# Comp 543 Assignment 2

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## 1.1 Connected Components

【Code】

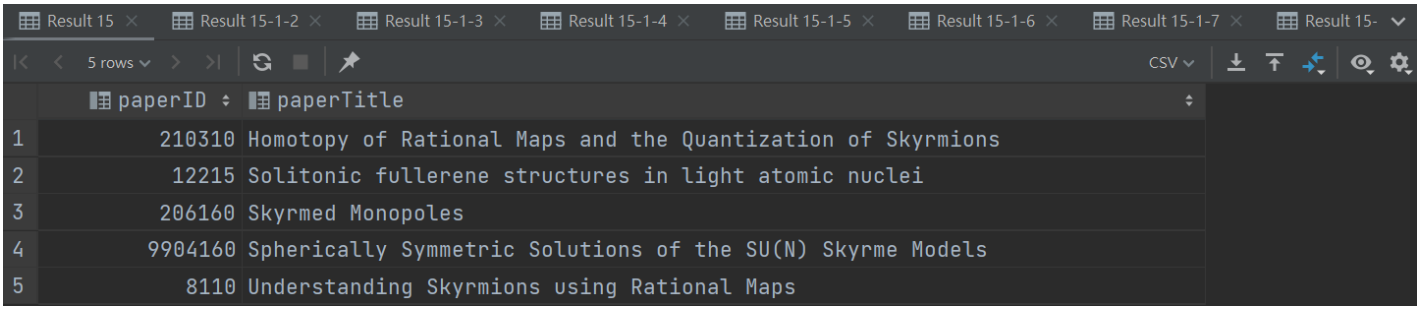
```
-- 1.1 Connected Components
BEGIN
	DECLARE @tempVisited TABLE (
		id INT
	);
	INSERT INTO @tempVisited (id) (SELECT n.paperid FROM Nodes n);

	DECLARE @tempVisitCnt INT = (
		SELECT Count(*)
		FROM @tempVisited
	);

	WHILE (@tempVisitCnt > 0)
		BEGIN
			DECLARE @paperID INT, @connectedCnt INT=0;
			DECLARE @Visited TABLE (
				id INT
			);
			DECLARE @NewAll TABLE (
				id INT,
				visCnt INT
			);
			DECLARE @Temp TABLE (
				id INT,
				visCnt INT
			);

			SET @paperID = (
				SELECT TOP (1) v.id
				FROM @tempVisited v
			);
			INSERT INTO @Visited VALUES (@paperid);
			UPDATE @NewAll SET visCnt = 0;

			INSERT INTO @Visited (id)
			OUTPUT inserted.id INTO @Temp(id)
```

```
SELECT DISTINCT e.citedPaperID
FROM Edges e
WHERE e.paperID = @paperID AND e.citedPaperID <> @paperID

UPDATE @Temp SET visCnt = 0;
UPDATE @NewAll SET visCnt += 1;
DELETE FROM @NewAll WHERE visCnt = 2;
INSERT INTO @NewAll (id, visCnt) (SELECT * FROM @Temp);
DELETE FROM @Temp;

INSERT INTO @Visited (id)
OUTPUT inserted.id INTO @Temp (id)
SELECT DISTINCT e.PaperID
FROM Edges e JOIN @Visited v ON e.citedPaperID = v.id
WHERE e.paperID NOT IN (SELECT v1.id FROM @Visited v1)

UPDATE @Temp SET visCnt = 0;
UPDATE @NewAll SET visCnt += 1;
DELETE FROM @NewAll WHERE visCnt = 2;
INSERT INTO @NewAll (id, visCnt) (SELECT * FROM @Temp);
DELETE FROM @Temp;

DECLARE @NewCnt INT = (SELECT COUNT(*) FROM @NewAll);
WHILE (@NewCnt > 0)
    BEGIN
        INSERT INTO @Visited (id)
        OUTPUT inserted.id INTO @Temp (id)
