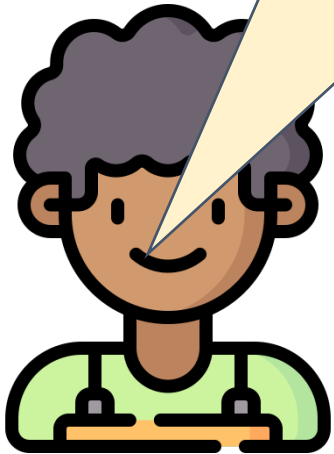


Takeaways Day 2

Before today

Hello, could you please fit a logistic regression for me using gradient descent? Also use linear algebra to do it.
K bye thanks!



You: *angry apple noises*

Now:



You: *completely overworked but somewhat understanding apple noises*

Logistic regression

- Pass linear predictions through a sigmoid \rightarrow binary classification!
- More than one class \rightarrow multiple binary ones, no problem!

Logistic regression

- Pass linear predictions through a sigmoid → bam classification!
- More than one class → multiple binary ones, no problem!
- New cost function:

$$J(\theta) = \frac{1}{m} \sum_{i=1}^m -y^{(i)} \cdot \log(h_{\theta}(x^{(i)})) - (1 - y^{(i)}) \cdot \log(1 - h_{\theta}(x^{(i)}))$$

- But same form of partial derivatives:

$$\frac{\partial}{\partial \theta_j} J(\theta) = \frac{1}{m} \sum_{i=1}^m ((h_{\theta}(x^{(i)}) - y^{(i)}) \cdot x_j^{(i)})$$

Logistic regression

- Congratulations, you can do classification!



Performance

- Don't just use accuracy
- Use ROC (AUC) when data is balanced
- Use Precision-Recall (AUC) when data is imbalanced (and you care about the positive class)

How to pick hyperparameters?

- Nested cross-validation
- Do an inner cross-validation where you try different hyperparameters, then use the one that performs best there on the outer fold.
- Prevent fitting your parameters to the data you are using to assess how well you generalise



What about neural networks?

- Layered logistic regressors (when using sigmoid function)
- Get matrices of parameters, because we have multiple units in a layer
- Automatically learn to go from input to some classification target.

Where you got

- Probably not too far in the afternoon practical, if that. So much coding to do. Boo!



- That's fine. Leave it for now. Lecture materials are the most important, implementing it yourself is to really get it and to feel accomplished. If you can read the answer and understand what's going on: good!

Ex. Implementing an ROC curve: if you know what it does and why: you are golden!