

MACHINE LEARNING

[Jump to Today](#)

Time & Location

Online, via Zoom: <https://wpi.zoom.us/j/97662293745?pwd=SnhzS0JMRUhKQWtHS3ZnYWVFMHB6UT09> .(<https://wpi.zoom.us/j/97662293745?pwd=SnhzS0JMRUhKQWtHS3ZnYWVFMHB6UT09>).

Teaching Staff

Instructor: Jacob Whitehill (jwhitehill@wpi.edu); office hours: Wed 3–4pm, Fri 9–10am, on Zoom (note it's a different link from lecture):

<https://wpi.zoom.us/j/91008486417?pwd=VmQ3bG4xN3JsYkNRaDUrNkdBZDMzd09> .(<https://wpi.zoom.us/j/91008486417?pwd=VmQ3bG4xN3JsYkNRaDUrNkdBZDMzd09>)

Teaching assistants:

- Ashley Schuliger (amschuliger@wpi.edu); office hours: Mon 4–5pm, Tues 2–3pm, Thurs 2–3pm, on Zoom (<https://wpi.zoom.us/j/99261355847> (<https://wpi.zoom.us/j/99261355847>))

- Jean-Baptiste Truong (jtruong2@wpi.edu); office hours: Tues 10 – 11 am, Thurs 9 – 11 am, on Zoom (<https://wpi.zoom.us/j/94990727860> (<https://www.google.com/url?q=https://wpi.zoom.us/j/94990727860&sa=D&source=calendar&used=2&usg=AOvVaw2pMaHyku0gkdl36mhxe5G3>)

Slack

You are required to join the course's Slack workspace:

https://join.slack.com/t/wpics4342/shared_invite/zt-o8nk0z81-T2H1gJHyw7IreE_HfXEzLw .(https://join.slack.com/t/wpics4342/shared_invite/zt-o8nk0z81-T2H1gJHyw7IreE_HfXEzLw)

Grading

Homework: 70%
Final project: 25%
Class participation: 5%

Late submission policy & extensions

Homework submitted >0 but <=24 hours late will be capped at 80% of the maximum grade for that assignment; homeworks >24 but <= 48 hours late will be capped at 60% of the maximum grade; etc.

Requests for extensions due to illness -- either to you or a family member -- will be granted liberally. Please email me as soon as possible in such circumstances.

Topics

Week 1 — introduction to supervised learning; linear regression

1. faces demo (age, smile/non-smile), accuracy metrics, features, classifiers/regressors as a "machine", training versus testing, numpy
2. greedy approximations, step-wise regression
3. linear regression
4. matrix calculus, gradient descent

Week 2 — regularization; logistic & softmax regression; SGD

1. overfitting, regularization
2. logistic regression
3. softmax regression
4. stochastic gradient descent (SGD)

Week 3 — convexity; support vector machines

1. convexity, positive semi-definiteness (PSD)
2. constrained optimization, Lagrange multipliers, quadratic programming
3. support vector machines (SVM)
4. feature transformations

Week 4 — kernel methods; introduction to unsupervised learning

1. kernel trick
2. non-linear SVMs
3. radial basis function (RBF) kernels
4. k-nearest neighbors (kNN)
5. principal component analysis (PCA)
6. k-means clustering

Week 5 — introduction to neural networks

1. neural networks (NN)
2. XOR problem
3. activation functions
4. chain rule of multivariate calculus
5. derivation of back-propagation (backprop)

Week 6 — more on neural networks

1. weight initialization
2. regularization in NN: L1, L2, dropout
3. pretraining
4. auto-encoders
5. convolutional neural networks (CNNs)

Week 7 — applications and practical machine learning