

COMP 330/543 001 SP24

ASSIGNMENT 2

NAMAN GUPTA(NG63)

1. CONNECTED COMPONENTS

PROCEDURE:

```
CREATE PROCEDURE BFS
AS
BEGIN
    DECLARE @curNode INT;
    DECLARE @componentID INT = 1;

    IF OBJECT_ID('tempdb..#CurrentComponent', 'U') IS NOT NULL DROP TABLE
#CurrentComponent;
    CREATE TABLE #CurrentComponent (NodeID INT PRIMARY KEY);
    IF OBJECT_ID('tempdb..#UniquePapers', 'U') IS NOT NULL DROP TABLE
#UniquePapers;
    CREATE TABLE #UniquePapers (
        ID INT
    );

    INSERT INTO #UniquePapers (ID)
    SELECT DISTINCT paperID AS ID FROM edges
    UNION
    SELECT DISTINCT citedPaperID AS ID FROM edges;

    IF OBJECT_ID('tempdb..#Components', 'U') IS NOT NULL DROP TABLE
#Components;
    CREATE TABLE #Components (
        ComponentID INT,
        NodeID INT,
    );

    IF OBJECT_ID('tempdb..#Visited', 'U') IS NOT NULL DROP TABLE #Visited;
    CREATE TABLE #Visited (
        NodeID INT PRIMARY KEY
    );

    DECLARE nodeCursor CURSOR FOR SELECT ID FROM #UniquePapers;
    OPEN nodeCursor;

    FETCH NEXT FROM nodeCursor INTO @curNode;
    WHILE @@FETCH_STATUS = 0
    BEGIN
        IF NOT EXISTS (SELECT 1 FROM #Visited WHERE NodeID = @curNode)
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BEGIN
  TRUNCATE TABLE #CurrentComponent;
  INSERT INTO #CurrentComponent (NodeID) VALUES (@@curNode);

  WHILE 1 = 1
  BEGIN
    INSERT INTO #CurrentComponent (NodeID)(
      SELECT e.paperID FROM edges e
      WHERE EXISTS (SELECT 1 FROM #CurrentComponent cc WHERE
cc.NodeID = e.citedPaperID)
      AND NOT EXISTS (SELECT 1 FROM #CurrentComponent cc WHERE
cc.NodeID = e.paperID)
      UNION
      SELECT e.citedPaperID FROM edges e
      WHERE EXISTS (SELECT 1 FROM #CurrentComponent cc WHERE
cc.NodeID = e.paperID)
      AND NOT EXISTS (SELECT 1 FROM #CurrentComponent cc WHERE
cc.NodeID = e.citedPaperID));

    IF @@ROWCOUNT = 0 BREAK;
  END

  INSERT INTO #Components (ComponentID, NodeID)
  SELECT @componentID, NodeID FROM #CurrentComponent;

  INSERT INTO #Visited (NodeID)
  SELECT NodeID FROM #CurrentComponent;

  SET @componentID = @componentID + 1;
END

  FETCH NEXT FROM nodeCursor INTO @@curNode;
END;

  CLOSE nodeCursor;
  DEALLOCATE nodeCursor;
  with comp as (select ComponentID,Count(*) as comp_Count from #Components group by
ComponentID having Count(*)>4 and Count(*)<=10)
  select c.ComponentID, d.NodeID as PaperID,n.paperTitle from comp c join #Components
d on d.ComponentID=c.ComponentID join nodes n on n.paperID= d.NodeID order by
c.ComponentID asc
END;
Go

EXEC BFS;

```

OUTPUT:

ComponentID	PaperID	paperTitle
2	9509135	Classical and Quantum Mechanics of Non-Abelian Chern-Simons Particles
2	304155	Exact String-like Solutions of the Gauged Nonlinear O(3) Model
2	9805010	On the Gauged Non-compact Spin System
2	9507015	Topological and Nontopological Solitons in a Gauged O(3) Sigma Model
2	9703185	N=2 Supersymmetric Gauged O(3) Sigma Model
2	9506015	Statistical Mechanics of Non-Abelian Chern-Simons Particles
2	9303080	Non-Abelian Chern-Simons Quantum Mechanics
2	9707150	Bogomolnyi Solitons and Hermitian Symmetric Spaces
16	9502105	FIELD THEORETICAL AND QUANTUM MECHANICAL DESCRIPTIONS OF COLLIDING AND
16	9703200	The Low Energy Limit of the Chern-Simons Theory Coupled to Fermions
16	9402020	Perturbative Bosonic End Anyon Spectra and Contact Interactions
16	7080	Relativistic scalar Aharonov-Bohm scattering
16	9703090	Perturbative Expansion in the Galilean Invariant Spin One-Half
16	9603185	The Aharonov-Bohm scattering : the role of the incident wave
16	9510085	Calculation of the Aharonov-Bohm wave function
16	9906170	Radiative Corrections to the Aharonov-Bohm Scattering
16	9411175	Aharonov-Bohm Scattering of a Localized Wave Packet: Analysis of the
16	9710025	On the Nonrelativistic Limit of the Scattering of Spin One-half
19	9212110	Three Dimensional Chern-Simons Theory as a Theory of Knots and Links III
19	9812105	Vassiliev Invariants in the Context of Chern-Simons Gauge Theory
19	9312215	Knot invariants from rational conformal field theories
19	9401095	Chirality of Knots 9_{42} and 10_{71} and Chern-Simons Theory
19	9607030	Vassiliev Invariants for Links from Chern-Simons Perturbation Theory
19	9807155	Combinatorial Formulae for Vassiliev Invariants from Chern-Simons Gauge
30	9706080	Moving Frames Hierarchy and BF Theory
30	9712255	Chiral solitons from dimensional reduction of Chern-Simons gauged
30	9709075	Chiral solitons from dimensional reduction of Chern-Simons gauged
30	9611185	A Nonrelativistic Chiral Soliton in One Dimension
30	9507110	Calogero-Sutherland model from excitations of Chern-Simons vortices
43	9904055	Finiteness following from underlying theory: a natural strategy
43	9906015	Two- and Three-particle States in a Nonrelativistic Four-fermion Model
43	9412050	Generalised Point Interactions for the Radial Schrodinger Equation via
43	5195	A differential equation approach for examining the subtraction schemes
43	3255	Dimensional Transmutation and Dimensional Regularization in Quantum
43	9511010	The regulated four parameter one dimensional point interaction
43	9706070	Non-perturbative regularization and renormalization: simple examples
48	8110	Understanding Skyrmions using Rational Maps
48	12215	Solitonic fullerene structures in light atomic nuclei
48	9904160	Spherically Symmetric Solutions of the SU(N) Skyrme Models
48	206160	Skyrmed Monopoles
48	210310	Homotopy of Rational Maps and the Quantization of Skyrmions

63	9611150	Dimensional Renormalization in ϕ^3 theory: ladders and rainbows
63	9805025	A dilogarithmic 3-dimensional Ising tetrahedron
63	9612010	Weight Systems from Feynman Diagrams
63	9712140	Non-zeta knots in the renormalization of the Wess-Zumino model?
63	9807125	How useful can knot and number theory be for loop calculations?
141	9511210	Modular Invariance and the Odderon
141	9508025	Quasiclassical QCD Pomeron
141	9802100	Solution of the Odderon Problem
141	9611025	Direct solution of the hard pomeron problem for arbitrary conformal
141	9805135	New Results on the Odderon in QCD

