LAPORAN PROJECT SAINS DATA (DATA SCIENCE)
PENERAPAN METODE DATA SAINS UNTUK ANALISIS PENEMPATAN MAHASISWA DENGAN DATA "CAMPUS RECRUITMENT"

DISUSUSN OLEH :
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2022

BAB I
BUSINESS UNDERSTANDING

Pada project kali ini akan menganalisis kumpulan dataset penempatan mahasiswa di kampus XYZ. Data yang tersedia memiliki fitur persentasi sekolah menengah, sekolah menengah atas dan spesialisasi, termasuk gelar, jenis dan pengalamn kerja mahasiswa yang ditempatkan.

DEFINISI PROBLEM

- Faktor apa yang mempengaruhi seorang kandidat dalam mendapatkan tempat?
- Apakah persentase penting bagi seseorang untuk ditempatkan?
- Spesialisasi gelar apa yang banyak diminta oleh perusahaan?
- Apa algoritma klasifikasi yang tepat digunakan untuk kasus ini?

BATASAN MASALAH

- Dataset diperoleh dari : https://www.kaggle.com/datasets/benroshan/factors-affecting-campus-placement
- Klasifikasi yang akan digunakan adalah Decission Tree Classifier, Random Foest Algorithm, dan Logistic Regression

BAB II
DATA UNDERSTANDING

1. Informasi Data

```
In [6]:  1  Data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 215 entries, 0 to 214
Data columns (total 15 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   sl_no           215 non-null    int64
 1   gender          215 non-null    object
 2   ssc_p           215 non-null    float64
 3   ssc_b           215 non-null    object
 4   hsc_p           215 non-null    float64
 5   hsc_b           215 non-null    object
 6   hsc_s           215 non-null    object
 7   degree_p        215 non-null    float64
 8   degree_t        215 non-null    object
 9   workex          215 non-null    object
 10  etest_p         215 non-null    float64
 11  specialisation  215 non-null    object
 12  mba_p           215 non-null    float64
 13  status          215 non-null    object
 14  salary          148 non-null    float64
dtypes: float64(6), int64(1), object(8)
memory usage: 25.3+ KB
```

Dari proses koding diatas terdapat fakta bahwa kolom berjumlah 15 kolom, dengan tipe data integer sebanyak satu, onjek sebanyak 8 dan float sebanyak 6. Penggunaan memori sebesar 25.3 KB, dengan jumlah data sebanyak 215 data.

2. Jenis-jenis Data

```
In [10]:
s = (Data.dtypes == 'object')
object_cols = list(s[s].index)
print("Categorical variables:")
print(object_cols)
```

```
Categorical variables:
['gender', 'ssc_b', 'hsc_b', 'hsc_s', 'degree_t', 'workex', 'specialisation', 'status']
```

```
In [11]:
x = (Data.dtypes == ('int64'))
integer_cols = list(x[x].index)
print("integer variables:")
print(integer_cols)
```

```
integer variables:
['sl_no']
```

```
In [12]:
x = (Data.dtypes == ('float64'))
float_cols = list(x[x].index)
print("float variables:")
print(float_cols)
```

```
float variables:
['ssc_p', 'hsc_p', 'degree_p', 'etest_p', 'mba_p', 'salary']
```

```
In [13]:
print("numerical variables:")
numerical_cols=float_cols+integer_cols
print(numerical_cols)
```

```
numerical variables:
['ssc_p', 'hsc_p', 'degree_p', 'etest_p', 'mba_p', 'salary', 'sl_no']
```

Data kategori terdiri dari kolom gender,ssc_b,hsc_b,degree_t,workex,specialization, dan status. Untuk integer sl_no. Untuk numerikal ssc_p,hsc_p,degree_p,etest_p.mba_p,salary,dan sl_no. Sementara untuk float yakni ssc_p,hsc_p,degree_p,estest_p,mba_p, dan salary.

3. Kolom-kolom

```
In [24]:
Data.columns
```

```
Out[24]: Index(['sl_no', 'gender', 'ssc_p', 'ssc_b', 'hsc_p', 'hsc_b', 'hsc_s',
       'degree_p', 'degree_t', 'workex', 'etest_p', 'specialisation', 'mba_p',
       'status', 'salary'],
      dtype='object')
```

Kolom-kolom terdiri dari 'sl_no', 'gender', 'ssc_p', 'ssc_b', 'hsc_p', 'hsc_b', 'hsc_s', 'degree_p', 'degree_t', 'workex', 'etest_p', 'specialisation', 'mba_p', 'status', dan 'salary'.

4. Informasi statistik

```
In [18]: 1 Data.describe()
```

Out[18]:

	sl_no	ssc_p	hsc_p	degree_p	etest_p	mba_p	salary
count	215.000000	215.000000	215.000000	215.000000	215.000000	215.000000	148.000000
mean	108.000000	67.303395	66.333163	66.370186	72.100558	62.278186	288655.405405
std	62.209324	10.827205	10.897509	7.358743	13.275956	5.833385	93457.452420
min	1.000000	40.890000	37.000000	50.000000	50.000000	51.210000	200000.000000
25%	54.500000	60.600000	60.900000	61.000000	60.000000	57.945000	240000.000000
50%	108.000000	67.000000	65.000000	66.000000	71.000000	62.000000	265000.000000
75%	161.500000	75.700000	73.000000	72.000000	83.500000	66.255000	300000.000000
max	215.000000	89.400000	97.700000	91.000000	98.000000	77.890000	940000.000000

Diatas terdapat informasi statistik data dengan jumlah, mean, standar deviasi, min,max, dan persentil.

5. Data Kosong

```
In [15]: 1 Data.isnull().sum()

Out[15]: sl_no             0
         gender            0
         ssc_p             0
         ssc_b             0
         hsc_p             0
         hsc_b             0
         hsc_s             0
         degree_p          0
         degree_t          0
         workex            0
         etest_p           0
         specialisation    0
         mba_p             0
         status            0
         salary           67
         dtype: int64
```

Terdapat 67 data kosong yakni pada salary.

6. Kategori-kategori tiap kolom

```
In [26]:
# getting the object columns
object_columns = Data.select_dtypes(include=['object']).columns

# iterating over each object type column
for col in object_columns:
    print('-' * 40 + col + '-' * 40 , end='-')
    display(Data[col].value_counts())
```

```
----------------------------------------gender----------------------------------------

M    139
F     76
Name: gender, dtype: int64

----------------------------------------ssc_b----------------------------------------

Central    116
Others      99
Name: ssc_b, dtype: int64

----------------------------------------hsc_b----------------------------------------

Others     131
Central     84
Name: hsc_b, dtype: int64

----------------------------------------hsc_s----------------------------------------

Commerce    113
Science      91
Arts         11
Name: hsc_s, dtype: int64

----------------------------------------degree_t----------------------------------------

Comm&Mgmt    145
Sci&Tech      59
Others        11
Name: degree_t, dtype: int64

----------------------------------------workex----------------------------------------

No     141
Yes     74
Name: workex, dtype: int64

----------------------------------------specialisation----------------------------------------

Mkt&Fin    120
Mkt&HR      95
Name: specialisation, dtype: int64

----------------------------------------status----------------------------------------

Placed        148
Not Placed     67
Name: status, dtype: int64
```

Pada gambar diatas merupakan kategori-kategori yang ada pada tiap kolom bertipe data “Object”.

BAB III
DATA PREPARATION

II.1 DATA PREPROCESSING

1. Mengatasi Data Null

Mengatasi Data Null

```
In [36]: 1 Data['salary'].fillna((Data['salary'].mean()), inplace=True)

In [37]: 1 Data.isnull().sum()

Out[37]: sl_no            0
         gender           0
         ssc_p            0
         ssc_b            0
         hsc_p            0
         hsc_b            0
         hsc_s            0
         degree_p         0
         degree_t         0
         workex           0
         etest_p          0
         specialisation   0
         mba_p            0
         status           0
         salary           0
         dtype: int64
```

Pada koding diatas dilakukan pengisian data null dengan mengisinya dengan data rata-rata (mean).

