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| 来源 | KDD 2016 Approximate Personalized PageRank on Dynamic Graphs |
| 摘要 | We propose and analyze two algorithms for maintaining approximate Personalized PageRank (PPR) vectors on a dynamic graph, where edges are added or deleted. Our algorithms are natural dynamic versions of two known local variations of power iteration. One, Forward Push, propagates probability mass forwards along edges from a source node, while the other, Reverse Push, propagates local changes backwards along edges from a target. In both variations, we maintain an invariant between two vectors, and when an edge is updated, our algorithm ﬁrst modiﬁes the vectors to restore the invariant, then performs any needed local push operations to restore accuracy.  For Reverse Push, we prove that for an arbitrary directed graph in a random edge model, or for an arbitrary undirected graph, given a uniformly random target node t, the cost to maintain a PPR vector to t of additive error ε as k edges are updated is O(k + d/ε), where d is the average degree of the graph. This is O(1) work per update, plus the cost of computing a reverse vector once on a static graph. For Forward Push, we show that on an arbitrary undirected graph, given a uniformly random start node s, the cost to maintain a PPR vector from s of degree-normalized error ε as k edges are updated is O(k + 1/ε), which is again O(1) per update plus the cost of computing a PPR vector once on a static graph. |
| 对比目的 |  |
| 数据集 |  |
| 应用 |  |
| 测试方法 |  |
| 研究问题 |  |
| Ensemble算法发现 |  |
| Mahout算法发现 |  |
| 结论 |  |
| 相关有趣的参考文献 |  |
| 启发 |  |

# KDD 2016 Approximate Personalized PageRank on Dynamic Graphs

**Abstracts**

[方法]

我们提供了两种算法，实现了在动态图上（即图中的边时可以随时增加和删除的）的PPR(Personalized PageRank)的估计算法。我们的算法是两个已知的局部变化幂律迭代（local variations of power iteration）的动态版本。一个是Forward Push，从一个源节点顺着边向外传播概率信息，另外一个是Reverse Push,从一个目标节点顺着边回传局部变化。在这两个变化（variations）中，我们维持了一个两个向量之间的不变量，当一条边被更新时，我们的算法首先修改向量来重新存储这个不变量，然后执行本地的push操作来重新存储精确度。

[复杂度]

针对Reverse Push,我们提供了针对任意的有向图，它的边时采用随机模型产生的，或者针对任意的无向图，给出一个均匀随机的目标节点t, 维持PPR向量的代价，在附加误差（additive error）ε的情况下，k条边被更新的代价是O(k + d/ε)，其中d是图中所有节点的平均的度。平均到每次更新上，这是O(1)的更新代价，在一个静态图上来计算一个reverse vector.

特征，场景，背景，约束，算法，精确度和性能