LAPORAN HASIL TUGAS KECIL 2 IF2211 STRATEGI ALGORITMA
SEMESTER II TAHUN 2021/2022

Implementasi Convex Hull untuk Visualisasi Tes Linear Separability Dataset dengan Algoritma Divide and Conquer

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DAFTAR ISI

BAB I
ALGORITMA DIVIDE AND CONQUER SECARA GARIS BESAR

1.1 Pengertian Algoritma *Divide and Conquer*

Algoritma *divide and conquer* merupakan algoritma yang membagi persoalan menjadi beberapa upa-persoalan lebih kecil yang memiliki kemiripan dengan persoalan semula. Cara kerja algoritma ini adalah dengan menyelesaikan upa-persoalan lalu menggabungkan solusi dari upa-persoalan tersebut.

Contoh persoalan yang dapat diselesaikan dengan memanfaatkan algoritma *divide and conquer*

1. Persoalan MinMaks
2. Menghitung perpangkatan
3. *Sorting (Mergesort & Quicksort)*
4. Mencari pasangan titik terdekat
5. *Convex Hull*
6. Perkalian matriks
7. Perkalian bilangan bulat besar
8. Perkalian dua buah polinom

1.2 *Convex Hull* dan Kaitannya dengan Algoritma *Divide and Conquer*

Convex Hull merupakan sebuah pembungkusan dari kumpulan titik. Syarat suatu bidang dikatakan *convex* adalah jika untuk sembarang pasang titik pada bidang tersebut, seluruh segmen garis tetap berada pada himpunan tersebut

Dalam kaitannya dengan algoritma *divide and conquer*, *convex hull* diselesaikan dengan menggunakan ide dasar dari algoritma *quicksort*. Langkah-langkahnya adalah dengan mengurutkannya dengan prioritas berupa nilai absis yang menaik lalu nilai ordinat yang menaik. Setelah itu, tentukan 2 buah titik ekstrim yang akan menjadi acuan algoritma ini. Setelah itu, tarik garis untuk menghubungkan kedua buah titik ekstrim tersebut sedemikian sehingga terbentuk 2

buah area pada himpunan yang dimana pembentukan 2 buah area inilah yang disebut dengan *divide* dalam algoritma *divide and conquer*. Tidak hanya itu, semua titik yang berada pada garis ekstrim juga tidak perlu diperiksa karena sudah pasti tidak akan membentuk *convex hull*. Lakukan proses ini berulang untuk area yang terkena *division*. Setelah semua area telah diselesaikan, kembalikan pasangan titik yang dihasilkan.

1.3 Deskripsi Masalah *Convex Hull* pada Tugas Kecil 2 IF2211 Strategi Algoritma

Pada Tugas Kecil 2 IF2211 Strategi Algoritma, masalah yang diberikan adalah mengimplementasikan *convex hull* untuk visualisasi tes *linear separability dataset* dengan algoritma *divide and conquer* dengan spesifikasi sebagai berikut. Membuat sebuah pustaka myConvexHull dalam bahasa Python yang dapat mengembalikan *convex hull* dari kumpulan data 2 dimensi. Selanjutnya, gunakan pustaka tersebut ke dalam program visualisasi data dan *convex hull* berikut ini. Misalnya program menerima dataset berlabel, misalnya iris yang memiliki 150 baris dan 5 kolom. Program akan mengembalikan convexhull dari setiap label lalu menampilkannya dengan warna yang berbeda. Hasil dari convex hull data iris dapat dilihat pada gambar di bawah ini.

