```
Tugas Kelompok Akhir 3 dan 4 Microdential Data Science UGM07
         Nama:

    Ari Budi Prasetyo

           · Helmi Saifullah Mansur

    Ruslan Anwar

In [ ]: #import library
         import pandas as pd
         import numpy as np
         import matplotlib.pyplot as plt
         import seaborn as sns
         %matplotlib inline
In [ ]: #mount drive
         from google.colab import drive
         drive.mount('/content/gdrive')
         Mounted at /content/gdrive
         Drive already mounted at /content/gdrive; to attempt to forcibly remount, call drive.mount("/
         content/gdrive", force_remount=True).
In [ ]: #Upload File
         from google.colab import files
         files.upload()
          Choose Files | No file chosen
         Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.
         Saving Book2.csv to Book2.csv
Out[]: {'Book2.csv': b'No., Nama, Pesanan, Varian , Jumlah, Harga asli, Harga Jual, Untung\r\n1, Fina, origin
         al, small, 1, 12000, 15000, 3000\r\n2, Bilqis, original, small_saus pisah, 1, 12000, 15000, 3000\r\n3, Fia
         nicha, original , small, 1, 12000, 15000, 3000\r\n4, Nabela, original, small, 1, 12000, 15000, 3000\r\n5, K
         aysa, original, small, 1, 12000, 15000, 3000\r\n6, Shevira, taro, small, 1, 14000, 17000, 3000\r\n7, Nabil
         a, original, medium, 1, 18000, 21000, 3000\r\n8, Kiat Ramdan Sumadi, usus toples , Balado_4, 1, 38000, 42
         000,4000\r\n9,Elzachra Laras Kinasih,Makaroni bungkus,Pedas asin_0,1,7999,12000,4001\r\n10,El
         zachra Laras Kinasih, Bihun krenyes bungkus, Pedas asin_0,1,8928,13000,4072\r\n11,Mbak Ayu, mie
         lidi bungkus, pedas asin_4,1,8928,13000,4072\r\n12,Octavia Nur, Makaroni bungkus, asin pedas_1,
         1,7999,11000,3001\r\n13,Nafisah Mifatahul,makaroni bungkus ,asin pedas_1,1,7999,11000,3001\r
         \n14, Nafisah Mifatahul, makaroni mix bihun, jagung bakar_1, 1, 8928, 13000, 4072\r\n15, Bu Cholifah,
         makaroni basah, -, 1, 9200, 13000, 3800\r\n16, Iliyin, makaroni bungkus , pedas asin_2, 1, 7999, 11000, 3
         001\r\n17, Nafisah miftahul ,makaroni bungkus, balado, 1,8928,10000,1072\r\n18, Fianicha ,makaron
         i bungkus, asin pedas_0,1,7999,10000,2001\r\n19,Fianicha ,makaroni bungkus, asin pedas_1,1,799
         9,10000,2001\r\n20,Illiyin ,mie lidi ,pedas asin_2,1,8928,11000,2072\r\n21,Nabila Afidatu Z.,
         Makaroni bungkus, Pedas asin_1,1,7999,10000,2001\r\n22, Musfinda Al fisani, Makaroni bungkus, Asi
         n pedas_1,1,7999,9500,1501\r\n23,Hasna Azzahra,Makaroni bungkus,asin pedas_4,1,7999,9500,1501
         \r\n24, Anie yuni, Makaroni bungkus, asin pedas_2,1,7999,9500,1501\r\n25, Anie yuni, Mie lidi ,asi
         n pedas_2,1,8928,9500,572\r\n26,AMEL ,KRIPIK KACA,-,2,4950,6500,1550\r\n27,Kaysa ,makaroni bu
         ngkus, asing pedas_4,1,7999,9500,1501\r\n28,Eka Febriyanti,Makaroni bungkus ,balado_2,1,8928,9
         500,572\r\n29,Eka Febriyanti,USUS BALADO ,balado_2,1,13500,14500,1000\r\n30,Fianicha Shaliha
         h, Makaroni bungkus, Asin pedas_1, 1, 7999, 9500, 1501\r\n31, Sekar Wahyu, Makaroni bungkus, asin peda
         s_4,1,7999,9500,1501\r\n32,Nabela Tri Wahyuni,Makaroni bungkus,asin pedas_3,1,7999,9500,1501
         \r\n33,Lisa Rosita,Makaroni toples,asin pedas_3,1,21250,26500,5250\r\n34,Elzachra Laras Kinas
         ih, makaroni bungkus, asin pedas_0_1,2,15998,19000,3002\r\n35,Erma Nur Setyaningrum, Makaroni bu
         ngkus, asing pedas_3,1,7999,9500,1501\r\n36,Azizah Nur Amalia,Makaroni toples,balado_5,1,2125
         0,26500,5250\r\n37,Azizah Nur Amalia,Mie lidi,balado_5,3,26928,28500,1572\r\n38,Indah Nur lit
         a, Mie lidi, keju_2,1,8928,9500,572\r\n39,Fianicha Shalihah (stock), makaroni bungkus, asin pedas
         _1,1,7999,9500,1501\r\n40,Fianicha Shalihah (stock),makaroni bungkus ,asin pedas_3,1,7999,950
         0,1501\r\n'
          Choose Files No file chosen
         Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.
In [ ]: #Load Dataset
          #Membaca File
         df = pd.read_csv('/content/Book2.csv')
         df.head(40)
Out[]:
                                                                Varian Jumlah Harga asli Harga Jual Untung
                                Nama
              No.
                                                Pesanan
           0
               1
                                                                           1
                                                                                 12000
                                                                                           15000
                                                                                                   3000
                                 Fina
                                                 original
                                                                 small
           1
               2
                                Bilqis
                                                 original small_saus pisah
                                                                           1
                                                                                 12000
                                                                                           15000
                                                                                                   3000
           2
                              Fianicha
                                                                                 12000
                                                                                           15000
                                                                                                   3000
                                                 original
                                                                 small
                                                                           1
           3
                                                                                 12000
                                                                                           15000
                                                                                                   3000
               4
                               Nabela
                                                                 small
                                                                           1
                                                 original
                                                                                 12000
                                                                                           15000
                                                                                                   3000
                               Kaysa
                                                 original
                                                                 small
                                                                           1
           5
               6
                               Shevira
                                                    taro
                                                                 small
                                                                           1
                                                                                 14000
                                                                                           17000
                                                                                                   3000
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                               Nabila
