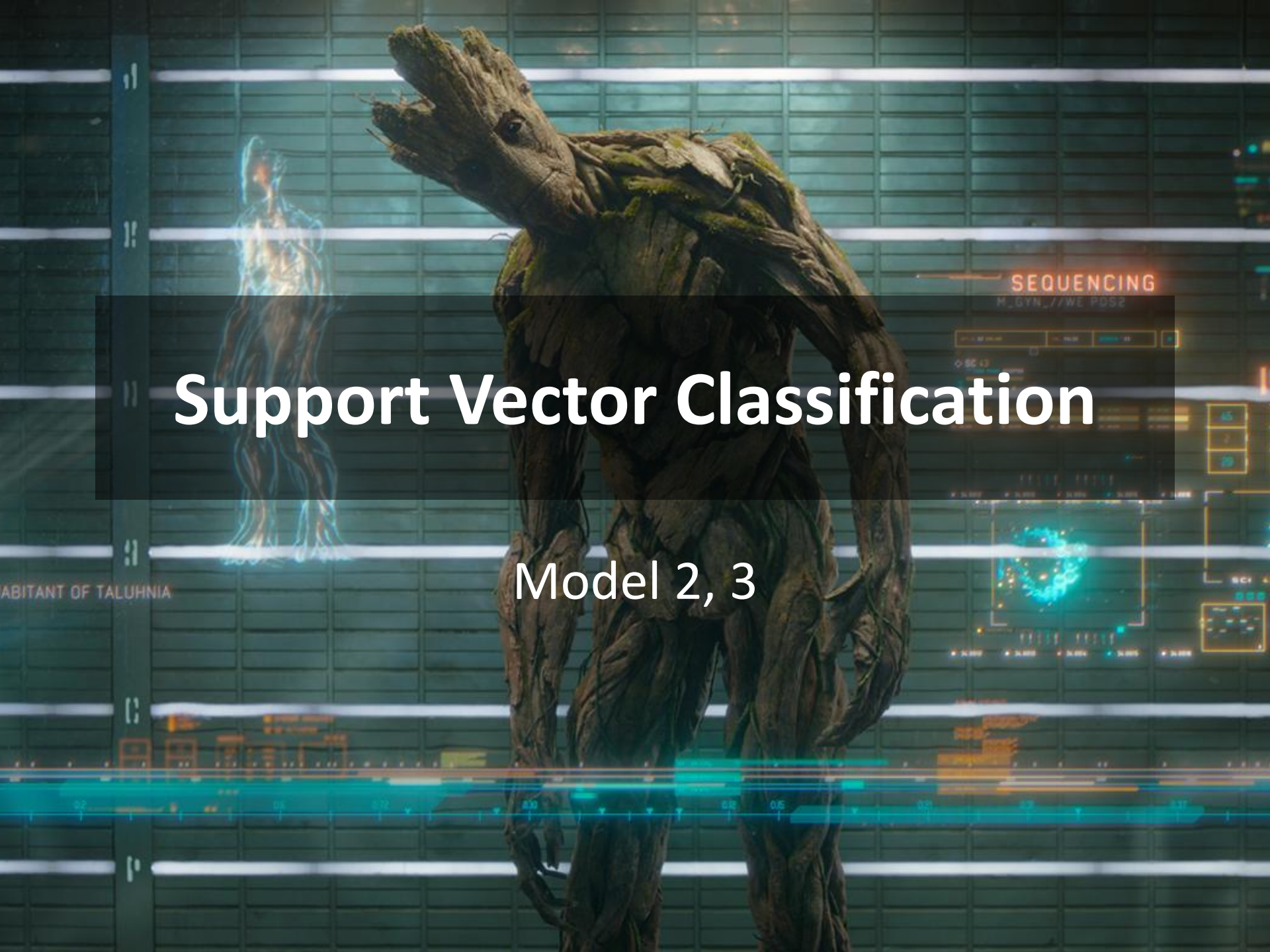# Support Vector Classification
