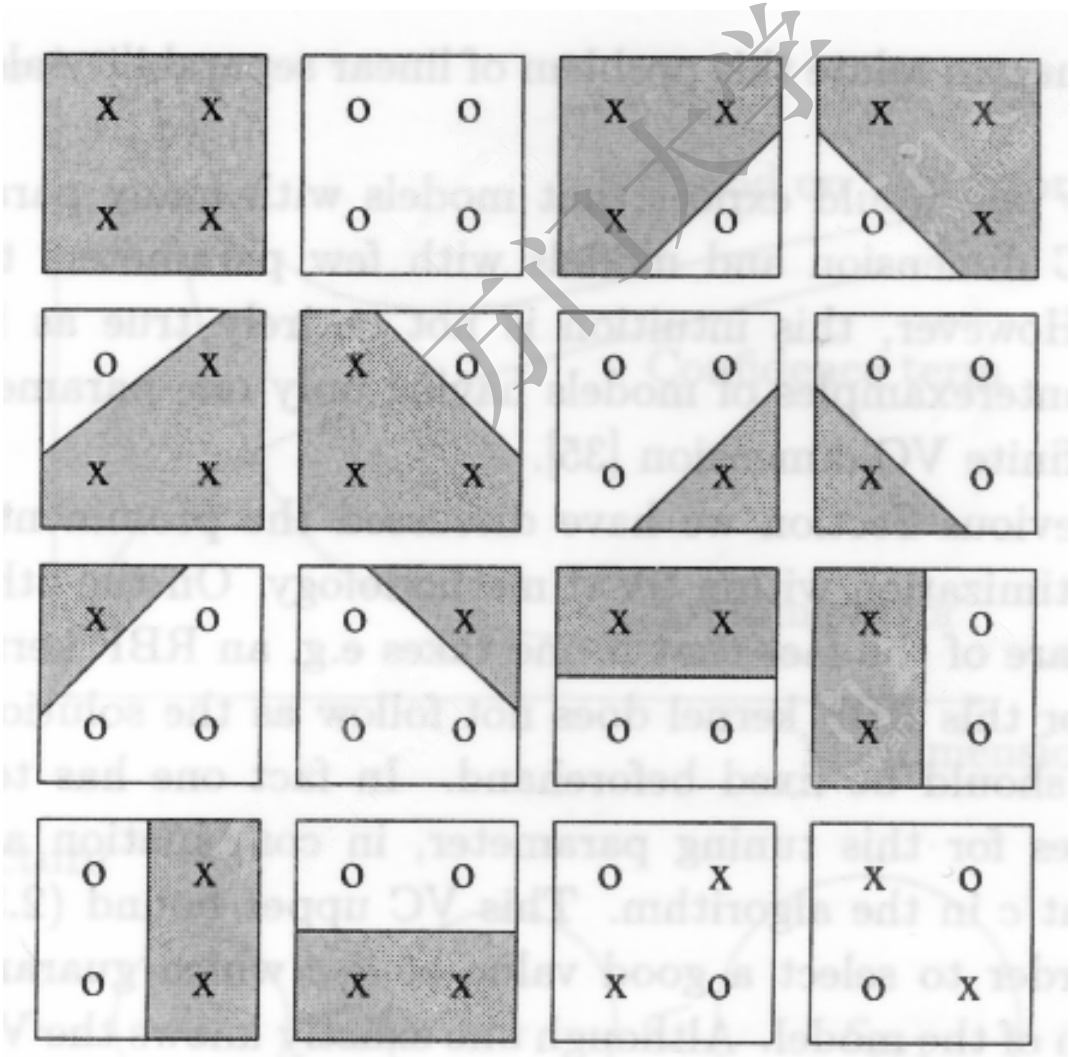
# 线性分类器极限



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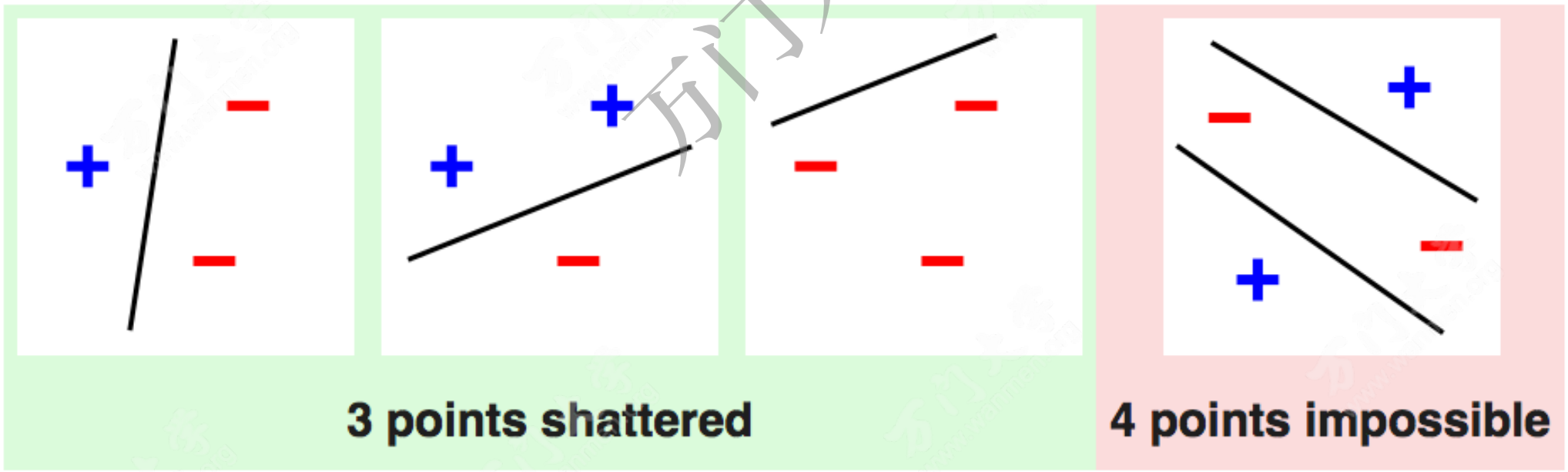
# VC维概念： 模型太简单-现实太复杂

可怜的线性分类器



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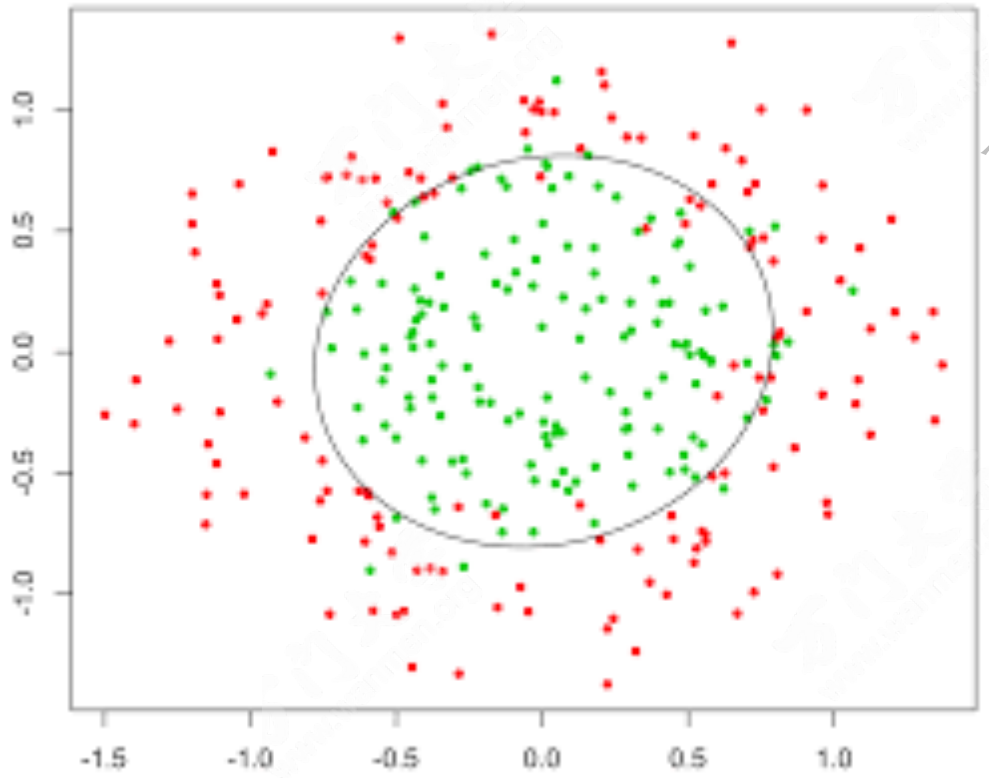
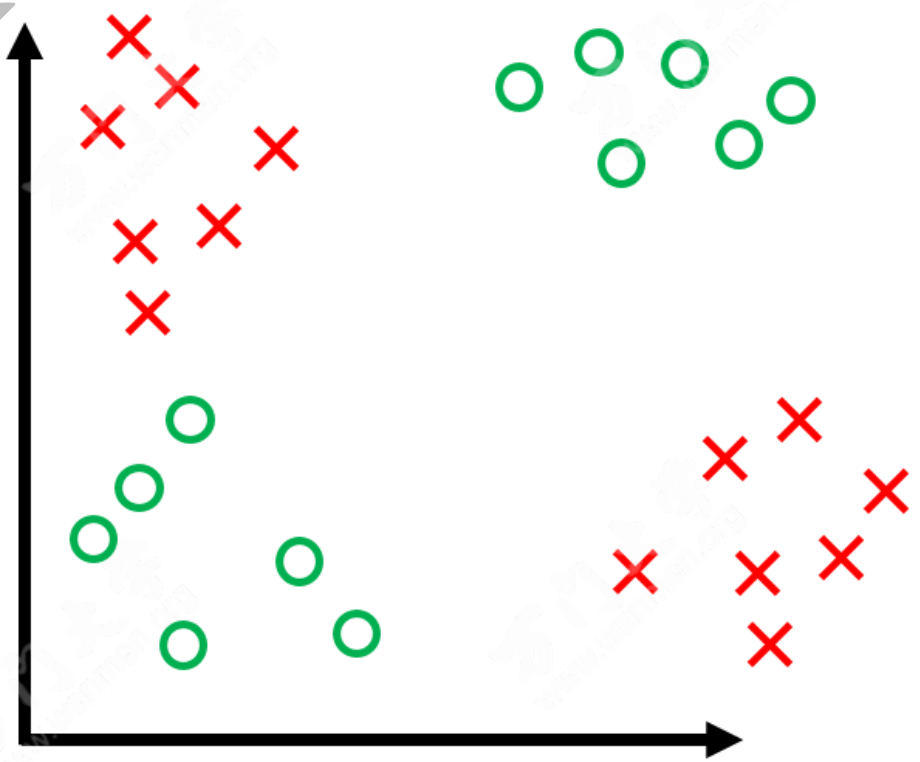
# 非线性突围



