**Introduction**

**Lymphocytes**
- A type of white blood cell in immune system.
- About 7 micros in diameter.
- Observed with staining.
  - Eg. H-E, Silver impregnation, Lieshmann staining.

**Lymphocytic Infiltration & Significance of Autosegmentation**
- Increase in lymphocyte count.
- Diseases - Breast cancer, ovarian cancer, AIDS, viral infections.
- Conventional methods make it difficult to detect due to enormity of data.

**Challenges Associated**
- Different staining procedures.
- Visual inspection of histology slides, does not allow to distinguish lymphocytes from non-lymphocytes.
- Variable illumination conditions.
- High occurrence of overlapping objects.

**Training Data: PR in HIMA Contest**
- 10 RGB colored images.
- Image Size: 100px x 100px.

**Proposed Scheme**

**Clustering**
- Mean Shift Clustering - Non parametric clustering.
- Used to reduce computations and generalize color space.
- Reduced number of colors from 4061 to 172.
- Computationally slower than EM Clustering, K-means.

**HSV Based Thresholding**

\[ M(i,j) = \begin{cases} 1, & \text{if } 0.6667 \leq \text{hue}(i,j) \leq 0.7292 \\ 0, & \text{otherwise} \end{cases} \]

**Morphological Processing**
- Performed on the mask obtained with ECM segmentation.
- Boundary smoothing.
- Hole filling.

**Feature Extraction & Classification**
- GLCM (Gray Level Co-occurrence matrix) based features for each cell like blob.
- Used SVM (Support Vector Machines), for classification.

**Contour BasedOverlap Resolution**
- Criteria for Overlap Resolution:
  - Occupied area less than 60% of bounding box area.
  - Iterate through each contour formed by Euclidean Distance Transform.
  - Retain those contour-blobs which have area and perimeter in range of a lymphocyte.

**Results**
- Training with 6 of the given images.
- Testing with 4 of the given images.
- Sensitivity: 94.90%
- Classification Accuracy: 55.06%
- Negative Predictive Value: 16.66%

**Automatic Segmentation**

Ground Truth:
- Centers of all lymphocytes.
- Boundaries for some lymphocytes.

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