**Q1. Write an in-mapper combiner algorithm to compute relative frequencies (pairs approach)**

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| class Mapper  method Initialize  H = new AssociativeArray  method Map(docid a; doc d)  for all term w in doc d do  for all term u in Neighbors(w) do  // add 2 elements to the associative array  H{pair(w;u)} = H{pair(w;u)}+1  H{pair(w;\*)} = H{pair(w;\*)}+1  method Close  for all pair p in H do  Emit(p; H{p})  class Reducer  method Initialize  Total = 0  H = new AssociativeArray  method Reduce(pair p; counts [c1; c2; …])  Sum = 0  for all count c in counts [c1; c2; …] do  Sum += c  if(p.Last == \*)  Total = Sum  else  H{p} = Sum/Total  method Close  for all pair p in H do  Emit(p; H{p}) |

**Q2. Write an algorithm to compute relative frequencies (stripes approach)**

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| class Mapper  method Initialize  H = new AssociativeArray  method Map(docid a; doc d)  for all term w in doc d do  H = new AssociativeArray  for all term u in Neighbors(w) do  //Tally words co-occurring with w  H{u} = H{u} + 1  Emit(Term w; Stripe H)    method Close  for all term t in H do  Emit(term t; count H{t})  class Reducer  method Reduce(term w; stripes [H1;H2;H3; : : :])  HF = new AssociativeArray  Total = 0  for all stripe H in stripes [H1;H2;H3; …] do  Total += Sum(HF; H)  for all stripe H in HF  HF{H} = HF{H}/ Total  Emit(term w; stripe HF) |

**Q3. Write an in-mapper combiner algorithm to compute relative frequencies (pairs in mapper and stripes in reducer or hybrid approach)**

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| class Mapper  method Initialize  H = new AssociativeArray  method Map(docid a; doc d)  for all term w in doc d do  for all term u in Neighbors(w) do  // add 2 elements to the associative array  H{pair(w;u)} = H{pair(w;u)}+1  H{pair(w;\*)} = H{pair(w;\*)}+1  method Close  for all pair p in H do  Emit(p; H{p})  class Reducer  method Reduce(term w; stripes [H1;H2;H3; : : :])  HF = new AssociativeArray  Total = 0  for all stripe H in stripes [H1;H2;H3; …] do  Total += Sum(HF; H)  for all stripe H in HF  HF{H} = HF{H}/ Total  Emit(term w; stripe HF) |