        SELECT DISTINCT e.citedPaperID
        FROM Edges e JOIN @NewAll a ON e.paperID = a.id
        WHERE e.citedPaperID NOT IN (SELECT v.id FROM @Visited v)

        UPDATE @Temp SET visCnt = 0;
        UPDATE @NewAll SET visCnt += 1;
        DELETE FROM @NewAll WHERE visCnt = 2;
        INSERT INTO @NewAll (id, visCnt) (SELECT * FROM @Temp);
        DELETE FROM @Temp;

        SET @NewCnt = (SELECT COUNT(*) FROM @NewAll);
        IF (@NewCnt > 0)
            BEGIN
                INSERT INTO @Visited (id)
                OUTPUT inserted.id INTO @Temp (id)
```

```
                    SELECT DISTINCT e.PaperID
                    FROM Edges e JOIN @NewAll a ON e.citedPaperID = a.id
                    WHERE e.paperID NOT IN (SELECT v.id FROM @Visited v)

                    UPDATE @Temp SET visCnt = 0;
                    UPDATE @NewAll SET visCnt += 1;
                    DELETE FROM @NewAll WHERE visCnt = 2;
                    INSERT INTO @NewAll (id, visCnt) (SELECT * FROM @Temp);
                    DELETE FROM @Temp;
                END;
            SET @NewCnt = (SELECT COUNT(*) FROM @NewAll);
        END;

        SET @connectedCnt = (
            SELECT COUNT(DISTINCT v.id)
            FROM @Visited v
        );

        IF (@connectedCnt > 4 AND @connectedCnt <= 10)
        BEGIN
            SELECT n.paperID, n.paperTitle
            FROM Nodes n, @Visited v
            WHERE n.paperID = v.id
        END;

        DELETE t FROM @tempVisited t JOIN @Visited v ON t.id = v.id;
        DELETE FROM @Visited

        SET @tempVisitCnt = (
            SELECT DISTINCT Count(*)
            FROM @tempVisited
        );
    END;
END;
```

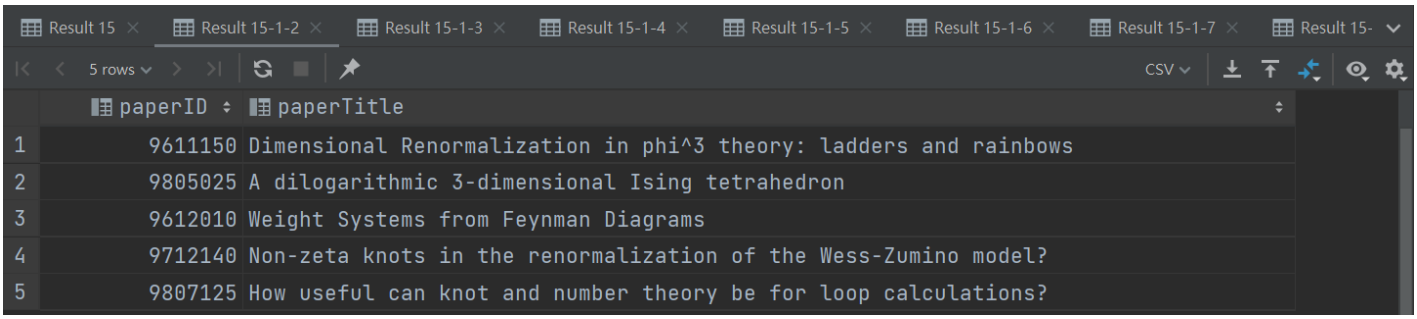
【Result】

Table 1



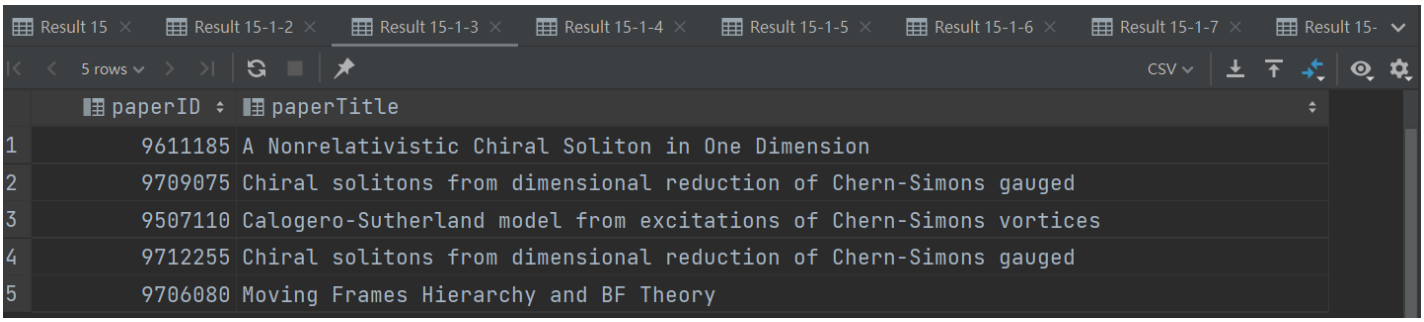

| | paperID | paperTitle |
|---|---|---|
| 1 | 210310 | Homotopy of Rational Maps and the Quantization of Skyrmions |
| 2 | 12215 | Solitonic fullerene structures in light atomic nuclei |
| 3 | 206160 | Skyrmed Monopoles |
| 4 | 9904160 | Spherically Symmetric Solutions of the SU(N) Skyrme Models |
|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

Table 2



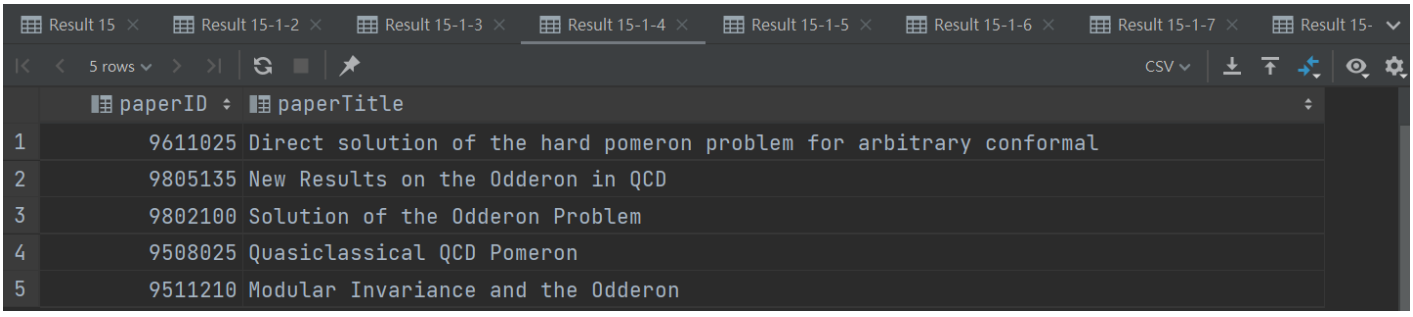

| | paperID | paperTitle |
|---|---|---|
| 1 | 9611150 | Dimensional Renormalization in phi^3 theory: ladders and rainbows |
| 2 | 9805025 | A dilogarithmic 3-dimensional Ising tetrahedron |
| 3 | 9612010 | Weight Systems from Feynman Diagrams |
| 4 | 9712140 | Non-zeta knots in the renormalization of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

Table 3



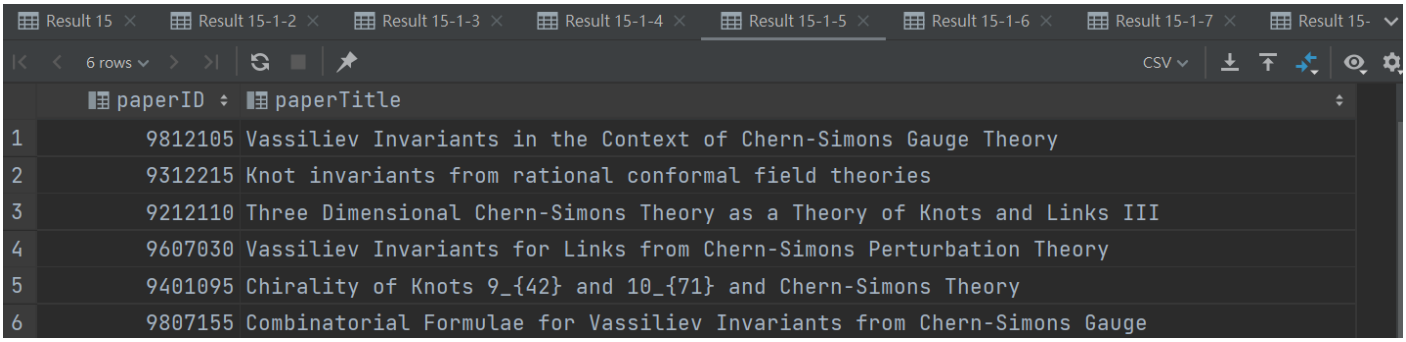

| | paperID | paperTitle |
|---|---|---|
| 1 | 9611185 | A Nonrelativistic Chiral Soliton in One Dimension |
| 2 | 9709075 | Chiral solitons from dimensional reduction of Chern-Simons gauged |
| 3 | 9507110 | Calogero-Sutherland model from excitations of Chern-Simons vortices |
| 4 | 9712255 | Chiral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

Table 4



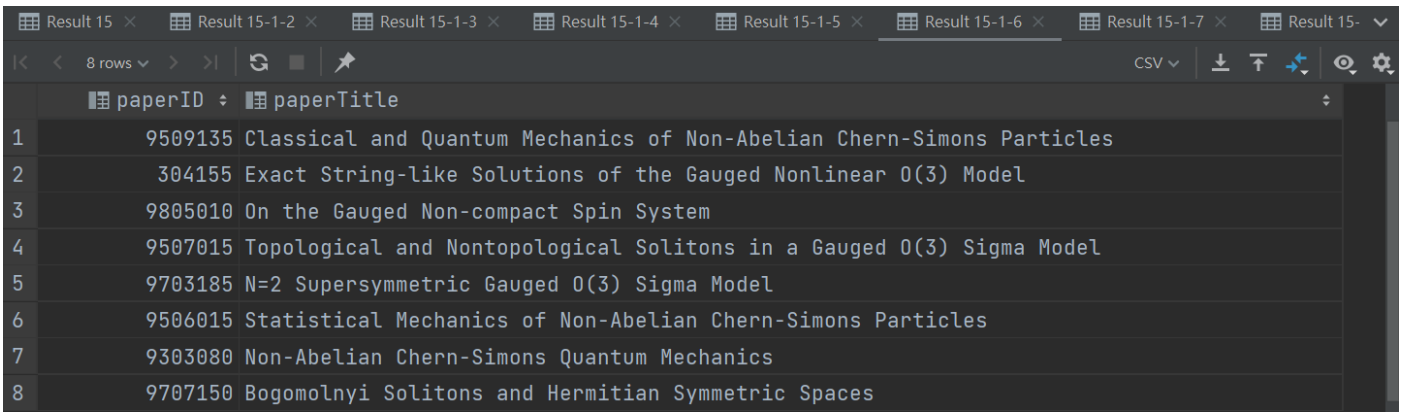

| | paperID | paperTitle |
|---|---|---|
| 1 | 9611025 | Direct solution of the hard pomeron problem for arbitrary conformal |
| 2 | 9805135 | New Results on the Odderon in QCD |
| 3 | 9802100 | Solution of the Odderon Problem |
| 4 | 9508025 | Quasiclassical QCD Pomeron |
| 5 | 9511210 | Modular Invariance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

