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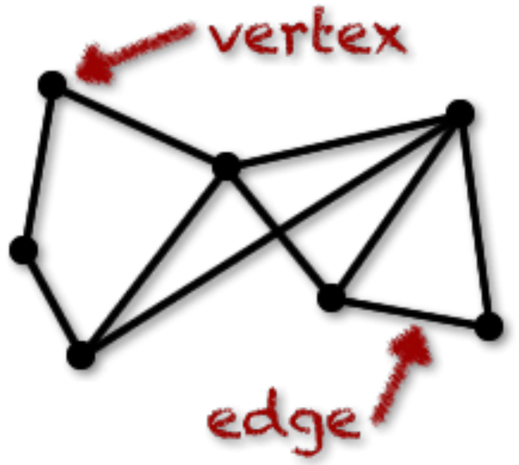


G

Basic principles of G - Graph Library

G

- Low Level **Fast** and **Memory Efficent Graph** Libary in Java.
- Manage **Weighted** Direct / Undirect **Graph** also with weigths on **Vertices**.
- Many algorithms ready to use **PageRank**, **HITS**, many others.
- Multithread **concurrent** algorithm model **configurable** by call.

How to Get G (not on mvn repo)

- GIT Clone or Download :
  - https://github.com/giovanni-stilo/G.git
  - Uncompress the archive (if it is needed) and go to G-master directory;
  - Install using maven (mvn install)
  - Include the dependency in your project:

```
<dependency>
        <groupId> it.stilo </groupId>
        <artifactId> G </artifactId>
        <version> 1.0.0-PUBLIC </version>
</dependency>
```

Main Concepts
Create Graph

- The **core** of G is based on simple **Arrays**; for this reason is very **fast**; the **drawbacks** of this approach is that you must specify the **biggest vertex id +1** at graph **creation** time.
- G is **memory efficient** even if the graph is very sparse and some index are not used.

-
  ```
  WeightedDirectedGraph g = new
  WeightedDirectedGraph(4+1);
  ```

```
    g.testAndAdd(0, 1, 0.1);
    g.testAndAdd(0, 2, 0.2);
    g.testAndAdd(0, 3, 0.3);
    g.testAndAdd(0, 4, 0.4);
```

Main Concepts
Load Graph

- Create the graph and read the graph from a file with:
  - `GraphReader.readGraph`
- The file must contain a list of edge (one per line) **tab** separated with weight in text compressed gzip form:
  - ***id_node_A***<TAB>***id_node_B***<TAB>***edge_weight***<CR>

```
WeightedUndirectedGraph g = new
WeightedUndirectedGraph(3000);

GraphReader.readGraph(g, ”myGraph.gz",
true);
```

Algorithms

Algorithms in G are implemented

externally from the Graph Class; and it is possible to selected number of used cores.

To generate the well know zachary's network for example:

WeightedDirectedGraph g = new WeightedDirectedGraph(**ZacharyNetwork.VERTEX**);

ZacharyNetwork.**generate**(g, **numberOfThreads**);

Print Arrays

3 important arrays with direct access:

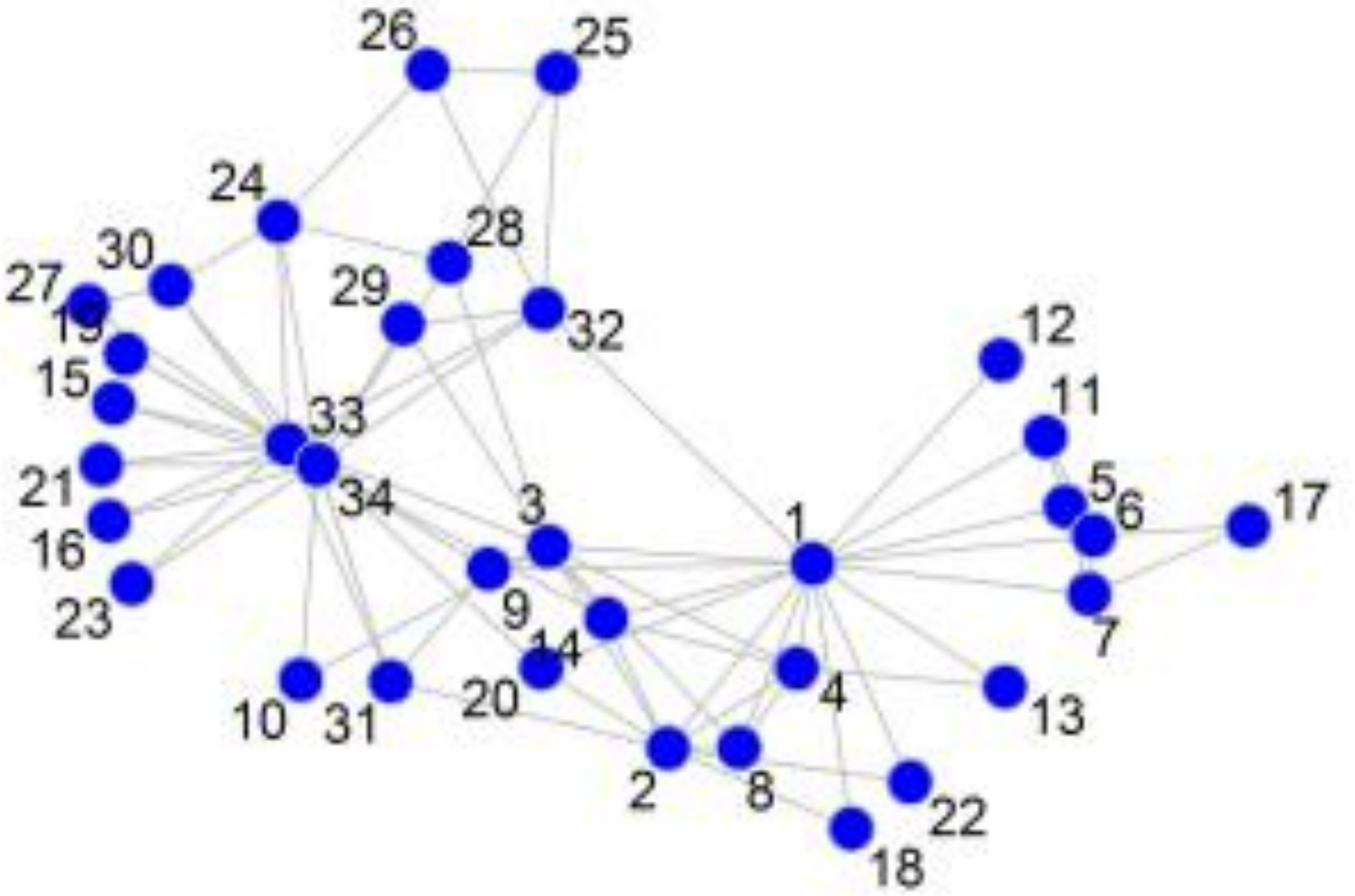
g.**out** { is the outlink of everynodes}

g.**weights** { is the weigths of outlink of everynodes}

g.**in**{ is the inlink of everynodes}

System.out.println(Arrays.deepToString(g.out))

Zachary



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HITS

```
ArrayList<ArrayList<DoubleValues>> list;

list = HubnessAuthority.compute(g, 0.00001, worker);

        for (int i = 0; i < list.size(); i++) {

            ArrayList<DoubleValues> score = list.get(i);

            String x = "";

            if (i == 0) { x = "Auth ";

            } else { x = "Hub ";}

            for (int j = 0; j < score.size(); j++) {

                System.out.println( x + score.get(j).value +
                              ":\t\t" + score.get(j).index);

            }

        }
```

