




Leave quizzes facedown.  
(Crib-sheet side up!)





# Introduction to Machine Learning

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3 Questions I will answer...



Deep Reinforcement Learning  
(bots for games, currently for  
Starcraft 2)

confused about life

4th year

# Who are you?

Computer vision (for  
self-driving cars)

<3 cheesecake



Is this course going to be hard?



Yes.



Math

Math

Math

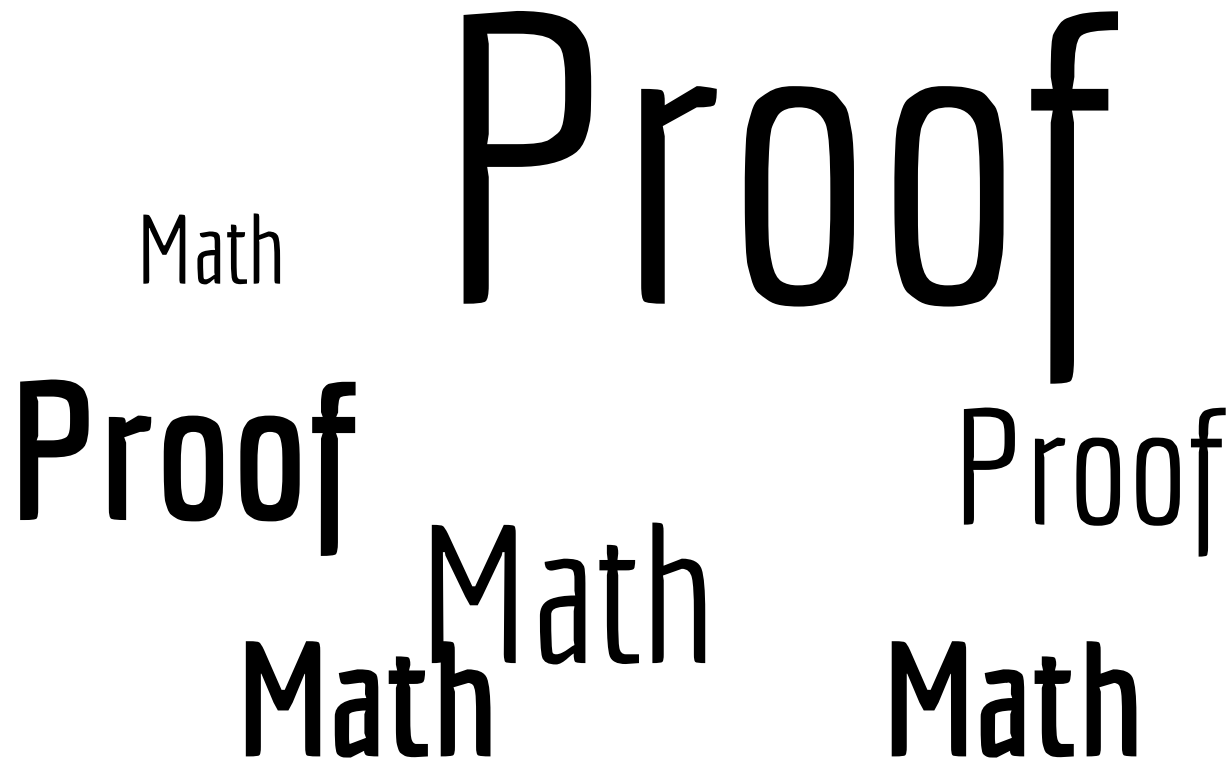
Math

Math

Math

Math

Math



Math

# Proof

Math

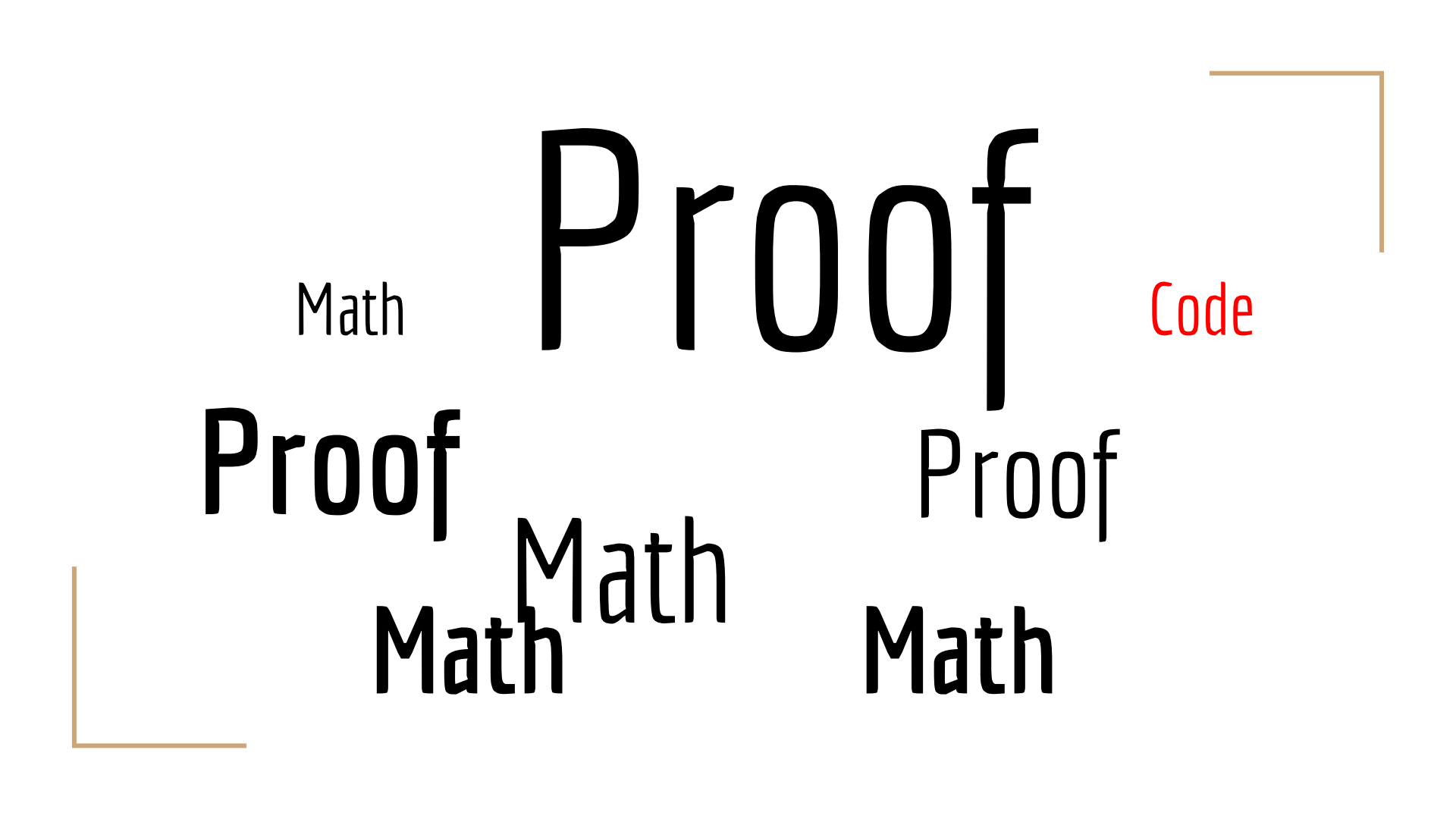
Proof

Math

Math

Math





Math Proof Code

Proof Math

Math Proof

Math





...but we'll do it together.



# How?

Every week, I'll...

Release a quiz

Release a crib sheet

Host extra office hours on  
Monday (administrative questions  
have priority tho)

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Questions?