BAB II
KODE PROGRAM DALAM BAHASA PYTHON

2.1 myconvexhull.py

Berisi class MyConvexHull yang merupakan implementasi dari pustaka *convex hull*.

```python
from typing import List, Sequence, Tuple

class MyConvexHull:

    # Menerima seluruh data berupa posisi dari titik-titik
    def __init__(self, points):
        # Mengubah bentuk data ke generator of tuple
        # sehingga dapat diolah
        param = ((i[0], i[1]) for i in points)
        res = self.make_hull(sorted(param))
        self.x_coords = [i[0] for i in res]
        self.x_coords.append(res[0][0])
        self.y_coords = [i[1] for i in res]
        self.y_coords.append(res[0][1])

    # Membuat Convex Hull
    def make_hull(self, points):
        # Menangani edgecase
        if len(points) <= 1:
            return list(points)

        # Membuat array untuk menampung hasil dari
        # pembagian area akibat algoritma divide and conquer
        area_one = []
        area_two = []

        # Melakukan conquer sesuai dengan
        # pengertian dari convex hull
        for area in (area_one, area_two):
            if (area != area_one):
                points = reversed(points)

            for p in points:
                while len(area) >= 2:
                    check1 = (area[-1][0] - area[-2][0]) * (p[1] - area[-2][1])
                    check2 = (area[-1][1] - area[-2][1]) * (p[0] - area[-2][0])
```

```
                    if (check1 >= check2):
                        area.pop()
                    else:
                        break
                area.append(p)

            area.pop()

        if (len(area_one) == 1):
            if (area_one == area_two):
                area_two = []

        # Menggabungkan hasil dari kedua buah area
        area_one += area_two

        # Mengembalikan hasil
        return area_one
```

2.2 main.py

Merupakan program utama yang akan memanggil pustaka MyConvexHull lalu menerima input berupa dataset dan mengembalikan c*onvex hull* dari dataset tersebut.

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn import datasets

from myconvexhull import MyConvexHull

# Untuk checking hasil
# from scipy.spatial import ConvexHull

if __name__ == "__main__":
    print("List dataset yang tersedia:")
    print("A. Iris                              C. Breast Cancer")
    print("    1. Sepal Length                      1. Mean Radius                   20. Fractal Dimension Error")
    print("    2. Sepal Width                       2. Mean Teture                   21. Worst Radius")
    print("    3. Petal Length                      3. Mean Perimeter                22. Worst Texture")
    print("    4. Petal Width                       4. Mean Area                     23. Worst Perimeter")
    print("                                         5. Mean Smoothness               24. Worst Area")
    print("B. Wine                                  6. Mean Compactness              25. Worst Smoothness")
    print("    1. Alcohol                           7. Mean Concavity                26. Worst Compactness")
    print("    2. Malic Acid                        8. Mean Concave Points           27. Worst Concavity")
    print("    3. Ash                               9. Mean Symmetry                 28. Worst Concave Points")
    print("    4. Alcalinity of Ash                10. Mean Fractal Dimension        29. Worst Symmetry")
    print("    5. Magnesium                        11. Radius Error                  30. Worst Fractal Dimension")
    print("    6. Total Phenols                    12. Texture Error                 ")
    print("    7. Flavanoids                       13. Perimeter Error               ")
    print("    8. Non Flavanoid Phenols            14. Area Error                    ")
    print("    9. Proanthocyanis                   15. Smoothness Error              ")
    print("   10. Color Intensity                  16. Compactness Error             ")
    print("   11. Hue                              17. Concavity Error               ")
    print("   12. OD280/OD315 of Diluted Wines     18. Concave Points Error          ")
    print("   13. Proline                          19. Symmetry Error                ")
    print()

```

```
    print("Contoh Input: C 4 25")
    option = str(input("Input dataset yang diinginkan: ")).split()

    if (option[0]=='A'):
        if (int(option[1]) > 4 or int(option[2]) > 4):
            print("Dataset tidak tersedia")
            exit()
        if (int(option[1]) < 1 or int(option[2]) < 1):
            print("Dataset tidak tersedia")
            exit()
        if (option[1] == option[2]):
            print("Pilihan kolom harus berbeda")
            exit()

        col_a = int(option[1]) - 1
        col_b = int(option[2]) - 1
        data = datasets.load_iris()

    elif (option[0]=='B'):
        if (int(option[1]) > 13 or int(option[2]) > 13):
            print("Dataset tidak tersedia")
            exit()
        if (int(option[1]) < 1 or int(option[2]) < 1):
            print("Dataset tidak tersedia")
            exit()
        if (option[1] == option[2]):
            print("Pilihan kolom harus berbeda")
            exit()

        col_a = int(option[1]) - 1
        col_b = int(option[2]) - 1

        data = datasets.load_wine()