Table 5



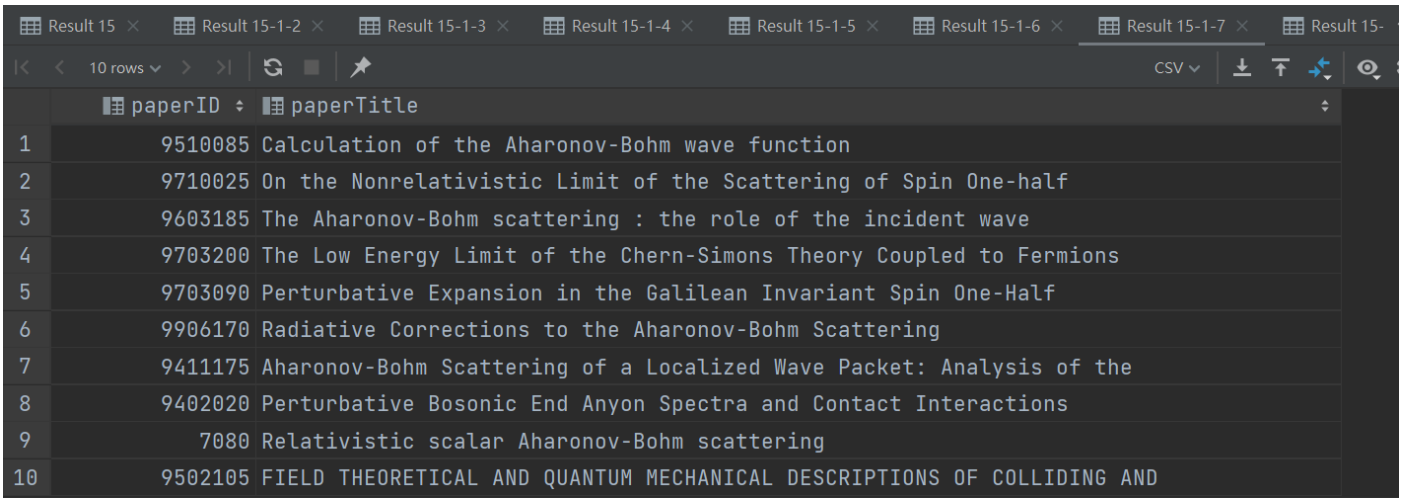

| | paperID | paperTitle |
|---|---|---|
| 1 | 9812105 | Vassiliev Invariants in the Context of Chern-Simons Gauge Theory |
| 2 | 9312215 | Knot invariants from rational conformal field theories |
| 3 | 9212110 | Three Dimensional Chern-Simons Theory as a Theory of Knots and Links III |
| 4 | 9607030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

Table 6



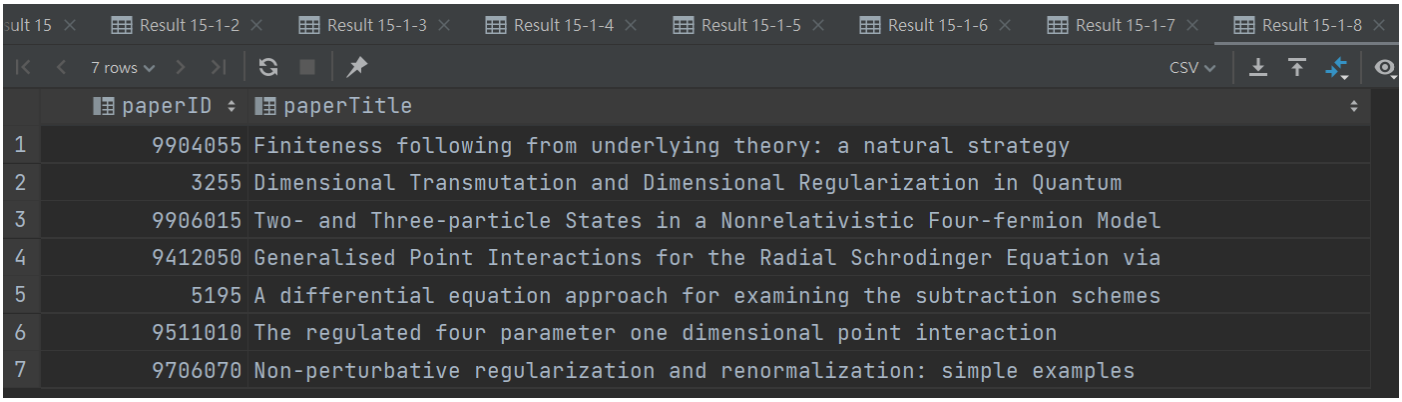

| | paperID | paperTitle |
|---|---|---|
| 1 | 9509135 | Classical and Quantum Mechanics of Non-Abelian Chern-Simons Particles |
| 2 | 304155 | Exact String-like Solutions of the Gauged Nonlinear O(3) Model |
| 3 | 9805010 | On the Gauged Non-compact Spin System |
| 4 | 9507015 | Topological and Nontopological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

