SCHOOL RECOMMENDATION SYSTEM

USING CONTENTBASED FILTERING(COSINE SIMILARITY)

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.metrics.pairwise import cosine_similarity
import networkx as nx

# Sample Data
schools_data = {
    'name': ['School A', 'School B', 'School C','School D', 'School
E', 'School F'],
    'location': ['Central', 'North', 'Central','South', 'North',
'Central'],
    'curriculum': ['CBSE', 'IB', 'ICSE','CBSE', 'IB', 'ICSE'],
    'sports_offered': ['Basketball', 'Football',
'Cricket','Basketball', 'Football', 'Cricket'],
    'ratio': ['15:1', '20:1', '18:1','15:1', '20:1', '18:1'],
    'extracurricular_activities': ['Debate', 'Music',
'Dance','Debate', 'Music', 'Debate']
}

students_data = {
    'grade': [8, 10, 9, 1, 3, 12],
    'location': ['Central', 'North', 'Central','Central', 'South',
'Central'],
    'curriculum_preference': ['CBSE', 'IB', 'ICSE','CBSE',
'IB','ICSE'],
    'sports_preference': ['Basketball', 'Cricket',
'Cricket','Basketball', 'Cricket','Footbal'],
    'extracurricular_preference': ['Debate', None, None,'Music',
'Dance','Debate']
}

# Converting data into DataFrames
schools_df = pd.DataFrame(schools_data)
students_df = pd.DataFrame(students_data)

schools_df
```

```
       name location curriculum sports_offered ratio  \
0  School A  Central       CBSE     Basketball  15:1
1  School B    North         IB       Football  20:1
2  School C  Central       ICSE        Cricket  18:1
3  School D    South       CBSE     Basketball  15:1
4  School E    North         IB       Football  20:1
5  School F  Central       ICSE        Cricket  18:1
```

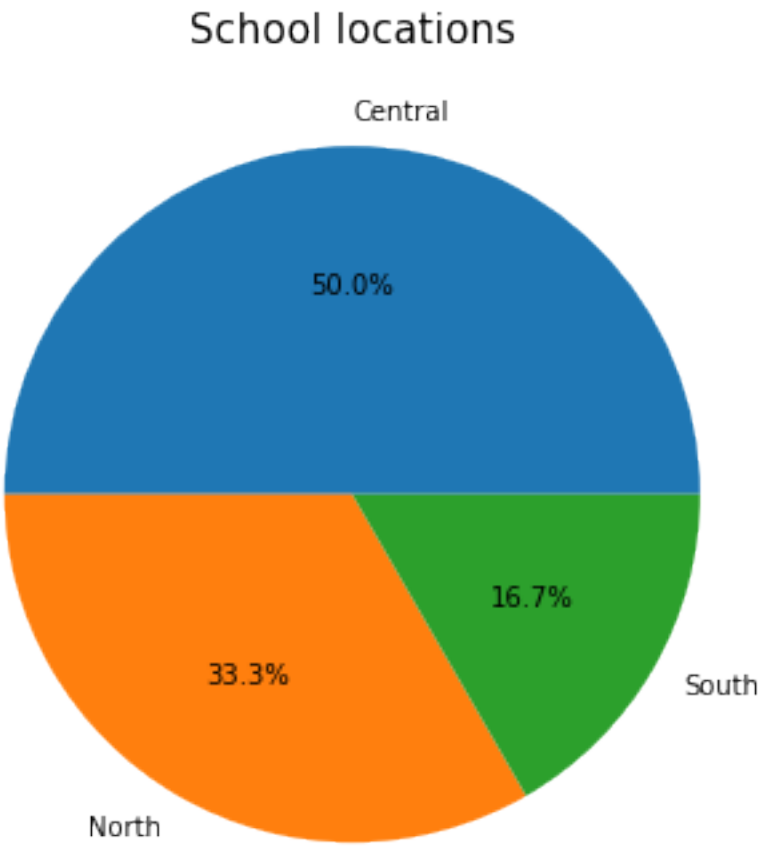
```
  extracurricular_activities
0                     Debate
1                      Music
2                      Dance
3                     Debate
4                      Music
5                     Debate
```

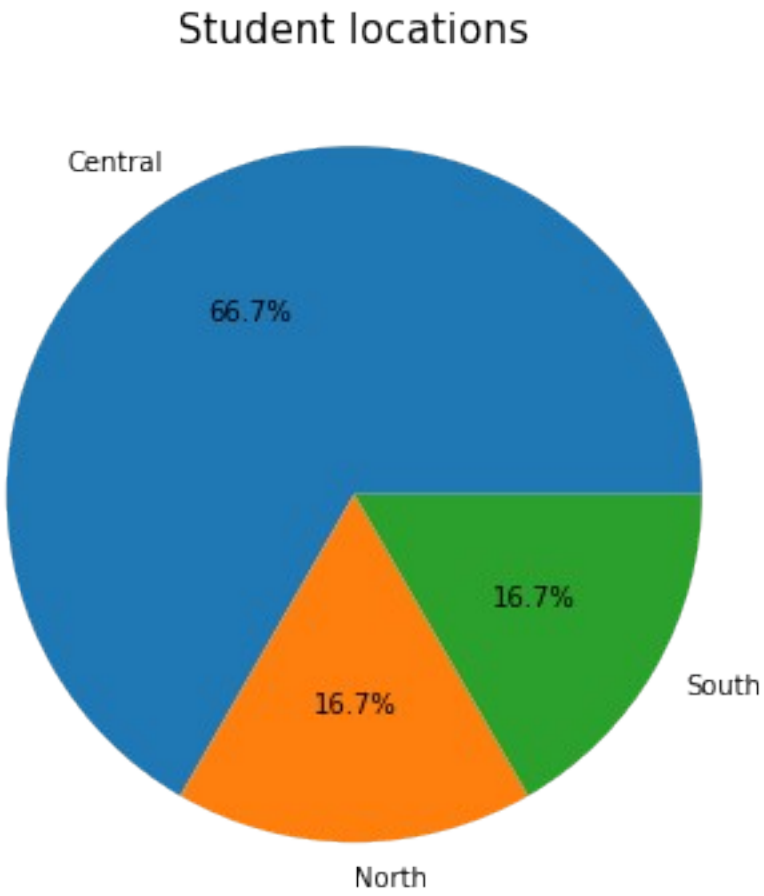
```
students_df
```

