

Practical Task 1: Analyzing Student Feedback Using Artificial Intelligence techniques in Python

Step 1: Data Pre-processing

Importing Libraries

```
In [313]:

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

import nltk
from nltk.sentiment.vader import SentimentIntensityAnalyzer
from nltk.corpus import stopwords
from nltk.tokenize import word_tokenize
from nltk.stem import WordNetLemmatizer
nltk.download('all')

from wordcloud import WordCloud
import re
import os
import warnings
warnings.filterwarnings('ignore')

import gensim
import pyLDAvis.gensim_models
from gensim.utils import simple_preprocess
from gensim.models import CoherenceModel
import gensim.corpora as corpora

%matplotlib inline

[nltk_data] Downloading collection 'all'
[nltk_data] |
[nltk_data] | Downloading package abc to
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[illegible]

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[nltk_data] Done downloading collection all
```

Loading xlsx file in dataFrame

```
In [314]:
df = pd.read_excel('AI_Engineer_Dataset_Task_1.xlsx') # importing xlsx file
```

```
In [315]:
df
```

Out[315]:

	AcademicYear	SemesterName	ParticipantID	DegreeLevel	Gender	Nationality	StudentProgram	CourseCode	CourseName	QuestionText	QuestionType	F
0	2021	Fall 2021 - 2022	7040336900	Bachelor	Female	Palestine	Bachelor of Business Administration	ACC 100	Principles of Accounting	CLO : Evaluate financial and managerial accoun...	Rating	
1	2021	Fall 2021 - 2022	6707335167	Bachelor	Male	United Arab Emirates	Bachelor of Business Administration	ACC 100	Principles of Accounting	The coursework and assignments are challenging	Rating	
2	2021	Fall 2021 - 2022	6707335167	Bachelor	Male	United Arab Emirates	Bachelor of Business Administration	ACC 100	Principles of Accounting	The course is relevant to my program of study	Rating	
3	2021	Fall 2021 - 2022	6707335167	Bachelor	Male	United Arab Emirates	Bachelor of Business Administration	ACC 100	Principles of Accounting	Course learning materials are available on the...	Rating	
4	2021	Fall 2021 - 2022	6707335167	Bachelor	Male	United Arab Emirates	Bachelor of Business Administration	ACC 100	Principles of Accounting	The faculty uses additional resources (other t...	Rating	
...
180964	2021	Spring 2021 - 2022	7040334533	Bachelor	Male	India	Bachelor of Business Administration	TOL 200	Tolerance and Diversity	Do you have any recommendations or suggestions...	User Comment	
180965	2021	Spring 2021 - 2022	6724000467	Bachelor	Male	United Arab Emirates	Bachelor of Arts in Security and Strategic Stu...	TOL 200	Tolerance and Diversity	CLO : analyze the relationship between diversi...	Rating	
180966	2022	Fall 2022 - 2023	6373669933	Bachelor	Male	United Kingdom	Bachelor of Business Administration	TOL 200	Tolerance and Diversity	The faculty discussed the course syllabus at t...	Rating	
180967	2022	Fall 2022 - 2023	6373669933	Bachelor	Male	United Kingdom	Bachelor of Business Administration	TOL 200	Tolerance and Diversity	The coursework and assignments are challenging	Rating	
180968	2022	Fall 2022 - 2023	6373669933	Bachelor	Male	United Kingdom	Bachelor of Business Administration	TOL 200	Tolerance and Diversity	The course is relevant to my program of study	Rating	

180969 rows x 12 columns

Overview of the dataFrame

```
In [316]:
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 180969 entries, 0 to 180968
Data columns (total 12 columns):
#   Column                Non-Null Count  Dtype
---  ---
0   AcademicYear          180969 non-null int64
1   SemesterName          180969 non-null object
2   ParticipantID         180969 non-null int64
3   DegreeLevel           180969 non-null object
4   Gender                180969 non-null object
5   Nationality           180969 non-null object
6   StudentProgram        180969 non-null object
7   CourseCode            180969 non-null object
8   CourseName            180969 non-null object
9   QuestionText          180969 non-null object
10  QuestionType          180969 non-null object
11  ParticipantResponse    168802 non-null object
dtypes: int64(2), object(10)
memory usage: 16.6+ MB
```

```
In [317]:
df.columns

Out[317]:
Index(['AcademicYear', 'SemesterName', 'ParticipantID', 'DegreeLevel',
      'Gender', 'Nationality', 'StudentProgram', 'CourseCode', 'CourseName',
      'QuestionText', 'QuestionType', 'ParticipantResponse'],
      dtype='object')

In [318]:
df.isnull().sum() # checking the number of missing values in each column

Out[318]:
AcademicYear      0
SemesterName      0
ParticipantID      0
DegreeLevel       0
Gender            0
Nationality       0
StudentProgram    0
CourseCode        0
CourseName        0
QuestionText      0
QuestionType      0
ParticipantResponse 12167
dtype: int64

In [319]:
df.dropna(inplace=True) # dropping rows with empty values

In [320]:
df

Out[320]:
```