                                                 original
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                                                                           1
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                                                                                                   3000
           7
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                                                                                           42000
                                                                                                   4000
                     Kiat Ramdan Sumadi
                                              usus toples
                                                              Balado_4
                                                                           1
                                                                                  7999
                                                                                           12000
                                                                                                   4001
           8
                    Elzachra Laras Kinasih
                                         Makaroni bungkus
                                                           Pedas asin_0
                                                                           1
           9
                    Elzachra Laras Kinasih Bihun krenyes bungkus
                                                                                  8928
                                                                                           13000
                                                                                                   4072
              10
                                                           Pedas asin_0
                                                                           1
          10
              11
                                                                                  8928
                                                                                           13000
                                                                                                   4072
                             Mbak Ayu
                                           mie lidi bungkus
                                                           pedas asin_4
                                                                           1
          11
              12
                            Octavia Nur
                                                                           1
                                                                                  7999
                                                                                           11000
                                                                                                   3001
                                         Makaroni bungkus
                                                           asin pedas_1
          12
              13
                        Nafisah Mifatahul
                                                                           1
                                                                                  7999
                                                                                           11000
                                                                                                   3001
                                         makaroni bungkus
                                                           asin pedas_1
          13
                                                                                           13000
                                                                                                   4072
              14
                        Nafisah Mifatahul
                                                                           1
                                                                                  8928
                                         makaroni mix bihun
                                                          jagung bakar_1
              15
                            Bu Cholifah
                                                                                  9200
                                                                                           13000
                                                                                                   3800
          14
                                           makaroni basah
                                                                           1
          15
              16
                                                                                           11000
                                 Iliyin
                                         makaroni bungkus
                                                           pedas asin_2
                                                                           1
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          16
              17
                         Nafisah miftahul
                                         makaroni bungkus
                                                                balado
                                                                           1
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          17
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                                                           asin pedas_0
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                                                                                                   2001
                                         makaroni bungkus
          18
              19
                              Fianicha
                                                                                  7999
                                                                                           10000
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                                         makaroni bungkus
                                                           asin pedas_1
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              20
          19
                                                                                  8928
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                                                           pedas asin_2
                                                                           1
          20
              21
                        Nabila Afidatu Z.
                                                                           1
                                                                                  7999
                                                                                           10000
                                                                                                   2001
                                         Makaroni bungkus
                                                           Pedas asin 1
          21
              22
                       Musfinda Al fisani
                                                                           1
                                                                                  7999
                                                                                            9500
                                                                                                   1501
