# 2019
# Research Experience for Undergraduates

## Diversity and its Correlation to Group Performance

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UNIVERSITY of HOUSTON

# Goal

To determine if there is a correlation between gender diversity in groups and group performance in hopes of finding the best way to group students

# Objectives

- Form groups of students using data mining methods
- Calculate the diversity index and cohesion for each group and find correlation between them
- Evaluate how well the algorithm chooses groups

# Objective 1: Tasks

- Generate a random acquaintance matrix, randomly assign genders
- Compute distance matrix
- Apply hierarchical clustering, k-means, and dbscan on distance matrix

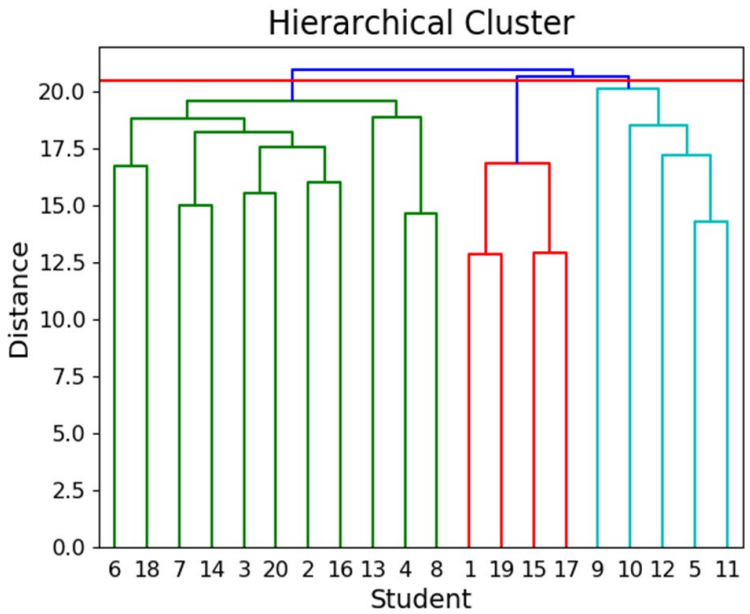
# Objective 1: Methodology

- Hierarchical Clustering and K-means
  - Chose optimal grouping by best silhouette score

- DBSCAN
  - Epsilon = 25, min # of points per cluster = 2

# Objective 1: Results

- Clusters from each method



# Objective 2: Tasks

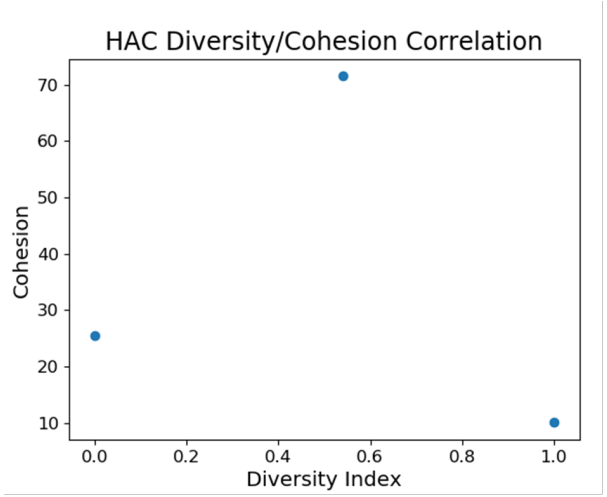
- For each clustering method
  - Calculate the cohesion for each cluster
  - Calculate the diversity for each cluster
  - Plot
  - Find correlation of diversity and cohesion

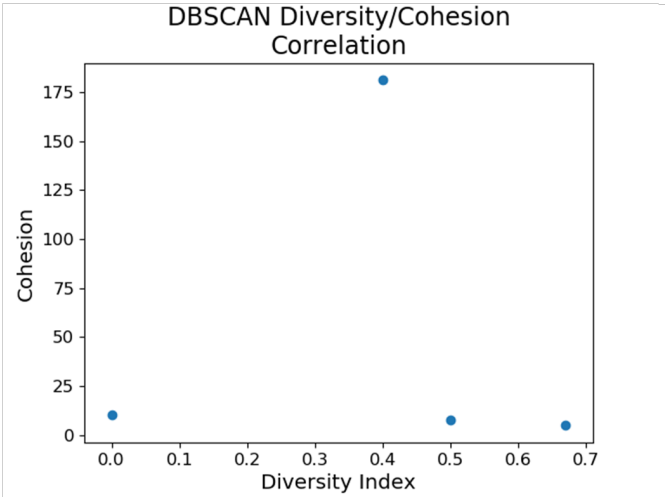
# Objective 2: Methodology

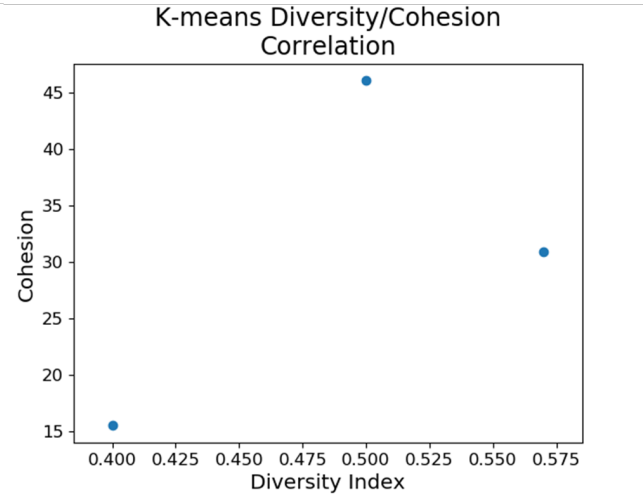
- Cohesion = Sum of Squared Error
- Diversity Index = $1 - \frac{|\#of\ males - \#of\ females|}{group\ cardinality}$
- Sci-py and matplotlib packages

# Objective 2: Results

## Diversity Index vs Cohesion




**Correlation Coefficients**

Hierarchical Clustering: -0.1968

DBSCAN: -0.00837

K-means: 0.5887

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# Objective 3: Tasks

- Compute silhouette score for each method
- Determine best clustering method by silhouette score

# Objective 3: Methodology

- Compute the silhouette score

The **silhouette** ranges from −1 to +1, where a high value indicates that the object is well matched to its own **cluster** and poorly matched to neighboring **clusters**. If most objects have a high value, then the **clustering** configuration is appropriate.

# Objective 3: Results

**Silhouette Scores**

Hierarchical Clustering: 0.1243

DBSCAN: 0.0515

K-Means:0.1134

# Deliverables

**Cluster Validation** is used to evaluate the goodness of clustering algorithm results: using cohesion, correlation and silhouette score

- Cohesion of each cluster
- Correlation of diversity index and cohesion of each clustering method
- Silhouette score for each clustering method

# Limitations

- Randomized data
- Small matrix

# Future Work

- Apply this research to classroom data through surveys
- Further test clustering methods
- Use other factors than acquaintance

# Conclusions

- Silhouette scores are overall low for each method
- Hierarchical clustering is best method
  - Refine
- Little correlation between diversity index and group cohesion
- With large datasets and more courses =>better results

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