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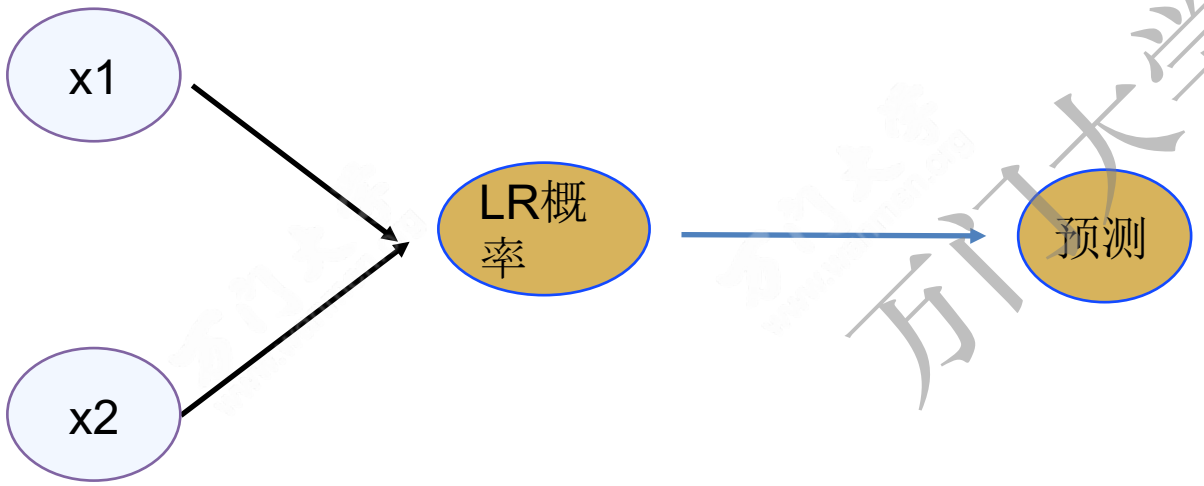
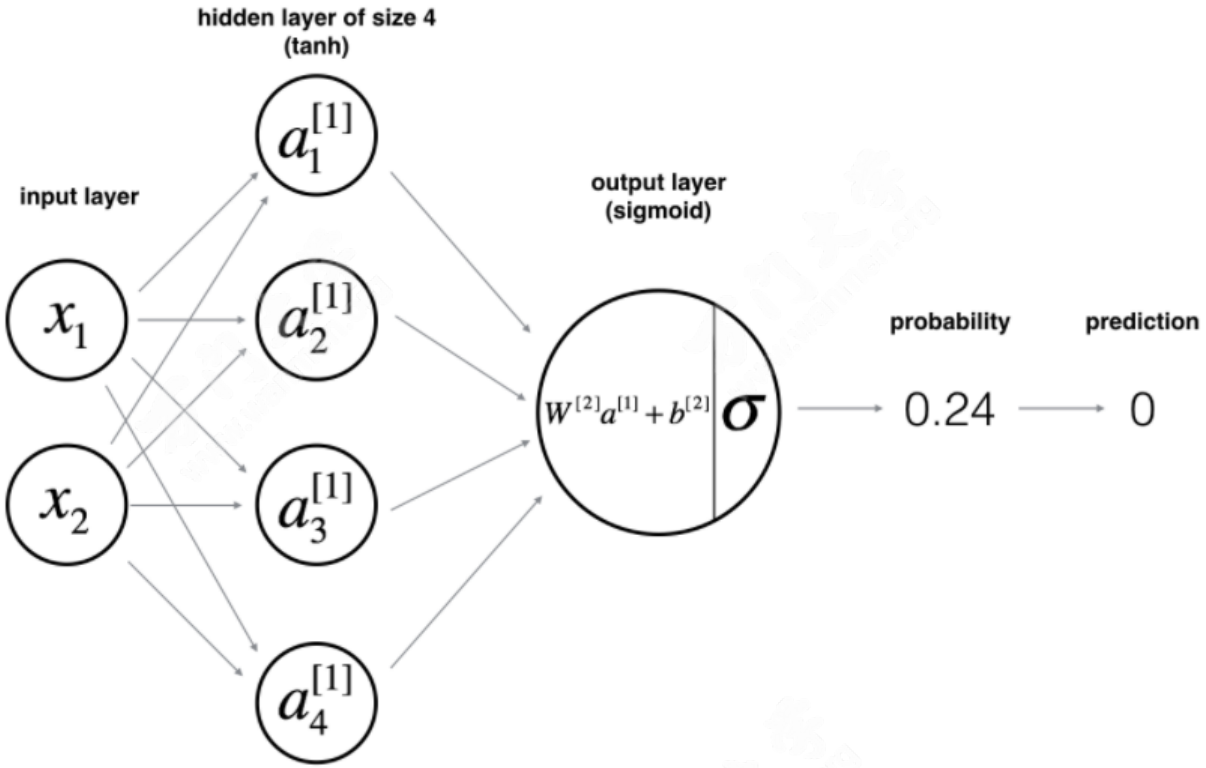
# 从逻辑斯蒂回归到神经网络



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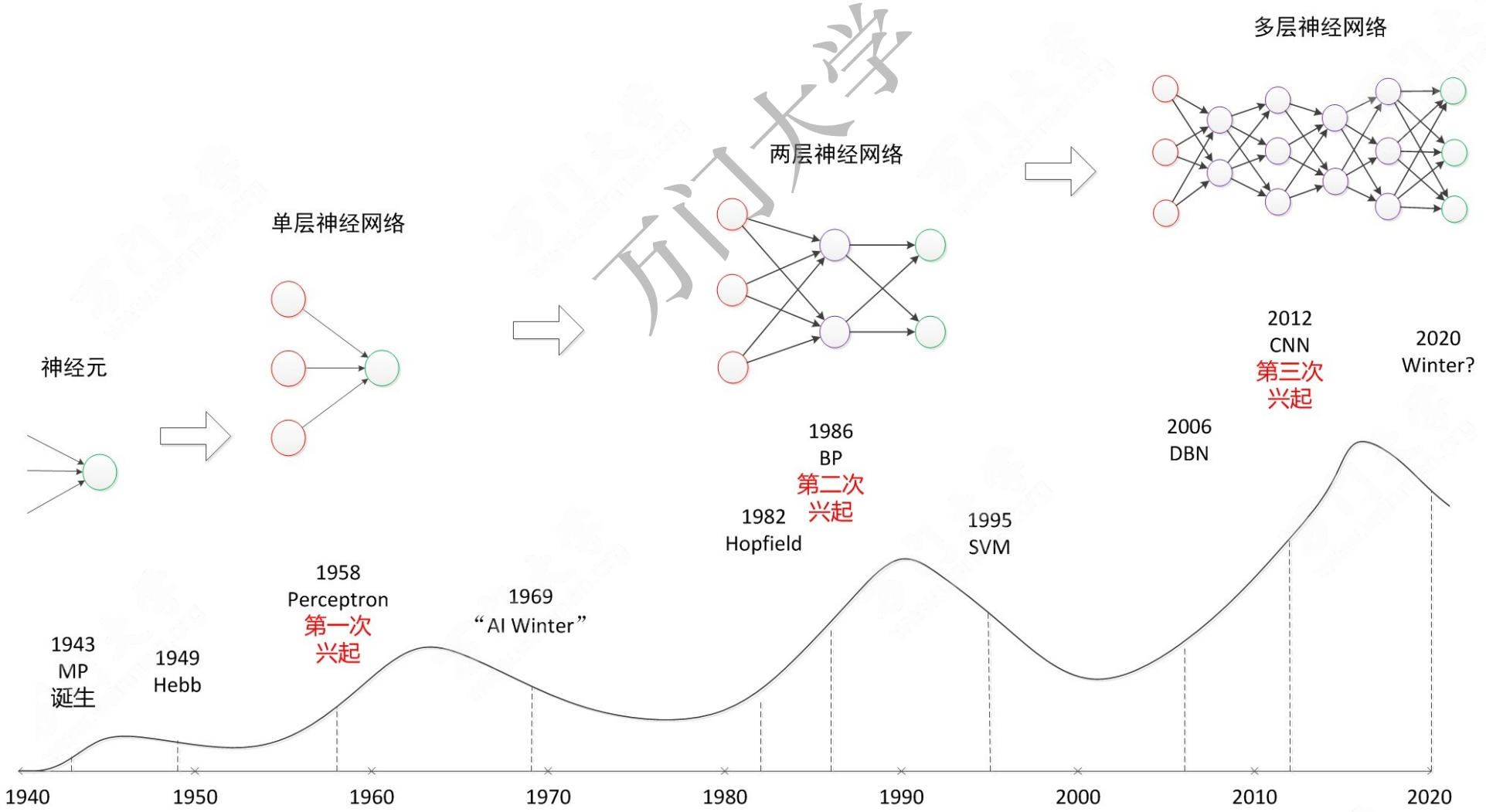
# 神经网络革命



