Connected Components

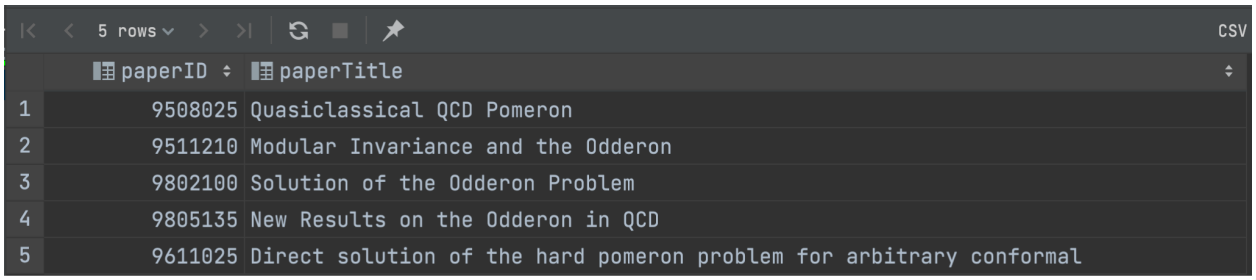
Query

```
CREATE TABLE nodes(
    paperID    INTEGER,
    paperTitle VARCHAR (100)
);

CREATE TABLE edges(
    paperID      INTEGER,
    citedPaperID INTEGER
);

-- Q1: Connected Components
DECLARE @myVisited TABLE(
    paperID INTEGER,
    visited INTEGER
);

INSERT INTO @myVisited
SELECT n.paperID, 0
FROM nodes n

DECLARE @totalNodesCnt INTEGER = (SELECT Count(*) FROM nodes);
DECLARE @visitCnt INTEGER = 0;
DECLARE @startFromID INTEGER;

WHILE @visitCnt < @totalNodesCnt
 BEGIN
     DECLARE @myComponent TABLE(
          paperID INTEGER,
          paperTitle VARCHAR (1000)
       );

     SET @startFromID = (SELECT TOP(1) n.paperID
                         FROM nodes n, @myVisited v1
                         WHERE  ( n.paperID = v1.paperID
                                  AND v1.visited = 0 )
                         ORDER BY paperID)
```

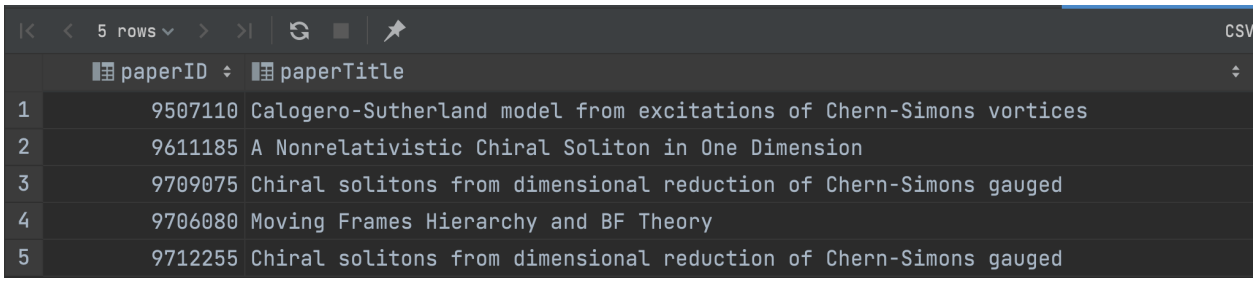
```
     INSERT INTO @myComponent
     SELECT DISTINCT n.paperID, n.paperTitle
     FROM nodes n
     WHERE n.paperID = @startFromID;

     DECLARE @prev_cnt INT = 0;

     WHILE @prev_cnt < (SELECT DISTINCT Count(*) FROM
@myComponent)
       BEGIN
           SET @prev_cnt = (SELECT DISTINCT Count(*) FROM
@myComponent)

           INSERT INTO @myComponent
           SELECT DISTINCT n.paperID, n.paperTitle
           FROM   nodes n,
                  edges e1
                  JOIN @myComponent cc1
                    ON ( cc1.paperID = e1.paperID )
           WHERE  n.paperID = e1.citedPaperID
                  AND n.paperID NOT IN (SELECT cc3.paperID
                                        FROM   @myComponent cc3)

           INSERT INTO @myComponent
           SELECT DISTINCT n.paperID,
                           n.paperTitle
           FROM   nodes n,
                  edges e2
                  JOIN @myComponent cc2
                    ON ( cc2.paperID = e2.citedPaperID )
           WHERE  n.paperID = e2.paperID
                  AND n.paperID NOT IN (SELECT cc3.paperID
                                        FROM   @myComponent cc3)
       END;

     DECLARE @myComponentCnt INTEGER = (SELECT DISTINCT COUNT(*)
FROM @myComponent);
     SET @visitCnt = @visitCnt + @myComponentCnt;

     UPDATE @myVisited
```

```
    SET    visited = 1
    WHERE  paperID IN (SELECT cc.paperID
                       FROM   @myComponent cc)
           AND visited = 0;

    IF @myComponentCnt > 4 AND @myComponentCnt <= 10
        SELECT * FROM @myComponent;

    DELETE FROM @myComponent;
END
```

