Programming Languages

Homework Assignment 4

Announced: 4/19/2016

Due: Tuesday, 5/3/2016 5pm

Submit via Blackboard

(Python code in a single module/file nn.py)

Intro

- **The assignment is to:**
  - **Design and implement a nearest neighbor classifier**
    - **Using Python 3.5**

Nearest Neighbor classifier

- Design a class Sample:
  - initialized with an array of F real values, and optionally some arbitrary value “label”, it stores all those values
  - has a method *distance* that takes another Sample object, and calculates some form of distance from itself to that object
- Classes inherited from Sample should implement a specific way of calculating the distance
  - E.g. EuclideanSample should calculate Euclidean distance

Nearest Neighbor classifier

- Classes inherited from Sample should implement a specific way of calculating the distance
  - E.g. EuclideanSample should calculate Euclidean distance
    - E.g.
      - x=EuclideanSample([1 2 3 4]);
      - y=EuclideanSample([2 3 4 5]);
      - x.distance(y) returns 2
        - » sqrt($(1-2)^2 + (2-3)^2 + (3-4)^2 + (4-5)^2$)
- Implement subclasses for: Euclidean, Taxicab, Maximum distances, see here: https://en.wikipedia.org/wiki/Norm_(mathematics)

Nearest Neighbor classifier

- Design a class Classifier, with methods
  - addSample that takes a sample as input, and stores it
  - predictLabel that takes a sample as input, calculates its distances to all other samples, finds the closest sample, and returns label of that sample as the prediction

Nearest Neighbor classifier

- The classes will be used in this way:

```
cl=Classifier()
cl.addSample(Sample([2 2 2],-1))
cl.addSample(Sample([0 0 0],1))
x=cl.predictLabel(EuclideanSample([-1 -1 -1]))
print(x)  #should print 1
```

Submission process

- **Submit via Blackboard**
  - **Any comments/additional info should in the comments section of the submission page (no README files etc.)**