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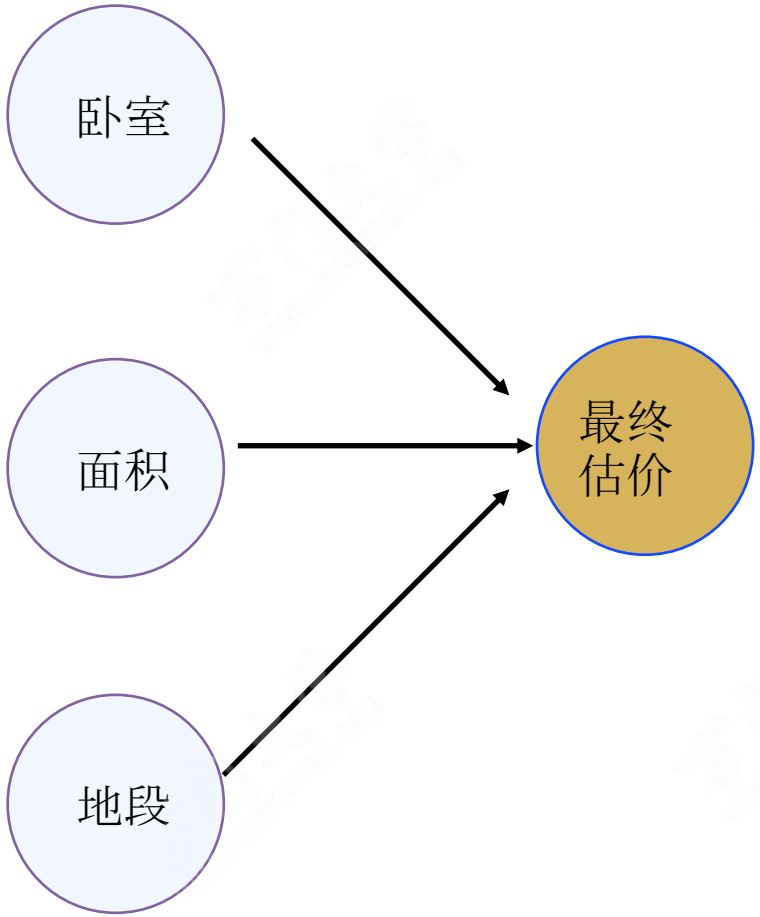
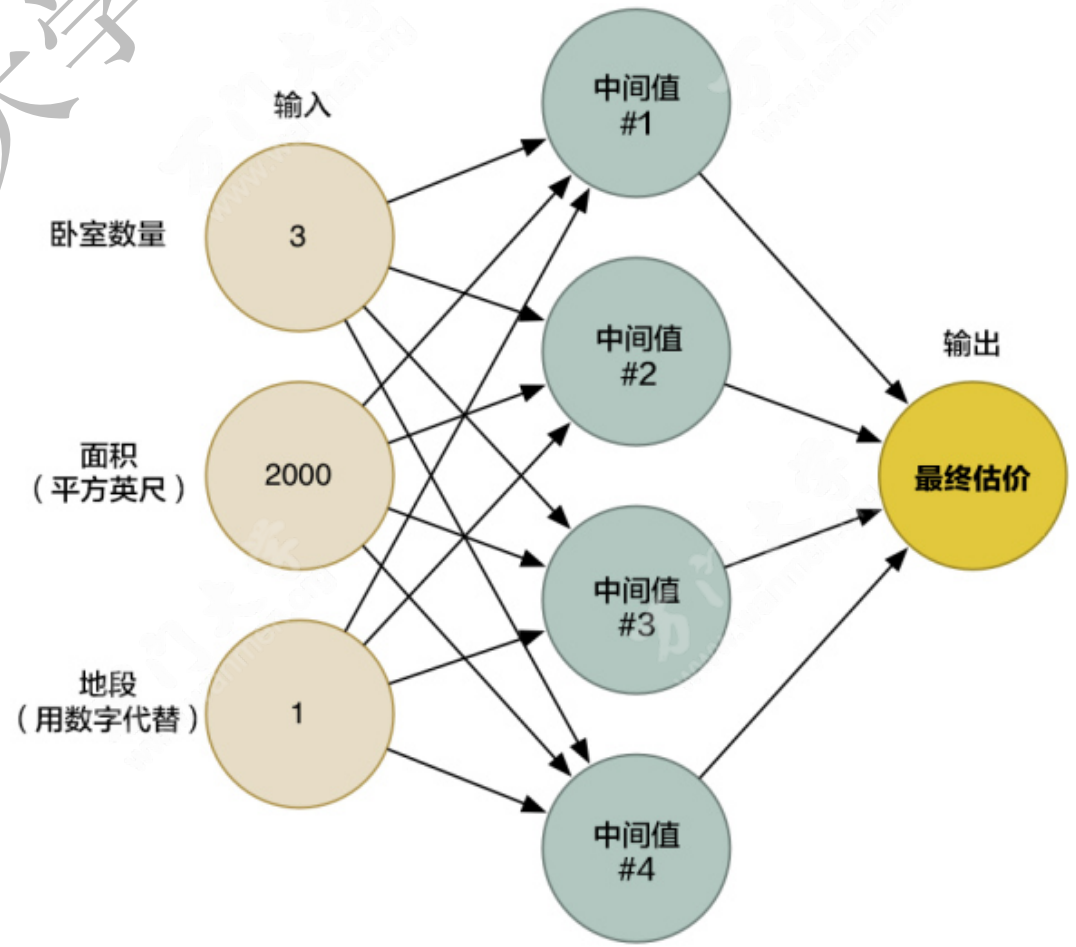
# 神经网络解回归