                                         Makaroni bungkus
                                                           Asin pedas_1
          22
              23
                                                                                  7999
                                                                                            9500
                                                                                                   1501
                         Hasna Azzahra
                                         Makaroni bungkus
                                                           asin pedas_4
                                                                           1
          23
              24
                             Anie yuni
                                                           asin pedas_2
                                                                           1
                                                                                  7999
                                                                                            9500
                                                                                                   1501
                                          Makaroni bungkus
          24
              25
                                                                                  8928
                                                                                            9500
                                                                                                    572
                             Anie yuni
                                                 Mie lidi
                                                           asin pedas_2
                                                                           1
              26
                                                                           2
          25
                                AMEL
                                                                                  4950
                                                                                            6500
                                                                                                   1550
                                            KRIPIK KACA
          26
              27
                                Kaysa
                                         makaroni bungkus
                                                          asing pedas_4
                                                                           1
                                                                                  7999
                                                                                            9500
                                                                                                   1501
              28
                          Eka Febriyanti
                                                                                            9500
                                                                                                    572
          27
                                                              balado_2
                                                                           1
                                                                                  8928
                                         Makaroni bungkus
          28
              29
                                           USUS BALADO
                                                                                 13500
                                                                                           14500
                                                                                                   1000
                          Eka Febriyanti
                                                              balado_2
                                                                           1
              30
                                                                                            9500
          29
                       Fianicha Shalihah
                                          Makaroni bungkus
                                                           Asin pedas_1
                                                                           1
                                                                                  7999
                                                                                                   1501
          30
              31
                                                                                  7999
                                                                                            9500
                                                                                                   1501
                          Sekar Wahyu
                                         Makaroni bungkus
                                                           asin pedas_4
                                                                           1
              32
                      Nabela Tri Wahyuni
          31
                                                           asin pedas_3
                                                                           1
                                                                                  7999
                                                                                            9500
                                                                                                   1501
                                          Makaroni bungkus
          32
              33
                                                                                 21250
                                                                                           26500
                                                                                                   5250
                            Lisa Rosita
                                           Makaroni toples
                                                           asin pedas_3
                                                                           1
                                                                           2
                                                                                 15998
                                                                                           19000
                                                                                                   3002
          33
              34
                    Elzachra Laras Kinasih
                                                         asin pedas_0_1
                                          makaroni bungkus
                   Erma Nur Setyaningrum
                                                                                  7999
                                                                                            9500
                                                                                                   1501
          34
              35
                                         Makaroni bungkus
                                                          asing pedas_3
                                                                           1
              36
                                                                                 21250
                                                                                           26500
