Artifical Intelligence Problem Set 8

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Problem 1.
0.9: classifier accepts a and b, rejects the rest.

- Precision is $\frac{2}{2} = 1$
- Recall is $\frac{2}{8} = \frac{1}{4}$
- F-score is $(\frac{4+1}{2})^{-1} = \frac{2}{5}$

0.6: classifier accepts items a through i, rejects the rest.

- Precision is $\frac{5}{9}$
- Recall is $\frac{5}{8}$
- F-score is $(\frac{\frac{9}{5}+\frac{8}{5}}{2})^{-1} = \frac{10}{17}$

0.4: classifier accepts items a through n, rejects the rest.

- Precision is $\frac{6}{14} = \frac{3}{7}$
- Recall is $\frac{6}{8} = \frac{3}{4}$
- F-score is $(\frac{\frac{7}{3}+\frac{4}{3}}{2})^{-1} = \frac{6}{11}$

0.1: classifier accepts items a through r, rejects s and t.

- Precision is $\frac{7}{18}$
- Recall is $\frac{7}{8}$
- F-score is $(\frac{\frac{18}{7}+\frac{8}{7}}{2})^{-1} = \frac{7}{13}$

Problem 2.

A. Points A, C, and D are classified incorrectly.

$$\begin{aligned} E_T(\vec{\omega}) &= \sum_{\mathbf{p}\in T, \mathbf{p} \text{ misclassified}} |\omega_1 \mathbf{p}_x + \omega_2 \mathbf{p}_y + \omega_3| \\ &= |1 \cdot 1 + 1 \cdot 1 - 3| + |1 \cdot 2 + 1 \cdot 2 - 3| + |1 \cdot 3 + 1 \cdot 4 - 3| \\ &= 6 \end{aligned}$$

B.

$$\vec{\nabla} E|_{\vec{\omega}} = \sum_{\mathbf{p}\in T} s_{\vec{\omega}}(\mathbf{p}) \cdot \langle \mathbf{p}_x, \mathbf{p}_y, 1 \rangle$$