Support vector machines unit:

- Linear programming (Wednesday)
- SVM concepts (**today**)
- Lab: SVM applications (next week Monday)
- The math of SVMs (next week Wednesday)
- SVM algorithms (next week Friday)

Today:

- Comparison with other classification techniques
- Geometric intuitions
- The simplest version
- SVM hyperplanes
- Soft margin SVM
- Kernelized SVM

"The SVM provides state-of-the-art results in many applications, without sound theoretical guaantees." *Deisenroth et al, pg 335*

"A support vector machine is a very powerful and versatile machine learning model, capable of performing linear or nonlinear classification, regression, and even outlier detection. It is one of the most popular models in machine learning, and anyone interested in machine learning should have it in their toolbox."

Geron, pg 147

"The support vector machine is one of the most popular algorithms in modern machine learning." *Marsland, pg 169*

"Support Vector Machines: Hype or Hallelujah?"

Title of paper by Bennett and Campbell, 2000

"Nobody uses support vector machines anymore."

ML practitioner I met a few weeks ago

Given training data $\mathbf{X}, \boldsymbol{y}$, where $y_n \in \{-1, +1\}$, find $\boldsymbol{w}$, b, and r, specifically

$$\begin{aligned} \text{maximize} \quad & r \\ \text{subject to the constraints} \quad & \forall\ \boldsymbol{x_n}, y_n, \quad y_n(\boldsymbol{w}^T \boldsymbol{x_n} + b) \geq r \\ & ||\boldsymbol{w}|| = 1 \\ & r > 0 \end{aligned}$$

Coming up:

Do GMM/EM assignment (due end-of-day today, Fri, Feb 24)

Read textbook about SVMs, Chapter 12 (due end-of-day Fri, Mar 3). This isn't long, but it's heavy—spread it out.

[SVM quiz forthcoming (probably due class time Wed, Mar 1).]

[SVM assignment forthcoming (due after spring break).]

[Midterm Fri, Mar 17.]