Table 7




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

Table 8




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

## 1-2 PageRank

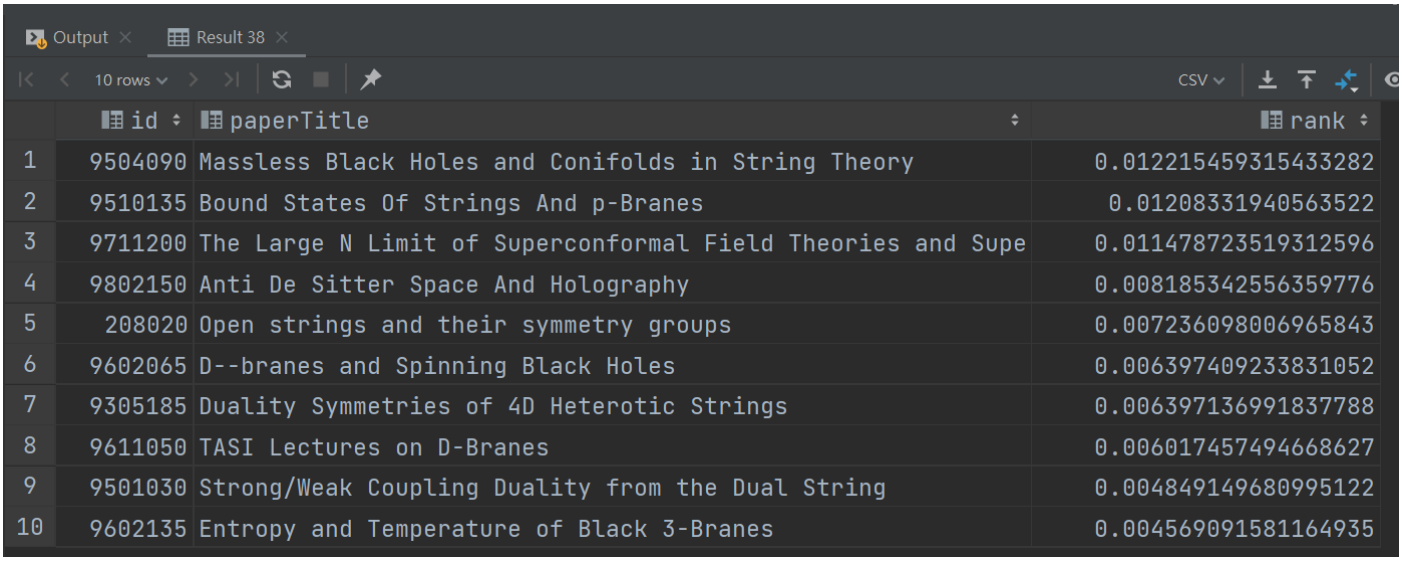
【Code】

```
-- 1.2 PageRank
BEGIN
	DECLARE @PageRank TABLE (
		id INT,
		rank FLOAT
	);
	DECLARE @paperCited TABLE (
		id INT
	);
	DECLARE @Visited TABLE (
		id INT
	);
	DECLARE @Sink TABLE (
		id INT
	);

	-- Set up variables
	DECLARE @dampingFactor FLOAT = 0.85;
	DECLARE @nodeCnt FLOAT = (SELECT Count(*) FROM Nodes);
	DECLARE @stayProb FLOAT = ((1 - @dampingFactor) / @nodeCnt);
	DECLARE @sigma FLOAT = 1;
	DECLARE @visitedCnt INT;

	INSERT INTO @sink (id)
	SELECT DISTINCT n.paperID
	FROM Nodes n
	WHERE NOT EXISTS (
		SELECT n1.paperID
		FROM Nodes n1, Edges e
		WHERE n.paperID = n1.paperID AND n1.paperID = e.paperID
	)

	-- Initialize all ranks
	INSERT INTO @PageRank (id) (SELECT n.paperID FROM Nodes n);
	UPDATE @PageRank SET rank = (1 / @nodeCnt);

	WHILE (@sigma > 0.01)
		BEGIN
			INSERT INTO @Visited (id) (SELECT n.paperid FROM Nodes n);
```

```
SET @visitedCnt = (SELECT COUNT(*) FROM @Visited)
SET @sigma = 0;
WHILE (@visitedCnt > 0)
	BEGIN
		-- Randomly pick a PaperID to calculate its PageRank
		DECLARE @curPaperID INT = (
			SELECT TOP(1) v.id
			FROM @Visited v
			ORDER BY NEWID()
		);

		INSERT INTO @paperCited (id)
		SELECT DISTINCT e.paperID
		FROM Edges e
		WHERE e.citedPaperID = @curPaperID

		-- @prevRank = All previous
		DECLARE @prevRank FLOAT = (
			SELECT p.rank
			FROM @PageRank p
			WHERE p.id = @curPaperID);
		DECLARE @updateVal FLOAT = 0;
		DECLARE @paperCitedCnt INT = (SELECT COUNT(*) FROM @paperCited);

		WHILE (@paperCitedCnt > 0)
			BEGIN
				DECLARE @paperID INT = (
					SELECT TOP (1) p.id
					FROM @paperCited p
				);

				DECLARE @paperIDCitedCnt INT = (
					SELECT COUNT(e.citedPaperID)
					FROM Edges e
					WHERE e.paperID = @paperID
