

Clustering Coefficient

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map1( $k, v$ )
  write( $k, v$ )

reduce1( $k, list(v)$ )
  //list( $v$ ) is the list of neighbours of node  $k$ 
  write( $k, list(v)$ )

map2( $k, v$ )
  //v is the list of neighbours of node  $k$ 
  foreach  $n \in v$  do
    write( $n, (k, v)$ )
  end
  write( $k, (k, v)$ )

reduce2( $k, list(v)$ )
  //k is a node
  //v is a pair ( $t, l$ ) = (a neighbour of  $k$ , list of neighbours of node  $t$ )
  neighbours( $k$ )  $\leftarrow v.l$  s.t.  $v \in list(v) \wedge t = k$ 
  foreach  $v \in list(v)$  do
    intersection  $\leftarrow \emptyset$ 
    if  $k \neq t$  then
      intersection  $\leftarrow$  neighbours( $k$ )  $\cap v.l$ 
      write( $t, (|v.l|, |intersection|)$ )
    end
  end

map3( $k, v$ )
  write( $k, v$ )

reduce3( $k, list(v)$ )
  //k is a node
  //v is a pair ( $a, b$ ) s.t.
  //a = |neighbours( $k$ )|
  //b = |list of (some) connections among neighbours( $k$ )|
  neighbours  $\leftarrow v.a$  s.t.  $v \in list(v)$ 
  union =  $\sum_{v \in list(v)} v.b$ 
  write( $k, \left( \frac{union/2}{\binom{neighbours}{2}} \right)$ )
```