

# CS 188 SECTION 13

These slides are on Piazza! Search for “Daylen’s slides”

# UPCOMING DEADLINES

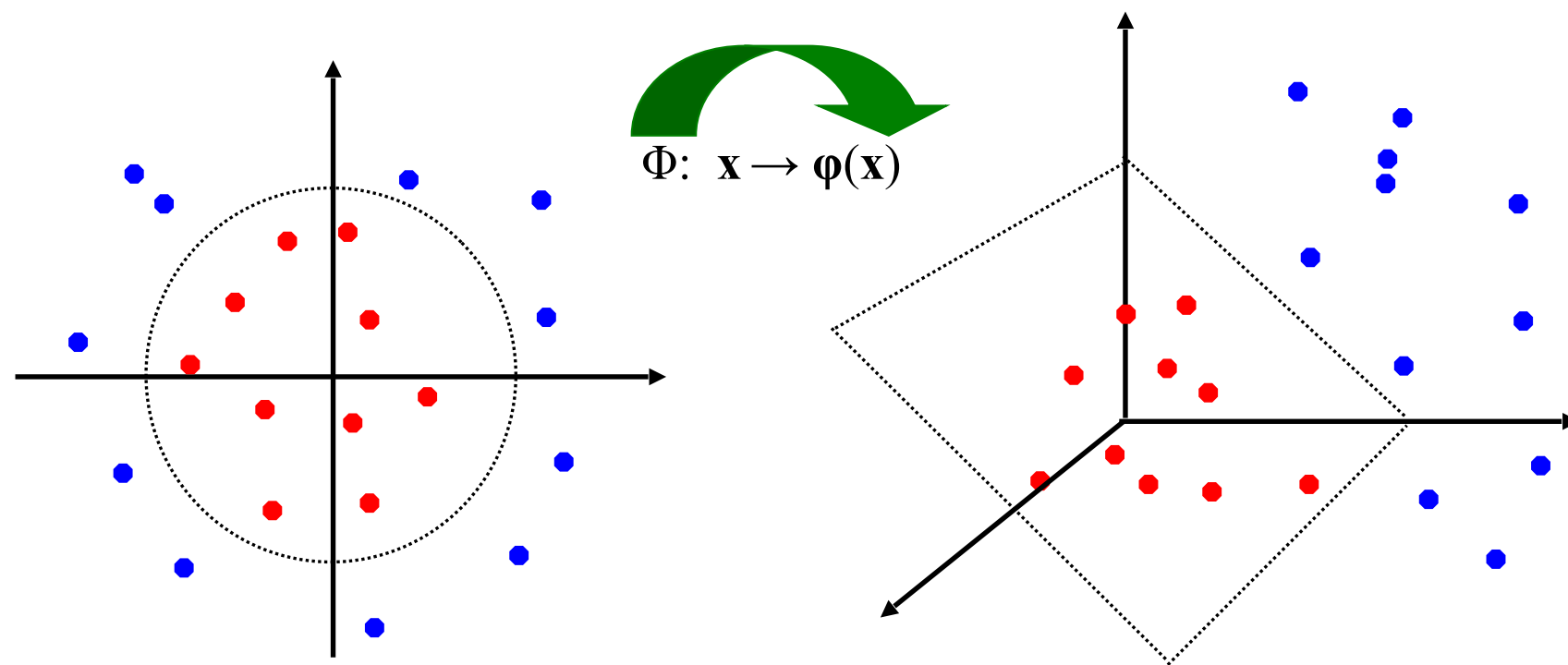
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- HW 6 due **tonight** @ 11:59
- Project 6 due **Sunday** @ 5pm
- Final Exam **next Thursday**

# FEATURE MAPS

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- Or: how to get better features without having to do anything
- If we can't separate the data with a line/plane, we can try to **map** the features to a space where we *can* separate the data
- Example: Polynomial feature map ([Video](#))



# TWO APPROACHES

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$$\varphi(x) = \langle x_n^2, \dots, x_1^2, \sqrt{2}x_n x_{n-1}, \dots, \sqrt{2}x_n x_1, \sqrt{2}x_{n-1} x_{n-2}, \dots, \sqrt{2}x_{n-1} x_1, \dots, \sqrt{2}x_2 x_1, \sqrt{2}c x_n, \dots, \sqrt{2}c x_1, c \rangle$$

1. **Explicitly** compute the new features and expand your current feature vector
2. **Implicitly** compute the new features, using a kernel

$$\begin{aligned} K(x, x') &= (x \cdot x' + 1)^2 \\ &= \sum_{i,j} x_i x_j x'_i x'_j + 2 \sum_i x_i x'_i + 1 \end{aligned}$$

# K-MEANS

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➤ Demo

# NEURAL NETWORKS

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- “Keep doing the chain rule”

**WORKSHEET**