单打独斗

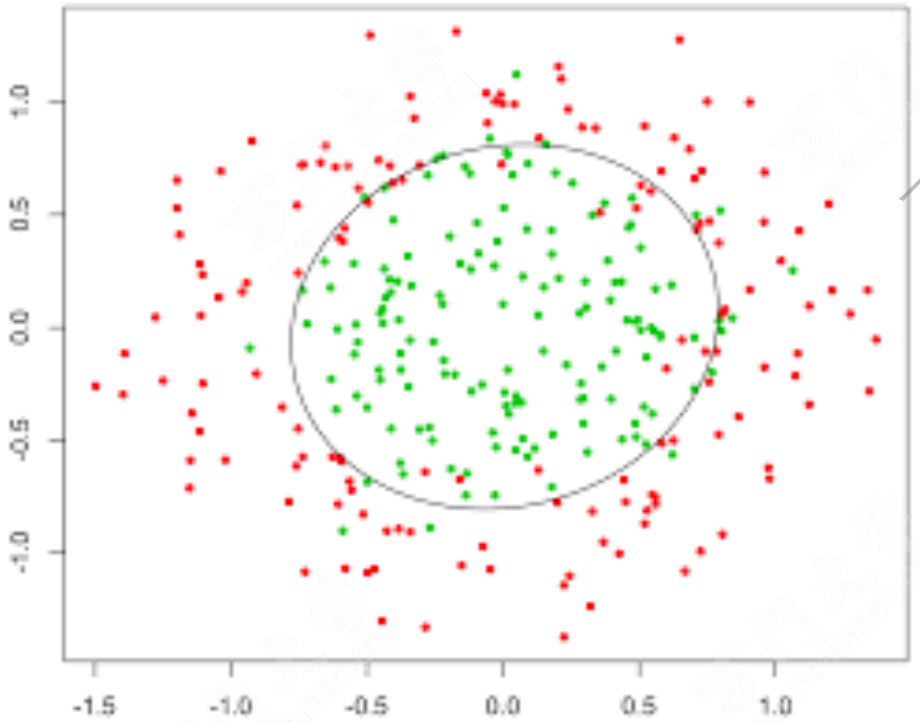


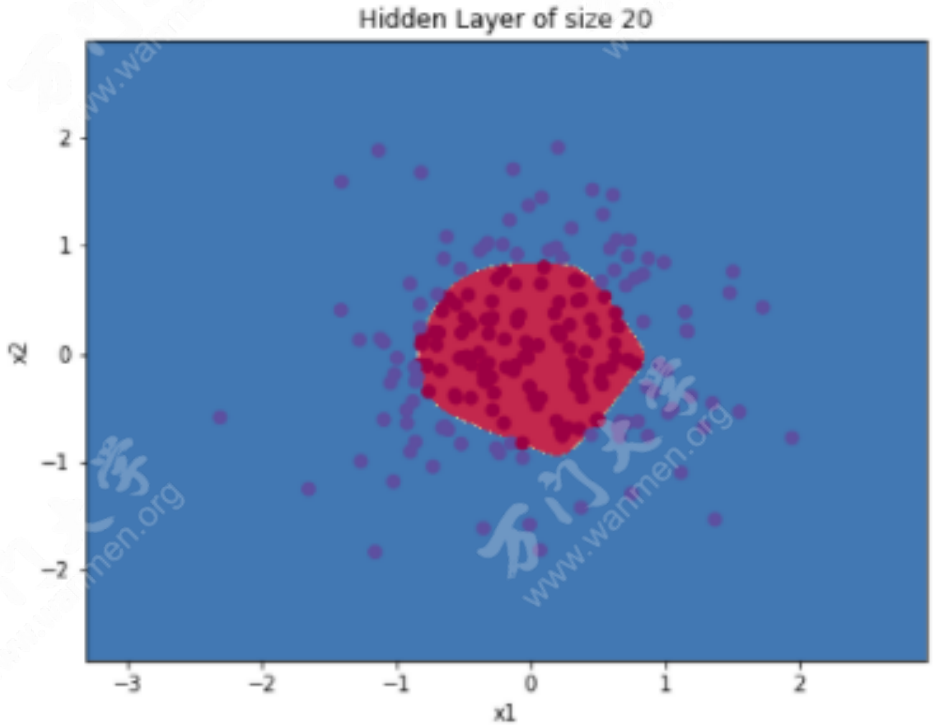

陪审团

# How it works:

## 神经网络三要素

## 讲个故事给你听



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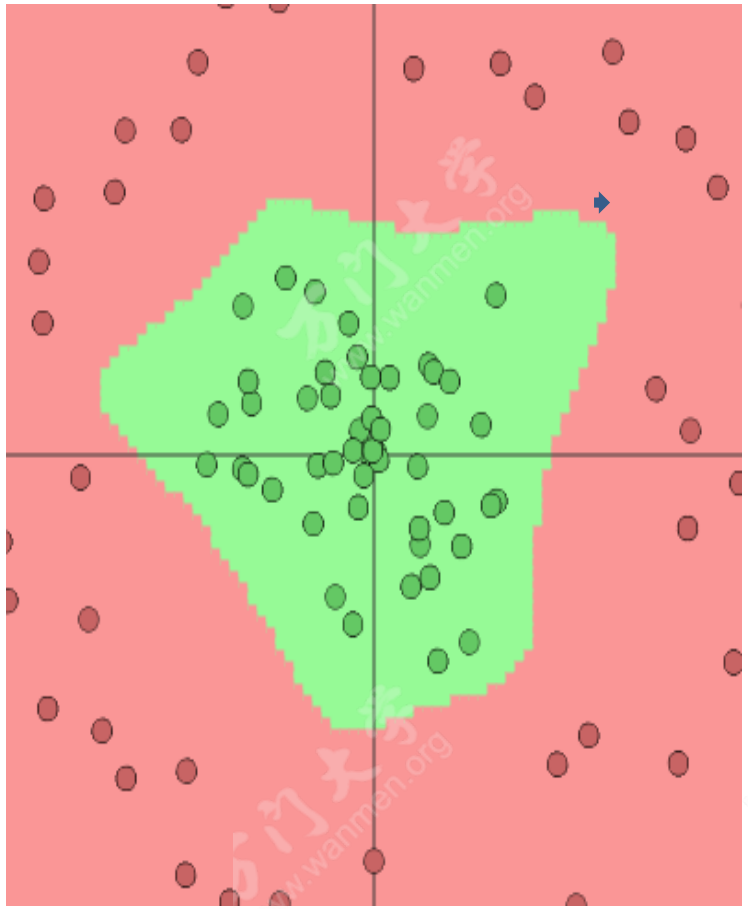
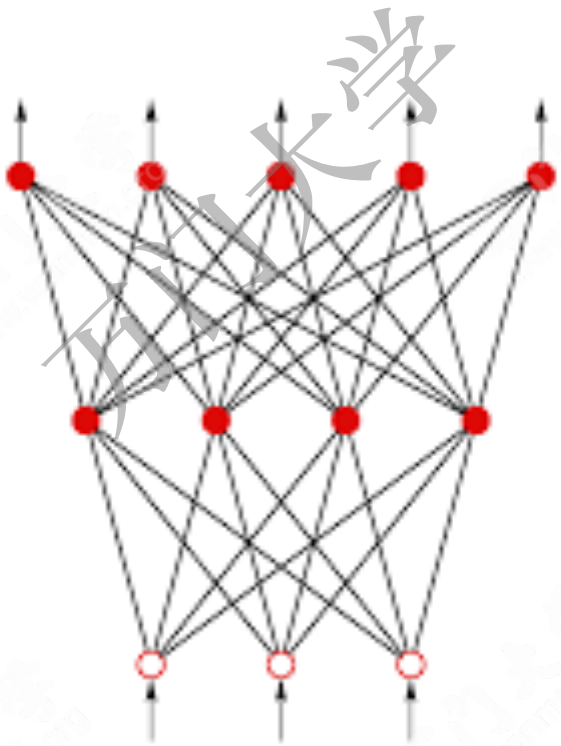
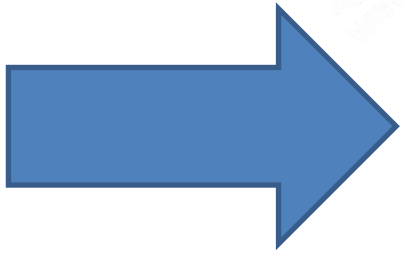
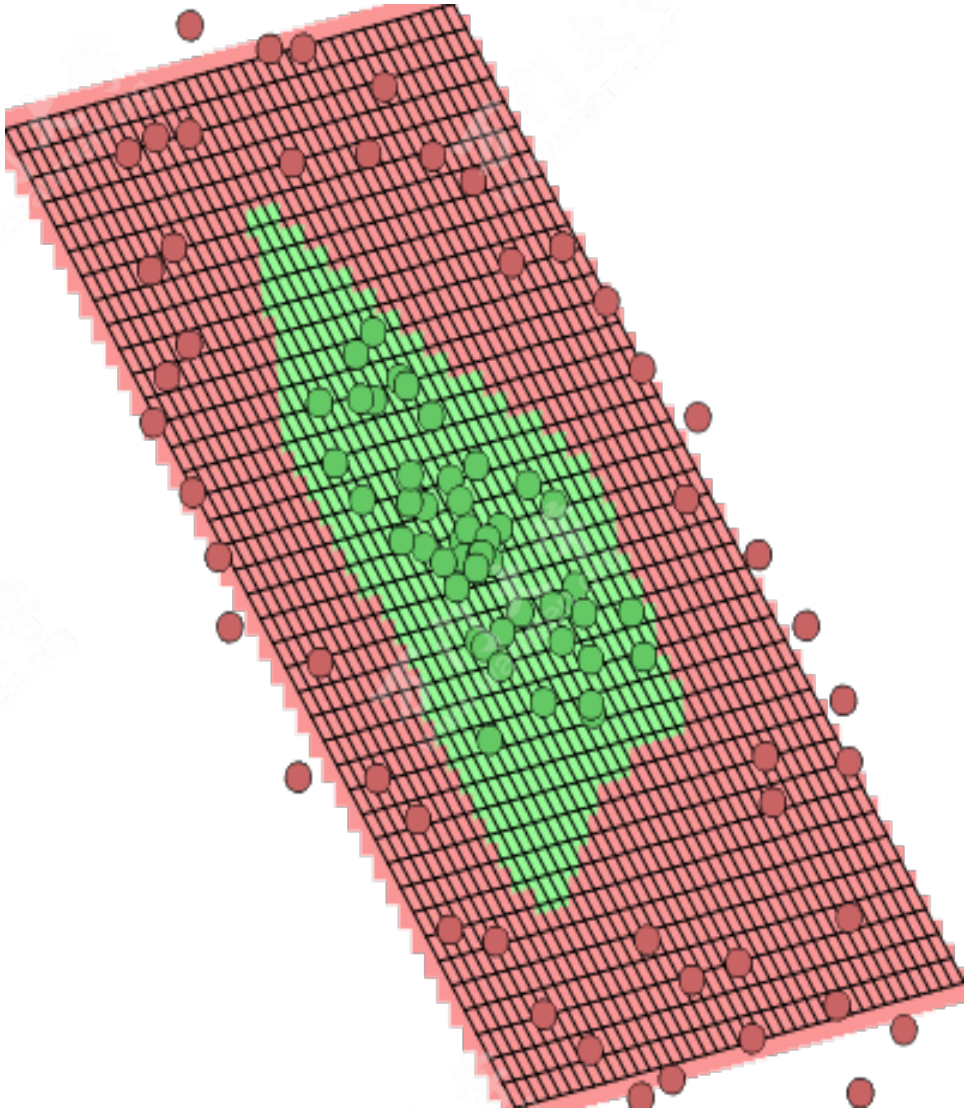
# I权重矩阵W –空间投影，缩放和旋转









