Example Calculations of the Weighted $\hat{R}^3$ and $R^3Cont@k$

1 Weighted $\hat{R}^3$

We will use Figure 1 from the paper for our example calculation. The formula to calculate the weighted $\hat{R}^3$ is given by

$$\hat{R}^3 = \frac{C(X)}{C(O_{\mathcal{T}})} \tag{1}$$

From Figure 1 we observe that the traversal path on the left, weighted by HTTP request times, includes edges with total weight $5 + 3 + 3$. In contrast, the optimal path on the right includes edges with weight $1 + 1 + 3 + 3$. We can calculate the HTTP weighted $\hat{R}^3$ by:

$$\hat{R}^3 = \frac{8}{11} = 0.73. \tag{2}$$

Figure 1: By considering HTTP request latency, the weighted R^3 metric ensures that the computed traversal path corresponds to the real-world optimum.

2 $R^3Cont@k$

We will calculate $R^3Cont@k$ on the unweighted example topology given in the paper and Figure 2. We assume that each HTTP request takes one second and that the next request is issued immediately after the previous one completes.

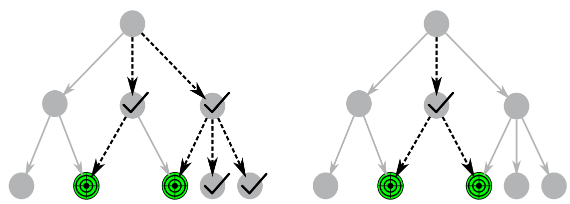

Figure 2: The traversal on the left follows an inefficient dereference path (checkmarks) to the target documents (green), compared to the optimal path on the right. The R^3 metric captures this inefficiency.

Given an example order of traversal given in Figure 3, we get the answer distribution functions as defined in the paper and shown in Figure 4 & 5

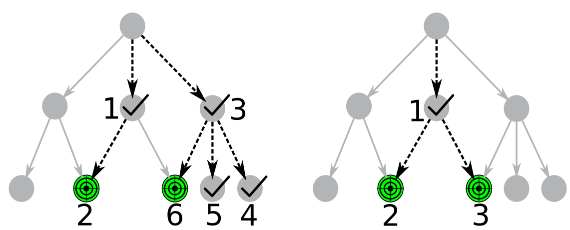

Figure 3: Example traversal path annotated with node dereference order.

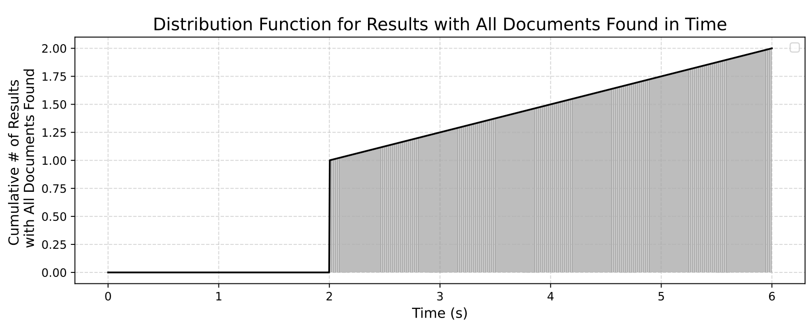

Figure 4: Answer distribution function for the suboptimal traversal order.

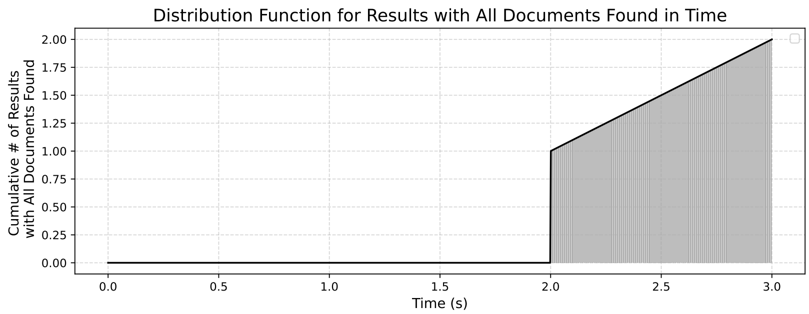

Figure 5: Answer distribution function for the optimal traversal order.

Using the $R^3Cont@k$ formula for $k = 2$

$$R^3Cont@2 = \int_0^{t_2} A_d(x)dx, \tag{3}$$

we find $R^3Cont@2 = 6.00$ for the left traversal path and $R^3Cont@2 = 1.50$ for the right traversal path. As lower is better, we find that the right traversal path displays significantly better continuous traversal efficiency.