    elif (option[0]=='C'):
        if (int(option[1]) > 30 or int(option[2]) > 30):
            print("Dataset tidak tersedia")
            exit()
        if (int(option[1]) < 1 or int(option[2]) < 1):
            print("Dataset tidak tersedia")
            exit()
        if (option[1] == option[2]):
            print("Pilihan kolom harus berbeda")
            exit()

        col_a = int(option[1]) - 1
        col_b = int(option[2]) - 1

        data = datasets.load_breast_cancer()


    else:
        print("Dataset tidak tersedia")
        exit()

    pd.set_option('display.max_columns', 500)
    #create a DataFrame
    df = pd.DataFrame(data.data, columns=data.feature_names)
    df['Target'] = pd.DataFrame(data.target)
    # print(df)
    df.head()
    plt.figure(figsize = (10, 6))
    colors = ['b','r','g', 'c', 'm', 'y', 'k', 'w', 'aquamarine', 'mediumseagreen']
    plt.title(data.feature_names[col_a] + " vs " + data.feature_names[col_b])
    plt.xlabel(data.feature_names[col_a])
    plt.ylabel(data.feature_names[col_b])
```

```
    for i in range(len(data.target_names)):
        bucket = df[df['Target'] == i]
        bucket = bucket.iloc[:,[col_a,col_b]].values
        # hull = ConvexHull(bucket)
        # print(bucket)
        hull = MyConvexHull(bucket)
        plt.plot(hull.x_coords, hull.y_coords, colors[i])
        plt.scatter(bucket[:, 0], bucket[:, 1], label=data.target_names[i])
        # plt.plot(hull[0], hull[1], colors[i])
        # print(hull.simplices)
        # for simplex in hull.simplices:
        #   print(simplex)
        #   plt.plot(bucket[simplex, 0], bucket[simplex, 1], colors[i])
    plt.legend()
    plt.show()
```

BAB III

INPUT/OUTPUT PROGRAM

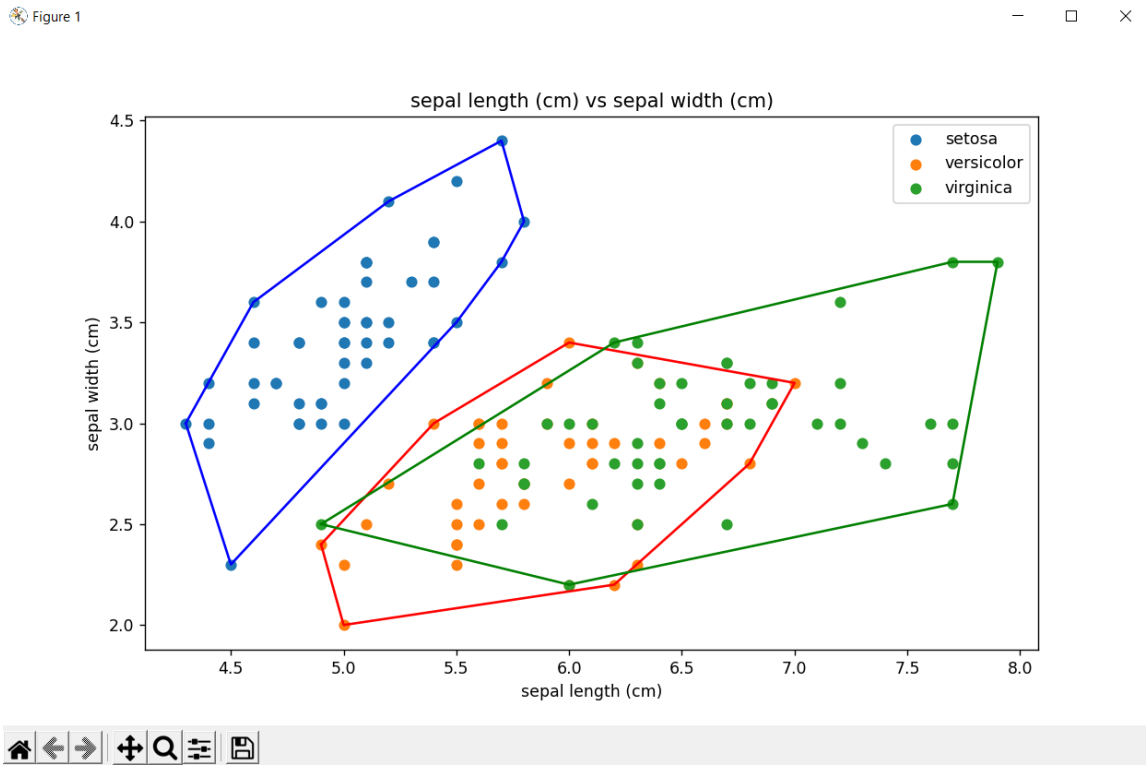
Test Case 1 (Dataset Iris – Sepal Length vs Sepal Width)

Input