2. Label Encoding

Label Encoding

```
In [41]: 1 label = LabelEncoder()
         2 Data["gender"] = label.fit_transform(Data["gender"])
         3 Data["ssc_b"] = label.fit_transform(Data["ssc_b"])
         4 Data["hsc_b"] = label.fit_transform(Data["hsc_b"])
         5 Data["hsc_s"] = label.fit_transform(Data["hsc_s"])
         6 Data["degree_t"] = label.fit_transform(Data["degree_t"])
         7 Data["workex"] = label.fit_transform(Data["workex"])
         8 Data["specialisation"] = label.fit_transform(Data["specialisation"])
         9 Data["status"] = label.fit_transform(Data["status"])

In [42]: 1 Data.head(10)

Out[42]:
```

	sl_no	gender	ssc_p	ssc_b	hsc_p	hsc_b	hsc_s	degree_p	degree_t	workex	etest_p	specialisation	mba_p	status	
0	1	1	67.00	1	91.00	1	1	58.00	2	0	55.00	1	58.80	1	27
1	2	1	79.33	0	78.33	1	2	77.48	2	1	86.50	0	66.28	1	20
2	3	1	65.00	0	68.00	0	0	64.00	0	0	75.00	0	57.80	1	25
3	4	1	56.00	0	52.00	0	2	52.00	2	0	66.00	1	59.43	0	28
4	5	1	85.80	0	73.60	0	1	73.30	0	0	96.80	0	55.50	1	42
5	6	1	55.00	1	49.80	1	2	67.25	2	1	55.00	0	51.58	0	28
6	7	0	46.00	1	49.20	1	1	79.00	0	0	74.28	0	53.29	0	28
7	8	1	82.00	0	64.00	0	2	66.00	2	1	67.00	0	62.14	1	25
8	9	1	73.00	0	79.00	0	1	72.00	0	0	91.34	0	61.29	1	23
9	10	1	58.00	0	70.00	0	1	61.00	0	0	54.00	0	52.21	0	28

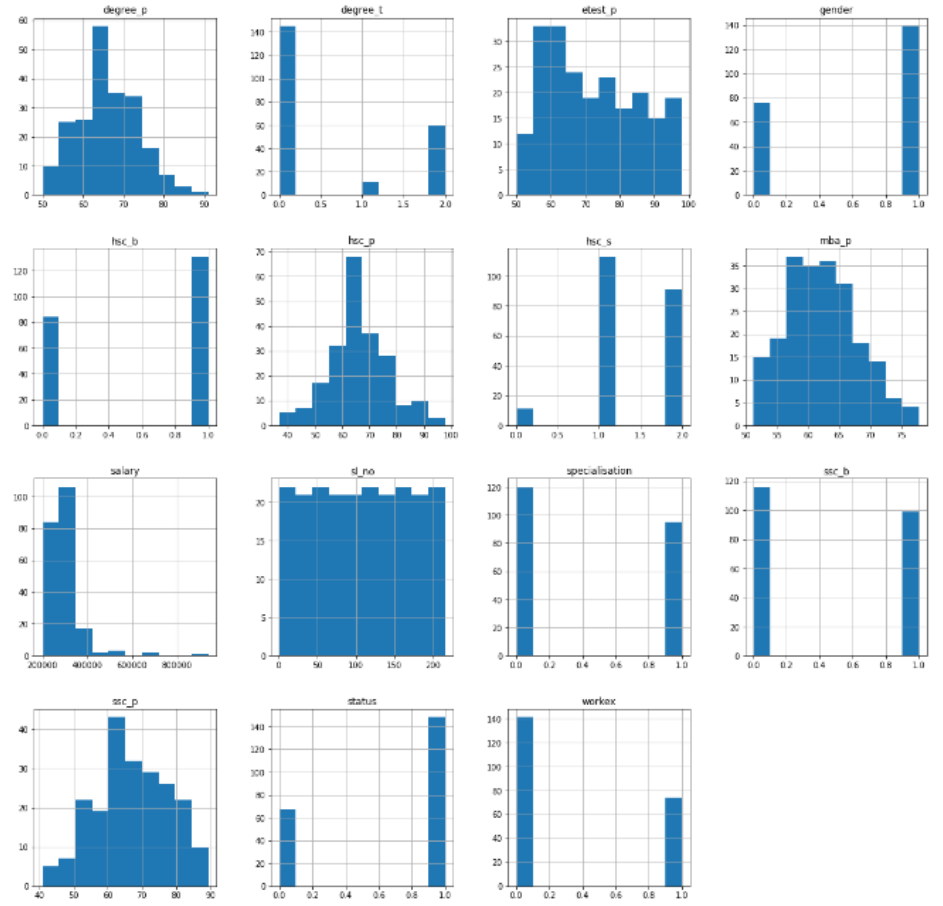
Encoding dilakukan untuk data kategori atau bertipe data object dengan pemberian angka 1,2,3 dan seterusnya.

II.Exploratory Data Analytics

1. Histogram Data

Eksplorasi Data (EDA)

```
In [43]:
1 Data.hist(figsize = (20, 20))
2 plt.show()
```



Data histogram untuk melakukan penyebaran data pada semua data yang ada.

2. Korelasi “Status” dan variabel lainnya

```
In [96]:
1 cor=Data.corr()
2 plt.figure(figsize=(14,6))
3 sns.heatmap(cor,annot=True)
```

```
Out[96]: <matplotlib.axes._subplots.AxesSubplot at 0x1718283adc0>
```

Pada visualisasi diatas dilakukan pengecekan korelasi antara “Status” dan seluruh fitur. Fitur yang memiliki korelasi tertinggi mempengaruhi status yakni fitur “ssc_p” dengan besaran 0.61, dan fitur terkecil yang mempengarui yakni “specialization” sebesar -0.25.

BAB IV
MODEL CREATION

Pada pembuatan model ini dilakukan pengklasifikasian menggunakan “Decission Tree Classifier”, “Random Forest Algorithm”, dan “Regresi Logistic”. Adapun untuk regresi Logistic dilakukan pengoptimalan mode dengan feature selection dan one-hot encoding untuk membandingkan apakah meningkat atau tidak akurasinya.

Train-test berbanding 7:3, yakni 70% data train dan 30% data test.

1. Decission Tree Classifier

DECISSION TREE CLASSIFIER

In [103]:
```
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score, classification_report
```

In [105]:
```
# Seperating Features and Target
X = data_clf[['gender', 'ssc_p', 'hsc_p', 'degree_p', 'workex','etest_p', 'specialisation', 'mba_p
y = data_clf['status']
```

In [106]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3)
```

In [107]:
```
dtree = DecisionTreeClassifier(criterion='entropy')
dtree.fit(X_train, y_train)
y_pred = dtree.predict(X_test)
```

In [108]:
```
accuracy_score(y_test, y_pred)
```

Out[108]: 0.8307692307692308

In [109]:
```
print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           0       0.88      0.62      0.73        24
           1       0.81      0.95      0.88        41

    accuracy                           0.83        65
   macro avg       0.85      0.79      0.80        65
weighted avg       0.84      0.83      0.82        65
```

Pada algoritma decission tree didapatkan akurasi sebesar 0.83.

2. Random Forest Algorithm

RANDOM FOREST ALGORITHM

```
In [114]:
1 #Using Random Forest Algorithm
2 random_forest = RandomForestClassifier(n_estimators=100)
3 random_forest.fit(X_train, y_train)
4 y_pred = random_forest.predict(X_test)
```

```
In [115]:
1 accuracy_score(y_test, y_pred)
```

```
Out[115]: 0.8615384615384616
```

```
In [116]:
1 print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           0       1.00      0.62      0.77        24
           1       0.82      1.00      0.90        41

    accuracy                           0.86        65
   macro avg       0.91      0.81      0.84        65
weighted avg       0.89      0.86      0.85        65
```

Pada random forest didapatkan akurasi sebesar 86%.

3. Logistic Regression

Regresi Linear