```
   grade location curriculum_preference sports_preference  \
0      8  Central                  CBSE        Basketball
1     10    North                    IB           Cricket
2      9  Central                  ICSE           Cricket
3      1  Central                  CBSE        Basketball
4      3    South                    IB           Cricket
5     12  Central                  ICSE          Football
```

```
  extracurricular_preference
0                     Debate
1                       None
2                       None
3                      Music
4                      Dance
5                     Debate
```

```
#EDA
plt.figure(figsize=(10,6))
plt.pie(schools_df.location.value_counts().values,
labels=schools_df.location.value_counts().index,autopct='%1.1f%%')
plt.title("School locations", size = 15)
plt.show()
plt.figure(figsize=(10,6))
plt.pie(students_df.location.value_counts().values,
labels=students_df.location.value_counts().index,autopct='%1.1f%%')
plt.title("Student locations", size = 15)
plt.show()
```


School locations
Central
50.0%
16.7%
33.3%
South
North




```
# Feature Engineering (Dummy variables for categorical features)
schools_df_encoded = pd.get_dummies(schools_df[['location',
'curriculum','sports_offered','extracurricular_activities']])
students_df_encoded = pd.get_dummies(students_df[['location',
'curriculum_preference','sports_preference','extracurricular_preferenc
e']])