```
(venv) PS C:\Users\Asus\desktop\github\Tucil-2-Stima-13520131\src> py main.py
List dataset yang tersedia:
A. Iris                              C. Breast Cancer
    1. Sepal Length                      1. Mean Radius                   20. Fractal Dimension Error
    2. Sepal Width                       2. Mean Teture                   21. Worst Radius
    3. Petal Length                      3. Mean Perimeter                22. Worst Texture
    4. Petal Width                       4. Mean Area                     23. Worst Perimeter
                                         5. Mean Smoothness               24. Worst Area
B. Wine                                  6. Mean Compactness              25. Worst Smoothness
    1. Alcohol                           7. Mean Concavity                26. Worst Compactness
    2. Malic Acid                        8. Mean Concave Points           27. Worst Concavity
    3. Ash                               9. Mean Symmetry                 28. Worst Concave Points
    4. Alcalinity of Ash                10. Mean Fractal Dimension        29. Worst Symmetry
    5. Magnesium                        11. Radius Error                  30. Worst Fractal Dimension
    6. Total Phenols                    12. Texture Error
    7. Flavanoids                       13. Perimeter Error
    8. Non Flavanoid Phenols            14. Area Error
    9. Proanthocyanis                   15. Smoothness Error
   10. Color Intensity                  16. Compactness Error
   11. Hue                              17. Concavity Error
   12. OD280/OD315 of Diluted Wines     18. Concave Points Error
   13. Proline                          19. Symmetry Error

Contoh Input: C 4 25
Input dataset yang diinginkan: A 1 2
```

Output



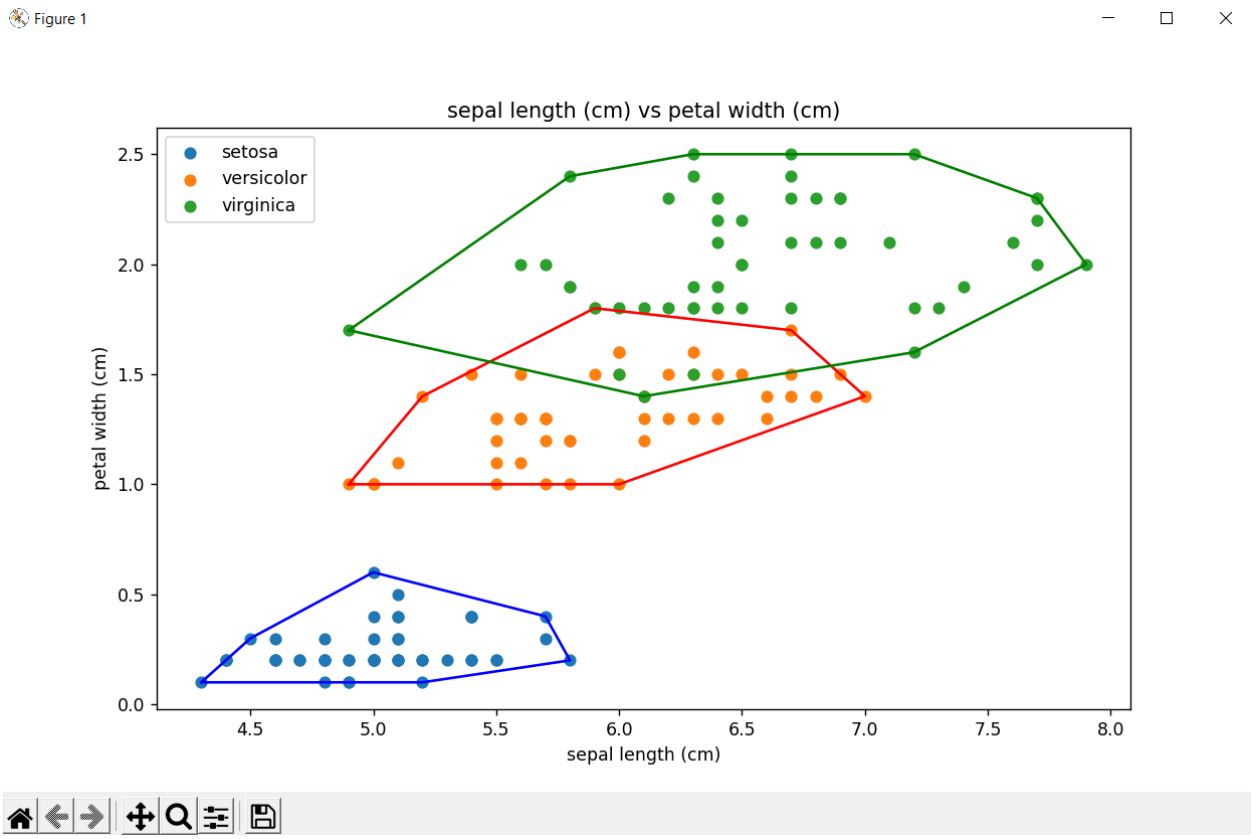
Test Case 2 (Dataset Iris – Sepal Length vs Petal Width)

Input

