Furniture Image Classification

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Outline

- Furniture image dataset
- Graph-based Image Classification
  - Convert Image to graph
  - Compute graph similarities
  - Classification using SVM
- Experiments results
- Conclusion and Future Work

Outline

- Furniture image dataset

Furniture Image Dataset

- 8 classes
  - Bed, Bench, Buffet Hutch, Chair, Chest, Dresser, Sofa, Table
- 200 images per class

Bed

Bench

Buffet Hutch

Chair

Chest

Dresser

Sofa

Table

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Connect Local Feature Points

- Compute SURF feature points
- Convert one point to one node
  - The SURF descriptor is feature vector of the node
- Connect the node using K nearest neighbors
  - Weight of edge is the distance between two nodes

Connect Tiles

- Train visual words
  - Compute dense SIFT feature of some images
  - Cluster the features using K-means
    - Cluster centroids = visual words
- Cut image to 4x4 tiles
- Compute visual words histogram within each tile
- Treat each tile as a node
  - Visual word histogram of the tile is feature vector of the node
- Connect the node using k nearest neighbors

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Shortest Path Graph Kernel (SPGK)

$$k_{sp}(G, G') = \sum_{e \in E} \sum_{e' \in E'} k_{walk}(e, e')$$

$$k_{walk}(e, e') = k_{node}(u, u') \cdot k_{edge}(e, e') \cdot k_{node}(v, v')$$

Unordered Neighboring Graph Kernel (UNGK)

- Given a node v, let us define a set N(v) contains all the neighboring nodes of v

$$k(G, G') = \sum_{v \in V} \sum_{v' \in V'} k_{node}(v, v') * (\alpha + k_{neb}(v, v'))$$