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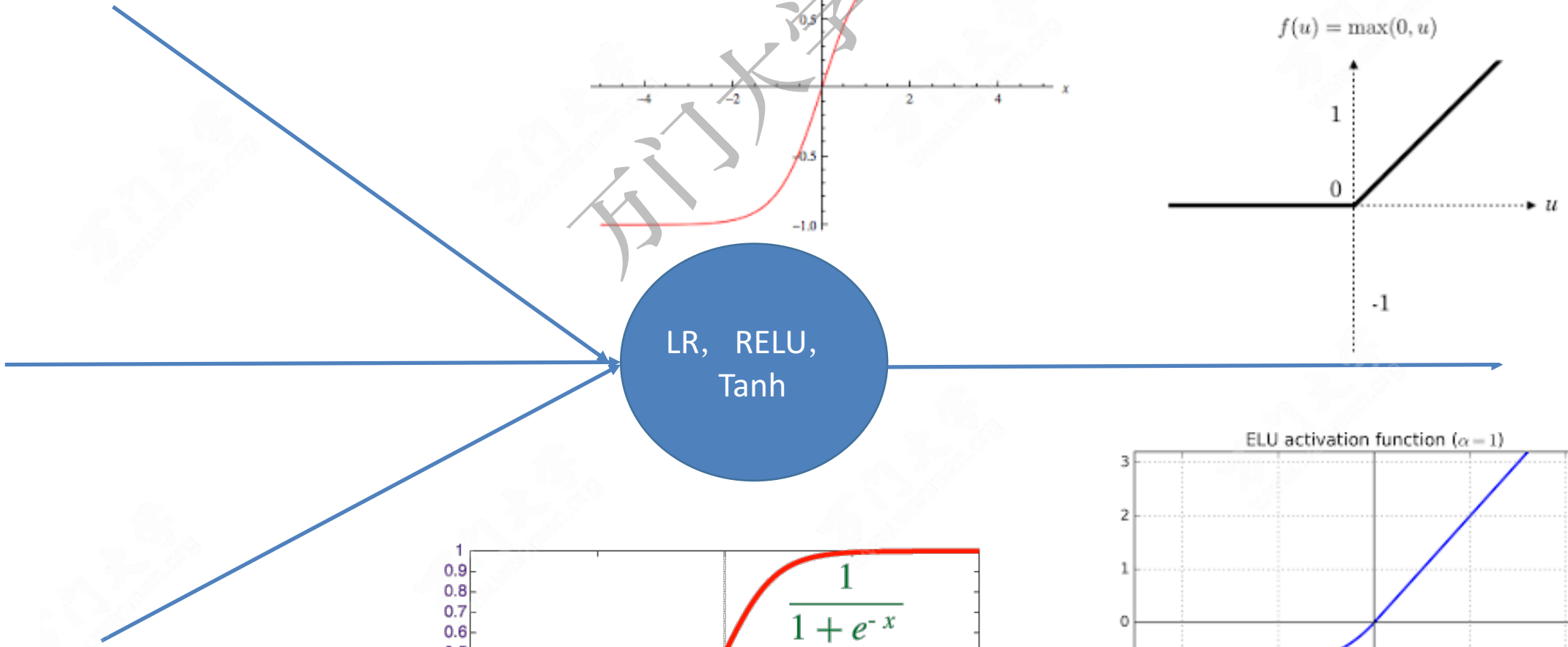
# II. 隐层激活函数-非线性



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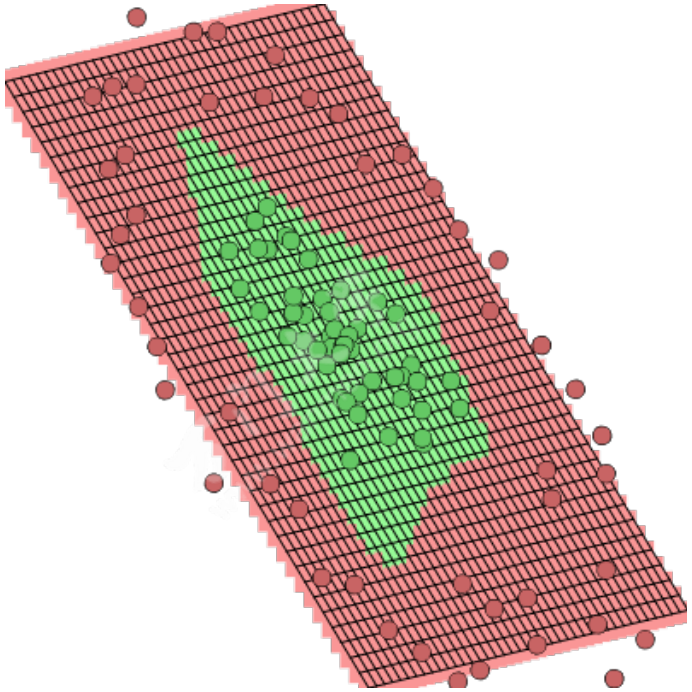
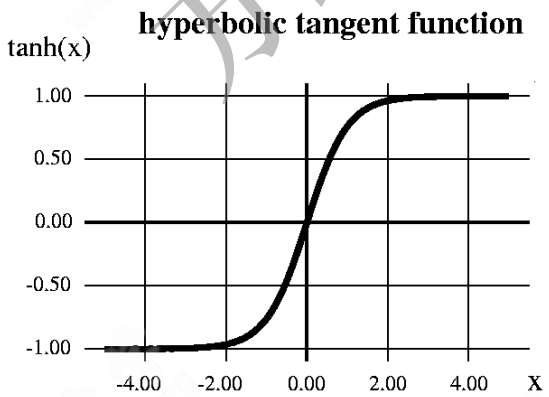
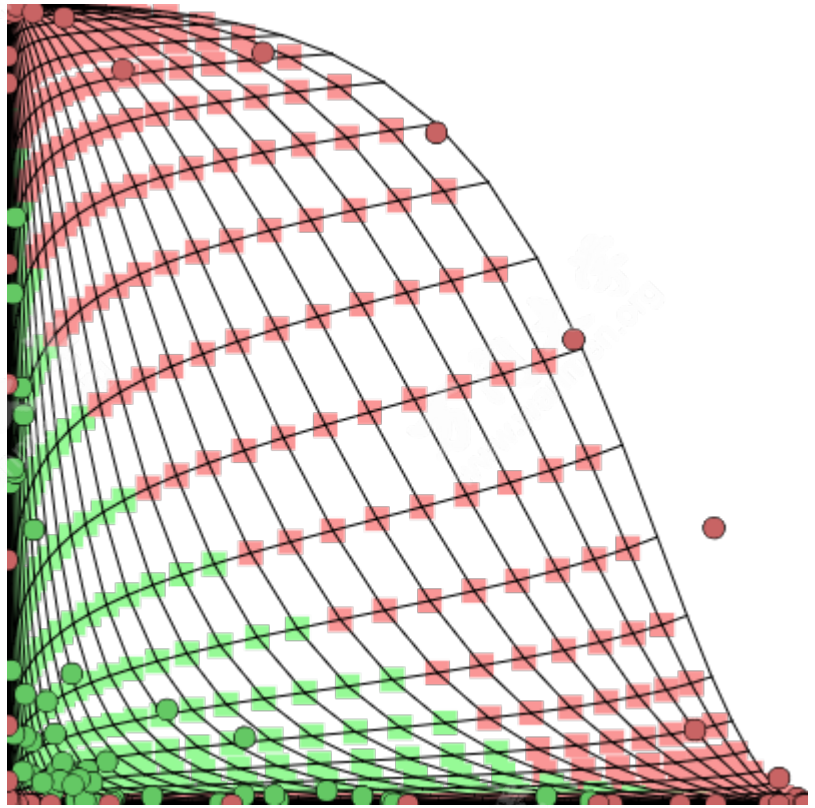
# 非线性的作用 – 信息升维





http://playground.tensorflow.org/

# QUIZ1

如果隐层神经元是线性的， 神经网络（假设两层）有意义吗？

A . 有，能够表达比线性模型更多的特征组合

B . 没有，等价于线性模型

C . 有，等价于PCA

D. 有， 但是只是相当于矩阵分解简化了运算

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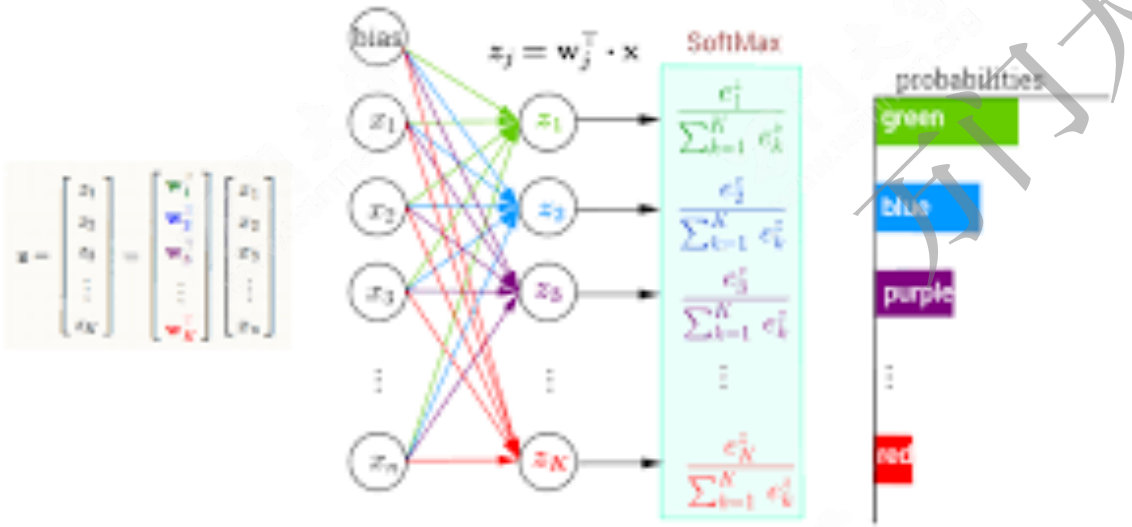
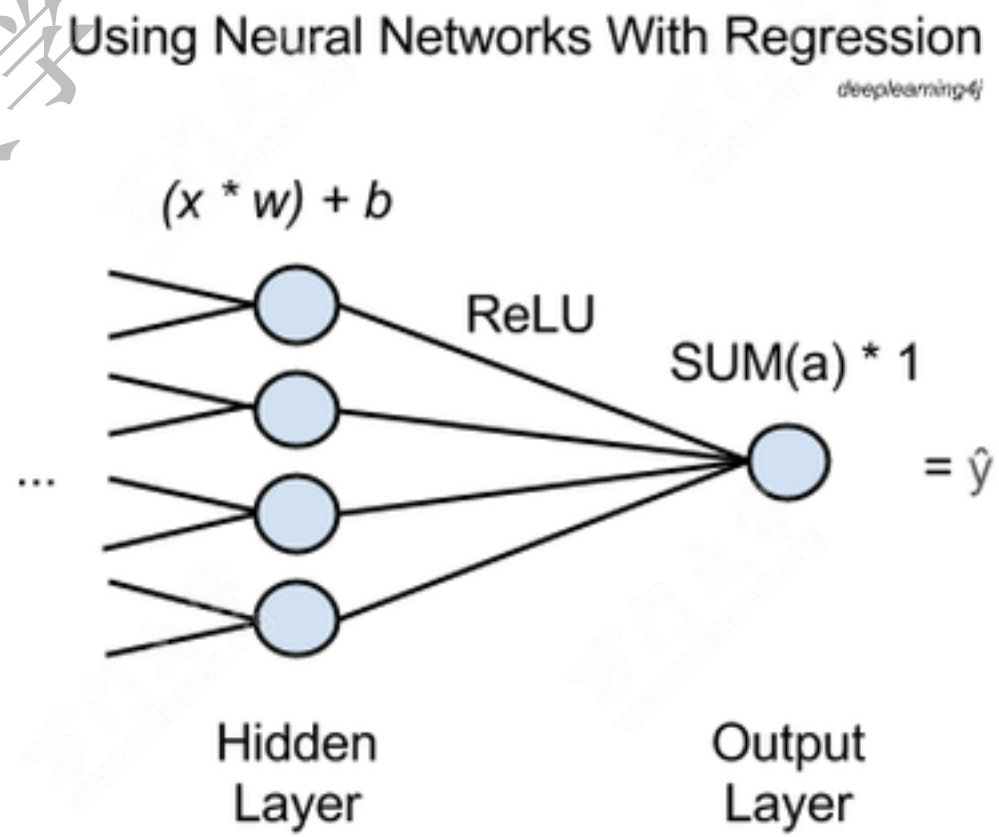
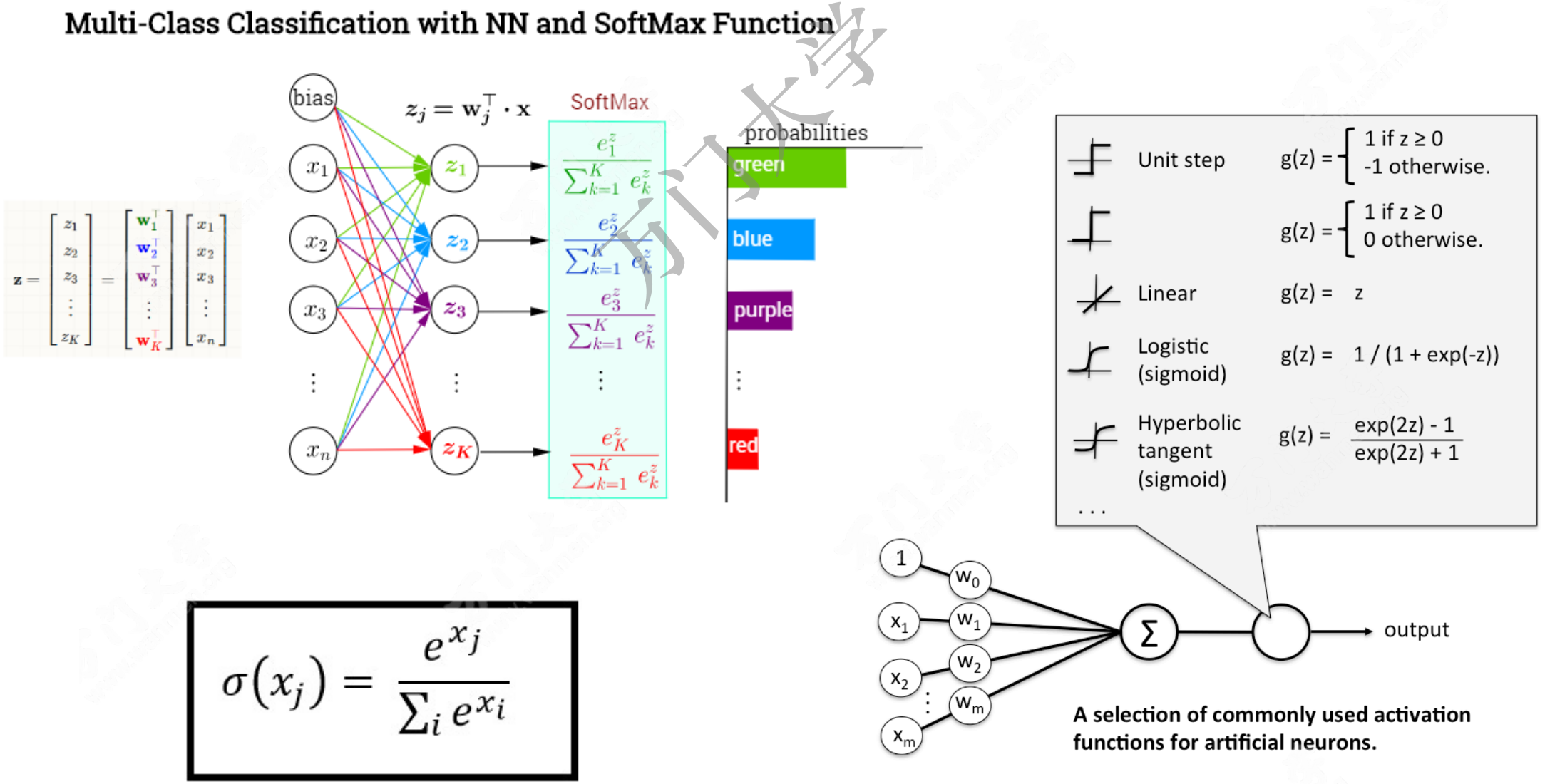
# III 决策层 - 常见cost function




