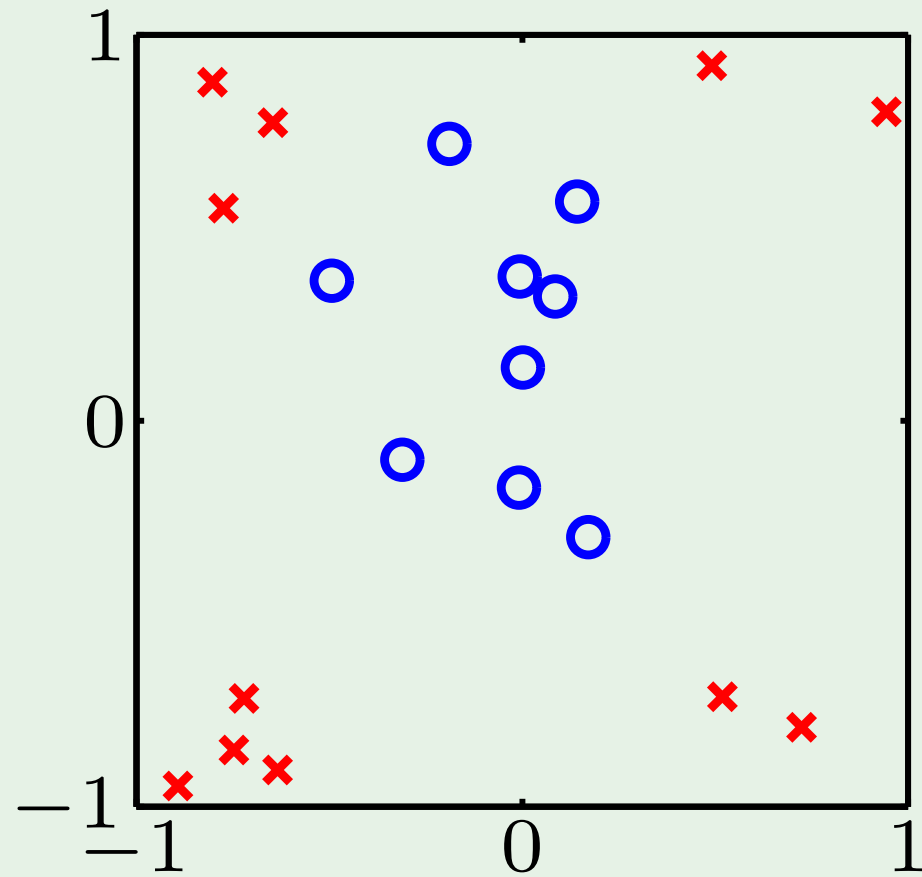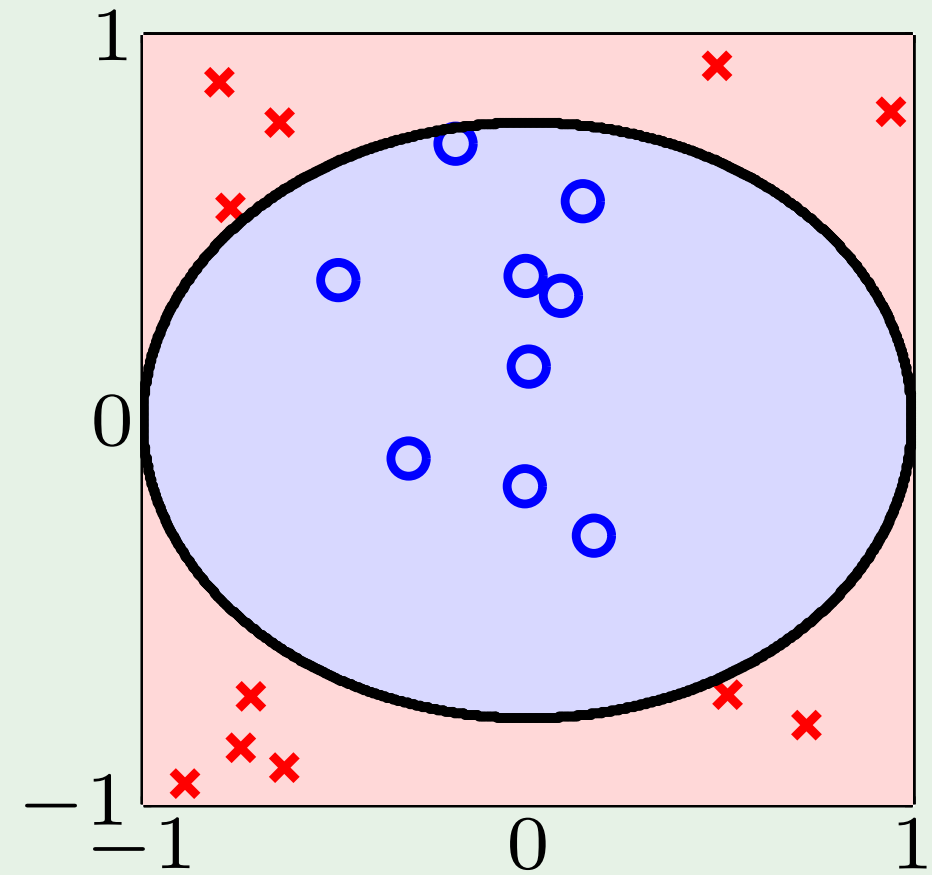# Outline

- Input representation

- Linear Classification

- Linear Regression

- **Nonlinear Transformation**

Linear is limited

Data:

Hypothesis:

Another example

Credit line is affected by 'years in residence'

but **not** in a linear way!

Nonlinear $[[x_i < 1]]$ and $[[x_i > 5]]$ are better.

Can we do that with linear models?

Linear in what?

Linear regression implements

$$\sum_{i=0}^{d} w_i \; x_i$$

Linear classification implements

$$\text{sign} \left(\sum_{i=0}^{d} w_i \; x_i \right)$$

Algorithms work because of **linearity in the weights**

Transform the data nonlinearly

$$(x_1, x_2) \xrightarrow{\ \Phi\ } (x_1^2, x_2^2)$$