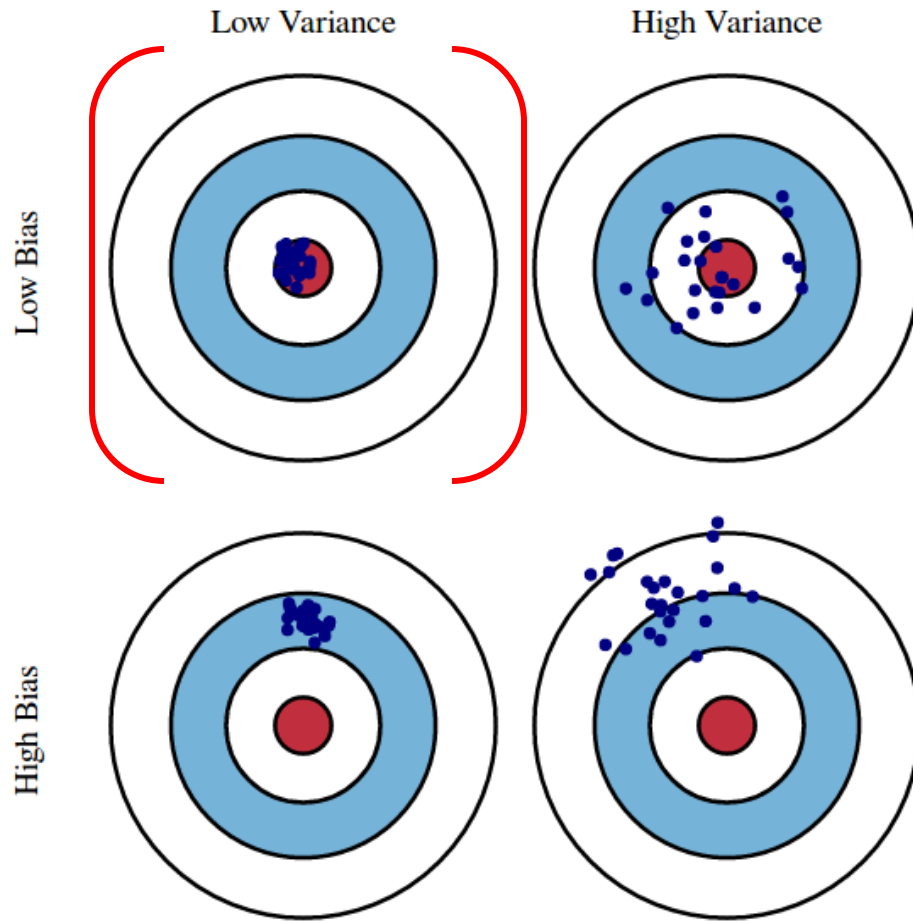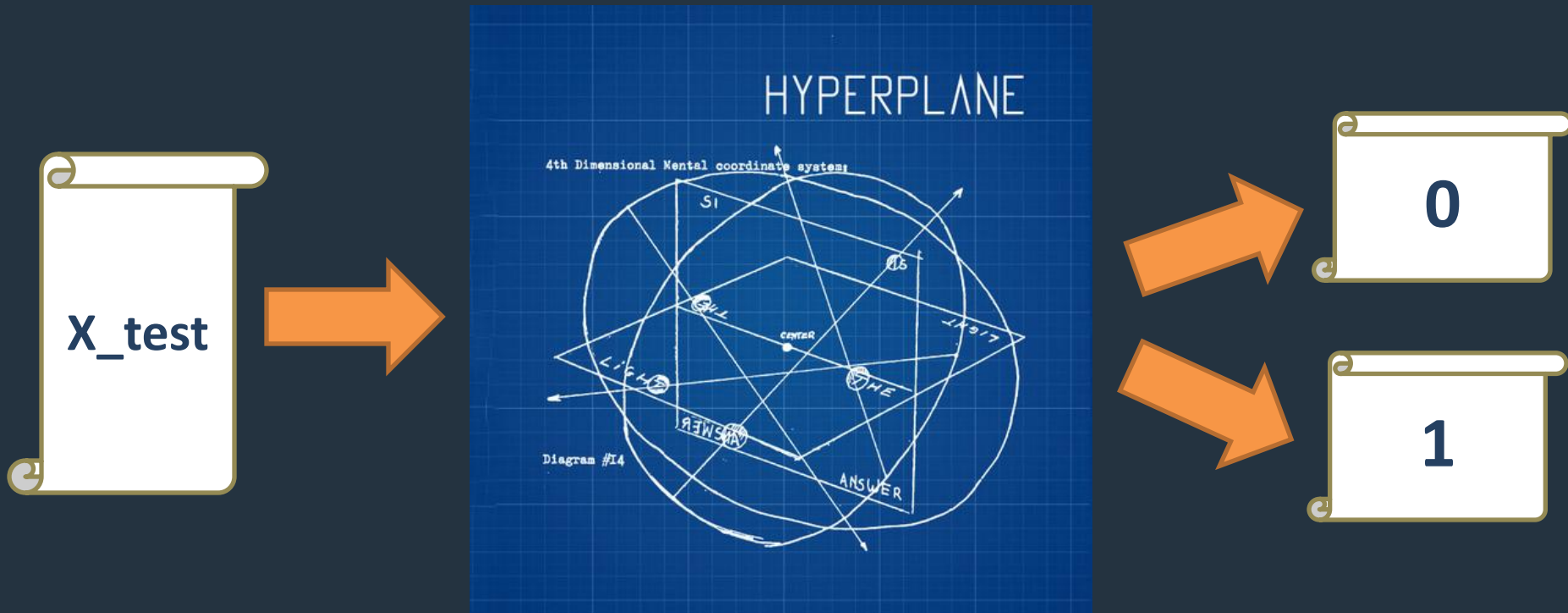
Model 2, 3