```
In [129]:
1 from sklearn.linear_model import LogisticRegression
```

```
In [130]:
1 logistic_reg = LogisticRegression()
2 logistic_reg.fit(X_train, y_train)
3 y_pred = logistic_reg.predict(X_test)
```

```
In [131]:
1 accuracy_score(y_test, y_pred)
```

```
Out[131]: 0.8615384615384616
```

```
In [133]:
1 print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           0       1.00      0.53      0.69        19
           1       0.84      1.00      0.91        46

    accuracy                           0.86        65
   macro avg       0.92      0.76      0.80        65
weighted avg       0.88      0.86      0.85        65
```

Pada Logistik regression terdapat akurasi 86%.

BAB V
EVALUASI DAN SARAN DEPLOYMENT

V.I Evaluasi

- Dengan menggunakan seleksi fitur dan one-hot encoding logistic regression hanya didapat sebesar 86%, perlu peningkatan

V.II Deployment

- Dapat mengambil inspirasi dari : https://www.kaggle.com/code/krooz0/complete-end2end-ml-pipeline-with-xai
- Contoh web deployment : https://recruitment-prediction.herokuapp.com/

BAB VI
KESIMPULAN

Dari project ini diperoleh :

- “Board of Education” dan “mba+percentage” pada MBA status, “persentase” pada ‘degree_p’,kemudian fitur ’etest_p’ tidak mempengaruhi penempatan.
- Algoritma klasifikasi terbaik ada pada Logistic Regression degan akurasi 86% dan Random Forest dengan akurasi 86%.

LAMPIRAN

GITHUB :

- **https://github.com/dwiahmaddzul/UNDIPSAINSDATA.git**
- **https://github.com/dwiahmaddzul/UNDIPSAINSDATA**

NOTEBOOK :

TUGAS UAS SAINS DATA

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Kampus asal : ITN Malang

Kampus ICEI : Universitas Diponegoro

Matkul : Sains Data (Data Science)

BUSINESS UNDESTANDING

MEMPERSIAPKAN LIBRARY

In [16]:
```
# data analysis and wrangling
import numpy as np
import pandas as pd
from scipy import stats
from scipy.stats import norm, skew
# visualization
import seaborn as sns
import matplotlib. pyplot as plt
import plotly.figure_factory as ff
import plotly.graph_objects as go
# machine learning
from sklearn.preprocessing import LabelEncoder
from sklearn.preprocessing import MinMaxScaler
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.svm import SVC
from sklearn.ensemble import RandomForestClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.naive_bayes import GaussianNB
from sklearn.linear_model import Perceptron
from sklearn.linear_model import SGDClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score,classification_report
from xgboost import XGBClassifier
from sklearn.feature_selection import SelectKBest
from sklearn.feature_selection import chi2
from sklearn.metrics import roc_curve
from sklearn.metrics import roc_auc_score
from sklearn.feature_selection import f_regression, mutual_info_regression
from xgboost import XGBRegressor
from xgboost import plot_importance
```

DATA (DATA WRANGLING)

MEMBACA DATA

In [4]:
```
Data = pd.read_csv("Placement_Data_Full_Class.csv")
```

In [99]:
```
Data.head(5)
```

Out[99]:

	sl_no	gender	ssc_p	hsc_p	degree_p	workex	etest_p	specialisation	mba_p	status
0	1	1	67.00	91.00	58.00	0	55.0	1	58.80	1
1	2	1	79.33	78.33	77.48	1	86.5	0	66.28	1
2	3	1	65.00	68.00	64.00	0	75.0	0	57.80	1
3	4	1	56.00	52.00	52.00	0	66.0	1	59.43	0
4	5	1	85.80	73.60	73.30	0	96.8	0	55.50	1

In [20]:
```
Data.shape
```

Out[20]: (215, 15)

Telaah TIPE DATA

In [6]:
```
Data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 215 entries, 0 to 214
Data columns (total 15 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   sl_no           215 non-null    int64  
 1   gender          215 non-null    object 
 2   ssc_p           215 non-null    float64
 3   ssc_b           215 non-null    object 
 4   hsc_p           215 non-null    float64
 5   hsc_b           215 non-null    object 
 6   hsc_s           215 non-null    object 
 7   degree_p        215 non-null    float64
 8   degree_t        215 non-null    object 
 9   workex          215 non-null    object 
 10  etest_p         215 non-null    float64
 11  specialisation  215 non-null    object 
 12  mba_p           215 non-null    float64
 13  status          215 non-null    object 
 14  salary          148 non-null    float64
dtypes: float64(6), int64(1), object(8)
memory usage: 25.3+ KB
```

TELAAH JENIS DATA

In [10]:
```
s = (Data.dtypes == 'object')
object_cols = list(s[s].index)
print("Categorical variables:")
print(object_cols)
```

```
Categorical variables:
['gender', 'ssc_b', 'hsc_b', 'hsc_s', 'degree_t', 'workex', 'specialisation', 'status']
```

In [11]:
```
x = (Data.dtypes == ('int64'))
integer_cols = list(x[x].index)
print("integer variables:")
print(integer_cols)
```

```
integer variables:
['sl_no']
```

In [12]:
```
x = (Data.dtypes == ('float64'))
float_cols = list(x[x].index)
print("float variables:")
print(float_cols)
```

```
float variables:
['ssc_p', 'hsc_p', 'degree_p', 'etest_p', 'mba_p', 'salary']
```

In [13]:
```
print("numerical variables:")
numerical_cols=float_cols+integer_cols
print(numerical_cols)
```

```
numerical variables:
['ssc_p', 'hsc_p', 'degree_p', 'etest_p', 'mba_p', 'salary', 'sl_no']
```

In [24]:
```
Data.columns
```

Out[24]:
```
Index(['sl_no', 'gender', 'ssc_p', 'ssc_b', 'hsc_p', 'hsc_b', 'hsc_s',
       'degree_p', 'degree_t', 'workex', 'etest_p', 'specialisation', 'mba_p',
       'status', 'salary'],
      dtype='object')
```

In [18]:
```
Data.describe()
```

Out[18]:

	sl_no	ssc_p	hsc_p	degree_p	etest_p	mba_p	salary
count	215.000000	215.000000	215.000000	215.000000	215.000000	215.000000	148.000000
mean	108.000000	67.303395	66.333163	66.370186	72.100558	62.278186	288655.405405
std	62.209324	10.827205	10.897509	7.358743	13.275956	5.833385	93457.452420
min	1.000000	40.890000	37.000000	50.000000	50.000000	51.210000	200000.000000
25%	54.500000	60.600000	60.900000	61.000000	60.000000	57.945000	240000.000000
50%	108.000000	67.000000	65.000000	66.000000	71.000000	62.000000	265000.000000
75%	161.500000	75.700000	73.000000	72.000000	83.500000	66.255000	300000.000000
max	215.000000	89.400000	97.700000	91.000000	98.000000	77.890000	940000.000000

In [15]:
```
Data.isnull().sum()
```

Out[15]:
```
sl_no             0
gender            0
ssc_p             0
ssc_b             0
hsc_p             0
hsc_b             0
hsc_s             0
degree_p          0
degree_t          0
workex            0
etest_p           0
specialisation    0
mba_p             0
status            0
salary           67
dtype: int64
```

In [26]:
```
# getting the object columns
object_columns = Data.select_dtypes(include=['object']).columns

# iterating over each object type column
for col in object_columns:
    print('-' * 40 + col + '-' * 40 , end='-')
    display(Data[col].value_counts())
```

```
----------------------------------------gender----------------------------------------

M    139
F     76
Name: gender, dtype: int64

----------------------------------------ssc_b----------------------------------------

Central    116
Others      99
Name: ssc_b, dtype: int64

----------------------------------------hsc_b----------------------------------------

Others     131
Central     84
Name: hsc_b, dtype: int64

----------------------------------------hsc_s----------------------------------------

Commerce    113
Science      91
Arts         11
Name: hsc_s, dtype: int64

----------------------------------------degree_t----------------------------------------