                                                                                                   5250
          35
                       Azizah Nur Amalia
                                           Makaroni toples
                                                              balado_5
                                                                           1
                                                              balado_5
          36
              37
                       Azizah Nur Amalia
                                                 Mie lidi
                                                                           3
                                                                                 26928
                                                                                           28500
                                                                                                   1572
              38
                                                                                            9500
                                                                                                    572
          37
                                                                           1
                                                                                  8928
                          Indah Nur lita
                                                 Mie lidi
                                                                keju_2
                  Fianicha Shalihah (stock)
                                                                                  7999
                                                                                            9500
                                                                                                   1501
          38
               39
                                         makaroni bungkus
                                                           asin pedas_1
                                                                           1
          39
              40 Fianicha Shalihah (stock)
                                                                           1
                                                                                  7999
                                                                                            9500
                                                                                                   1501
                                         makaroni bungkus
                                                           asin pedas_3
In [ ]: #Deskripsi Static data
         df.describe()
Out[]:
                           Jumlah
                                     Harga asli
                                                 Harga Jual
                                                               Untung
          count 40.000000 40.000000
                                     40.000000
                                                             40.000000
                                                 40.000000
                          1.100000 11262.075000 13700.000000 2437.925000
          mean 20.500000
                                    6225.668216
            std 11.690452
                          0.378932
                                               6829.235795 1234.618645
            min 1.000000
                          1.000000
                                    4950.000000
                                               6500.000000
                                                           572.000000
                                    7999.000000
           25% 10.750000
                          1.000000
                                               9500.000000 1501.000000
           50% 20.500000
                          1.000000
                                    8928.000000 11000.000000 2036.500000
                30.250000
                          1.000000 \quad 12000.000000 \quad 15000.000000 \quad 3001.000000
           max 40.000000
                          3.000000 38000.000000 42000.000000 5250.000000
In [ ]: df['Pesanan'].max()
Out[]: 'usus toples '
In [ ]: #Data Cleaning
         # Melihat Tipe data
         df.info()
         <class 'pandas.core.frame.DataFrame'>
         RangeIndex: 40 entries, 0 to 39
         Data columns (total 8 columns):
                            Non-Null Count Dtype
               Column
          0
               No.
                            40 non-null
                                               int64
          1
               Nama
                            40 non-null
                                               object
                            40 non-null
               Pesanan
                                               object
                            40 non-null
               Varian
          3
                                               object
                            40 non-null
          4
               Jumlah
                                               int64
          5
               Harga asli 40 non-null
                                               int64
               Harga Jual 40 non-null
                                               int64
                            40 non-null
               Untung
                                               int64
         dtypes: int64(5), object(3)
         memory usage: 2.6+ KB
In [ ]: # Mengecek data yang null
         df.isnull().sum()
Out[]: No.
         Nama
                         0
         Pesanan
         Varian
         Jumlah
         Harga asli
         Harga Jual
         Untung
         dtype: int64
In [ ]: # Melihat Jumlah Pesanan
         sns.countplot(x='Pesanan', data=df);
         plt.title('Data Pesanan');
                                Data Pesanan
            10
             8
                                   Pesanan
In [ ]: #Melihat Jumlah Data Varian
         sns.countplot(x='Varian ', data=df);
         plt.title('Data Pesanan');
                               Data Pesanan
            2
                                  Varian
In [ ]: # Melihat Tabel Pendapatan
         df.hist('Untung');
         plt.title('Pendapatan');
         plt.xlabel('Uang');
                               Pendapatan
          10
           8
           4
           2
                 1000
                          2000
                                  Uang
In [ ]: # Membuat Feature Bagaimana?
In [ ]: from matplotlib import colors
         cmap = colors.ListedColormap(["#682F2F", "#9E726F", "#D6B2B1", "#B9C0C9", "#9F8A78", "#F3AB6
         0"])
         corrmat = df.corr()
         plt.figure(figsize=(20,20))
         sns.heatmap(corrmat, annot = True, cmap = cmap, center = 0)
Out[]: <matplotlib.axes._subplots.AxesSubplot at 0x7fb42ad479d0>
                                     0.3
                                                                        -0.12
                                                                                                                - 0.6
                                                                                          -0.11
                                                                                                                - 0.4
                   -0.047
                                     0.32
                                                                                                                - 0.2
                   -0.12
                                     0.27
                                                                                                                -0.2
                                     -0.11