+SVM……

# 决策层 - 输出




$$\sigma(x_j) = \frac{e^{x_j}}{\sum_i e^{x_i}}$$

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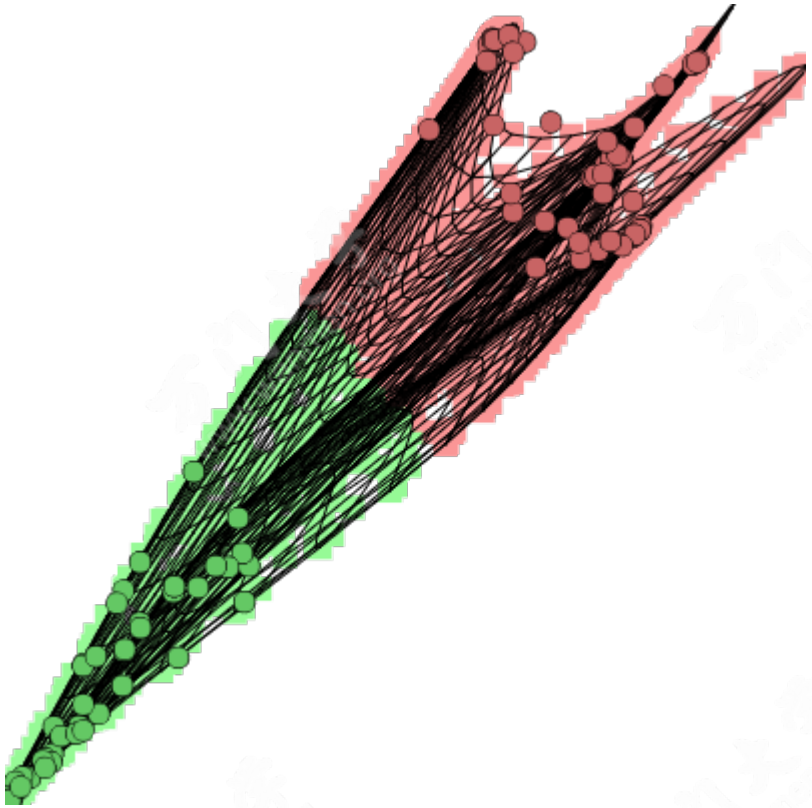
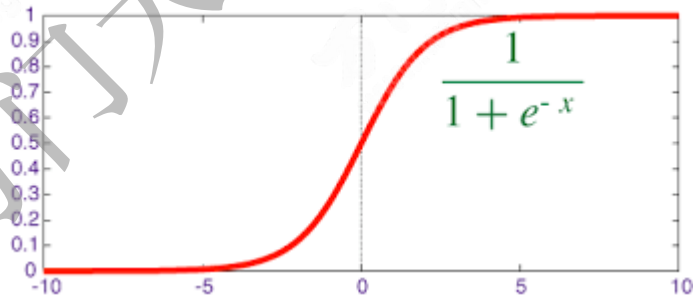
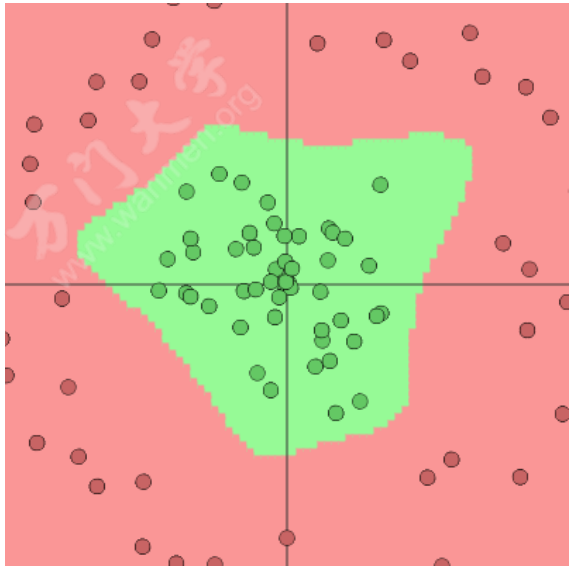
# 决策层的作用： 线性分类器or回归





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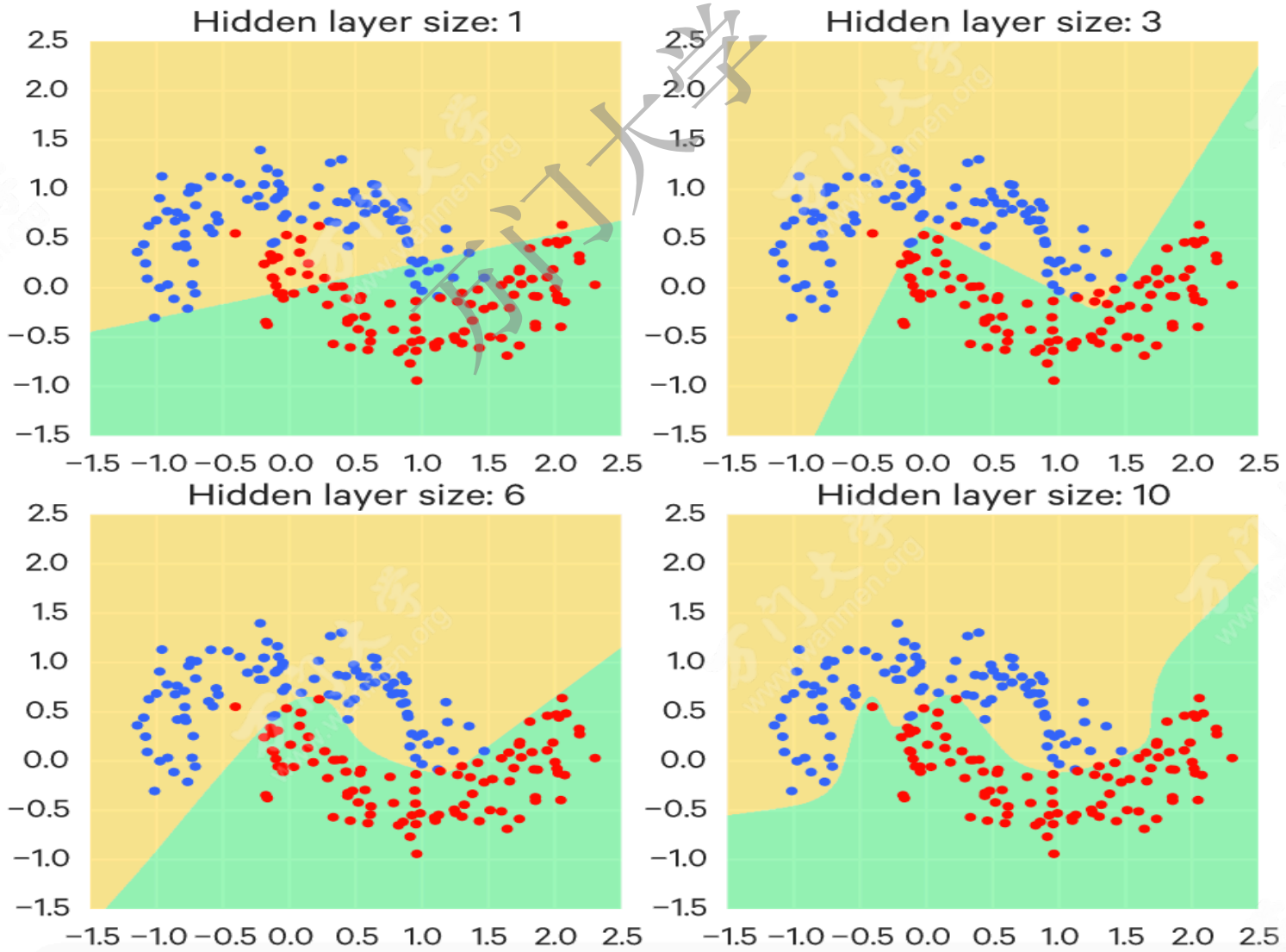
# 如果边界更复杂



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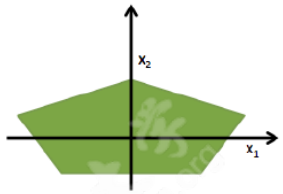
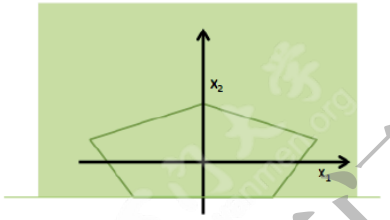
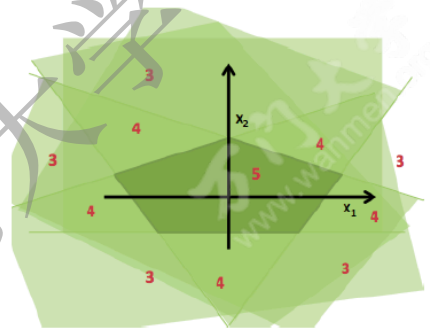
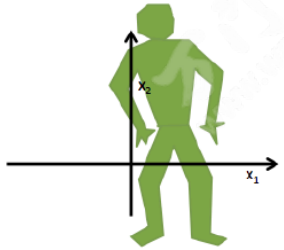
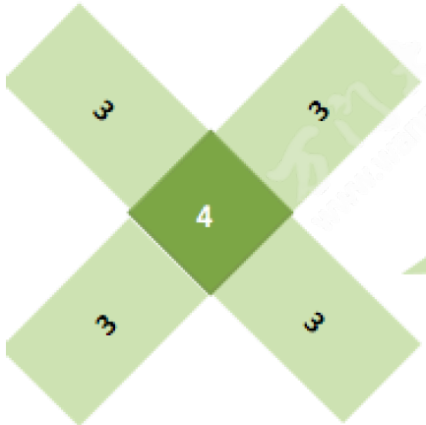
# 再加一层