	AcademicYear	SemesterName	ParticipantID	DegreeLevel	Gender	Nationality	StudentProgram	CourseCode	CourseName	QuestionText	QuestionType	F
0	2021	Fall 2021 - 2022	7040336900	Bachelor	Female	Palestine	Bachelor of Business Administration	ACC 100	Principles of Accounting	CLO : Evaluate financial and managerial accoun...	Rating	
1	2021	Fall 2021 - 2022	6707335167	Bachelor	Male	United Arab Emirates	Bachelor of Business Administration	ACC 100	Principles of Accounting	The coursework and assignments are challenging	Rating	
2	2021	Fall 2021 - 2022	6707335167	Bachelor	Male	United Arab Emirates	Bachelor of Business Administration	ACC 100	Principles of Accounting	The course is relevant to my program of study	Rating	
3	2021	Fall 2021 - 2022	6707335167	Bachelor	Male	United Arab Emirates	Bachelor of Business Administration	ACC 100	Principles of Accounting	Course learning materials are available on the...	Rating	
4	2021	Fall 2021 - 2022	6707335167	Bachelor	Male	United Arab Emirates	Bachelor of Business Administration	ACC 100	Principles of Accounting	The faculty uses additional resources (other t...	Rating	
...
180963	2021	Spring 2021 - 2022	6724000467	Bachelor	Male	United Arab Emirates	Bachelor of Arts in Security and Strategic Stu...	TOL 200	Tolerance and Diversity	CLO : apply lessons from diversity and toleran...	Rating	
180965	2021	Spring 2021 - 2022	6724000467	Bachelor	Male	United Arab Emirates	Bachelor of Arts in Security and Strategic Stu...	TOL 200	Tolerance and Diversity	CLO : analyze the relationship between diversi...	Rating	
180966	2022	Fall 2022 - 2023	6373669933	Bachelor	Male	United Kingdom	Bachelor of Business Administration	TOL 200	Tolerance and Diversity	The faculty discussed the course syllabus at t...	Rating	
180967	2022	Fall 2022 - 2023	6373669933	Bachelor	Male	United Kingdom	Bachelor of Business Administration	TOL 200	Tolerance and Diversity	The coursework and assignments are challenging	Rating	
180968	2022	Fall 2022 - 2023	6373669933	Bachelor	Male	United Kingdom	Bachelor of Business Administration	TOL 200	Tolerance and Diversity	The course is relevant to my program of study	Rating	

168802 rows x 12 columns

```
In [321]:
df_vis = df.copy() # copying the dataFrame

In [322]:
df.drop(['AcademicYear', 'SemesterName', 'ParticipantID', 'DegreeLevel',
      'Gender', 'Nationality', 'StudentProgram', 'CourseCode', 'CourseName'], axis=1, inplace=True) # dopping columns

In [323]:
df

Out[323]:
```

	QuestionText	QuestionType	ParticipantResponse
0	CLO : Evaluate financial and managerial accoun...	Rating	Disagree
1	The coursework and assignments are challenging	Rating	Strongly Disagree
2	The course is relevant to my program of study	Rating	Strongly Disagree
3	Course learning materials are available on the...	Rating	Strongly Disagree
4	The faculty uses additional resources (other t...	Rating	Strongly Disagree
...
180963	CLO : apply lessons from diversity and toleran...	Rating	Strongly Agree
180965	CLO : analyze the relationship between diversi...	Rating	Agree
180966	The faculty discussed the course syllabus at t...	Rating	Strongly Agree
180967	The coursework and assignments are challenging	Rating	Strongly Agree
180968	The course is relevant to my program of study	Rating	Strongly Agree

168802 rows x 3 columns

Step 2: Sentiment Analysis

```
In [324]:
df_rating = df.copy()
```

```
In [325]:
df_rating = df[df['QuestionType'] == 'Rating'] # filtering 'QuestionType to display on Rating'
```

```
In [326]:
df_rating
```

Out[326]:

	QuestionText	QuestionType	ParticipantResponse
0	CLO : Evaluate financial and managerial accoun...	Rating	Disagree
1	The coursework and assignments are challenging	Rating	Strongly Disagree
2	The course is relevant to my program of study	Rating	Strongly Disagree
3	Course learning materials are available on the...	Rating	Strongly Disagree
4	The faculty uses additional resources (other t...	Rating	Strongly Disagree
...
180963	CLO : apply lessons from diversity and toleran...	Rating	Strongly Agree
180965	CLO : analyze the relationship between diversi...	Rating	Agree
180966	The faculty discussed the course syllabus at t...	Rating	Strongly Agree
180967	The coursework and assignments are challenging	Rating	Strongly Agree
180968	The course is relevant to my program of study	Rating	Strongly Agree

163625 rows x 3 columns

```
In [327]:
column1_values = df_rating['ParticipantResponse'].unique() # display unique values in the column
```

```
In [328]:
column1_values
```

Out[328]:

```
array(['Disagree', 'Strongly Disagree', 'Strongly Agree', 'Agree',
      'Neutral', 'Good'], dtype=object)
```

```
In [329]:
analyzer = SentimentIntensityAnalyzer() # initialize NLTK sentiment analyzer
```

```
In [330]:
def get_sentiment_scores(text): # Define a function to calculate sentiment scores
    score = analyzer.polarity_scores(text) # calculate sentiment scores
    if score['compound'] > 0:
        return 'Positive'
    elif score['compound'] < 0:
        return 'Negative'
    else:
        return 'Neutral'

df_rating['Sentiment'] = df_rating['ParticipantResponse'].apply(get_sentiment_scores) # create a new column 'Sentiment'
```

```
In [331]:
df_rating
```

Out[331]:

	QuestionText	QuestionType	ParticipantResponse	Sentiment
0	CLO : Evaluate financial and managerial accoun...	Rating	Disagree	Negative
1	The coursework and assignments are challenging	Rating	Strongly Disagree	Negative
2	The course is relevant to my program of study	Rating	Strongly Disagree	Negative
3	Course learning materials are available on the...	Rating	Strongly Disagree	Negative
4	The faculty uses additional resources (other t...	Rating	Strongly Disagree	Negative
...
180963	CLO : apply lessons from diversity and toleran...	Rating	Strongly Agree	Positive
180965	CLO : analyze the relationship between diversi...	Rating	Agree	Positive
180966	The faculty discussed the course syllabus at t...	Rating	Strongly Agree	Positive
180967	The coursework and assignments are challenging	Rating	Strongly Agree	Positive
180968	The course is relevant to my program of study	Rating	Strongly Agree	Positive

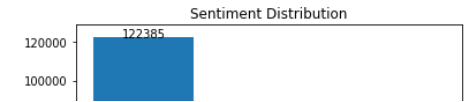
163625 rows x 4 columns

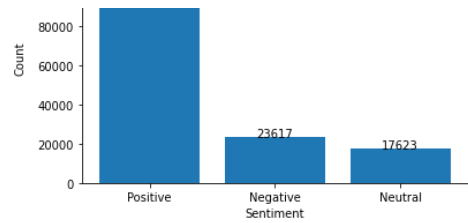
```
In [332]:
sentiment_counts = df_rating['Sentiment'].value_counts()

plt.bar(sentiment_counts.index, sentiment_counts.values) # Visualize sentiment distribution
plt.xlabel('Sentiment')
plt.ylabel('Count')
plt.title('Sentiment Distribution')

for i, v in enumerate(sentiment_counts.values):
    plt.text(i, v, str(v), ha='center')

plt.show()
```