                                    Jumlah
                                                     Harga asli
                                                                       Harga Jual
                                                                                          Untung
In [ ]: # Data Preprocessing
         # Import LabelEncoder dari module sklearn
         from sklearn.preprocessing import LabelEncoder
         # Label Encoding (dtypes: objek)
         LE=LabelEncoder()
         for i in df:
              df[i]=df[[i]].apply(LE.fit_transform)
         print("Semua fitur sekarang numerik")
         Semua fitur sekarang numerik
In [ ]: from sklearn.preprocessing import StandardScaler
         ds = df.drop(['No.', 'Harga asli', 'Harga Jual'], axis = 1)
         #Scaling
         scaler = StandardScaler()
         scaler.fit(ds)
         scaled_ds = pd.DataFrame(scaler.transform(ds),columns= ds.columns)
         print("Semua fitur sekarang sudah diskalakan")
         Semua fitur sekarang sudah diskalakan
In [ ]: print("Dataframe to be used for further modelling:")
         scaled_ds.head()
         Dataframe to be used for further modelling:
Out[]:
                                                Untung
               Nama Pesanan
                                Varian
                                        Jumlah
          0 -0.221046 1.304178 1.447942 -0.267261 0.298162
          1 -1.179799 1.304178 1.594942 -0.267261 0.298162
          2 -0.647158 1.505595 1.447942 -0.267261 0.298162
          3 0.950764 1.304178 1.447942 -0.267261 0.298162
             0.311595 1.304178 1.447942 -0.267261 0.298162
In [ ]: #Dimensional Reduction
         from sklearn.decomposition import PCA
         pca = PCA(n_components=3)
         pca.fit(scaled_ds)
         PCA_ds = pd.DataFrame(pca.transform(scaled_ds), columns=(["col1", "col2", "col3"]))
         PCA_ds.describe().T
Out[]:
                                               min
                                      std
                                                       25%
                                                                50%
                                                                         75%
               count
                            mean
                                                                                 max
                40.0 -9.020562e-17 1.391910 -2.715169 -1.190066
                                                            0.198496 1.091998 3.211695
          col1
                40.0 -5.898060e-17 1.080191 -1.648709 -0.436719 -0.093357 0.476740 4.132598
          col2
                40.0 3.053113e-17 0.988332 -1.727121 -0.580513 -0.334829 0.734363 2.070504
          col3
In [ ]: # Proyeksi 3D Data Dalam Dimensi yang Dikurangi/Reduced Dimension
         x =PCA_ds["col1"]
         y =PCA_ds["col2"]
         z =PCA_ds["col3"]
         # plotting
         fig = plt.figure(figsize=(10,8))
         ax = fig.add_subplot(111, projection="3d")
         ax.scatter(x,y,z, c="maroon", marker="o" )
         ax.set_title("Proyeksi 3D Data Dalam Dimensi yang Dikurangi/Reduced Dimension")
         plt.show()
                    Proyeksi 3D Data Dalam Dimensi yang Dikurangi/Reduced Dimension
                                                                               2.0
                                                                               1.5
                                                                               0.0
                                                                               -0.5
                                                                              -1.0
                                                                              -1.5
                        -2
                             -1
In [ ]: #Model Clustering
         from sklearn.cluster import KMeans
         from yellowbrick.cluster import KElbowVisualizer
          print('Metode Elbow untuk menentukan jumlah cluster yang akan dibentuk:')
         Elbow_M = KElbowVisualizer(KMeans(), k=10)
         Elbow_M.fit(PCA_ds)
         Elbow_M.show()
         Metode Elbow untuk menentukan jumlah cluster yang akan dibentuk:
                             Distortion Score Elbow for KMeans Clustering
                                              --- elbow at k = 4, score = 46.133
            100
                                                                             0.30
             80
                                                                             0.25
          distortion score
                                                                             0.20 ह
             60
                                                                             0.15 🛱
             40
                                                                             0.05
             20
Out[ ]: <matplotlib.axes._subplots.AxesSubplot at 0x7fb4197077d0>
In [ ]: from sklearn.cluster import AgglomerativeClustering
         # Memulai model Agglomerative Clustering
         AC = AgglomerativeClustering(n_clusters=4)
         # fit model and predict clusters
         yhat_AC = AC.fit_predict(PCA_ds)
         PCA_ds["Clusters"] = yhat_AC
         # Menambahkan fitur Cluster ke dataframe asli.
         df["Clusters"] = yhat_AC
In [ ]: #Plotting clusters
         fig = plt.figure(figsize=(10,8))
         ax = plt.subplot(111, projection='3d', label="bla")
         ax.scatter(x, y, z, s=40, c=PCA_ds["Clusters"], marker='o', cmap = cmap )
         ax.set_title("Plot Clusters")
         plt.show()
                                            Plot Clusters
                                                                                2.0
                                                                                15
                                                                                1.0
                                                                                0.5
                                                                               0.0
                                                                               -0.5
                                                                               -1.0
                                                                               -1.5
In [ ]: #Evaluasi Model
         pal = ["#682F2F","#B9C0C9", "#9F8A78","#F3AB60"]
         pl = sns.countplot(x=df["Clusters"], palette= pal)
         pl.set_title("Distribusi dari Clusters")
         plt.show()
                                      Distribusi dari Clusters
            17.5
            15.0
            12.5
            10.0
             7.5
             5.0
             25
             0.0
                       0
                                                     2
                                                                    3
                                      1
In [ ]: #Kluster Berdasarkan Pesanan tertinggi
         pl = sns.scatterplot(data = df, x=df["Pesanan"], y=df["Untung"], hue=df["Clusters"], palette=
         pl.set_title("Profil Cluster Berdasarkan Pesanan Dan Untung")
         plt.legend()
         plt.show()
                           Profil Cluster Berdasarkan Pesanan Dan Untung
            14
            12
            10
```

0.0

plt.legend()
plt.show()

14

12

10

Untung

In []: # Kesimpulan

25

In []: #Kluster Berdasarkan Varian tertinggi

0

5.0

7.5

Pesanan

pl.set_title("Profil Cluster Berdasarkan Varian Dan Untung")

Varian

10.0

12.5

pl = sns.scatterplot(data = df,x=df["Varian "], y=df["Untung"],hue=df["Clusters"], palette=

15.0

17.5

• 2

20