1. Implementation of SVM via Batch Gradient Descent
   1. Equation for ∇bf(w, b): w=w+η(yixi−2λw)
   2. See for iteration-vs-cost for plot.
   3. See for svm-bgd.py for source code.
2. Decision tree
   1. Gini index G = Wine: 0, Running: 0.38, Pizza: 0.5
   2. I would use the Pizza attribute for splitting the data at the root.

**Pizza**

50/80 pizza like beer

10/20 non pizza like beer

Pizza = 80 \* (1 - (0.625^2 + 0.375^2)) = 37.5

!Pizza = 20 \* (1 - (0.5^2 + 0.5^2)) = 10

48 - 37.5 - 10 = 0.5

Impurity =

100 \* (1 - (0.6^2 + 0.4^2)) = 48

**Wine**

30/50 wine like beer

30/50 non wine like beer

Wine = 50 \* (1 - (0.6^2 + 0.4^2)) = 24

!Wine = 50 \* (1 - (0.6^2 + 0.4^2)) = 24

24 = 24 = No reduction

**Running**

20/30 runners like beer

40/70 non-runners like beer

Runners = 30 \* (1 - (0.6666^2 + 0.3333^2)) = 13.333

!Runners= 70 \* (1 - (0.571428^2 + 0.428571^2)) = 34.2857

48 - 13.3333 - 34.2857 = 0.38