Step 3: Topic Modelling & Opinion Mining

```
In [333]:
df_comment = df.copy()
```

```
In [334]:
df_comment = df[df['QuestionType'] == 'User Comment'] # filter 'QuestionType' column to display only User Comment
```

```
In [335]:
df_comment
```

Out[335]:

	QuestionText	QuestionType	ParticipantResponse
32	Do you have any recommendations or suggestions...	User Comment	no
93	Do you have any recommendations or suggestions...	User Comment	No
129	Do you have any recommendations or suggestions...	User Comment	Good
182	Do you have any recommendations or suggestions...	User Comment	no
202	Do you have any recommendations or suggestions...	User Comment	the instructor should solve more
...
180710	Do you have any recommendations or suggestions...	User Comment	nothing
180740	Do you have any recommendations or suggestions...	User Comment	n-a
180939	Do you have any recommendations or suggestions...	User Comment	-
180948	Do you have any recommendations or suggestions...	User Comment	no suggestion
180961	Do you have any recommendations or suggestions...	User Comment	nul

5177 rows x 3 columns

```
In [336]:
# Remove punctuation
df_comment['ParticipantResponse_processed'] = df_comment['ParticipantResponse'].map(lambda x: re.sub('[,\.\!?\']', '', x))
# Convert the titles to lowercase
df_comment['ParticipantResponse_processed'] = df_comment['ParticipantResponse_processed'].map(lambda x: x.lower())
```

```
In [337]:
df_comment
```

Out[337]:

	QuestionText	QuestionType	ParticipantResponse	ParticipantResponse_processed
32	Do you have any recommendations or suggestions...	User Comment	no	no
93	Do you have any recommendations or suggestions...	User Comment	No	no
129	Do you have any recommendations or suggestions...	User Comment	Good	good
182	Do you have any recommendations or suggestions...	User Comment	no	no
202	Do you have any recommendations or suggestions...	User Comment	the instructor should solve more	the instructor should solve more
...
180710	Do you have any recommendations or suggestions...	User Comment	nothing	nothing
180740	Do you have any recommendations or suggestions...	User Comment	n-a	n-a
180939	Do you have any recommendations or suggestions...	User Comment	-	-
180948	Do you have any recommendations or suggestions...	User Comment	no suggestion	no suggestion
180961	Do you have any recommendations or suggestions...	User Comment	nul	nul

5177 rows x 4 columns

```
In [338]:
# Join the different processed titles together.
long_string = ','.join(list(df_comment['ParticipantResponse_processed'].values))
# Create a WordCloud object
wordcloud = WordCloud(background_color="white", max_words=1000, contour_width=5, contour_color='steelblue')
# Generate a word cloud
```


[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

'best', 'course'], [], [], ['good', 'd_x', 'fb'], [], ['benefited', 'lot', 'course', 'great', 'learning', 'incomes', 'great'], [], ['يوجد', 'samer', 'supportive', 'amazing', 'skills', 'teaching'], [], ['best', 'doctor', 'university_x', 'f'], [], [], ['nothing', 'present'], [], ['ok'], [], ['software', 'understand', 'practicality', 'course'], [], ['nothing'], [], [], ['nothing', 'comment'], [], ['doctor', 'helpful', 'try', 'deliver', 'much', 'always', 'asking', 'students', 'contact', 'time', 'clarification', 'thanks', 'alot', 'time'], [], ['good'], ['suggestion'], [], [], ['dr', 'sho ical', 'everything', 'since', 'students', 'lost', 'idea', 'exactly', 'wants', 'meets', 'demands'], ['thanks', 'lot', 'instructor', 'cooperative', 'suppo nts'], [], [], [], ['doctor', 'good', 'teaching', 'us'], ['everything', 'perfect'], ['great', 'well', 'learning', 'incomes'], [], ['thanks', 'lot', 'ins operative', 'supportive', 'students'], ['dr', 'bassel', 'prepared', 'agile', 'workshop', 'theoretical', 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[illegible]

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1), (4415, 1), (4416, 1)], [(5, 1), (303, 1), (375, (627, 1), (628, 1), (629, 1), (630, 1)], [(4417, 1)], [(281, 1)], [(34, 1), (396, 1)], [(41, 1)], [(12, 1), (81, 1), (147, 1), (200, 1), (210, 1)], [(1 (200, 1), (1738, 1), (2407, 1), (4033, 1), (4418, 1)], [(49, 1), (86, 1), (147, 1), (157, 1), (158, 1), (185, 1), (405, 1), (526, 1), (1157, 1), (44 [(31, 2), (46, 1), (82, 1), (161, 1), (172, 1), (177, 1), (228, 1), (380, 1), (403, 1), (480, 1), (605, 1), (1563, 1), (1708, 1), (4237, 1), (4420, 1), 22, 1), (4423, 1)], [(19, 1), (71, 1), (1071, 1), (1208, 1), (3358, 1), (3883, 1), (4135, 1), (4424, 1), (4425, 1), (4426, 1), (4427, 1)], [(5, (319, 1), (371, 2), (541, 1), (542, 1), (575, 1), (729, 1), (746, 1), (1649, 1), (2350, 1), (2364, 1), (4160, 1), (4428, 1), (4429, 1)], [(12, 1), (56, (1, 1), [(281, 1)], [(88, 1)], [(19, 1), (4430, 1), (4431, 1)], [(1, 1), [(1, 1), [(213, 1)], [(147, 1), (161, 1), (194, 1), (3, 1), (405, 1)], [(3, 1)], [(46, 1), (147, 1), (245, 1), (399, 1), (1096, 1), (1821, 1), (2181, 1), (4033, 1), (4432, 1), (4433, 1)], [(228, 1), (277, (2231, 1), (4434, 1)], [(583, 1), (1667, 1)], [(148, 1), (161, 1), (645, 1), (673, 1), (942, 1), (2050, 1), (4435, 1)], [(58, 1), (245, 1), (470, (1249, 2), (2069, 1), (4436, 1), (4437, 1), (4438, 1)], [(12, 1), (213, 1)], [(4439, 1)], [(13, 1), (87, 1), (141, 1)], [(1, 1), [(160, 1), (501, 1, 1), [(137, 1)], [(908, 1), (1394, 1), (4441, 1), (4442, 1), (4443, 1), (4444, 1)], [(1, 1), [(4445, 1)], [(104, 1), (359, 1), (4446, 1 (391, 1), (511, 1), (1442, 1)], [(19, 1), (133, 1), (477, 1), (687, 1), (970, 1), (1573, 1), (1574, 1), (1576, 1), (4447, 1), (4448, 1)], [(542, 1), (1 [(256, 1), (600, 1), (2832, 1)], [(70, 1), (304, 1), (316, 1), (366, 1), (367, 1), (477, 1), (534, 1), (581, 1), (635, 1), (828, 1), (900, 1), (932, (1336, 1), (1387, 1), (1787, 1), (2276, 1), (2618, 1), (2832, 1), (3021, 1), (3037, 1), (3170, 1), (3859, 1), (4223, 1), (4225, 1), (4227, 1), (4449, 1) (4451, 1), (4452, 1), (4453, 1), 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(161, 1), (4402, 1 (1, 1), [(1, 1), [(12, 1), (213, 1)], [(12, 1), (34, 1), (42, 1), (56, 1), (58, 1), (178, 1), (408, 1), (413, 1), (1538, 1), (4471, 1), (44 (115, 1)], [(34, 1), (81, 1), (83, 1), (387, 1), (512, 1), (1039, 1), (1293, 1), (1442, 1), (1538, 1), (1745, 1), (2100, 1), (2402, 1), (2957, 1), (2960 187, 1)], [(0, 1)], [(12, 1), (40, 1), (52, 1), (86, 1), (200, 1), (2112, 1)], [(12, 1), (364, 1), (405, 1), (4420, 1)], [(1, 1), [(4473, 1)], [(1 74, 1)], [(1, 1), [(12, 1), (46, 1), (378, 1), (444, 1), (506, 1), (1293, 1), (1558, 1), (4475, 1)], [(1, 1), [(3, 1)], [(1, 1), [(0, 1)], [(12, 1) (19, 1), (366, 1), (623, 1), (631, 1), (1646, 1), (4476, 1), (4477, 1)], [(147, 1)], [(44, 1)], [(115, 1)], [(33, 1)], [(230, 1), (236, 1)], [(33, 1)], (87, 1)], [(115, 1)], [(115, 1)], [(5, 1), (828, 1), (1483, 1), (1787, 1), (4478, 1), (4479, 1)], [(256, 1)], [(33, 1)], [(88, 1)], [(115, 1)], [(797, 1 (46, 1), (102, 1), (115, 1), (185, 1), (265, 1), (387, 1), (1708, 1), (4035, 1), (4480, 1)], [(4481, 1)], [(3, 1)], [(3, 1)], [(33, 1)], [(15, 1), (3170, 1 (3842, 1), (4482, 1)], [(102, 1), (108, 1), (115, 1), (185, 1), (265, 1), (387, 1), (4035, 1), (4483, 1)], [(0, 1)], [(3, 1)], [(0, 1)], [(19, 2), (21, (61, 1), (73, 1), (1509, 1), (1663, 1), (2597, 1), (3256, 1), (3493, 1), (4024, 1), (4484, 1), (4485, 1), (4486, 1), (4487, 1), (4488, 1), (4489, 1)], [((1), [(230, 1), (236, 1)], [(115, 1)], [(12, 1), (200, 1), (380, 1), (403, 1)], [(115, 1)], [(33, 1)], [(1, 1), (3055, 1)], [(88, 1)], [(321, 1, 1), [(0, 1)], [(1, 1), [(5, 3), (21, 1), (74, 2), (351, 2), (578, 2), (612, 1), (635, 1), (770, 1), (802, 1), (815, 1), (1029, 1), (1123, 1), (1176, 2), 98, 1), (4490, 1), (4491, 1), (4492, 1), (4493, 1), (4494, 1), (4495, 2)], [(3, 1)], [(46, 1), (147, 1)], [(12, 1), (145, 1), (157, 1)], [(12, 1), (115,)], [(46, 1), (147, 1)], [(88, 1)], [(4496, 1)], [(147, 1), (502, 1)], [(1, 1), [(206, 1), (436, 2), (642, 2), (988, 1), (989, 1), (1362, 2), (1888, 1), 97, 1)], [(1466, 1)], 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1), (2676, 1), (2975, 1), (3039, 1), (3316, 1), (3487, 1), (3749, 2), (4562, 1), (4563, 1), (4 5, 1), (4566, 1), (4567, 1)], [(33, 1)], [(281, 1)], [(131, 1), (544, 1), (600, 1), (1384, 1), (2832, 1), (2989, 1), (3131, 1), (3646, 1), (4005, 1), (4 (5, 1), (4568, 1), (4569, 1), (4570, 1), (4571, 1), (4572, 1), (4573, 1), (4574, 1), (4575, 1), (4576, 1), (4577, 1), (4578, 1), (4579, 1), (4580, 1), (4 35, 1), (548, 1), (1315, 1), (1505, 1), (3358, 1), (3554, 1), (4096, 1), (4582, 1), (4583, 1), (4584, 1), (4585, 1), (4586, 1)], [(33, 1)], [(605, 1)], , 1), (4587, 1)], [(366, 1), (623, 1), (631, 1), (992, 1), (1646, 1), (2869, 1), (2975, 1), (3039, 1), (3316, 1), (3487, 1), (3749, 2), (4562, 1), (4565 1), (4589, 1)], [(31, 1), (366, 1), (600, 1), (623, 1), (900, 1), (992, 1), (1339, 1), (1448, 1), (2975, 1), (3039, 1), (3749, 2), (4562, 1), (4564, 1), 4590, 1), (4591, 1), (4592, 1)], [(5, 1), (256, 1), (4593, 1), (4594, 1)], [(256, 1)], [(256, 1)], [(624, 1), (635, 1), (1332, 1), (1333, 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(4630, 1), (4631, 1), (4632, 1), (4633, 1), (4634, 1)], [(19, 1), (65, 1), (319, 1), (530, 1), (925, 1), (1019, 1), (1025, 1), (1047, 1), (1269, 1), (1339, 1), (4448, 1), (4635, 1), (4636, 1), (4637, 1)], [(6, 1), (3308, 1), (4609, 1)], [(19, 1), (133, 1), (477, 1), (687, 1), (970, 1), (1573, 1), (1574, 1), (1576, 1), (4447, 1), (4448, 1)], [(19, 2), (1 1), (686, 1), (837, 1), (2997, 1), (3024, 1), (3298, 1), (4317, 1), (4448, 1), (4638, 1)], [(256, 1)], [(317, 1), (542, 1), (4639, 1)], [(256, 1), 2, 1), (304, 1), (530, 1), (578, 1), (1255, 1), (1315, 1), (3797, 1), (4125, 1), (4605, 1), (4607, 1), (4608, 1)], [(281, 1), (366, 1), (575, 1), (6 (1), (1182, 1), (1667, 1), (2975, 1), (3316, 1)], [(3, 1)], [(73, 1), (303, 1), (306, 1), (744, 1), (1014, 1), (2826, 1), (2965, 1), (3024, 1), (3037 1), (3486, 1), (3565, 1), (3948, 1), (4545, 1), (4640, 2), (4641, 1), (4642, 1), (4643, 1), (4644, 1), (4645, 1), (4646, 1), (4647, 1), (4648, 1), (4649 1), (4651, 1), (4652, 2), (4653, 1), (4654, 1), (4655, 1), (4656, 1), (4657, 1)], [(340, 1)], [(71, 1), (477, 1), (594, 1), (791, 1), (825, 1), (837, 1) (1049, 1), (1068, 1), (1208, 1), (1210, 1), (1686, 1), (4024, 1), (4658, 1), (4659, 1), (4660, 1)], [(5, 1), (21, 2), (311, 1), (462, 1), (627, 1), 98, 1), (2976, 1), (2977, 1), (2978, 1), (4661, 1), (4662, 1), (4663, 1), (4664, 1), (4665, 1)], [(213, 1)], [(7, 1), (21, 1), (1387, 1), (1414, 1), (37 , 1), (4667, 1), (4668, 1), (4669, 1), (4670, 1), (4671, 1), (4672, 1), (4673, 1)], [(19, 1), (60, 1), (61, 1), (282, 1), (544, 1), (1620, 1), (1937, 1) (4674, 1), (4675, 1), (4676, 1), (4677, 1)], [(12, 1), (145, 1)], [(256, 1)], [(115, 1)], [(5, 1), (303, 1), (375, 1), (626, 1), (627, 1), (628, (630, 1)], [(635, 1), (693, 1), (1124, 1), (2965, 1), (2967, 1), (3252, 1), (4678, 1), (4679, 1)], [(71, 1), (256, 1), (354, 1), (363, 1), (46

```
[341]:
# number of topics
num_topics = 5
# Build LDA model
lda_model = gensim.models.LdaMulticore(corpus=corpus,
                                       id2word=id2word,
                                       num_topics=num_topics)

for idx, topic in lda_model.print_topics(-1):
    print(f"Topic {idx}: {topic}")

Topic 0: 0.016*"everything" + 0.012*"perfect" + 0.011*"course" + 0.009*"dr" + 0.009*"good" + 0.009*"0.007" + "الدكتور"*0.007 + "المادة"*great" + 0.006*"دكتور"
Topic 1: 0.039*"course" + 0.014*"best" + 0.012*"dr" + 0.011*"us" + 0.010*"really" + 0.008*"instructor" + 0.008*"doctor" + 0.008*"students" + 0.007*"none"
Topic 2: 0.024*"great" + 0.019*"course" + 0.017*"0.010" + "يوجد"*dr" + 0.008*"recommendations" + 0.008*"0.007" + "المساق"*0.007 + "افضل"*nothing" + 0.007*
5*"everything"
Topic 3: 0.038*"good" + 0.021*"thank" + 0.016*"0.011" + "شكرا"*dr" + 0.010*"none" + 0.009*"0.009" + "ممتاز"*course" + 0.008*"best" + 0.007*"class" + 0.007
Topic 4: 0.030*"course" + 0.014*"0.012" + "شكرا"*nothing" + 0.012*"thanks" + 0.010*"dr" + 0.008*"students" + 0.008*"none" + 0.008*"good" + 0.006*"doctor"
zing"
```

Out [342]:

Selected Topic: [Previous Topic](#) [Next Topic](#) [Clear Topic](#)

Slide to adjust relevance metric: (2)
 $\lambda = 1$

Step 4: Insights

Visualizations also displayed in PPT

From the output of LDA above, here's a summary of potential insights:

Topic 0: Expressing Gratitude and Positivity Keywords: شكرا (thank you), great, course, المادة (the material), na, dr, ممتاز (excellent), الدكتور (the doctor), everything, best

This topic seems to revolve around expressions of gratitude and positivity. Participants are likely thanking someone (possibly an instructor) for the course content and might be describing it as excellent or great. "Everything" and "best" indicate high satisfaction.

Topic 1: Comments on Course Availability and Quality Keywords: none, يوجد (there is), amazing, course, suggestions, perfect, nothing, افضل (best), دكتور (doctor), شكرا (thank you)

This topic appears to be a mix of comments related to course availability, quality, and satisfaction. Participants are mentioning the availability of courses, some using positive descriptors like "amazing" and "best," while others might have suggestions or comments on aspects like course quality.

Topic 2: Positive Feedback on Instructors and Students Keywords: course, dr, best, students, doctor, amazing, instructor, us, comment, الدكتور (the doctor)

This topic seems to focus on positive feedback regarding instructors and students. Participants might be praising their instructors, referring to them as the best, and possibly highlighting positive interactions among students.

Topic 3: Mixed Sentiments with Thanks Keywords: great, thanks, nothing, everything, dr, course, good, us, المادة (the material), الدكتور (the doctor)

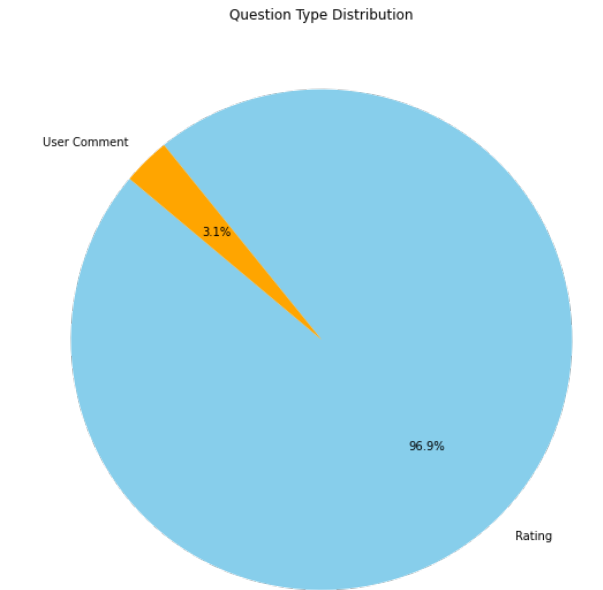
This topic appears to have a mix of sentiments. While "thanks" and "good" suggest positive feedback, the presence of "nothing" and "everything" might indicate varied opinions or experiences with the course and instructor.

Topic 4: Comments on Course Quality and Clear Communication Keywords: good, course, thank, dr, everything, clear, doctor, المساق (the course), students, افضل (best)

This topic seems to center around comments on course quality, clear communication, and possibly the quality of instructors. Participants might be praising the course content and the instructors' ability to communicate effectively.

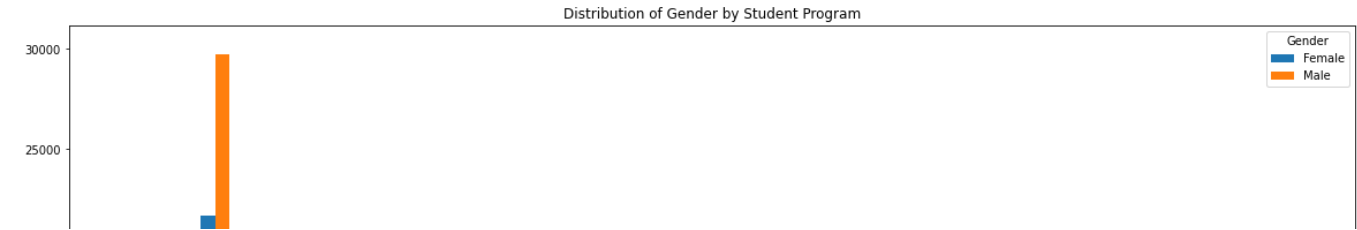
Pie chart showing the distribution of Question Type

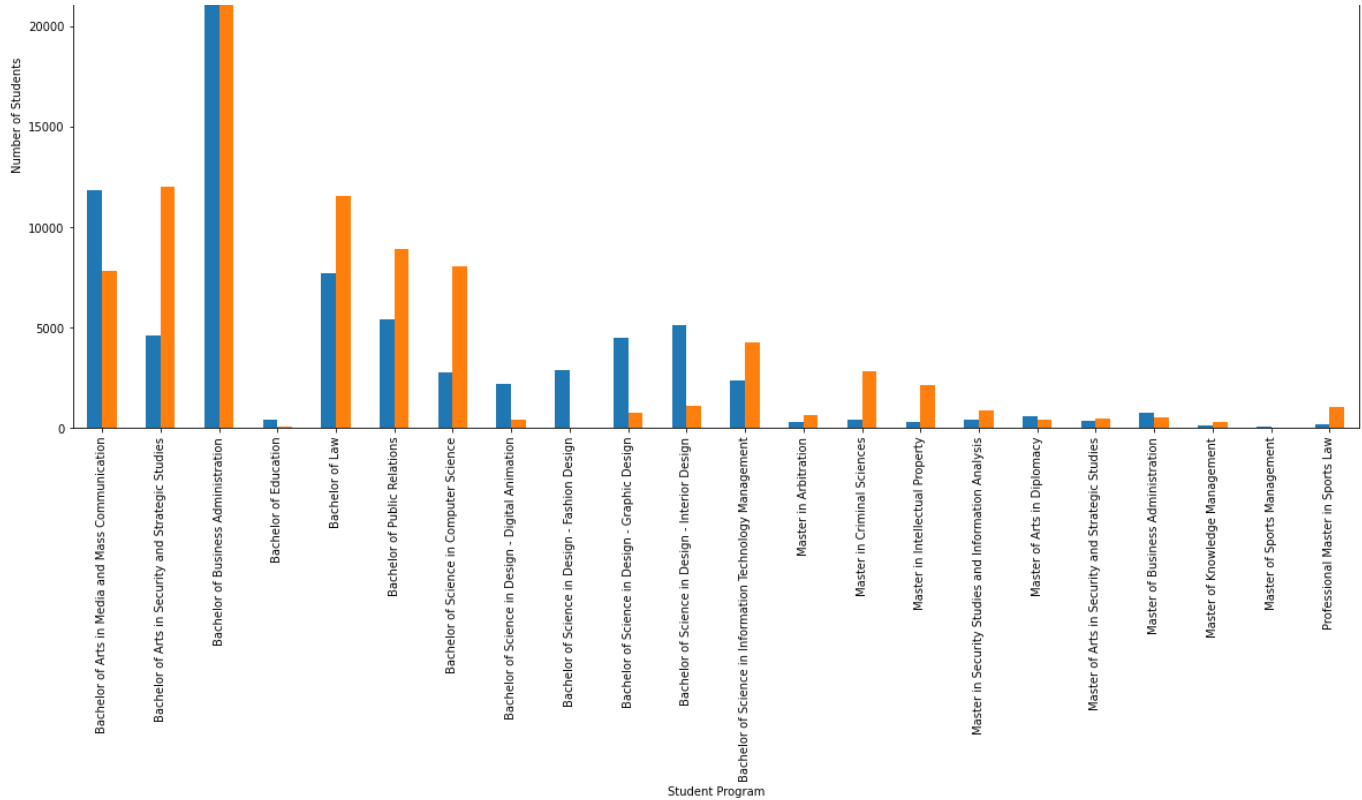
```
In [343]:  
  
# counting the occurrences of each question type  
question_type_counts = df_vis['QuestionType'].value_counts()  
  
plt.figure(figsize=(10, 10))  
plt.pie(question_type_counts, labels=question_type_counts.index, autopct='%1.1f%%', startangle=140, colors=['skyblue', 'orange'])  
plt.title("Question Type Distribution")  
plt.show()
```



Bar graph showing the distribution of Gender accross the different Student programmes

```
In [344]:  
  
# group by 'StudentProgram' and 'Gender' and count occurrences  
gender_program_counts = df_vis.groupby(['StudentProgram', 'Gender']).size().unstack()  
  
ax = gender_program_counts.plot(kind='bar', stacked=False, figsize=(20, 10))  
ax.set_xlabel('Student Program')  
ax.set_ylabel('Number of Students')  
ax.set_title('Distribution of Gender by Student Program')  
plt.xticks(rotation=90)  
plt.legend(title='Gender')  
  
plt.show()
```





100% Stacked Bar graph showing the Participant responses accross different student programmes

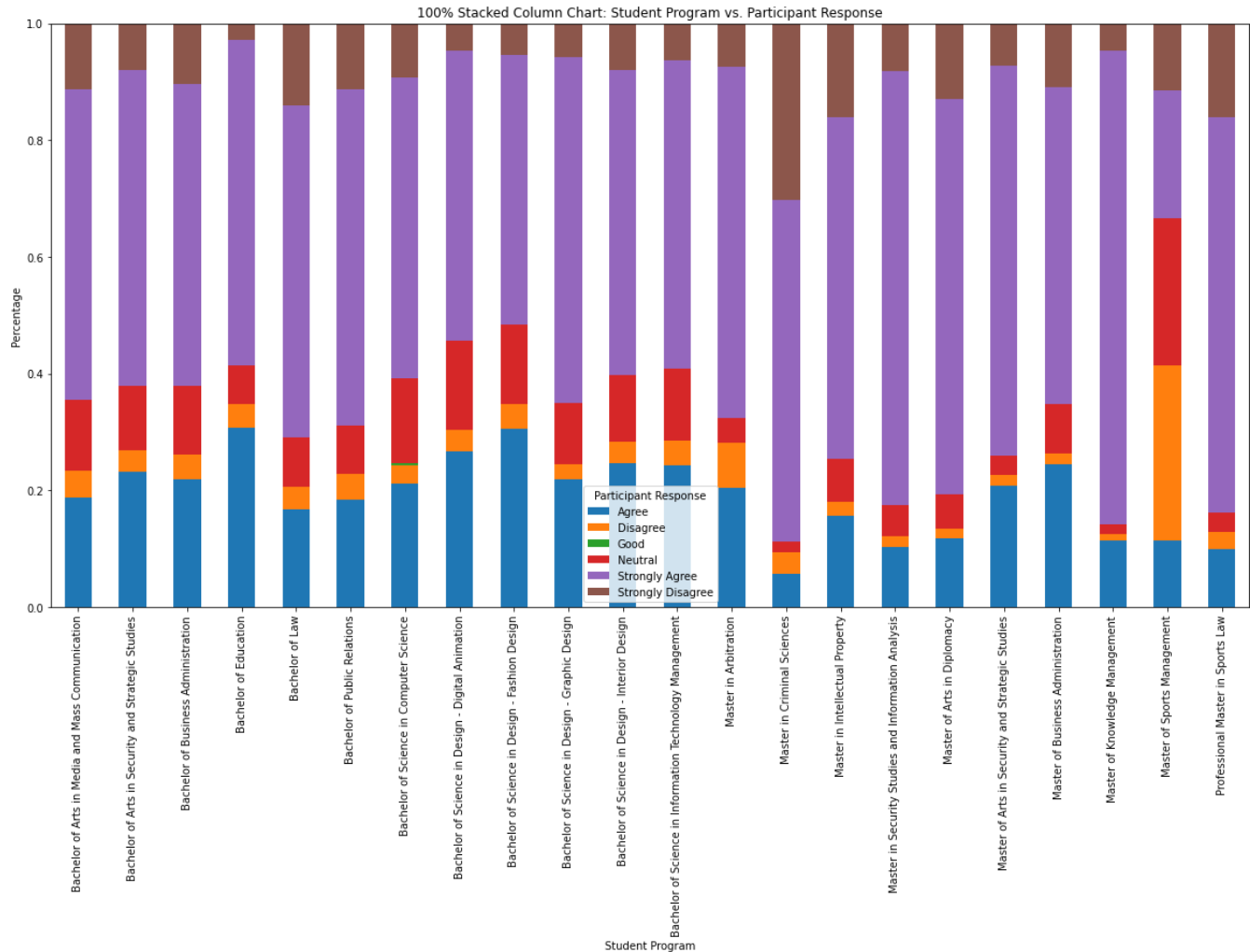
```
In [345]:

filtered_df = df_vis.loc[(df_vis['QuestionType'] == 'Rating')]

cross_tab = pd.crosstab(filtered_df['StudentProgram'], filtered_df['ParticipantResponse'], normalize='index')

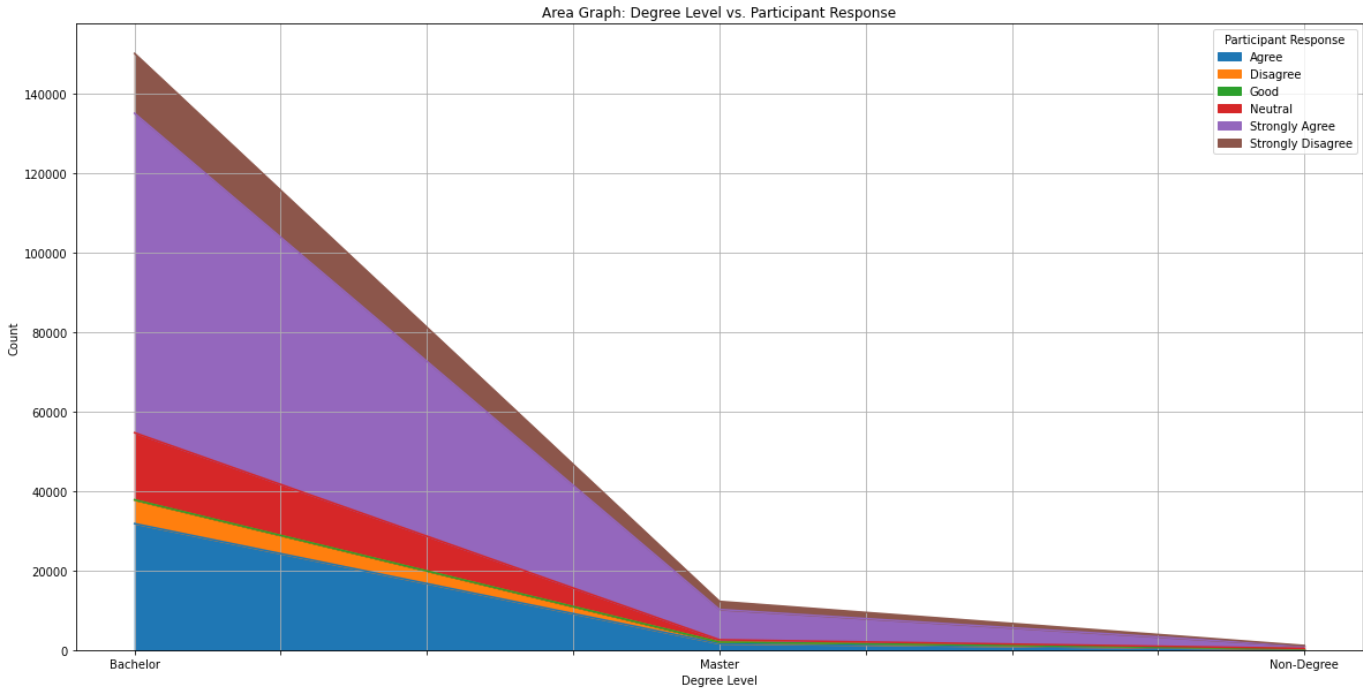
ax = cross_tab.plot(kind='bar', stacked=True, figsize=(20, 10))
plt.title("100% Stacked Column Chart: Student Program vs. Participant Response")
plt.xlabel("Student Program")
plt.ylabel("Percentage")
plt.legend(title='Participant Response')
plt.ylim(0, 1) # Ensure y-axis range is between 0 and 1

plt.show()
```