```
(venv) PS C:\Users\Asus\desktop\github\Tucil-2-Stima-13520131\src> py main.py
List dataset yang tersedia:
A. Iris                              C. Breast Cancer
    1. Sepal Length                      1. Mean Radius                   20. Fractal Dimension Error
    2. Sepal Width                       2. Mean Teture                   21. Worst Radius
    3. Petal Length                      3. Mean Perimeter                22. Worst Texture
    4. Petal Width                       4. Mean Area                     23. Worst Perimeter
                                         5. Mean Smoothness               24. Worst Area
B. Wine                                  6. Mean Compactness              25. Worst Smoothness
    1. Alcohol                           7. Mean Concavity                26. Worst Compactness
    2. Malic Acid                        8. Mean Concave Points           27. Worst Concavity
    3. Ash                               9. Mean Symmetry                 28. Worst Concave Points
    4. Alcalinity of Ash                10. Mean Fractal Dimension        29. Worst Symmetry
    5. Magnesium                        11. Radius Error                  30. Worst Fractal Dimension
    6. Total Phenols                    12. Texture Error
    7. Flavanoids                       13. Perimeter Error
    8. Non Flavanoid Phenols            14. Area Error
    9. Proanthocyanis                   15. Smoothness Error
   10. Color Intensity                  16. Compactness Error
   11. Hue                              17. Concavity Error
   12. OD280/OD315 of Diluted Wines     18. Concave Points Error
   13. Proline                          19. Symmetry Error