Comm&Mgmt    145
Sci&Tech      59
Others        11
Name: degree_t, dtype: int64

----------------------------------------workex----------------------------------------

No     141
Yes     74
Name: workex, dtype: int64

----------------------------------------specialisation----------------------------------------

Mkt&Fin    120
Mkt&HR      95
Name: specialisation, dtype: int64

----------------------------------------status----------------------------------------

Placed        148
Not Placed     67
Name: status, dtype: int64
```

Data Preprocessing

Mengatasi Data Null

In [36]:
```
Data['salary'].fillna((Data['salary'].mean()), inplace=True)
```

In [37]:
```
Data.isnull().sum()
```

Out[37]:
```
sl_no             0
gender            0
ssc_p             0
ssc_b             0
hsc_p             0
hsc_b             0
hsc_s             0
degree_p          0
degree_t          0
workex            0
etest_p           0
specialisation    0
mba_p             0
status            0
salary            0
dtype: int64
```

Label Encoding

In [41]:
```
label = LabelEncoder()
Data["gender"] = label.fit_transform(Data["gender"])
Data["ssc_b"] = label.fit_transform(Data["ssc_b"])
Data["hsc_b"] = label.fit_transform(Data["hsc_b"])
Data["hsc_s"] = label.fit_transform(Data["hsc_s"])
Data["degree_t"] = label.fit_transform(Data["degree_t"])
Data["workex"] = label.fit_transform(Data["workex"])
Data["specialisation"] = label.fit_transform(Data["specialisation"])
Data["status"] = label.fit_transform(Data["status"])
```

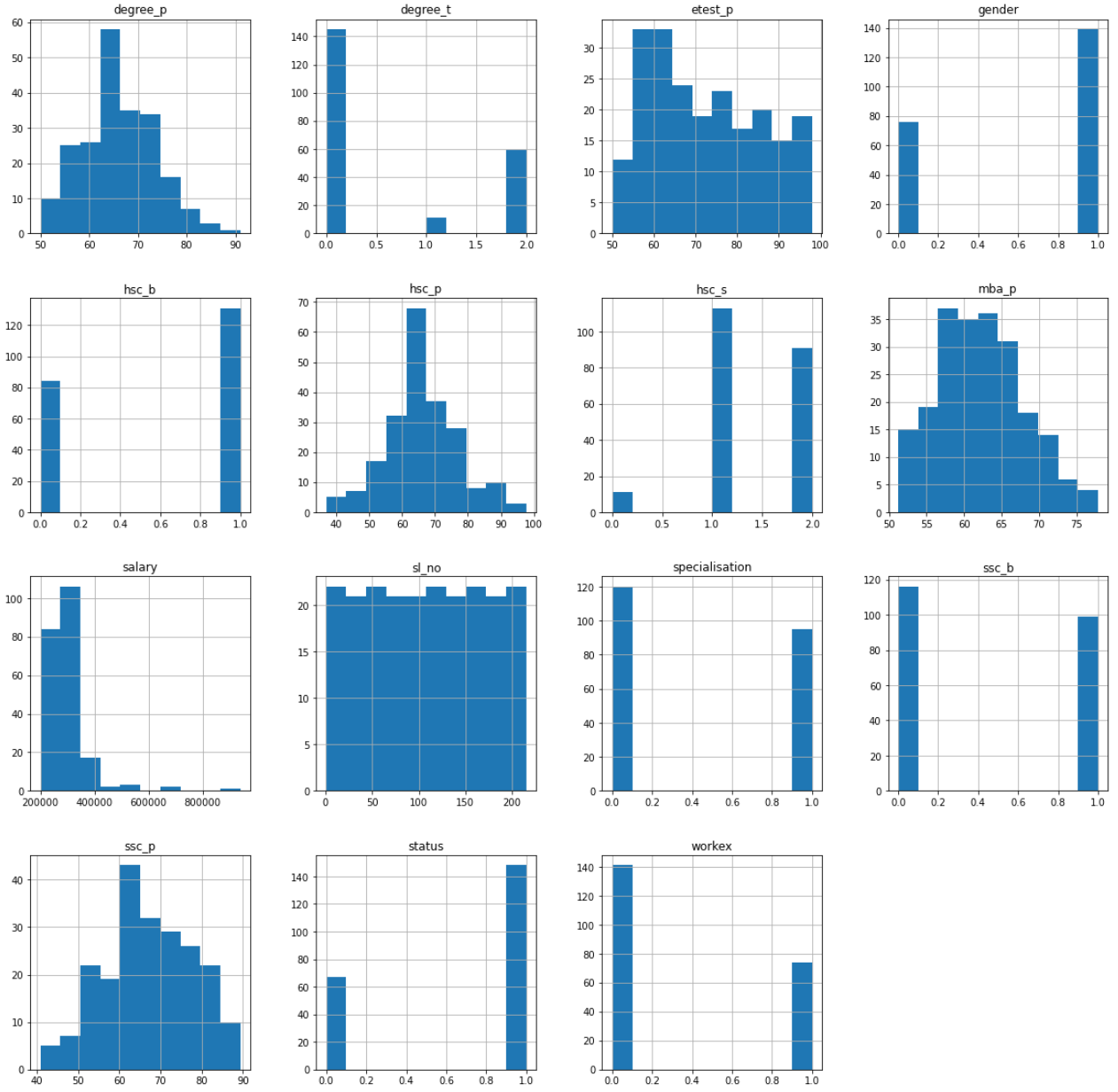
In [42]:
```
Data.head(10)
```

Out[42]:

	sl_no	gender	ssc_p	ssc_b	hsc_p	hsc_b	hsc_s	degree_p	degree_t	workex	etest_p	specialisation	mba_p	status	salary
0	1	1	67.00	1	91.00	1	1	58.00	2	0	55.00	1	58.80	1	270000.000000
1	2	1	79.33	0	78.33	1	2	77.48	2	1	86.50	0	66.28	1	200000.000000
2	3	1	65.00	0	68.00	0	0	64.00	0	0	75.00	0	57.80	1	250000.000000
3	4	1	56.00	0	52.00	0	2	52.00	2	0	66.00	1	59.43	0	288655.405405
4	5	1	85.80	0	73.60	0	1	73.30	0	0	96.80	0	55.50	1	425000.000000
5	6	1	55.00	1	49.80	1	2	67.25	2	1	55.00	0	51.58	0	288655.405405
6	7	0	46.00	1	49.20	1	1	79.00	0	0	74.28	0	53.29	0	288655.405405
7	8	1	82.00	0	64.00	0	2	66.00	2	1	67.00	0	62.14	1	252000.000000
8	9	1	73.00	0	79.00	0	1	72.00	0	0	91.34	0	61.29	1	231000.000000
9	10	1	58.00	0	70.00	0	1	61.00	0	0	54.00	0	52.21	0	288655.405405

Eksplorasi Data (EDA)

In [43]:
```
1 Data.hist(figsize = (20, 20))
2 plt.show()
```



In [96]:
```
cor=Data.corr()
plt.figure(figsize=(14,6))
sns.heatmap(cor,annot=True)
```

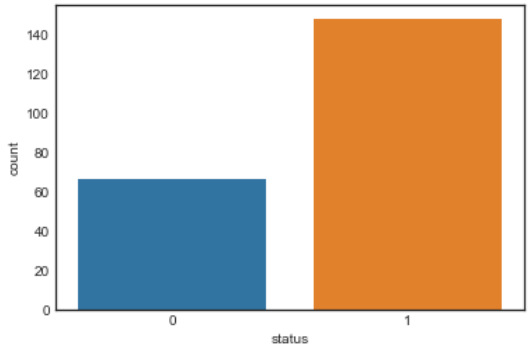
Out[96]: <matplotlib.axes._subplots.AxesSubplot at 0x1718283adc0>

Analisis Pengalaman Kerja dan Status Penempatan

In [47]:
```
sns.countplot('status', data=Data)
```

```
C:\Users\dwiah\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as
a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments
without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```

Out[47]: <matplotlib.axes._subplots.AxesSubplot at 0x17182cce2e0>



In [49]:
```
Data['gender'].value_counts()
```

Out[49]:
```
1    139
0     76
Name: gender, dtype: int64
```

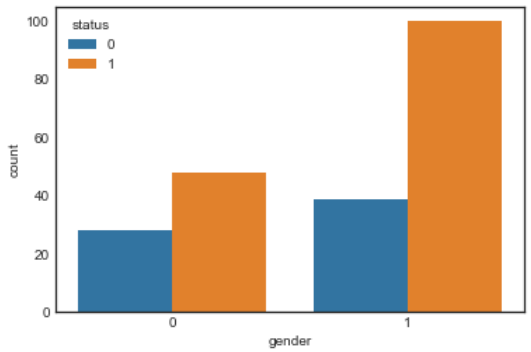
In [52]:
```
df = pd.DataFrame(Data.groupby(['gender','status'])['status'].count())
df
```

Out[52]:

		status
gender	**status**	
0	**0**	28
	1	48
1	**0**	39
	1	100

In [54]:
```
1 sns.countplot(x='gender', hue='status', data=Data)
```

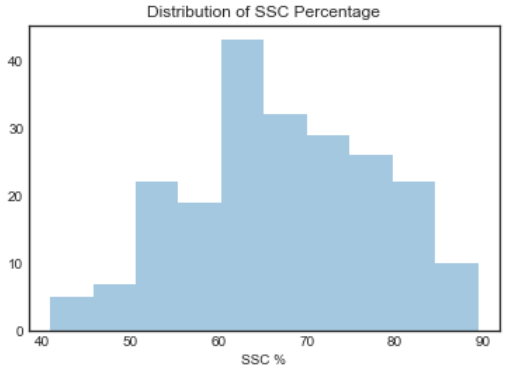
Out[54]: <matplotlib.axes._subplots.AxesSubplot at 0x171828e26d0>



In [56]:
```
1 sns.distplot(Data['ssc_p'], kde=False)
2 plt.title('Distribution of SSC Percentage')
3 plt.xlabel('SSC %')
```

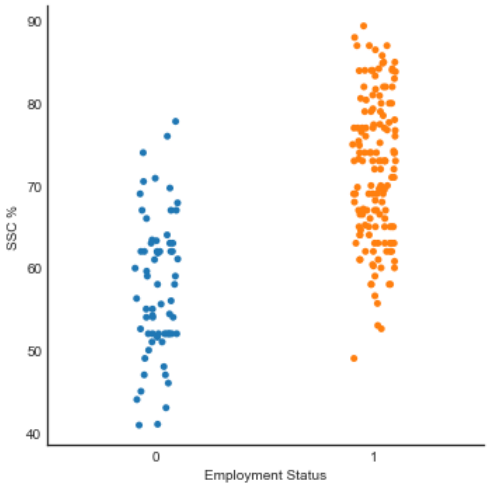
```
C:\Users\dwiah\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated
function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level fun
ction with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

Out[56]: Text(0.5, 0, 'SSC %')



In [58]:
```
1 sns.catplot(y='ssc_p', x='status', data=Data)
2 plt.xlabel('Employment Status')
3 plt.ylabel('SSC %')
```

Out[58]: Text(9.549999999999997, 0.5, 'SSC %')



In [59]:
```
Data['ssc_b'].value_counts()
```

Out[59]:
```
0    116
1     99
Name: ssc_b, dtype: int64
```

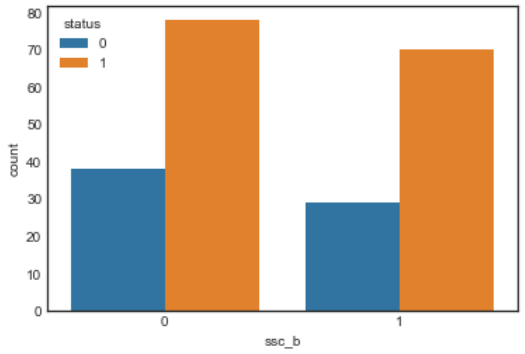
In [60]:
```
df = pd.DataFrame(Data.groupby(['ssc_b','status'])['status'].count())
df
```

Out[60]:

		status
ssc_b	**status**	
0	**0**	38
	1	78
1	**0**	29
	1	70

In [62]:
```
sns.countplot(x='ssc_b', hue='status', data=Data)
```

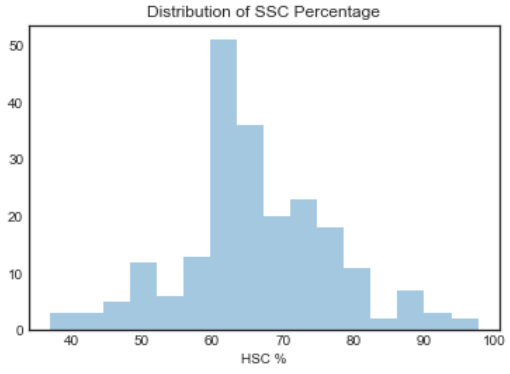
Out[62]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x171808a1250>
```



In [63]:
```
sns.distplot(Data['hsc_p'], kde=False)
plt.title('Distribution of SSC Percentage')
plt.xlabel('HSC %')
```

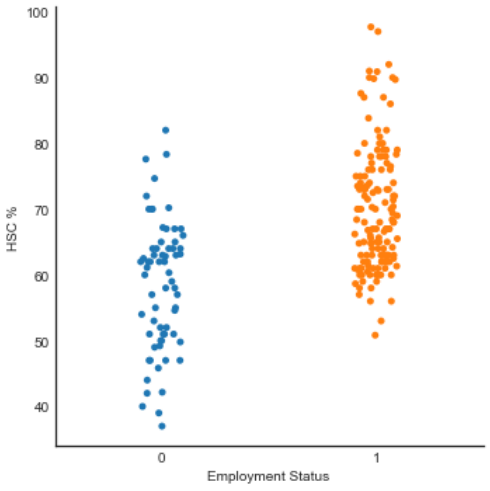
```
C:\Users\dwiah\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated
function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level fun
ction with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

Out[63]:
```
Text(0.5, 0, 'HSC %')
```



In [65]:
```
1 sns.catplot(y='hsc_p', x='status', data=Data)
2 plt.xlabel('Employment Status')
3 plt.ylabel('HSC %')
```

Out[65]:
```
Text(3.924999999999997, 0.5, 'HSC %')
```



In [66]:
```
1 Data['hsc_b'].value_counts()
```

Out[66]:
```
1    131
0     84
Name: hsc_b, dtype: int64
```

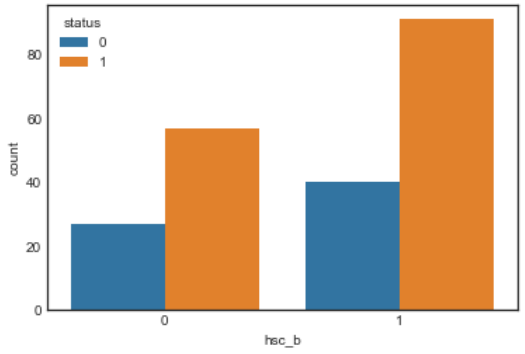
In [67]:
```
1 df = pd.DataFrame(Data.groupby(['hsc_b','status'])['status'].count())
2 df
```

Out[67]:

		status
hsc_b	**status**	
0	**0**	27
	1	57
1	**0**	40
	1	91

In [68]:
```
1 sns.countplot(x='hsc_b', hue='status', data=Data)
```

Out[68]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x171822753d0>
```



In [69]:
```
1 Data['hsc_s'].value_counts()
```

Out[69]:
```
1    113
2     91
0     11
Name: hsc_s, dtype: int64
```

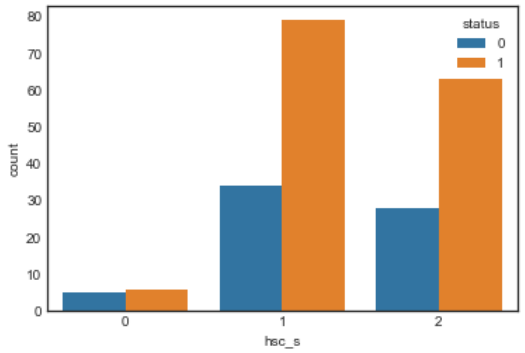
In [70]:
```
1 df = pd.DataFrame(Data.groupby(['hsc_s','status'])['status'].count())
2 df
```

Out[70]:

		status
hsc_s	**status**	
0	**0**	5
	1	6
1	**0**	34
	1	79
2	**0**	28
	1	63

In [71]:
```
1 sns.countplot(x='hsc_s', hue='status', data=Data)
```

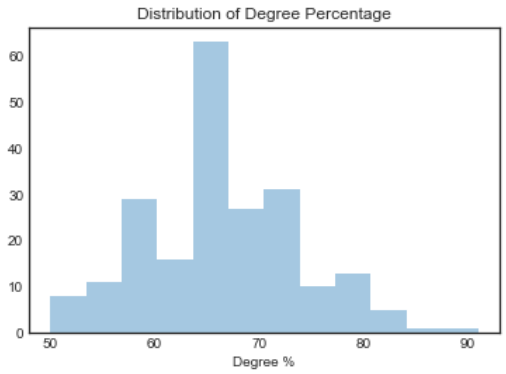
Out[71]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x17180876e50>
```



In [72]:
```
1 sns.distplot(Data['degree_p'], kde=False)
2 plt.title('Distribution of Degree Percentage')
3 plt.xlabel('Degree %')
```

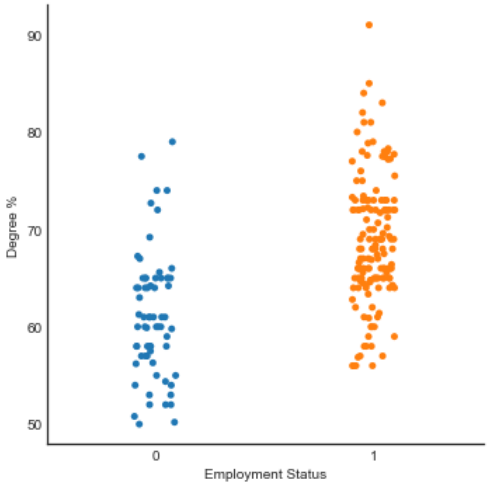
```
C:\Users\dwiah\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated
function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level fun
ction with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

Out[72]:
```
Text(0.5, 0, 'Degree %')
```



In [73]:
```
sns.catplot(y='degree_p', x='status', data=Data)
plt.xlabel('Employment Status')
plt.ylabel('Degree %')
```

Out[73]:
```
Text(9.549999999999997, 0.5, 'Degree %')
```



In [74]:
```
Data['degree_t'].value_counts()
```

Out[74]:
```
0    145
2     59
1     11
Name: degree_t, dtype: int64
```

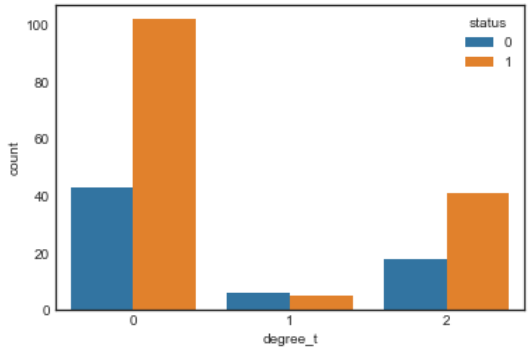
In [75]:
```
df = pd.DataFrame(Data.groupby(['degree_t','status'])['status'].count())
df
```

Out[75]:

		status
degree_t	**status**	
0	**0**	43
	1	102
1	**0**	6
	1	5
2	**0**	18
	1	41

In [76]:
```
sns.countplot(x='degree_t', hue='status', data=Data)
```

Out[76]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x1718089cc70>
```



In [77]:
```
1 Data['workex'].value_counts()
```

Out[77]:
```
0    141
1     74
Name: workex, dtype: int64
```

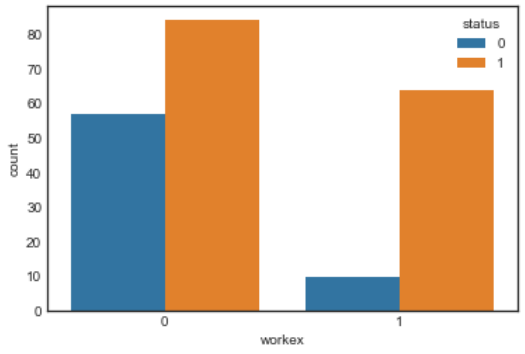
In [78]:
```
1 df = pd.DataFrame(Data.groupby(['workex','status'])['status'].count())
2 df
```

Out[78]:

		status
workex	**status**	
0	**0**	57
	1	84
1	**0**	10
	1	64

In [79]:
```
1 sns.countplot(x='workex', hue='status', data=Data)
```

Out[79]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x17180765b80>
```



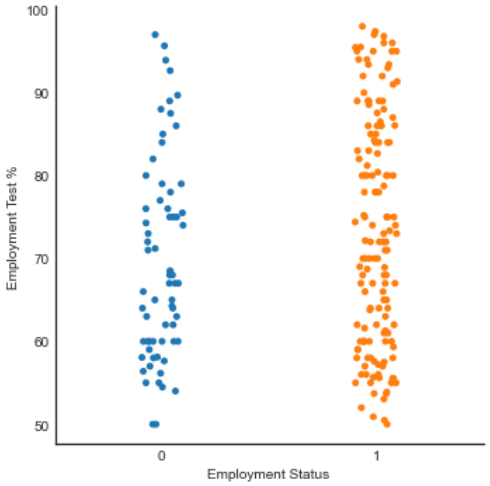
In [80]:
```
1 sns.distplot(Data['etest_p'], kde=False)
2 plt.title('Distribution of MBA Percentage')
3 plt.xlabel('Employment Test %')
```

```
C:\Users\dwiah\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated
function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level fun
ction with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

Out[80]:
```
Text(0.5, 0, 'Employment Test %')
```

In [81]:
```
1 sns.catplot(y='etest_p', x='status', data=Data)
2 plt.xlabel('Employment Status')
3 plt.ylabel('Employment Test %')
```

Out[81]:
```
Text(3.924999999999997, 0.5, 'Employment Test %')
```



In [82]:
```
1 Data['specialisation'].value_counts()
```

Out[82]:
```
0    120
1     95
Name: specialisation, dtype: int64
```

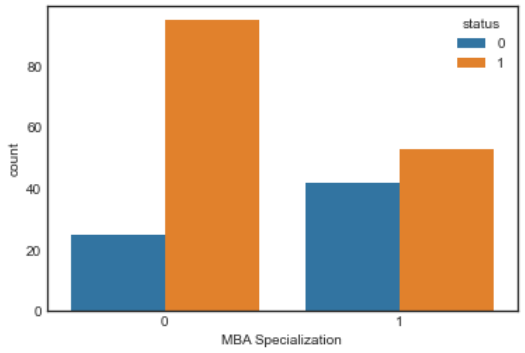
In [83]:
```
1 df = pd.DataFrame(Data.groupby(['specialisation','status'])['status'].count())
2 df
```

Out[83]:

		status
specialisation	**status**	
0	**0**	25
	1	95
1	**0**	42
	1	53

In [84]:
```
sns.countplot(x='specialisation', hue='status', data=Data)
plt.xlabel('MBA Specialization')
```

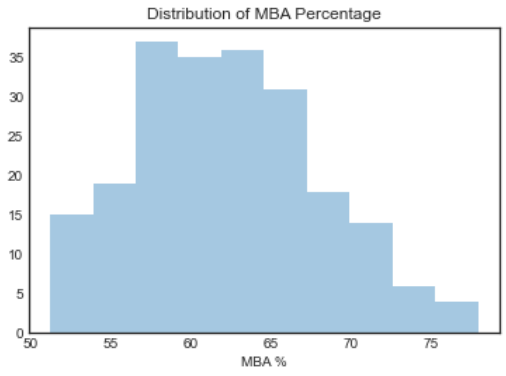
Out[84]: Text(0.5, 0, 'MBA Specialization')



In [85]:
```
sns.distplot(Data['mba_p'], kde=False)
plt.title('Distribution of MBA Percentage')
plt.xlabel('MBA %')
```

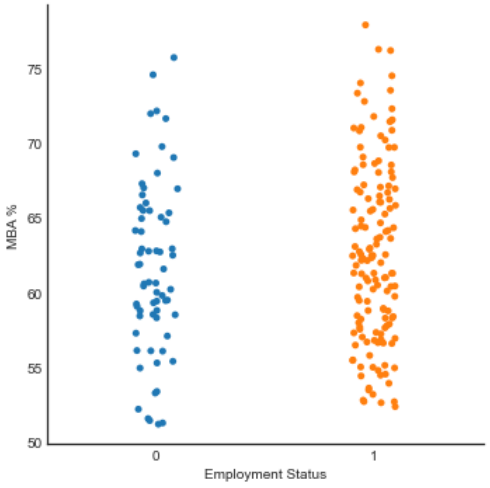
```
C:\Users\dwiah\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated
function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level fun
ction with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

Out[85]: Text(0.5, 0, 'MBA %')



In [86]:
```
sns.catplot(y='mba_p', x='status', data=Data)
plt.xlabel('Employment Status')
plt.ylabel('MBA %')
```

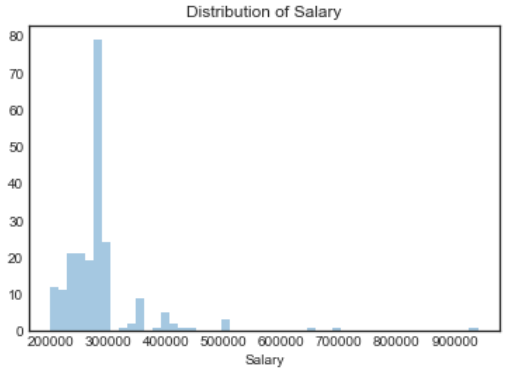
Out[86]: Text(9.549999999999997, 0.5, 'MBA %')



In [87]:
```
1 sns.distplot(Data['salary'], kde=False)
2 plt.title('Distribution of Salary')
3 plt.xlabel('Salary')
```

```
C:\Users\dwiah\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated
function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level fun
ction with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

Out[87]: Text(0.5, 0, 'Salary')

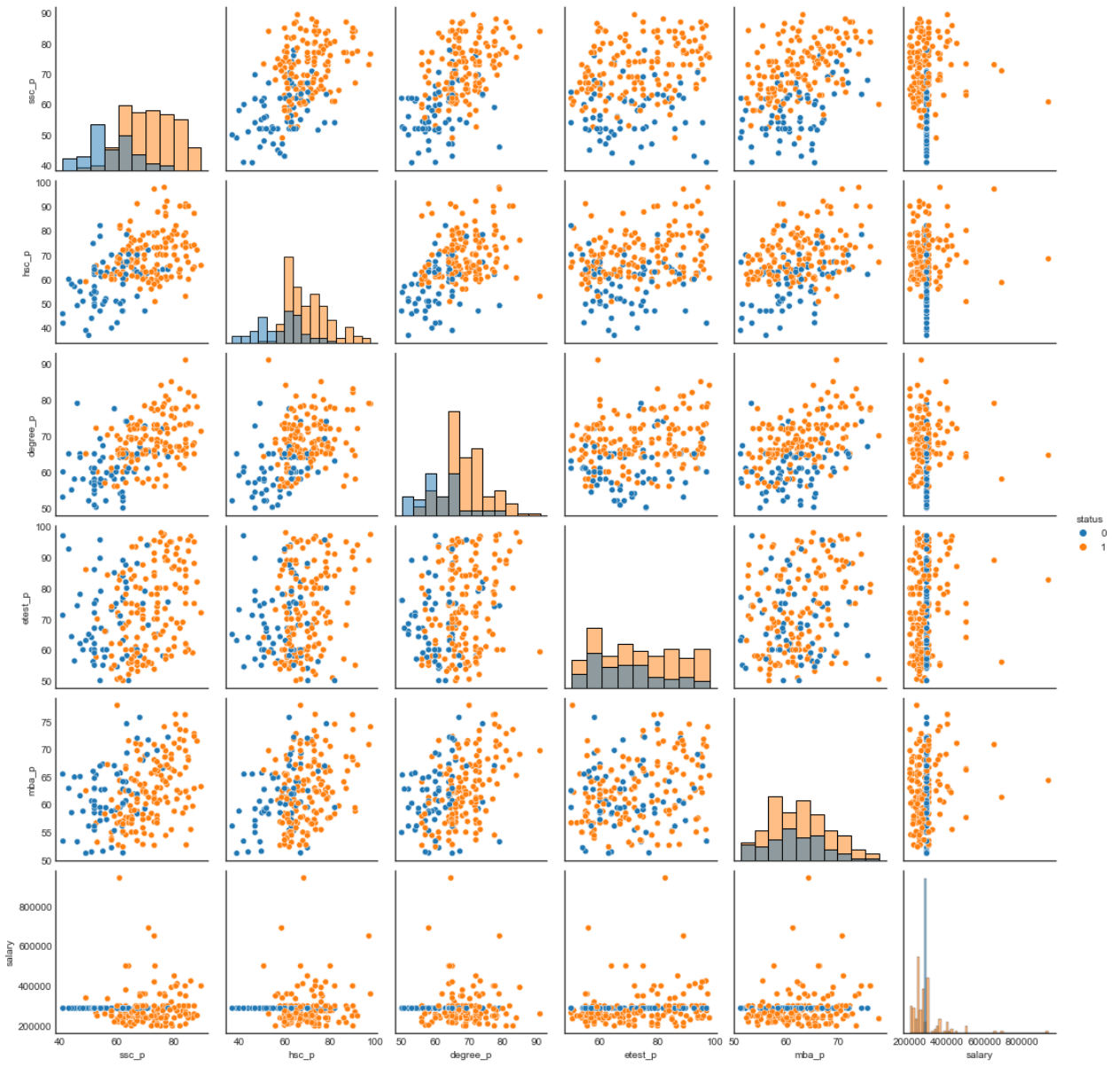


In [88]:
```
1 sns.catplot(y='salary', x='status', data=Data)
2 plt.xlabel('Employment Status')
3 plt.ylabel('Salary')
```

Out[88]: Text(-12.950000000000003, 0.5, 'Salary')

In [89]:
```
1 sns.pairplot(data=Data[['ssc_p','hsc_p','degree_p', 'etest_p','mba_p','salary', 'status']], hue="status", diag_ki
```

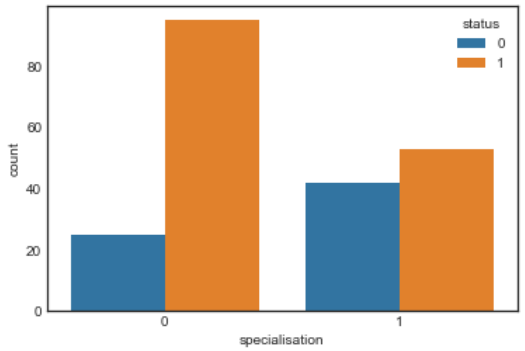
Out[89]: <seaborn.axisgrid.PairGrid at 0x17181a5c940>



In [92]:
```
sns.countplot("specialisation", hue="status", data=Data)
```

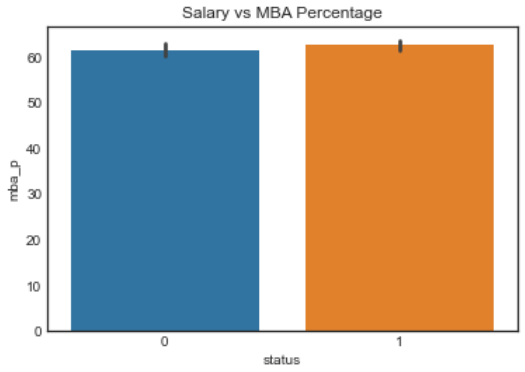
```
C:\Users\dwiah\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as
a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments
without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```

Out[92]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x171828371f0>
```



In [95]:
```
sns.barplot(x="status", y="mba_p", data=Data)
plt.title("Salary vs MBA Percentage")
```

Out[95]:
```
Text(0.5, 1.0, 'Salary vs MBA Percentage')
```



In [101]:
```
Data.dtypes
```

Out[101]:
```
sl_no              int64
gender             int32
ssc_p            float64
hsc_p            float64
degree_p         float64
workex             int32
etest_p          float64
specialisation     int32
mba_p            float64
status             int32
dtype: object
```

In [102]:
```
data_clf = Data.copy()
data_reg = Data.copy()
```

Data Modelling

DECISSION TREE CLASSIFIER

In [103]:
```
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score, classification_report
```

In [105]:
```
# Seperating Features and Target
X = data_clf[['gender', 'ssc_p', 'hsc_p', 'degree_p', 'workex','etest_p', 'specialisation', 'mba_p',]]
y = data_clf['status']
```

In [106]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3)
```

In [107]:
```
dtree = DecisionTreeClassifier(criterion='entropy')
dtree.fit(X_train, y_train)
y_pred = dtree.predict(X_test)
```

In [108]:
```
accuracy_score(y_test, y_pred)
```

Out[108]: 0.8307692307692308

In [109]:
```
print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           0       0.88      0.62      0.73        24
           1       0.81      0.95      0.88        41

    accuracy                           0.83        65
   macro avg       0.85      0.79      0.80        65
weighted avg       0.84      0.83      0.82        65
```

RANDOM FOREST ALGORITHM

In [114]:
```
#Using Random Forest Algorithm
random_forest = RandomForestClassifier(n_estimators=100)
random_forest.fit(X_train, y_train)
y_pred = random_forest.predict(X_test)
```

In [115]:
```
accuracy_score(y_test, y_pred)
```

Out[115]: 0.8615384615384616

In [116]:
```
print(classification_report(y_test, y_pred))
```

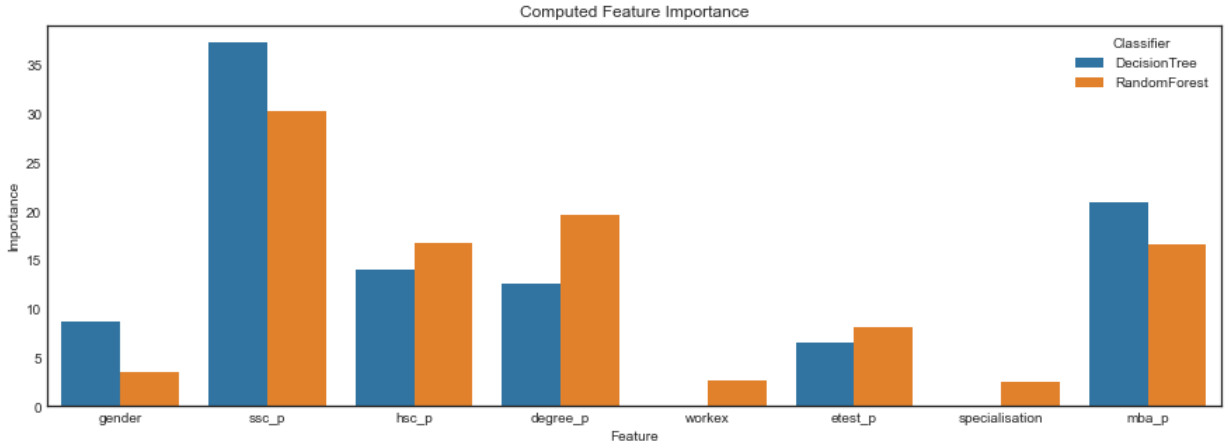
```
              precision    recall  f1-score   support

           0       1.00      0.62      0.77        24
           1       0.82      1.00      0.90        41

    accuracy                           0.86        65
   macro avg       0.91      0.81      0.84        65
weighted avg       0.89      0.86      0.85        65
```

Feature Selection untuk Regresi Linear

In [117]:
```
rows = list(X.columns)
imp = pd.DataFrame(np.zeros(6*len(rows)).reshape(2*len(rows), 3))
imp.columns = ["Classifier", "Feature", "Importance"]
#Add Rows
for index in range(0, 2*len(rows), 2):
    imp.iloc[index] = ["DecisionTree", rows[index//2], (100*dtree.feature_importances_[index//2])]
    imp.iloc[index + 1] = ["RandomForest", rows[index//2], (100*random_forest.feature_importances_[index//2])]
```

In [118]:
```
plt.figure(figsize=(15,5))
sns.barplot("Feature", "Importance", hue="Classifier", data=imp)
plt.title("Computed Feature Importance")
plt.show()
```

```
C:\Users\dwiah\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variables as
keyword args: x, y. From version 0.12, the only valid positional argument will be `data`, and passing other argument
s without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```



In [125]:
```
# Seperating Features and Target
X = data_clf[['gender', 'ssc_p', 'hsc_p', 'degree_p', 'workex','etest_p', 'specialisation', 'mba_p',]]
y = data_clf['status']
#Reverse Mapping and making Categorical
X["gender"] = pd.Categorical(X.gender.map({0:"M",1:"F"}))
X["workex"] = pd.Categorical(X.workex.map({0:"No",1:"Yes"}))
X["specialisation"] = pd.Categorical(X.specialisation.map({0:"Mkt&HR",1:"Mkt&Fin"}))
```

In [134]:
```
X.head(10)
```

Out[134]:

	ssc_p	hsc_p	degree_p	etest_p	mba_p	gender_F	gender_M	workex_No	workex_Yes	specialisation_Mkt&Fin	specialisation_Mkt&HR
0	67.00	91.00	58.00	55.00	58.80	1	0	1	0	1	0
1	79.33	78.33	77.48	86.50	66.28	1	0	0	1	0	1
2	65.00	68.00	64.00	75.00	57.80	1	0	1	0	0	1
3	56.00	52.00	52.00	66.00	59.43	1	0	1	0	1	0
4	85.80	73.60	73.30	96.80	55.50	1	0	1	0	0	1
5	55.00	49.80	67.25	55.00	51.58	1	0	0	1	0	1
6	46.00	49.20	79.00	74.28	53.29	0	1	1	0	0	1
7	82.00	64.00	66.00	67.00	62.14	1	0	0	1	0	1
8	73.00	79.00	72.00	91.34	61.29	1	0	1	0	0	1
9	58.00	70.00	61.00	54.00	52.21	1	0	1	0	0	1

One-Hot Encoding

In [126]:
```
X = pd.get_dummies(X)
colmunn_names = X.columns.to_list()
```

In [127]:
```
from sklearn.preprocessing import MinMaxScaler
scaler = MinMaxScaler()
X_scaled = scaler.fit_transform(X)
```

In [128]:
```
#Train Test Split
X_train, X_test, y_train, y_test = train_test_split(X_scaled, y, test_size=0.3)
```

Logistic Regression

In [129]:
```
from sklearn.linear_model import LogisticRegression
```

In [130]:
```
logistic_reg = LogisticRegression()
logistic_reg.fit(X_train, y_train)
y_pred = logistic_reg.predict(X_test)
```

In [131]:
```
accuracy_score(y_test, y_pred)
```

Out[131]: 0.8615384615384616

In [133]:
```
print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           0       1.00      0.53      0.69        19
           1       0.84      1.00      0.91        46

    accuracy                           0.86        65
   macro avg       0.92      0.76      0.80        65
weighted avg       0.88      0.86      0.85        65
```