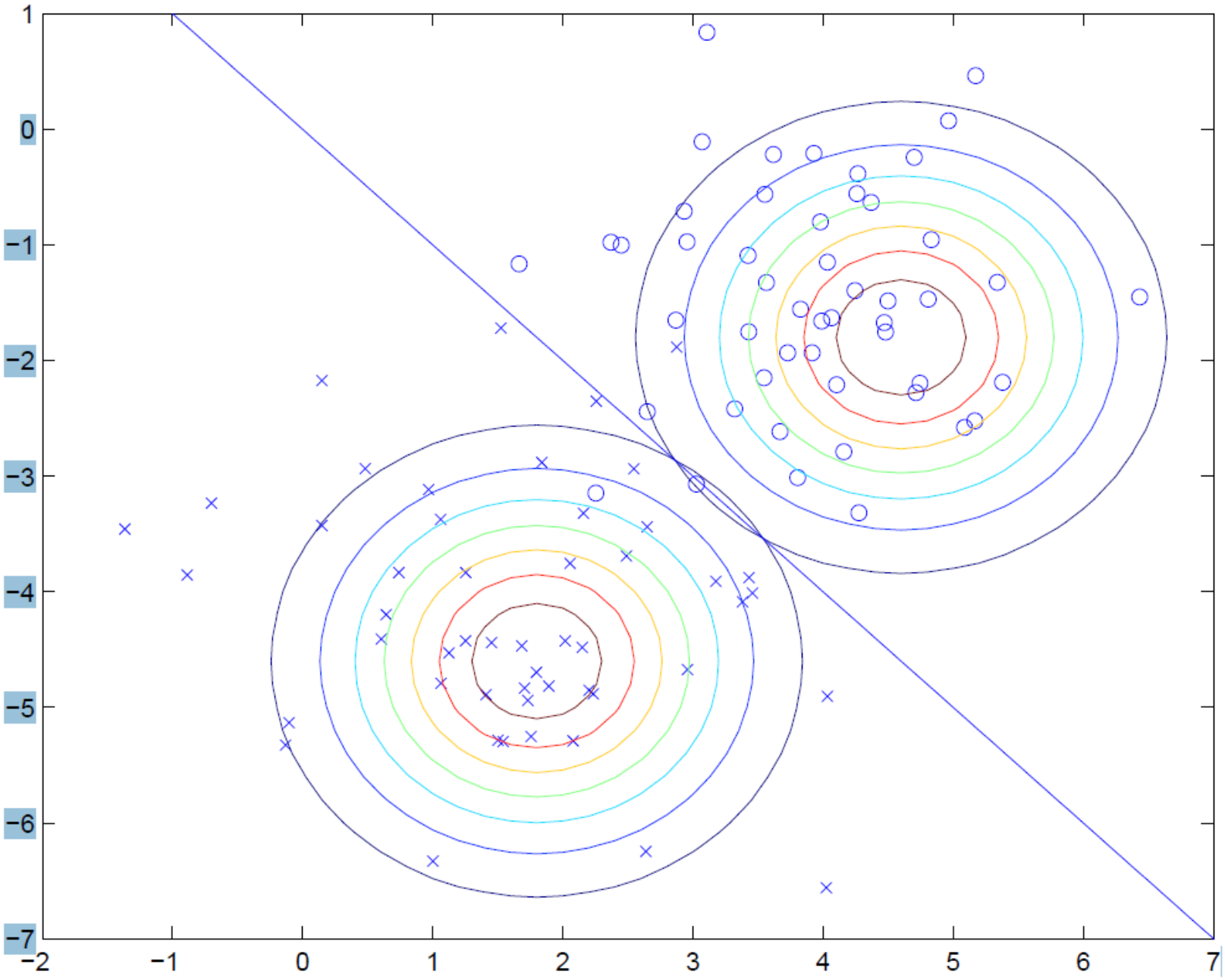
1
0
−1
−2
−3
−4
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−6
−7
−2
−1
0
1
2
3
4
5
6
7

4 Insight into Kernels

There are four basic kernels that are currently in use. The linear kernel in which K is just the identity matrix and the result is just the regular inner product. As a summary, the four most common kernels with parameters γ, r, and d are given as

- Linear Kernel: $K(x, z) = x^T z$
- Polynomial Kernel: $K(x, z) = (\gamma x^T z + r)^d, \gamma > 0$
- Radial Basis Function Kernel: $K(x, z) = \exp(-\gamma ||x - z||^2), \gamma > 0$
- Sigmoid: $K(x, z) = \tanh(\gamma x^T z + r)$

The Gaussian Kernel is a special case of the Radial Basis Function (RBF) kernel. The Gaussian Kernel is given as

$$K(x, z) = \exp\left(\frac{-||x - z||^2}{2\sigma^2}\right)$$

SVM Characteristics

- Maximizes Margins between Classifications
- Formulated as Convex Optimization Problem
- Parameter Selection for Kernel Function
  - Use Cross Validation
- Can be extended to multiclass
- Multi-valued categorical attributes can be coded by introducing binary variable for each attribute value (single, married, divorced)