Contoh Input: C 4 25
Input dataset yang diinginkan: A 1 4
```

Output



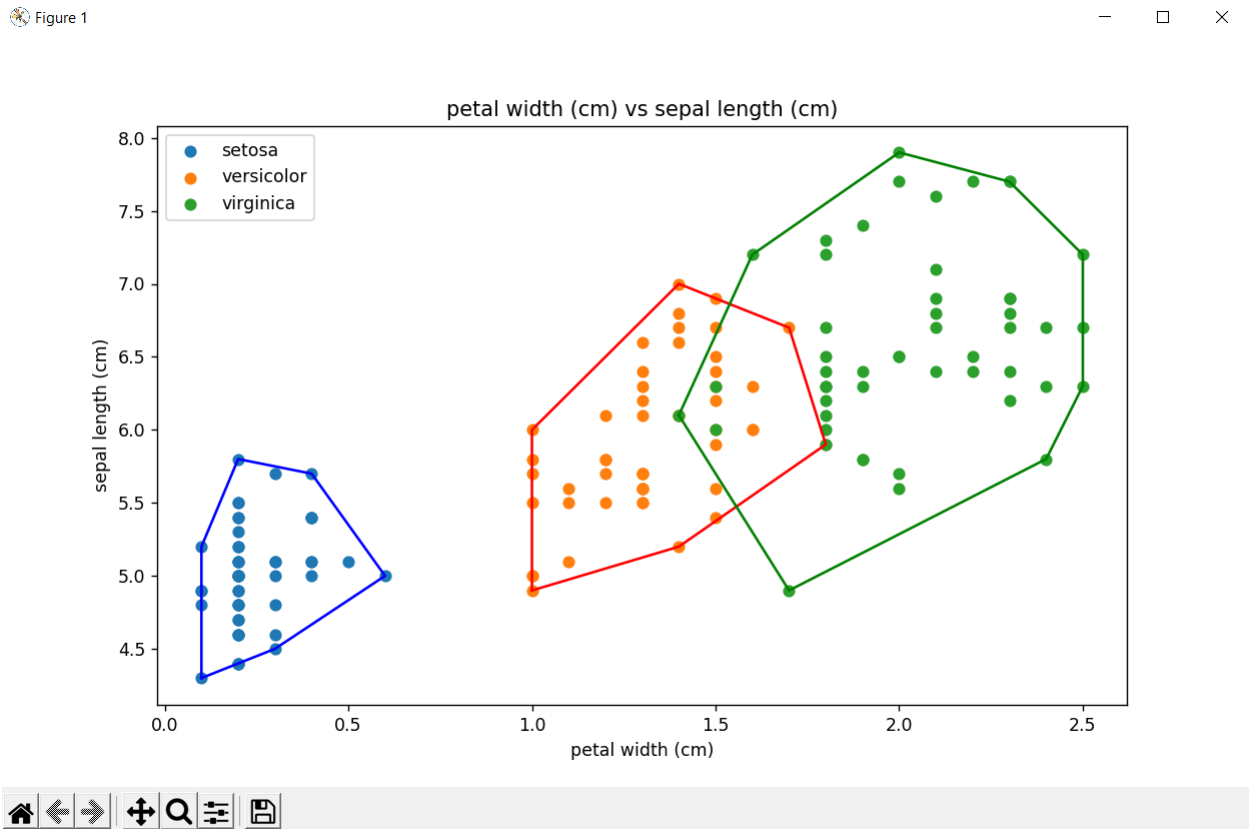
Test Case 3 (Dataset Iris – Petal Width vs Sepal Length)

Input

```
(venv) PS C:\Users\Asus\desktop\github\Tucil-2-Stima-13520131\src> py main.py
List dataset yang tersedia:
A. Iris                                C. Breast Cancer
    1. Sepal Length                        1. Mean Radius                      20. Fractal Dimension Error
    2. Sepal Width                         2. Mean Teture                      21. Worst Radius
    3. Petal Length                        3. Mean Perimeter                   22. Worst Texture
    4. Petal Width                         4. Mean Area                        23. Worst Perimeter
                                           5. Mean Smoothness                  24. Worst Area
B. Wine                                    6. Mean Compactness                 25. Worst Smoothness
    1. Alcohol                             7. Mean Concavity                   26. Worst Compactness
    2. Malic Acid                          8. Mean Concave Points              27. Worst Concavity
    3. Ash                                 9. Mean Symmetry                    28. Worst Concave Points
    4. Alcalinity of Ash                  10. Mean Fractal Dimension           29. Worst Symmetry
    5. Magnesium                          11. Radius Error                     30. Worst Fractal Dimension
    6. Total Phenols                      12. Texture Error
    7. Flavanoids                         13. Perimeter Error
    8. Non Flavanoid Phenols              14. Area Error
    9. Proanthocyanis                     15. Smoothness Error
   10. Color Intensity                    16. Compactness Error
   11. Hue                                17. Concavity Error
   12. OD280/OD315 of Diluted Wines       18. Concave Points Error
   13. Proline                            19. Symmetry Error

