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ECE 1395

Homework 1

1. A good problem to solve using a regression supervised learning technique would be item pricing in retail based on the current time of day/month/year (for example, Christmas items are more popular around November so their prices can be increased to generate more revenue).
   1. As features (x), I would use the time of day/month/year.
   2. As labels (y), I would use the price of items.
   3. I would collect data by conducting a trial over some period given existing price trends, and I would also consider artificially fluctuating prices to see how the market responds.
   4. This problem can be challenging because there are multiple factors to consider that can affect a buyer’s shopping habits, and it will be unclear if the current time alone is enough to affect habits.
2. A good problem to solve using a classification supervised learning technique would be speech recognition to classify certain sounds as words.
   1. As features (x), I would use the sound input.
   2. As labels (y), I would use the words that the sounds represent.
   3. I would collect data by providing various samples of recordings along with the words that they represent.
   4. This problem can be difficult because there are infinite ways that a word can be represented in sound, due to accents, tones of voice, and other factors.

3c.

The histogram for x does look like a Gaussian distribution.

A blue graph with numbers

Description automatically generated

The histogram for z does look like a uniform distribution.

A blue rectangular object with numbers

Description automatically generated

3d.



3e.



The NumPy function is far more efficient.

3f.

Trial 1:



Trial 2:



Trial 3:



There is a slight difference, but the numbers always float around 375000. This is because we used a randomization function to choose the numbers, but the given range will on average account for about 37.5% of the data because we have used a uniform distribution.

4a.

A screenshot of a black screen

Description automatically generated

4b.

A black screen with white text

Description automatically generated

4c.

A white board with black text

Description automatically generated

A black background with white text

Description automatically generated

5a.

A black background with white numbers

Description automatically generated

|  |  |  |
| --- | --- | --- |
| Trial 1: | Trial 2: | Trial 3: |
| A screenshot of a computer code  Description automatically generated | A screenshot of a computer code  Description automatically generated | A screenshot of a computer code  Description automatically generated |

We do not get the same submatrices each time. This is because, again, we used a randomization function to shuffle the matrix rows to choose the submatrices. Thus, we should expect different results each time.