WHAT DO WE WANT?

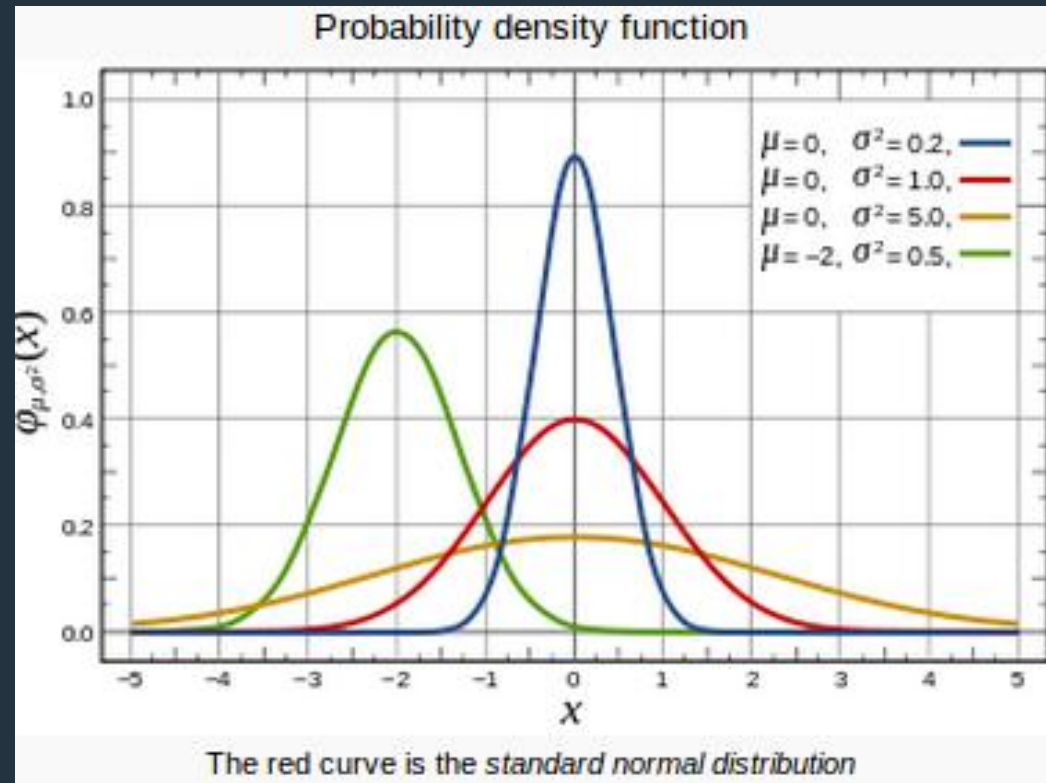Fig. 1 Graphical illustration of bias and variance.