Contoh Input: C 4 25
Input dataset yang diinginkan: A 4 1
```

Output



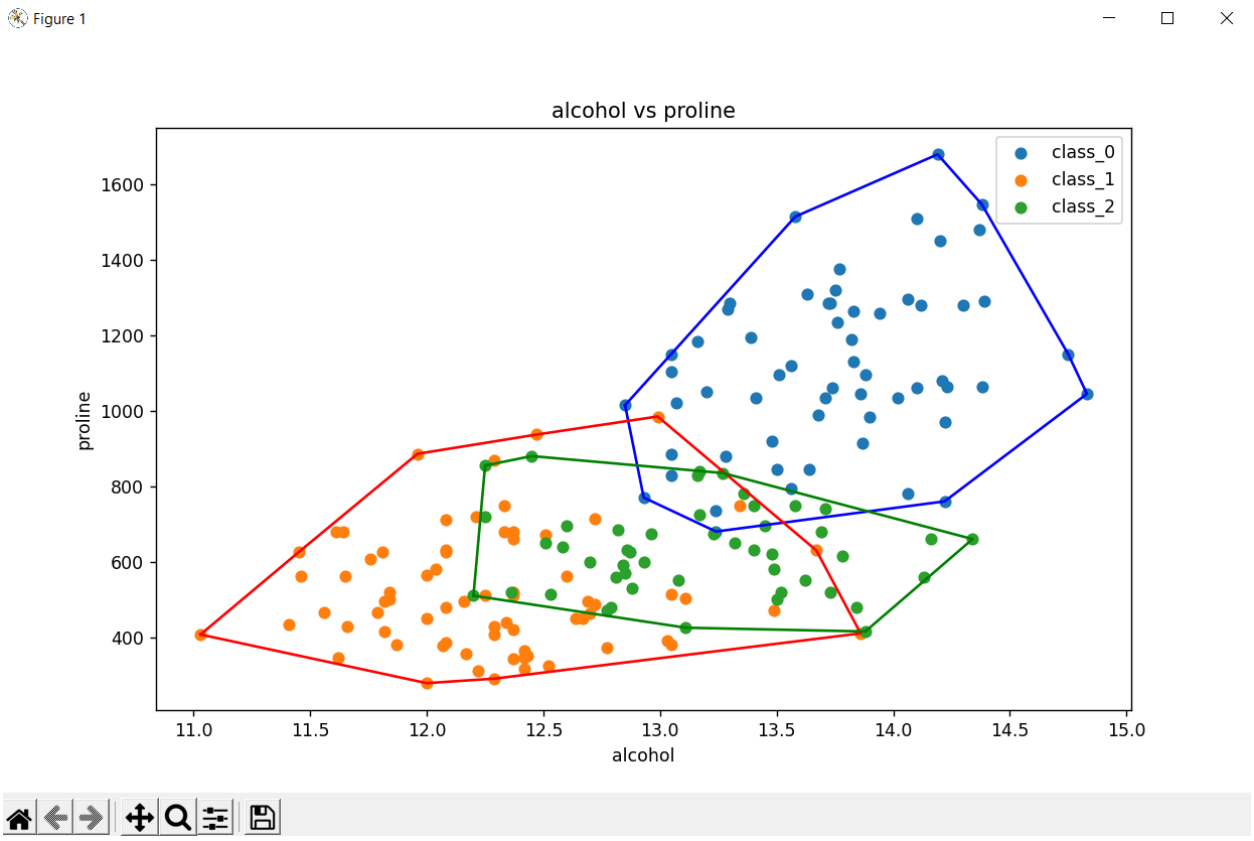
Test Case 4 (Dataset Wine – Alcohol vs Proline)

Input

```
(venv) PS C:\Users\Asus\desktop\github\Tucil-2-Stima-13520131\src> py main.py
List dataset yang tersedia:
A. Iris                              C. Breast Cancer
    1. Sepal Length                      1. Mean Radius                   20. Fractal Dimension Error
    2. Sepal Width                       2. Mean Teture                   21. Worst Radius
    3. Petal Length                      3. Mean Perimeter                22. Worst Texture
    4. Petal Width                       4. Mean Area                     23. Worst Perimeter
                                         5. