**Two-view Transductive Support Vector Machines**

A Multi-view Semi-supervised Learning Algorithm

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**Motivation**
- Two SVM classifiers are created from each view of the same problem
- Each classifier is optimized to maximize the overall consensus of their predictions

\[ f_1(x) - f_2(x) \leq \eta + \varepsilon \]

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**Semi-supervised Learning**
- A novel multi-view semi-supervised learning algorithm — two-view transductive SVM that takes advantage of both
  - the abundant amount of unlabeled data
  - and their multiple representations
  - to improve the classification result

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**Experimental Results**

**Toy Dataset**
- (a) Supervised SVM
- (b) CCCP TSVM
- (c) Two-view TSVM

**WebKB Course Dataset**
- Variation of Positive Class's F1-measure
- Variation of Negative Class's F1-measure

**Product Review Dataset**
- Classification results showing mean accuracy (in percentage)
- and its standard deviation (in brackets)

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**Our Approach: Two-view Transductive SVM**
- A multi-view semi-supervised learning problem contains
  - A set of labeled examples \( \{(x_i, y_i)\}_{i=1}^n \)
  - A set of unlabeled examples \( \{x_i\}_{i=n+1}^m \in \mathbb{R}^d \)
- For each view, we aim to find a decision function \( f_i(x) \) as
  \[ f_i(x) = w \cdot \Phi(x) + b \]
  where \( (w, b) \) are the parameters of the model, and \( \Phi(x) \) in the feature map.

\[
\min_{w, b} \frac{1}{2} \left( \sum_{i=1}^{n} (y_i - w \cdot \Phi(x_i) - b)^2 \right) + C \sum_{i=1}^{n} H(\varepsilon - y_i)
\]

**Multi-view Learning**
- For some problems, there may exist multiple perspectives, so-called views, of each data sample

**For text classification**
- The typical view contains a large number of raw content features such as term frequency
- Another view may contain a small but highly informative number of domain-specific features
- Can we use the multiple representations of the same problem to improve the performance of classifiers?

**SVM-2K**, proposed by Farquhar et al. [Farquhar, 2005]