Exercise G

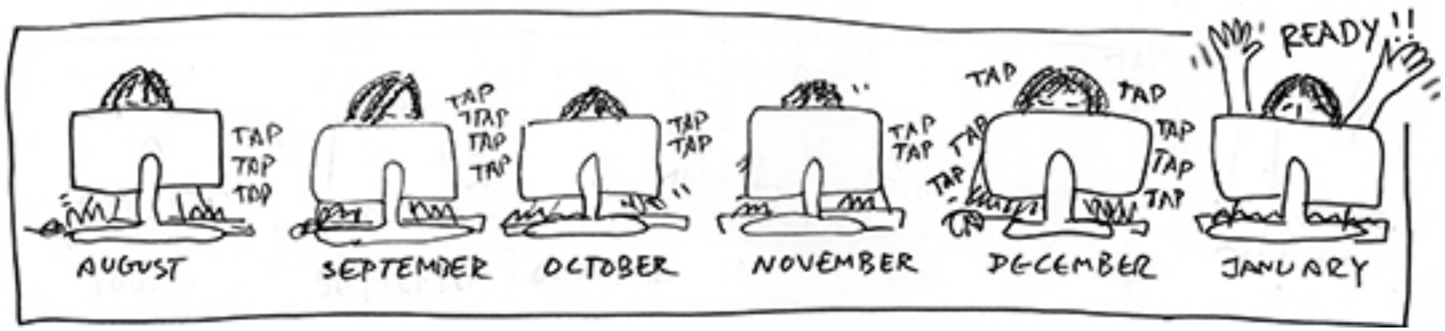
- Using G load Zachary network and use HITS on that.
- Try to remove subsequently the most important Authority

  (***g.remove(VERTEX_ID);***)

How the ranks are changed?

- Try to create your own graph on **file** and **load** it with G.

Let's Try?!?!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DECEMBER
READY!!
JANUARY

Dealing with String

```
NodesMapper<String> mapper = new NodesMapper<String>();
String stra = ″ANY_STRING_A";
String strb = "ANY_STRING_B";
int ida     = mapper.getId(stra);
int idb     = mapper.getId(strb);
System.out.println( mapper.getNode(ida) + ": ″ + ida );
System.out.println( mapper.getNode(idb) + ": ″ + idb );


WeightedDirectedGraph g = new WeightedDirectedGraph(2+1);
g.add( mapper.getId(stra), mapper.getId(strb), 1.0d);
```

Copy & SubGraph

```
WeightedUndirectedGraph g1     =
               UnionDisjoint.copy(g, numThreads);


WeightedDirectedGraph g1 =
               SubGraph.extract(g, {1,3,5},
numThreads);
```

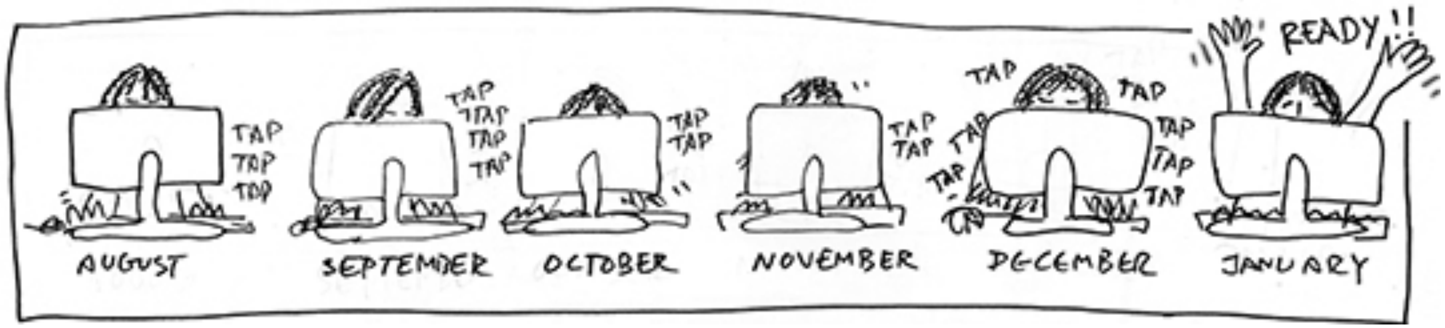
KPP-NEG

```
List<DoubleValues> brokers

             = KppNeg.searchBroker(g, g.getVertex(), worker);


for(DoubleValues b : brokers){

       System.out.println(

             ”Broker value: ” + b.value +

             “\tid: " + b.index);

}
```

Exercise

- Using Twitter API get the network for 15 users (Politics, Football Player).
- Twitter ID are long or more, so use NodeMapper to convert to int;
- Load the network in G and execute KPP-NEG on that.

Let's Try?!?!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