Ranking of Translator result graphs: ARAX's approach

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October 26, 2021

ARAX result-graph ranking method

In ARAX, a result g is an edge-weighted multi-digraph $g = (\mathcal{V}, \mathcal{P}, \mathcal{E}, \mathcal{W})$, where $\mathcal{V}$ is the vertex-set, $\mathcal{P}$ is a predicate set, $\mathcal{E} \subset \mathcal{V} \times \mathcal{V} \times \mathcal{P}$ is the set of directed edges, and $\mathcal{W} : \mathcal{E} \to [0, 1]$ maps edges to edge weights. Let $\boldsymbol{A}_g$ denote the induced weighted-digraph adjacency matrix from summing edge weights. For each g, ARAX computes three scalar $\mathbb{R}$-valued scores:

1. $S_1(g) = ||\boldsymbol{A}_g||_F$, the Frobenius norm
2. $S_2(g) = \max\left(\text{max-flow}(\boldsymbol{A}_g)\right)$
3. $S_3(g) = \left\langle \left((\boldsymbol{A}_g)^{L(g)}\right)_{i,j} \right\rangle_{(i,j) \in G_g(L(g))} / L(g)!$

where $\text{max-flow}(\boldsymbol{A}_g)$ denotes the maximum-flow matrix computed for the weighted digraph via the Push-relabel algorithm; and $L(g)$ denotes the maximum unweighted geodesic path length of g; and $G_g(l)$ denotes the set of node pairs with geodesic path length l.