# Least Squares Framework

Objective function:  $\min_w \|Xw - y\|_2^2$

Solution:  $w^* = (X^T X)^{-1} X^T y$

Prediction:  $\hat{y} = Xw^*$

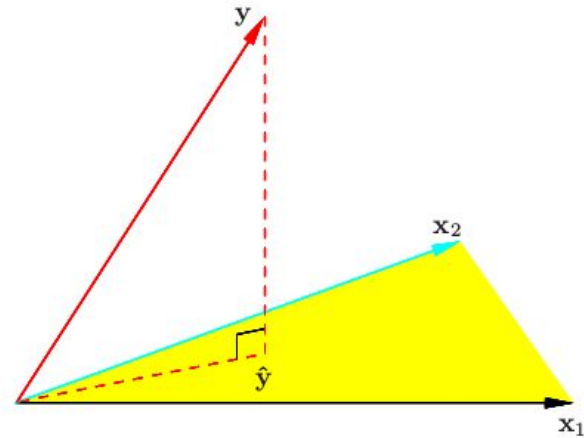


Image credits: Google Images lol

# Least Squares Framework: Intuition

Start with two dimensions

$(x, y)$   $\longrightarrow$   $(\text{color},)$   
*two values* *one value*

To higher dimensions:

$(x_1, x_2, \dots, x_d)$   $\longrightarrow$   $(\text{action},)$   
*d values* *one value*

It's a mapping! It's a *projection* :O

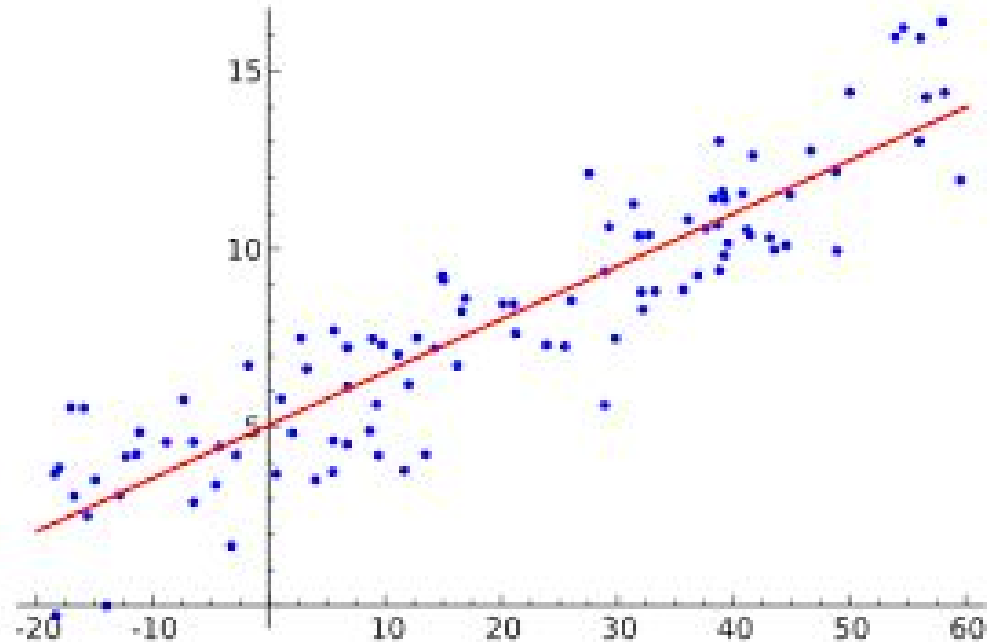


Image credits: Google Images again lol



Math

Math

Math

Math

Math

Math

Math

Math




# Crib Sheet

- Conventions
- Definition: Positive Semi-Definite (PSD)
- Decompositions: Eigenvalue Decomposition, Singular Value Decomposition
- Matrix Calculus
- Ordinary Least Squares

# Discussion Worksheet

1. Linear algebra review: norms, orthonormal, orthogonal etc.
  - a. Orthogonal matrix is has orthonormal column vectors
  - b. Four conditions for norms: absolutely scalable, triangle inequality, non-negative, norm is 0 iff vector is 0
2. Linear algebra review: eigenvalues
  - a. Proofs!
3. Ordinary Least Squares derivation
  - a. Matrix calculus
  - b. Foundation for many things in CS189



5 minutes to do your quiz...

Feedback? [aaalv.in/survey](https://aaalv.in/survey)

