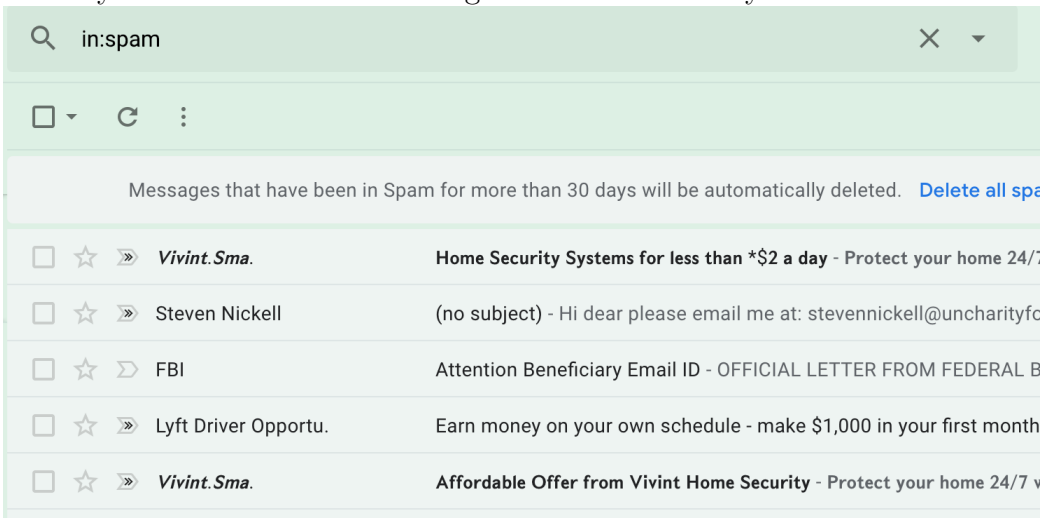
1 Week 1 - Linear Regression

2 Introduction

We come across machine learning all the time

It's why I don't have to sift through these emails in my inbox



It's why I can search my photos, by photos

2.1 What is Machine Learning?

According to wikipedia: Machine learning (ML) is the scientific study of algorithms and statistical models that computer systems use to effectively

perform a specific task without using explicit instructions, relying on patterns and inference instead.

Machine learning algorithms can learn to do a particular task without being explicitly programmed by building a mathematical model based on sample data, known as "training data". Then, that model can be applied to new data not previously used to build the model.

2.2 What is an algorithm?

An algorithm is often described as a set of steps to accomplish a particular task. You could describe an algorithm for brushing your teeth, or making a grilled cheese sandwich

But it's a bit more general than just a set of steps

An algorithm is a way to solve a computational problem, and a computational problem just specifies valid input and desired output.

For example, for the problem of spam filtering the input would be an email message, and the output would be a classification (spam/not spam). The algorithm could be a set of steps. We could compose a series of regular expressions to the message that are based on previous messages that we know have turned out to be spam.

We could also train a model based on a dataset of emails and classifications, to learn patterns of what spam messages look like without explicitly writing spam identification rules. Then, we could use the model for new data without a classification. That's the approach we're more interested in here, but both approaches are algorithms.

2.3 What is a machine learning algorithm?

The ML Coursera course defines a *Well Posed Machine Learning Problem*

A computer program is said to learn from experience *E* with respect to some task *T* and some performance measure *P* if its performance on *T*, as measured by *P* improves with experience *E*

So, we can see that the rule based spam filtering approach wouldn't be a machine learning based approach because having more labelled data would not help us to classify spam any more accurately.

3 What is a machine learning algorithm?

Suppose we want to be able to predict someone's weight given their height.

We start with a data set of height and weight pairs