Example: random graphs

Goal: Compute the probability that a random graph contains a triangle.

\[
\begin{array}{c|cccc}
T & u & v & \text{bit} & p \\
\hline
1 & 2 & 1 & 5 & .25 \\
1 & 2 & 0 & 5 & \\
1 & 3 & 1 & .5 & \\
1 & 3 & 0 & 5 & \\
2 & 3 & 1 & .5 & \\
2 & 3 & 0 & 5 & \\
\end{array}
\]

create table E as select Q.u, Q.v from (repair key \(uv\) in T weight by p) Q where Q.bit = 1; 8 possible worlds, one has a triangle. E not given as symmetric relation, but as subset of total order.

select \text{conf()} as triangle_prob from E e1, E e2, E e3 where e1.u == e2.u and e2.v == e3.v and e1.u == e3.u and e1.u < e2.u and e2.u < e3.v;

\[
\begin{array}{c|c}
\text{triangle_prob} & 0.125 \\
\end{array}
\]

Example: hypothetical queries

Suppose I buy a company and exactly one employee leaves. Which skills do I gain for certain?

create table RemainingEmployees as select CE.cid, CE eid from CE, (repair key \( \text{dummy} \) in \( \text{select 1 as dummy, } * \) from CE) Choice where CE.cid = Choice.cid and CE.eid <> Choice.eid;

create table SkillGained as select Q1.cid, Q1.skill, p1, p2, p1/p2 as p from (select R.cid, ES.skill, \text{conf()} as p1 from RemainingEmployees R, ES where R.eid = ES.eid group by R.eid, ES.skill) Q1, (select cid, \text{conf()} as p2 from RemainingEmployees group by cid) Q2 where Q1.cid = Q2.cid;

Example: Tossing a biased coin twice.

repair key Toss in R weight by FProb;

\[
\begin{array}{c|cc|c}
R & \text{Toss} & \text{Face} & \text{FProb} \\
\hline
1 & 1 & 1 & 4 \\
2 & 1 & 2 & 2 \\
\end{array}
\]

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Confidence computation (#P-hard)

Three techniques implemented:

1. Exact AI heuristic search technique.
2. For hierarchical queries, PTIME techniques for exact confidence computation. Special secondary storage operator (SPROUT) that requires few sequential passes over the data. Generalizations to obtain larger PTIME query fragment via functional dependencies.

Our techniques are the state of the art in confidence computation.

The MayBMS System

- An extension of the Postgres server backend. Compiles and runs on the same platform as Postgres.
- Postgres APIs and middleware can be used, e.g. ODBC, JDBC, PLSQL, PHP.
- Full SQL support. Same performance as Postgres on nonprobabilistic data.
- Full support for updates, transactions and recovery.
- Secondary storage implementations for all operations!

Selected publications