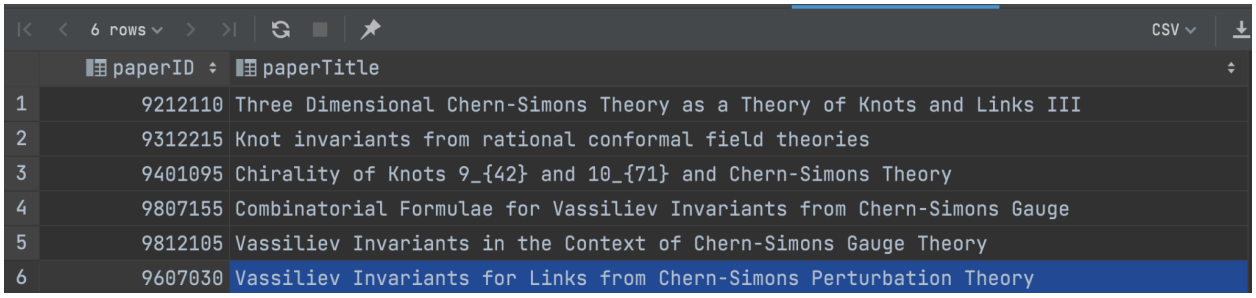
Result:



	paperID	paperTitle
1	9508025	Quasiclassical QCD Pomeron
2	9511210	Modular Invariance and the Odderon
3	9802100	Solution of the Odderon Problem
4	9805135	New Results on the Odderon in QCD
5	9611025	Direct solution of the hard pomeron problem for arbitrary conformal



	paperID	paperTitle
1	9507110	Calogero-Sutherland model from excitations of Chern-Simons vortices
2	9611185	A Nonrelativistic Chiral Soliton in One Dimension
3	9709075	Chiral solitons from dimensional reduction of Chern-Simons gauged
4	9706080	Moving Frames Hierarchy and BF Theory
5	9712255	Chiral solitons from dimensional reduction of Chern-Simons gauged



	paperID	paperTitle
1	9212110	Three Dimensional Chern-Simons Theory as a Theory of Knots and Links III
2	9312215	Knot invariants from rational conformal field theories
3	9401095	Chirality of Knots 9_{42} and 10_{71} and Chern-Simons Theory
4	9807155	Combinatorial Formulae for Vassiliev Invariants from Chern-Simons Gauge
5	9812105	Vassiliev Invariants in the Context of Chern-Simons Gauge Theory
6	9607030	Vassiliev Invariants for Links from Chern-Simons Perturbation Theory

8 rows CSV

	paperID	paperTitle
1	304155	Exact String-like Solutions of the Gauged Nonlinear O(3) Model
2	9507015	Topological and Nontopological Solitons in a Gauged O(3) Sigma Model
3	9703185	N=2 Supersymmetric Gauged O(3) Sigma Model
4	9707150	Bogomolnyi Solitons and Hermitian Symmetric Spaces
5	9509135	Classical and Quantum Mechanics of Non-Abelian Chern-Simons Particles
6	9805010	On the Gauged Non-compact Spin System
7	9303080	Non-Abelian Chern-Simons Quantum Mechanics
8	9506015	Statistical Mechanics of Non-Abelian Chern-Simons Particles

5 rows

	paperID	paperTitle
1	8110	Understanding Skyrmions using Rational Maps
2	9904160	Spherically Symmetric Solutions of the SU(N) Skyrme Models
3	12215	Solitonic fullerene structures in light atomic nuclei
4	206160	Skyrmed Monopoles
5	210310	Homotopy of Rational Maps and the Quantization of Skyrmions

	paperID	paperTitle
1	7080	Relativistic scalar Aharonov-Bohm scattering
2	9402020	Perturbative Bosonic End Anyon Spectra and Contact Interactions
3	9710025	On the Nonrelativistic Limit of the Scattering of Spin One-half
4	9502105	FIELD THEORETICAL AND QUANTUM MECHANICAL DESCRIPTIONS OF COLLIDING AND
5	9906170	Radiative Corrections to the Aharonov-Bohm Scattering
6	9411175	Aharonov-Bohm Scattering of a Localized Wave Packet: Analysis of the
7	9603185	The Aharonov-Bohm scattering : the role of the incident wave
8	9703090	Perturbative Expansion in the Galilean Invariant Spin One-Half
9	9703200	The Low Energy Limit of the Chern-Simons Theory Coupled to Fermions
10	9510085	Calculation of the Aharonov-Bohm wave function

