IR Assignment IV

1. **An IR system returns 12 relevant documents and 10 irrelevant documents. There are a total of 25 relevant documents in the collection. What is the precision of the system on this search and what is the recall.**

   Precision = (Number of relevant items retrieved) / (Total number of retrieved items)

   Recall = (Number of relevant items retrieved) / (Total number of relevant items)

   Precision = 12 / 22

   Recall = 12 / 25

2. **For a given query there are 20 relevant documents in the collection. The precision of the query is 0.50 and recall for the query is 0.35. How many documents are there in the result set.**

   P = 0.50

   R = 0.35

   Let the number of relevant items in result set = x
   Let the number of irrelevant items in result set = y

   0.35 = x / 20

   x = 20 * 0.35 = 7

   0.50 = 7 / (x + y)

   y = 7

   Total number of documents in the result set = x + y = 14

3. Below is a table showing how two human judges rated the relevance of a set of 12 documents to a particular information need (0 = nonrelevant, 1 = relevant). Let us assume that you've written an IR system that for this query returns the set of documents {4, 5, 6, 7, 8}.

DocID	1	2	3	4	5	6	7	8	9	10	11	12
Judge 1	0	0	1	1	1	1	1	1	0	0	0	0
Judge 2	0	0	1	1	0	0	0	0	1	1	1	1

a. Calculate the kappa measure between the two judges.

Judge 2 → Judge 1 ↓	Yes	No	Total
Yes	2	4	6
No	4	2	6
Total	6	6	12

P(A) = (2 + 2) / 12 = 4/12

P(relevant) = (6 + 6) / (12 + 12) = 1/2

P(non relevant) = (6 + 6) / (12 + 12) = 1/2

P(E) = P(non relevant)^2 + P(relevant)^2 = 1/2

κ = [P(A) - P(E)] / [1 + P(E)] = [4/12 - 1/2] / [1 - 1/2] = - 1/3 = - 0.333333

b. Calculate precision, recall, and F1 of your system if a document is considered relevant only if the two judges agree.

P = 1/5
R = 1/2

F1 = 2PR / (P+R) = 2 * 1/5 * 1/2 / (1/5 + 1/2) = 2/7 = 0.285714

c. Calculate precision, recall, and F1 of your system if a document is considered relevant if either judge thinks it is relevant.

P = 1
R = 5/10

F = 2 * 1 * 1/2 / (1 + 1/2) = 2/3 = 0.666666

4. Omar has implemented a relevance feedback web search system, where he is going to do relevance feedback based only on words in the title text returned for a page. The user is going to rank 3 results. The user queries for:

   q = *banana slug*

   and the top three titles returned are:

   d_1 = *banana slug Ariolimax columbianus*
   d_2 = *Santa Cruz mountains banana slug*
   d_3 = *Santa Cruz Campus Mascot*

   User judges the first two documents relevant, and the third nonrelevant. Assume that Omar's search engine uses term frequency but no length normalization nor IDF. Assume that he is using the Rocchio relevance feedback mechanism, with α = β =γ = 1. Show the final revised query that would be run. (list the vector elements in alphabetical order.)

   The vectors are:

	Q	D1	D2	D3
ariolimax	0	1	0	0
banana	1	1	1	0
campus	0	0	0	1
columbians	0	1	0	0
cruz	0	0	1	1
mascot	0	0	0	1
mountains	0	0	1	0
santa	0	0	1	1
slug	1	1	1	0

   The rocchio RF mechanism (α β γ) :

$$\vec{q}_m = \alpha\vec{q}_0 + \beta\frac{1}{|D_r|}\sum_{\vec{d}_j\in D_r}\vec{d}_j - \gamma\frac{1}{|D_{nr}|}\sum_{\vec{d}_j\in D_{nr}}\vec{d}_j$$

   q_m = [1/2, 2, 0, 1/2, 0, 0, 1/2, 0, 2]

Thanks Jitesh for the solutions.