sklearn.svm.SVC

- Support Vector Classifier (aka SVC)
  - Fit the data, returning a "best fit" hyperplane that divides/categorizes, the data.
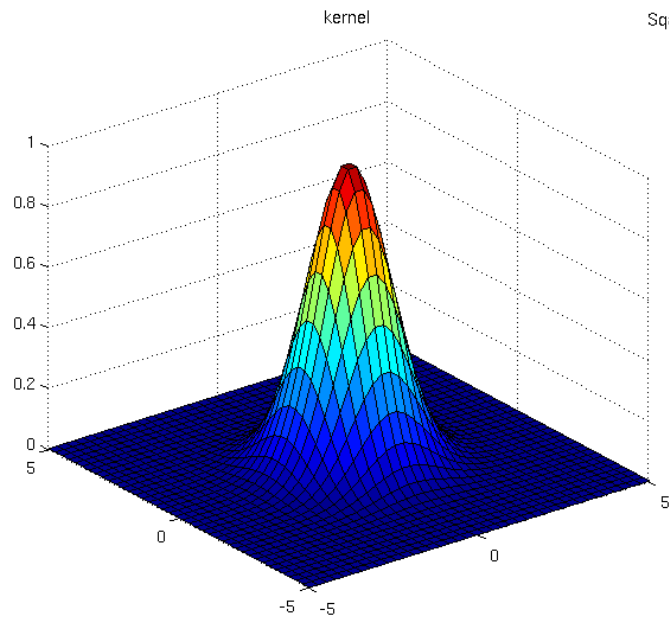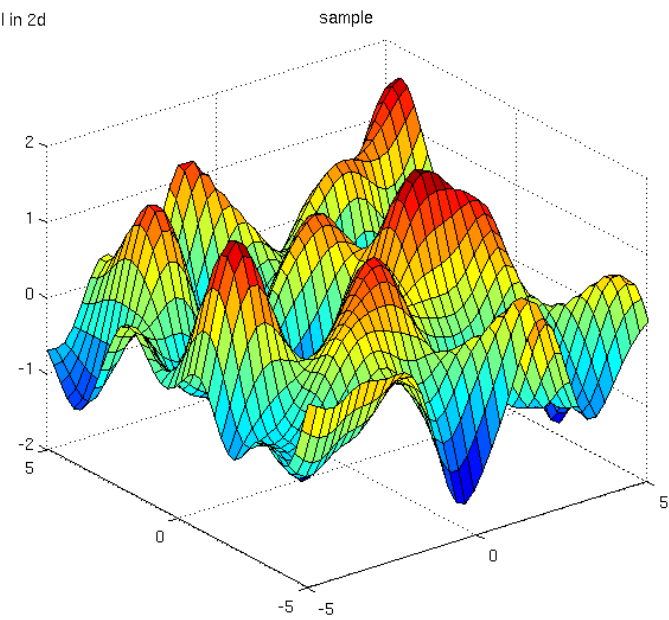
sklearn.svm.SVC

- Radial basis function as the kernel
  - Gaussian kernel (aka bell-curve)
  - No-man's land between different classes is created with a Gaussian function
  - Less tunable
  - Basically, linear interpolation

Probability density function

$\mu = 0, \quad \sigma^2 = 0.2,$
$\mu = 0, \quad \sigma^2 = 1.0,$
$\mu = 0, \quad \sigma^2 = 5.0,$
$\mu = -2, \quad \sigma^2 = 0.5,$

The red curve is the *standard normal distribution*

sklearn.svm.SVC

kernel   Sqaured-exp kernel in 2d   sample

sklearn.svm.SVC

- Multi-Class Classification
  - One-Against-One
    - n_class = # of classes ➔ n_class * (n_class-1)/2 classifiers
    - Each classifier trains data from two classes

sklearn.svm.LinearSVC

- Linear kernel

$$a=b1+b2 \cdot X + b3 \cdot X2 + b4 \cdot X3$$

- Scales better to large numbers of samples

- Supports dense and sparse input

sklearn.svm.LinearSVC

- Multi-Class Classification
  - One-Vs-the-Rest
    - One classifier/class
    - For each classifier, class is fitted against all other classes
    - n_classes classifiers