	paperID	paperTitle
1	3255	Dimensional Transmutation and Dimensional Regularization in Quantum
2	9511010	The regulated four parameter one dimensional point interaction
3	9706070	Non-perturbative regularization and renormalization: simple examples
4	9904055	Finiteness following from underlying theory: a natural strategy
5	9412050	Generalised Point Interactions for the Radial Schrodinger Equation via
6	5195	A differential equation approach for examining the subtraction schemes
7	9906015	Two- and Three-particle States in a Nonrelativistic Four-fermion Model

	paperID	paperTitle
1	9611150	Dimensional Renormalization in phi^3 theory: ladders and rainbows
2	9612010	Weight Systems from Feynman Diagrams
3	9712140	Non-zeta knots in the renormalization of the Wess-Zumino model?
4	9805025	A dilogarithmic 3-dimensional Ising tetrahedron
5	9807125	How useful can knot and number theory be for loop calculations?

Page Rank

Query:

```
DECLARE @totalNodesCnt INTEGER = (SELECT COUNT(*) FROM
nodes);
DECLARE @damping FLOAT = 0.85;
DECLARE @prDiff FLOAT = 100;

-- Make a table to store out degree, i.e How many paper does
this paper cites
DECLARE @OutDegree TABLE (
   paperID INTEGER,
   citesCnt INTEGER
)

INSERT INTO @OutDegree
SELECT DISTINCT e.paperID, COUNT(e.paperID)
FROM edges e
GROUP BY e.paperID

INSERT INTO @OutDegree
SELECT DISTINCT n.paperID, @totalNodesCnt
FROM nodes n, edges e
WHERE n.paperID NOT IN (SELECT e1.paperID FROM edges e1)

DECLARE @PageRank TABLE (
   paperID INTEGER,
   pageRank FLOAT
)

INSERT INTO @PageRank
SELECT DISTINCT n.paperID, 1.0 / @totalNodesCnt
FROM nodes n

WHILE (@prDiff > 0.01)
BEGIN
   DECLARE @nextPageRank TABLE (
```

```
   paperID INTEGER,
   pageRank FLOAT
   )

   INSERT INTO @nextPageRank
   SELECT DISTINCT pr.paperID, ((1 - @damping) /
@totalNodesCnt) + @damping * SUM(pr2.pageRank / deg.citesCnt)
   FROM @PageRank pr JOIN edges e on pr.paperID =
e.citedPaperID, @OutDegree deg
      , @PageRank pr2
   WHERE e.paperID = deg.paperID AND e.paperID = pr2.paperID
AND deg.citesCnt <> 4560   -- k is e.paperID
   GROUP BY pr.paperID

   -- Handle papers that doesn't have anyone citing them
   INSERT INTO @nextPageRank
   SELECT DISTINCT pr.paperID, (1 - @damping) /
@totalNodesCnt
   FROM @pageRank pr, @OutDegree od
   WHERE pr.paperID NOT IN (SELECT e2.citedPaperID FROM edges
e2) AND pr.paperID = od.paperID AND od.citesCnt <> 4560

   -- Update sink nodes
   UPDATE @nextPageRank
   SET pageRank = npr.pageRank + 0.85 * (SELECT
SUM(pr2.pageRank) FROM @PageRank pr2, @OutDegree od2 WHERE
od2.paperID = pr2.paperID AND od2.citesCnt =
4560)/@totalNodesCnt
   FROM @nextPageRank npr, @OutDegree od
   WHERE npr.paperID = od.paperID

   SET @prDiff = (SELECT DISTINCT SUM(ABS(nextPr.pageRank -
pr.pageRank))
                  FROM @PageRank pr, @nextPageRank nextPr
                  WHERE pr.paperID = nextPr.paperID)
   print @prDiff

   UPDATE @PageRank
```

```
      SET pageRank = npr.pageRank
      FROM @nextPageRank npr, @PageRank pr
      WHERE pr.paperID = npr.paperID

   DELETE FROM @nextPageRank
END

SELECT TOP(10) pr.paperID, pr.pageRank, n.paperTitle
FROM @PageRank pr JOIN nodes n on pr.paperID = n.paperID
ORDER BY pr.pageRank DESC
```

Result:

10 rows

	paperID	pageRank	paperTitle
1	9504090	0.014726301489589675	Massless Black Holes and Conifolds in.
2	9510135	0.01444560734542386	Bound States Of Strings And p-Branes
3	9711200	0.01364692185545901	The Large N Limit of Superconformal F.
4	9802150	0.009697437359075944	Anti De Sitter Space And Holography
5	208020	0.0086311043505559	Open strings and their symmetry groups
6	9602065	0.007717399363362192	D--branes and Spinning Black Holes
7	9305185	0.007549428739849736	Duality Symmetries of 4D Heterotic St.
8	9611050	0.007129032554566822	TASI Lectures on D-Branes
9	9501030	0.005815174142168702	Strong/Weak Coupling Duality from the.
10	9602135	0.005415907562197611	Entropy and Temperature of Black 3-Br.