Area graph showing the responses of the participants accross degree levels

```
In [346]:  
  
# Create a pivot table to prepare data for the area plot  
pivot_table = filtered_df.pivot_table(index='DegreeLevel', columns='ParticipantResponse', aggfunc='size', fill_value=0)  
  
ax = pivot_table.plot(kind='area', stacked=True, figsize=(20, 10))  
plt.title("Area Graph: Degree Level vs. Participant Response")  
plt.xlabel("Degree Level")  
plt.ylabel("Count")  
plt.legend(title='Participant Response')  
plt.grid(True)  
  
plt.show()
```



```
In [347]:  
  
sentiment_df = filtered_df.copy()  
sentiment_df['Sentiment'] = df_rating['Sentiment'] # copying 'Sentiment' column from the dataframe 'df_rating' to 'sentiment_df'
```

```
In [348]:  
  
sentiment_df
```

Out[348]:

	AcademicYear	SemesterName	ParticipantID	DegreeLevel	Gender	Nationality	StudentProgram	CourseCode	CourseName	QuestionText	QuestionType	ParticipantR
0	2021	Fall 2021 - 2022	70403336900	Bachelor	Female	Palestine	Bachelor of Business Administration	ACC 100	Principles of Accounting	CLO : Evaluate financial and managerial account...	Rating	
1	2021	Fall 2021 - 2022	6707335167	Bachelor	Male	United Arab Emirates	Bachelor of Business Administration	ACC 100	Principles of Accounting	The coursework and assignments are challenging	Rating	Strongly I
2	2021	Fall 2021 - 2022	6707335167	Bachelor	Male	United Arab Emirates	Bachelor of Business Administration	ACC 100	Principles of Accounting	The course is relevant to my program of study	Rating	Strongly I
3	2021	Fall 2021 - 2022	6707335167	Bachelor	Male	United Arab Emirates	Bachelor of Business Administration	ACC 100	Principles of Accounting	Course learning materials are available on the...	Rating	Strongly I
4	2021	Fall 2021 - 2022	6707335167	Bachelor	Male	United Arab Emirates	Bachelor of Business Administration	ACC 100	Principles of Accounting	The faculty uses additional resources (other t...	Rating	Strongly I
...
180963	2021	Spring 2021 - 2022	6724000467	Bachelor	Male	United Arab Emirates	Bachelor of Arts in Security and Strategic Stu...	TOL 200	Tolerance and Diversity	CLO : apply lessons from diversity and toleran...	Rating	Strong
180965	2021	Spring 2021 - 2022	6724000467	Bachelor	Male	United Arab Emirates	Bachelor of Arts in Security and Strategic Stu...	TOL 200	Tolerance and Diversity	CLO : analyze the relationship between diversi...	Rating	
180966	2022	Fall 2022 - 2023	6373669933	Bachelor	Male	United Kingdom	Bachelor of Business Administration	TOL 200	Tolerance and Diversity	The faculty discussed the course syllabus at t...	Rating	Strong
180967	2022	Fall 2022 - 2023	6373669933	Bachelor	Male	United Kingdom	Bachelor of Business Administration	TOL 200	Tolerance and Diversity	The coursework and assignments are challenging	Rating	Strong
180968	2022	Fall 2022 - 2023	6373669933	Bachelor	Male	United Kingdom	Bachelor of Business Administration	TOL 200	Tolerance and Diversity	The course is relevant to my program of study	Rating	Strong

163625 rows x 13 columns

Stack Bar graph showing the distribution of Sentiments across the different student programmes

```
In [349]:  
  
# group the data by 'StudentProgram' and 'Sentiment' and count occurrences  
grouped = sentiment_df.groupby(['StudentProgram', 'Sentiment']).size().unstack()  
  
ax = grouped.plot(kind='bar', stacked=True, figsize=(20, 10))  
plt.title("Sentiment Distribution by Student Program")  
plt.xlabel("Student Program")  
plt.ylabel("Number of Responses")  
plt.legend(title='Sentiment')  
  
plt.show()
```

Sentiment Distribution by Student Program

