

E7 SOLUTION PROPOSAL

Team:

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QUESTION :- 1

Method 1 -

1. Calculating the number of edges of every bitmap using opencv library.
2. Making histograms of the number of edges and checking the output for clustering purposes.
3. Making a tight fit box around the image of minimum area and calculating the difference of box area and the actual image.
4. Making histograms of the difference of area.
5. Using the two above features we will cluster the data using K means Clustering, Hierarchical clustering etc.
6. Evaluating the model using metrics like Davis- Bouldin index etc.

Method 2 - Using Pre Trained CNN features like VGG, ResNet, Inception

1. Extracting features from the above pretrained modules
2. Using tSNE & PCA reducing the dimensionality of data
3. Using K means clustering or other clustering method we will cluster the reduced data.
4. Evaluating the model using metrics like Davis- Bouldin index etc.

QUESTION :- 2 [Complexity Classification of Layouts]

1. Feature Extraction and Analysis:

- Analyze layout characteristics such as density, structural intricacy, and spatial arrangement.
- Develop features representing layout complexity, including edge density, area-to-perimeter ratio, and symmetry measures.

2. Criteria Definition:

- Establish criteria for classifying layouts into Low, Medium, or High complexity based on the extracted features.
- Define thresholds or rules for each complexity level (e.g., low complexity if $\text{edge density} < \text{threshold1}$, medium if $\text{threshold1} < \text{edge density} < \text{threshold2}$, high otherwise).

3. Model Development:

- Train a classification model using machine learning techniques such as decision trees, random forests, or neural networks.
- Utilize labeled data to learn the relationship between layout features and complexity levels.

4. Evaluation:

- Evaluate the classification model's performance using metrics such as accuracy, precision, recall, and F1-score.
- Validate the model's effectiveness through cross-validation and testing with unseen data.

QUESTION :- 3

1. Using the input parameters such as the dimensions (length, width) of the tight-fitting box , the layout area, and the permissible layout complexity we will use the similarity search algorithms to predict the most similar bitmap.
2. This will be based on the labels such as complexity and clustering done using the methods specified for part 1 and 2.
3. When we will get the input of layout by using custom similarity metrics we will give the closest bitmap among all the bitmaps.
4. One example of such metrics can be the percentage of area the tight-fitting box covers to the complete layout area , the shape of the layout area etc.

QUESTION :- 4

Innovative Design Generation:

1. We can explore generative design algorithms like GANs and VAEs, and research if we can train them on the given dataset.
2. We can then use these trained models to generate new layout designs based on a predefined set of parameters instead of just predicting the closest design.
3. These parameters might include the maximum usable area , the complexity of the layout , number of edges, layout area etc.