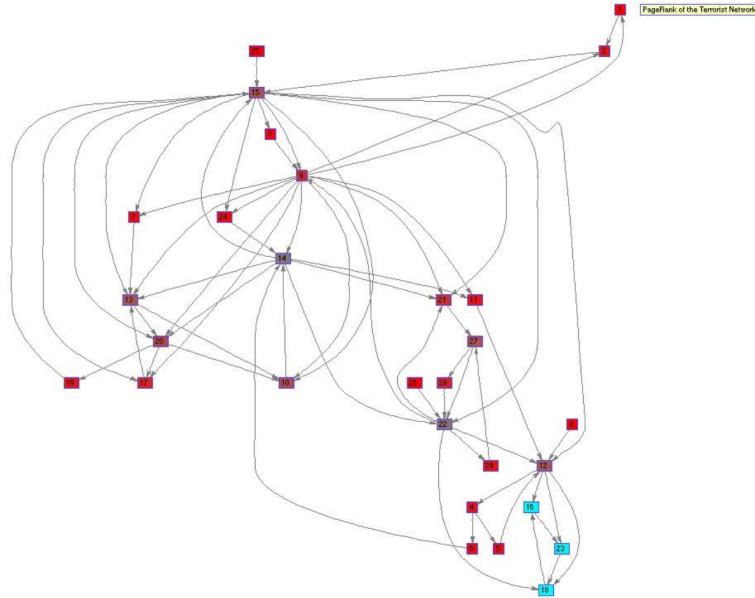# Lab 7: Ranking the Terrorists

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The Basics

- Goal: Create a directed terrorist network graph that is color-coded based on rank:

PageRank

- Structural measure vs. behavioral
- More accurate measure of relative "importance" than degree

PageRank cont.

- Create matrix R from the terrorist file based on these probabilities:

$$
\mathbf{R}_{ij} = \begin{cases} \frac{0.85}{d_j} + \frac{0.15}{n} & \text{if } j \rightarrow i \\ \frac{0.15}{n} & \text{otherwise} \end{cases}
$$

PageRank cont.

- The catch: there won't be a unique solution when solving for the PageRank vector using Gaussian Elimination
  - Concatenate R with a row of ones at the bottom → we'll go into this further later on

Gaussian Elimination

- Solve for p, the pagerank vector
- Rp = p
- (R-I)p = 0
  - In order to make sure the probabilities add to 1, add a 1 to the end of the 0 vector

Augment (R-I) with the modified 0 vector and use Gaussian Elimination (pseudocode in notes)

Gaussian Elimination cont.

- row swapping

$$S([j\ k],:) = S([k\ j],:)$$

- row mixing

$$S(j,:) = S(j,:) + magicnumber*S(k,:)$$

Gaussian Elimination cont.

- upper triangular structure
- back-substitution (trisolve function) to generate solution set: rank vector, p

$$\begin{pmatrix} \times & \times & \times & \times & \times \\ & \times & \times & \times & \times \\ & & \times & \times & \times \\ & 0 & & \times & \times \\ & & & & \times \end{pmatrix}$$

pagerankdriver

- reads text file
- creates R from the txt file
- uses gauss to solve for the rank vector, p
- creates **directed** biograph with nodes colored based on rank