				);
				SET @updateVal += (
					SELECT p.rank
					FROM @PageRank p
					WHERE p.id = @paperID
				) / @paperIDCitedCnt;
```

```
                    DELETE FROM @paperCited WHERE id = @paperID;
                    SET @paperCitedCnt -= 1;
                END;
            DECLARE @curSinkVal FLOAT = ((
                SELECT SUM(p.rank)
                FROM @Sink s, @PageRank p
                WHERE s.id = p.id) / @nodeCnt) * @dampingFactor;
            SET @updateVal += @curSinkVal
            DECLARE @curRank FLOAT = @stayProb + @dampingFactor * @updateVal;
            SET @sigma += ABS(@curRank - @prevRank);

            UPDATE @PageRank SET rank = @curRank WHERE id = @curPaperID;
            DELETE FROM @Visited WHERE id = @curPaperID;
            SET @visitedCnt -= 1
        END;
    PRINT @sigma;
END;
SELECT TOP(10) p.id, n.paperTitle, p.rank
FROM @PageRank p, Nodes n
WHERE n.paperID = p.id
ORDER BY p.rank DESC
END;
```

【Result】



Output | Result 38

10 rows | CSV

| | id | paperTitle | rank |
|---|---|---|---|
| 1 | 9504090 | Massless Black Holes and Conifolds in String Theory | 0.012215459315433282 |
| 2 | 9510135 | Bound States Of Strings And p-Branes | 0.01208331940563522 |
| 3 | 9711200 | The Large N Limit of Superconformal Field Theories and Supe | 0.011478723519312596 |
| 4 | 9802150 | Anti De Sitter Space And Holography | 0.008185342556359776 |
| 5 | 208020 | Open strings and their symmetry groups | 0.007236098006965843 |
| 6 | 9602065 | D--branes and Spinning Black Holes | 0.006397409233831052 |
| 7 | 9305185 | Duality Symmetries of 4D Heterotic Strings | 0.006397136991837788 |
| 8 | 9611050 | TASI Lectures on D-Branes | 0.006017457494668627 |
| 9 | 9501030 | Strong/Weak Coupling Duality from the Dual String | 0.004849149680995122 |
| 10 | 9602135 | Entropy and Temperature of Black 3-Branes | 0.004569091581164935 |