$$k_{neb}(v, v') = \sum_{n \in N(v)} \sum_{n' \in N(v')} k_{node}(n, n')$$

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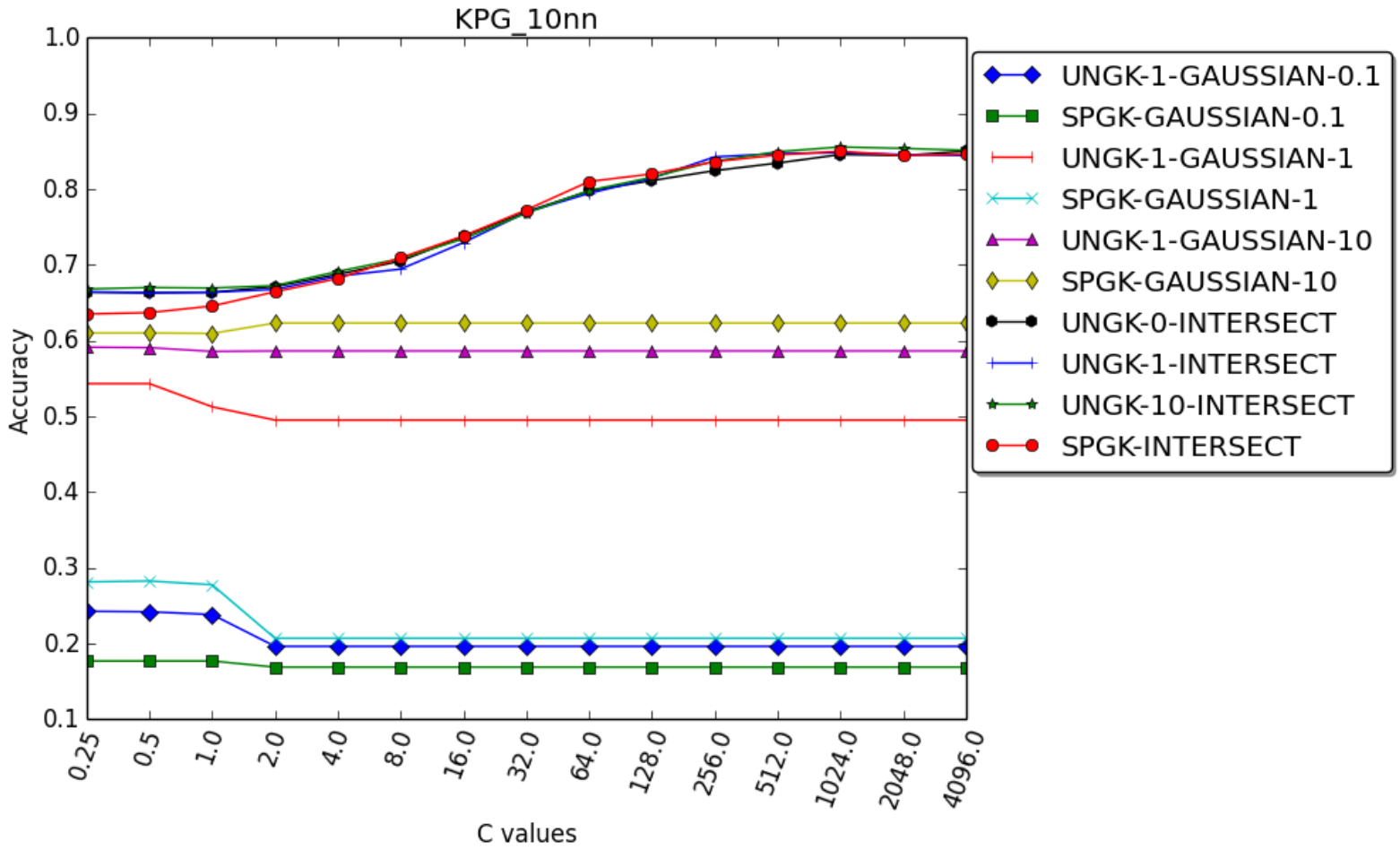
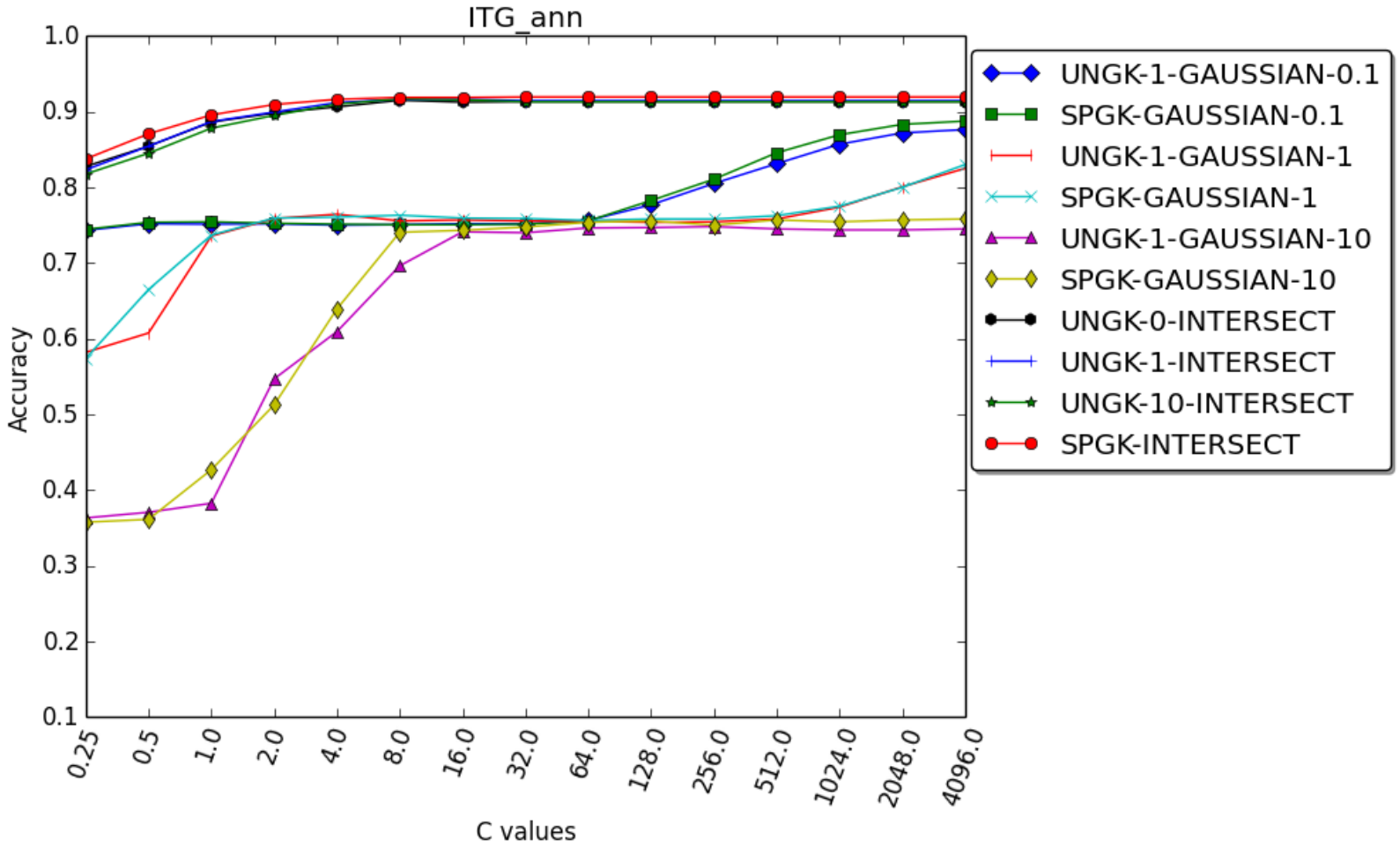
Results on Key-Point-Graph



Results on Image-Tiling-Graph



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Conclusion

- Furniture Image dataset
- Graph-based image classification
  - Two image-graph conversion methods
  - Two graph kernels for similarity computation
- Best accuracy is 92%

Future Work

- More classes
- Cut each class into sub-classes
- More graph kernels

Thanks!

Questions?