schools_df_encoded.shape
```

```
(6, 12)
```

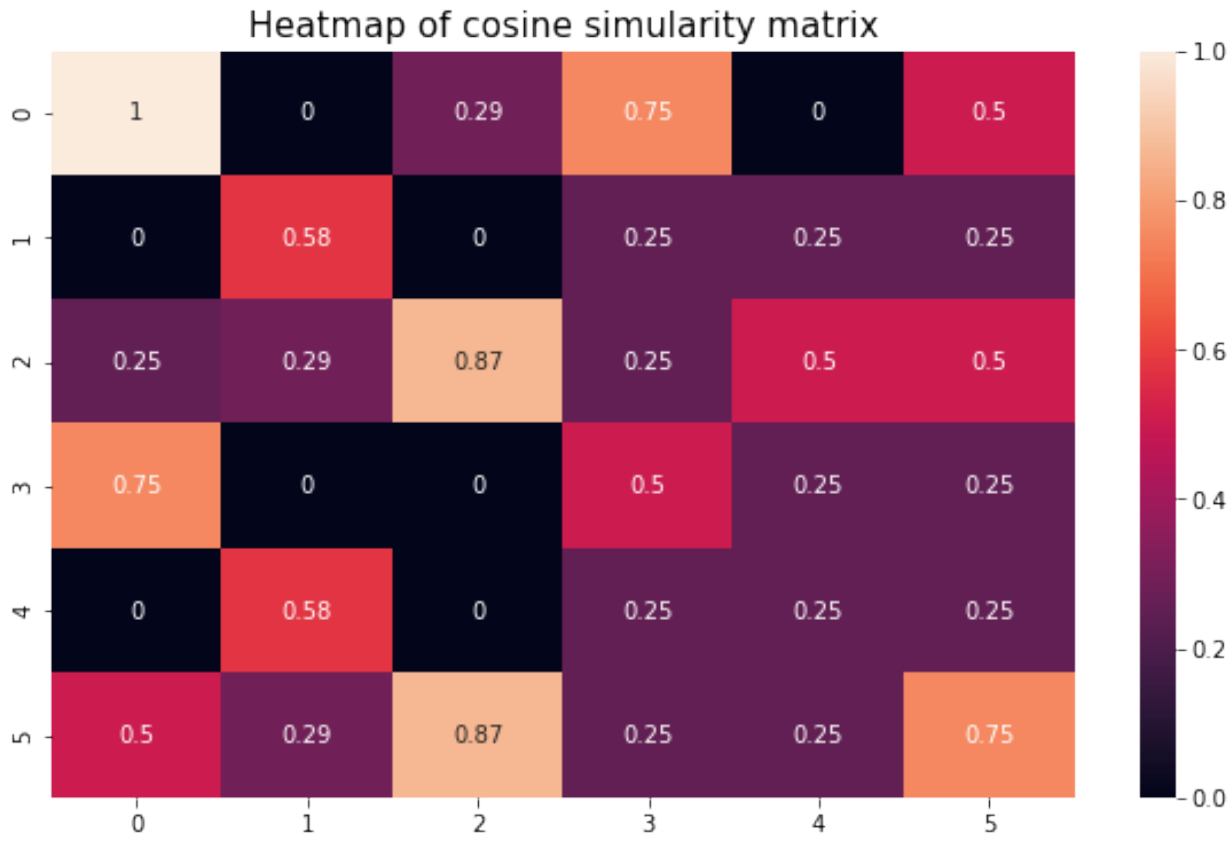
```
students_df_encoded.shape
```

```
(6, 12)
```

```
# Calculate cosine similarity between schools and students based on
features
similarity_matrix = cosine_similarity(schools_df_encoded,
students_df_encoded)

similarity_matrix
```

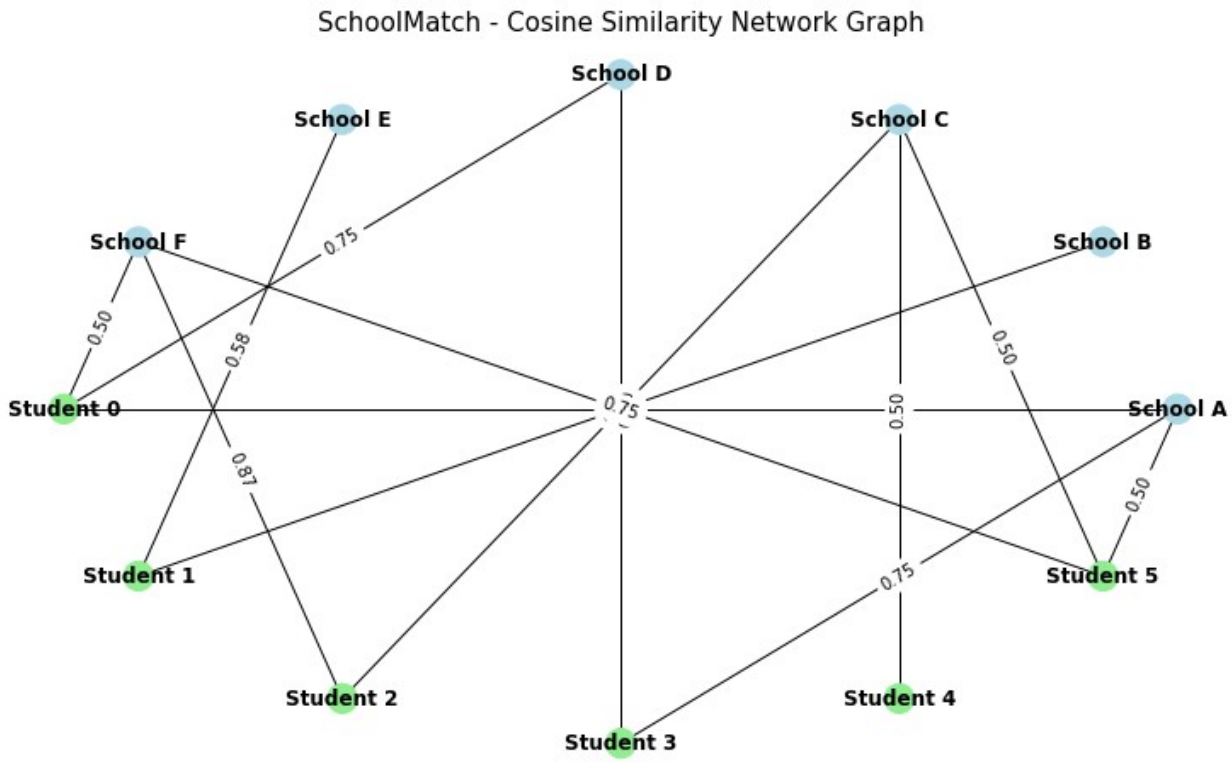
```
array([[1.        , 0.        , 0.28867513, 0.75      , 0.        ,
        0.5       ],
       [0.        , 0.57735027, 0.        , 0.25      , 0.25      ,
        0.25      ],
       [0.25      , 0.28867513, 0.8660254 , 0.25      , 0.5       ,
        0.5       ],
       [0.75      , 0.        , 0.        , 0.5       , 0.25      ,
        0.25      ],
       [0.        , 0.57735027, 0.        , 0.25      , 0.25      ,
        0.25      ],
       [0.5       , 0.28867513, 0.8660254 , 0.25      , 0.25      ,
        0.75      ]])
```

