CS583 – Probabilistic Graphical Models
Spring 2014

Topic: Iterative Classification Algorithm
Chapter: http://www.cs.iit.edu/~ml/pdfs/sen-aimag08.pdf
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Today

- We'll take an excursion, in the hope that it might help with your projects

Collective Classification

- Problem definition
  - We have a set of input variables that are observed, $\mathbf{X}$
  - We have a set of target variables that are not observed, $\mathbf{Y}$
  - We are interested in a MAP assignment to $\mathbf{Y}$ given $\mathbf{X}$

Examples

- Webpage classification, document classification, image segmentation, etc…
- Any classification problem where $\mathbf{y}$ are correlated (positive or negative)

Two Approaches

- Global approach
  - A global objective to model P($\mathbf{Y}$, $\mathbf{X}$) or P($\mathbf{Y}|\mathbf{X}$) and use MAP inference
  - Pretty much every model we discuss in this class
- Local approach
  - Use local classifiers that are specialized on predicting a single target variable using all the available information
    - Naïve Bayes
    - Logistic regression
    - Support vector machines

Local Approach

- Iterative Classification Algorithm

ICA Papers

- https://kdl.cs.umass.edu/papers/neville-jensen-srl2000.pdf
- http://www.cs.umd.edu/~getoor/Publications/icml03.pdf
- http://www.cs.iit.edu/~ml/pdfs/sen-aimag08.pdf

Main Idea

- To predict the label of a node, use
  - The node's own attributes
  - The attributes and labels of the node's neighbors
- A problem: node's neighbors' labels are probably unknown, hence a decision needs to be made 'collectively'
- ICA approach: train two classifiers
  - First one uses only local attributes
  - Second one: two approaches
    - Uses only relational information
    - Uses both local and relational information

Java Code

- https://github.com/linqs/GAIA