Writing Exercise

Bochen Wang
Tianyuan Liu

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1 Association rule learning

1.1

Nile.com fulfills 927,125 transactions last month.

1.2

Lower bound: 231
Upper bound: Unknown, could be very large

1.3

Lower bound: 185279 - (60159 + 120091) = 5029,
Upper bound: 185279 - 120091 = 65188

1.4

Lower bound: 0%
Upper bound: 231 / 927125 = 0.02%

1.5

The {Burger,Buns} item numbers must be greater than {Burger, Buns, Ketchup} item numbers.
And should be lower than {Burger} numbers.
Lower bound: 15293 / 927125 = 1.65%
Upper bound: 29751 / 927125 = 3.21%

1.6

Support of {Burgers, VitaminCTablets} is 231, Support of {Burgers} is 29751.
Thus the confidence is
231 / 29751 = 0.78%
Conf is low, it is not an interesting promotion strategy.

1.7

Lower bound: 0 / 60159 = 0%
Upper bound: 60159 / 60159 = 100%

1.8

(60159 / 927125) / (80915/927125 * 185279/927125) = 3.72

1.9

{DogFood}, {CatFood, DogFood}, {Burgers}, {Burgers, VitaminCTablets}, {VitaminCTablets, ArtisianTapWater}, {Burgers, Buns, Ketchup}

1.10

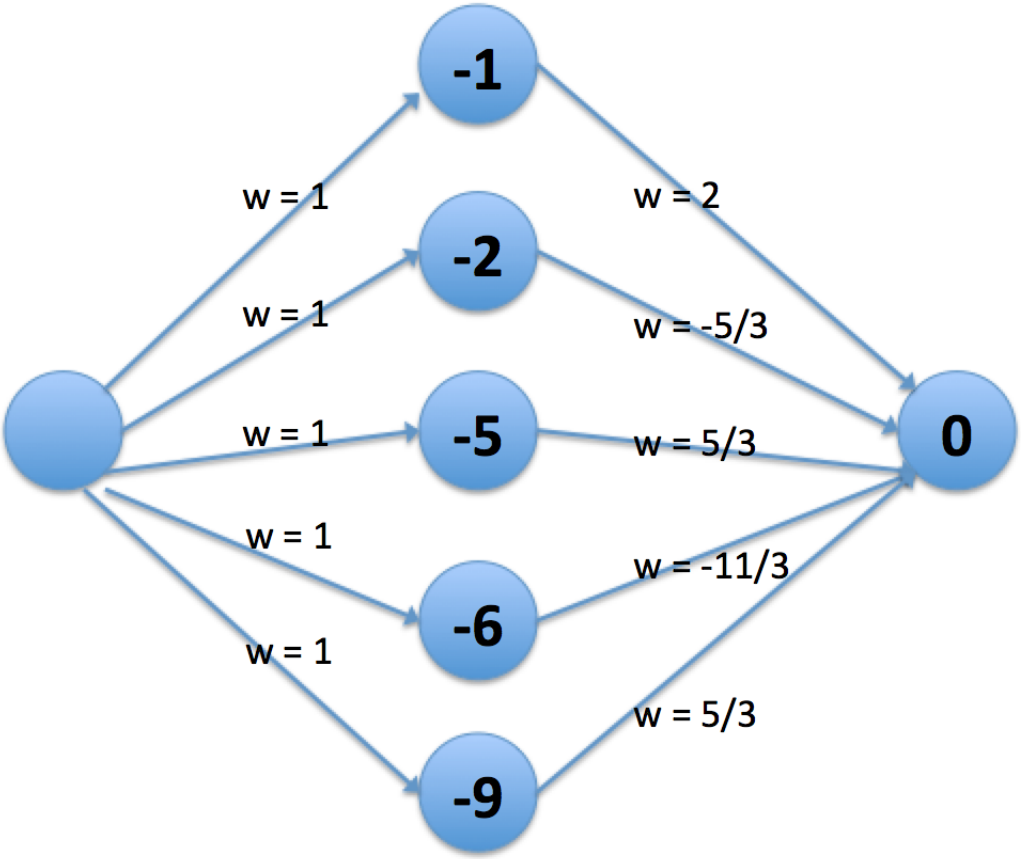
{VitaminCTablets}, {ArtisianTapWater}, {Buns}, {Ketchup}

1.11

{CatFood}, {CatLitter}, {CatFood, CatLitter}

2 Neural networks as function approximators

2.1



3 Approximating images with neural networks

3.1

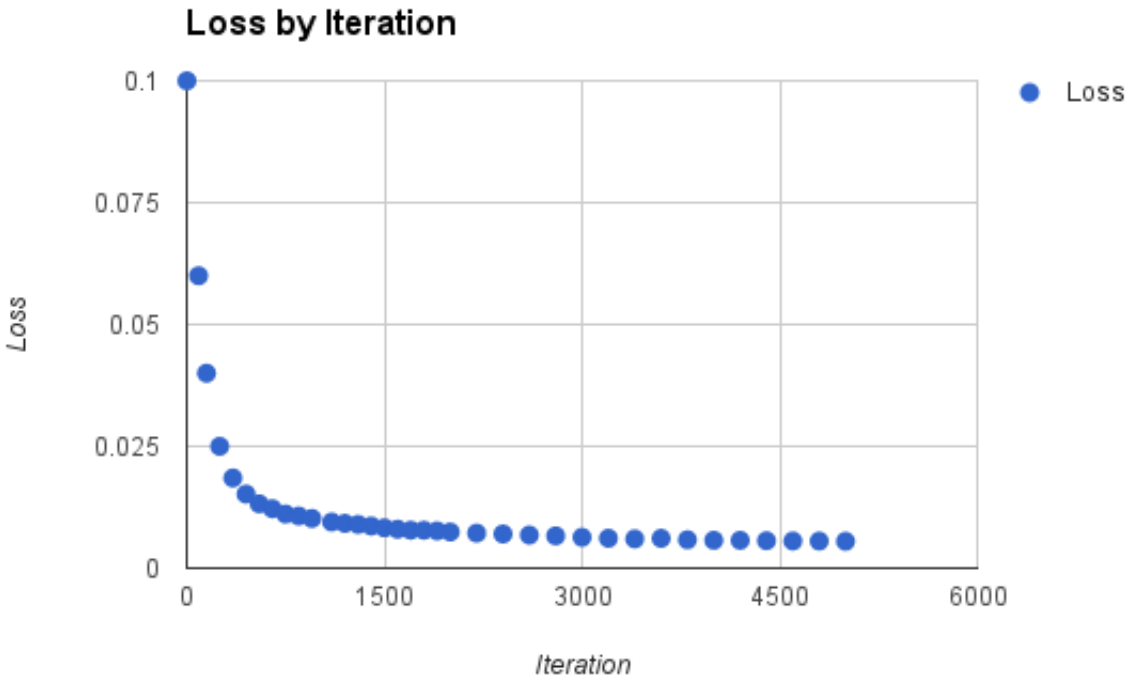
9 layers.
First Layer: Input layer, two dimension location info: x and y.
2 - 8 Layer: Hidden layers, 20 neurons, fully connected, reLU activation.
9th Layer: Output layer, using regression to predict three output neurons, which stands for r,g,b three channels.

3.2

loss is the class negative log likelihood.

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

3.3



3.4

Yes, lowering the learning rate, which is the step size α, the network might converge to a lower loss function. The reason is that loss function is non-convex, lowering the step size might lead to lower loss.

3.5 Lesion Study

Can drop 5 layers. Can get away with 2 hidden layers before quality drops noticeably.

3.6

No, there is no noticeable increase in the accurancy.