2. PAGERANK

PROCEDURE:

```

CREATE PROCEDURE CalculatePageRank
AS
BEGIN
    DECLARE @n INT,
            @dampingFactor FLOAT,
            @convergenceThreshold FLOAT,
            @iteration INT,
            @difference FLOAT;

    SET @dampingFactor = 0.85;
    SET @convergenceThreshold = 0.01;
    SET @iteration = 0;
    SET @difference = 0;

    SELECT @n = COUNT(DISTINCT paperID) FROM nodes;

    CREATE TABLE #Pagerank (
        PaperID INT PRIMARY KEY,
        PageRank FLOAT
    );
    INSERT INTO #Pagerank (PaperID, PageRank)
    SELECT DISTINCT PaperID, 1.0 / @n as Rank
    FROM nodes;

    CREATE TABLE #edges_updated (
        PAPERID INT,
        CITEDPAPERID Int
    );
    insert into #edges_updated (PAPERID, CITEDPAPERID) (select e.PAPERID,
e.CITEDPAPERID
                from edges e
                union

```

```

        select sn.sink_paperid as PAPERID, no.paperid as CITEDPAPERID
        from (select DISTINCT e.citedPaperID as sink_paperid from edges e where
e.citedPaperID not in (select Distinct e1.paperID from edges e1 join edges e2 on
e2.citedPaperID=e1.paperID)) sn join nodes no on sn.sink_paperid!=no.paperID)
CREATE TABLE #num_citations (
    PaperID INT PRIMARY KEY,
    Citations INT
);

INSERT INTO #num_citations (PaperID, Citations)
SELECT paperID, COUNT(*) as Num_of_Citations
FROM #edges_updated
GROUP BY paperID;

CREATE TABLE #iteration_Pagerank (
    PaperID INT PRIMARY KEY,
    PageRank FLOAT
);
WHILE 1 = 1
BEGIN
    INSERT INTO #iteration_Pagerank (PaperID, PageRank)
    SELECT
        p.PaperID,
        ((1 - @dampingFactor) / @n) + (@dampingFactor * (SUM(pr.PageRank /
c.Citations)))
    FROM
        #Pagerank p
    JOIN #edges_updated e ON e.citedPaperID = p.PaperID
    JOIN #Pagerank pr ON pr.PaperID = e.PaperID
    JOIN #num_citations c ON c.PaperID = e.PaperID
    GROUP BY
        p.PaperID;

    SELECT @difference = SUM(ABS(pr.PageRank - ipr.PageRank))
    FROM #Pagerank pr
    INNER JOIN #iteration_Pagerank ipr ON pr.PaperID = ipr.PaperID;

    UPDATE pr
    SET pr.PageRank = ipr.PageRank
    FROM #Pagerank pr
    INNER JOIN #iteration_Pagerank ipr ON pr.PaperID = ipr.PaperID;

    IF @difference <= @convergenceThreshold
        BREAK;

    SET @iteration = @iteration + 1;
    Delete from #iteration_Pagerank where PageRank is not null ;
END
Declare @Sum Float;
Select @Sum=Sum(PageRank) from #Pagerank

```

```
select top 10 pr.PaperID,pr.PageRank/@sum as PageRank,n.paperTitle from #Pagerank pr
join nodes n on n.paperID=pr.PaperID order by pr.PageRank desc
```

END

```
go
Exec CalculatePageRank;
```

OUTPUT:

PaperID	PageRank	paperTitle
9504090	0.014724248584604100	Massless Black Holes and Conifolds in String Theory
9510135	0.014446305360815100	Bound States Of Strings And p-Branes
9711200	0.013647582829266400	The Large N Limit of Superconformal Field Theories and Supergravity
9802150	0.009697907266117290	Anti De Sitter Space And Holography
208020	0.008629895477463100	Open strings and their symmetry groups
9602065	0.007716301077518260	D--branes and Spinning Black Holes
9305185	0.007549767481589170	Duality Symmetries of 4D Heterotic Strings
9611050	0.00712937877170942	TASI Lectures on D-Branes
9501030	0.005815454823456700	Strong/Weak Coupling Duality from the Dual String
9602135	0.005416172003172840	Entropy and Temperature of Black 3-Branes