```
plt.figure(figsize=(10,6))
sns.heatmap(similarity_matrix,annot=True)
plt.title('Heatmap of cosine simularity matrix', size=15)
plt.show()
```




```
# Create NetworkX graph object
G = nx.Graph()

# Add nodes for schools and students with labels
```

```
G.add_nodes_from(schools_df['name'].tolist())
G.add_nodes_from([f"Student {i}" for i in range(len(students_df))],
bipartite=True)
# Add edges with weight based on similarity score (threshold optional)
threshold = 0.5  # Optional threshold to filter weak connections
for i in range(len(schools_df)):
  for j in range(len(students_df)):
    if similarity_matrix[i][j] >= threshold:
      G.add_edge(schools_df.loc[i, 'name'], f"Student {j}",
weight=similarity_matrix[i][j])

# Customize node colors (optional)
school_colors = ['lightblue' for _ in range(len(schools_df))]
student_colors = ['lightgreen' for _ in range(len(students_df))]
node_colors = school_colors + student_colors

# Layout options (choose based on preference)
# pos = nx.spring_layout(G)  # Spring layout
pos = nx.circular_layout(G)  # Circular layout

# Visualization using matplotlib
import matplotlib.pyplot as plt

plt.figure(figsize=(10, 6))
nx.draw(G, pos, with_labels=True, node_color=node_colors,
font_weight='bold')

# Optional customizations (adjust based on preference)
edge_labels = {(u, v): f"{G.edges[u, v]['weight']:.2f}" for u, v in
G.edges}
nx.draw_networkx_edge_labels(G, pos, edge_labels=edge_labels)
plt.title("SchoolMatch - Cosine Similarity Network Graph", size='15')
plt.axis('off')
plt.show()
```




```
# Recommend top 3 schools for each student based on similarity scores
for i, student in students_df.iterrows():
  similar_schools = schools_df.iloc[similarity_matrix[i].argsort()[-
3:]]
  print(f"Student (Grade {student['grade']}, {student['location']})
Recommended Schools:")
  for index, row in similar_schools.iterrows():
    print(f"\t- {row['name']}")
```

```
Student (Grade 8, Central) Recommended Schools:
      - School F
      - School D
      - School A
Student (Grade 10, North) Recommended Schools:
      - School E
      - School F
      - School B
Student (Grade 9, Central) Recommended Schools:
      - School E
      - School F
      - School C
Student (Grade 1, Central) Recommended Schools:
      - School F
      - School D
      - School A
Student (Grade 3, South) Recommended Schools:
```

```
      - School E
      - School F
      - School B
Student (Grade 12, Central) Recommended Schools:
      - School A
      - School F
      - School C
```