Lecture 13 Outline:

1. Non-linear Classification.
2. SVMs and the Kernel Trick.
   - Dual problem - replace $x_i^T x_j$ with $k(x_i, x_j)$.
   - Kernel, $k(x_i, x_j)$, acts as a non-linear inner product.
4. Take Home Message:
   - Construct proper kernels and don’t worry about the math.
   - Replace inner products with kernels in ANY statistical learning problem.
5. Strengths and weaknesses of kernel methods.
   - Perform poorly when many features are irrelevant.
6. Statistical Learning Process:
   (a) What is my goal?
   (b) Which model do I use?
   (c) Which tuning parameter do I use?
   (d) Model Fitting.
   (e) How good is my model / How do I expect it to perform?
7. Model Selection vs. Model Assessment.
   - Model Selection: Tuning parameters.
   - Model Assessment: How good is my model?
   - What criteria should we use for model selection or model assessment?
8. Training, Validation, Query, Test Sets.
9. Introduction to Cross-Validation.