Algorithms for Graph-Based Supervised Learning

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Hello

1 Modified Adsorption

This routine is described in Talukdar below.

I'm looking for a good parallelization strategy for this function. I'm going to expand it as far as I can to see if something presents itself. We are aiming to find c_v and d_v for each vertex in the graph. First, let's define

$$\begin{aligned} m(x) &= \sum_u W_{u,x} && (1) \\ l(x) &= \sum_u W_{u,x} \log W_{u,x} && (2) \end{aligned}$$

Okay, check my math here...

$$\begin{aligned} p(a|b) &= \frac{W_{a,b}}{\sum_u W_{u,b}} && (3) \\ &= \frac{W_{a,b}}{m(b)} && (4) \\ H(x) &= -\sum_y p(y|x) \log p(y|x) && (5) \\ &= -\sum_y \left(\frac{W_{y,x}}{\sum_u W_{u,x}} \right) \log \left(\frac{W_{y,x}}{\sum_u W_{u,x}} \right) && (6) \\ &= -\sum_y \left(\frac{W_{y,x}}{m(x)} \right) \log \left(\frac{W_{y,x}}{m(x)} \right) && (7) \\ &= \frac{-1}{m(x)} \sum_y W_{y,x} \left[\log W_{y,x} - \log m(x) \right] && (8) \\ &= \frac{-1}{m(x)} \left[\sum_y W_{y,x} \log W_{y,x} - \sum_y W_{y,x} \log m(x) \right] && (9) \end{aligned}$$

$$= \frac{-1}{m(x)}\left[\sum_y W_{y,x}\log W_{y,x} - m(x)\log m(x)\right] \tag{10}$$

$$= \log m(x) - \frac{1}{m(x)}\sum_y W_{y,x}\log W_{y,x} \tag{11}$$

$$= \log m(x) - \frac{l(x)}{m(x)} \tag{12}$$

Next we have the smoothing function for a given β

$$
\begin{aligned}
f(x) &= \frac{\log\beta}{\log(\beta+e^{x})} &(13)\\
c_x &= f(H(x)) &(14)\\
&= \log\beta\,[\log(\,\beta+e^{H(x)}\,)]^{-1} &(15)\\
d_x &= (1-c_x)\sqrt{H(x)} &(16)\\
z_x &= \max(c_x+d_x,1) &(17)
\end{aligned}
$$

2 References

BibTeX is a pain, so for right now I'm going to do


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@article{doi:10.2200/S00590ED1V01Y201408AIM029,
author = {  Amarnag
  Subramanya  and   Partha Pratim
  Talukdar },
title = {Graph-Based Semi-Supervised Learning},
journal = {Synthesis Lectures on Artificial Intelligence and Machine Learning},
volume = {8},
number = {4},
pages = {1-125},
year = {2014},
doi = {10.2200/S00590ED1V01Y201408AIM029},

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