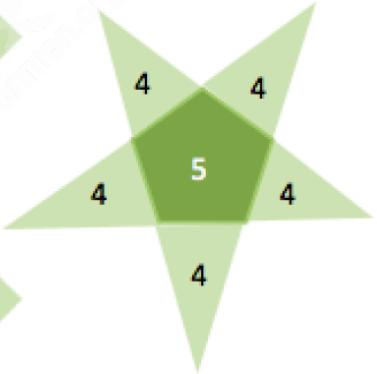


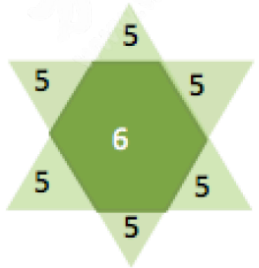



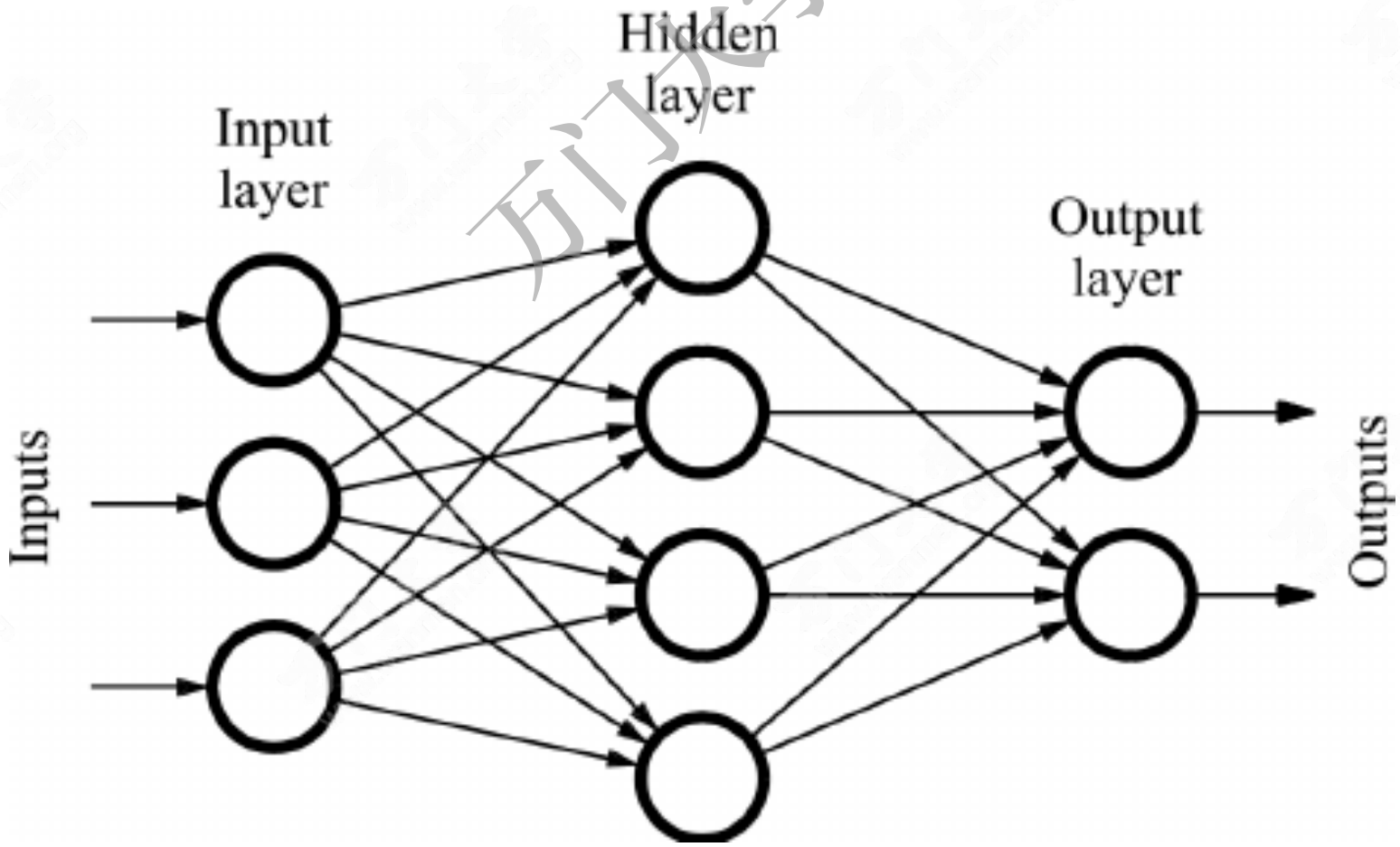




# 由浅入深 DNN



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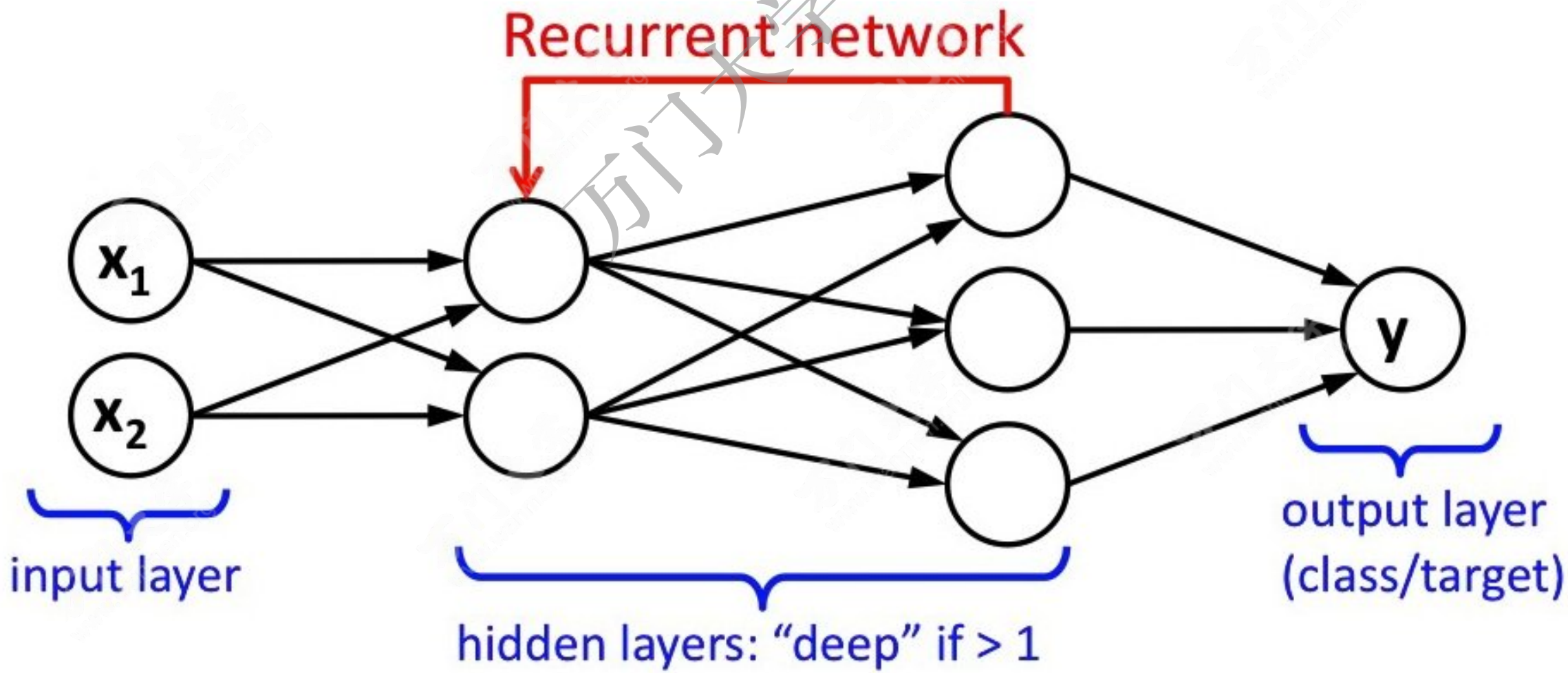
# Recurrent Neural Network



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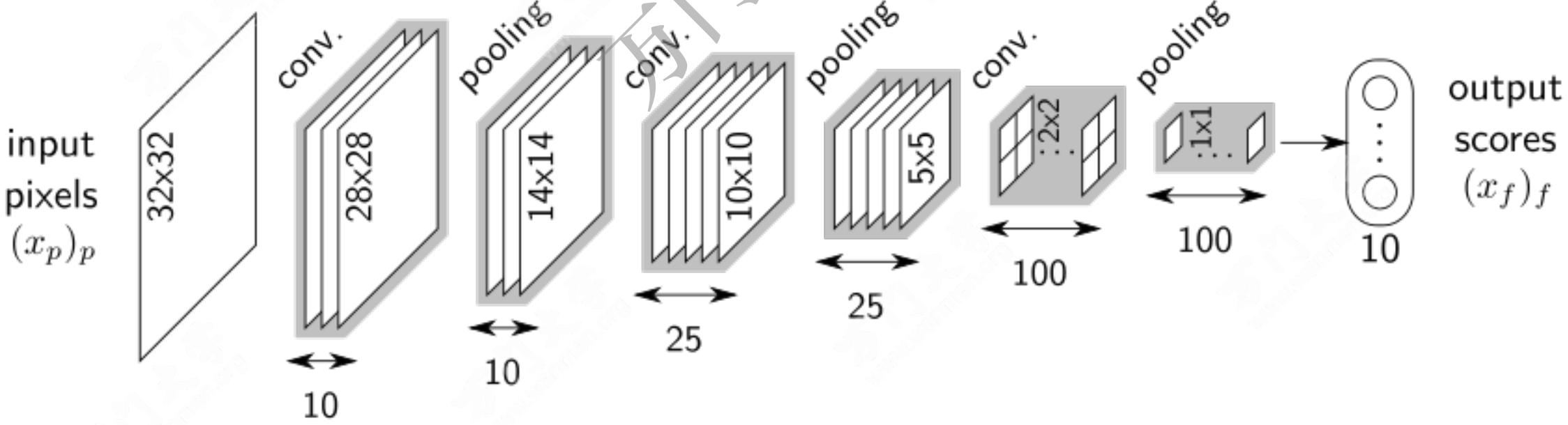
# CNN


input
pixels
$(x_p)_p$
32x32
conv.
28x28
10
pooling
14x14
10
conv.
10x10
25
pooling
5x5
25
conv.
2x2
100
pooling
1x1
100
10
output
scores
$(x_f)_f$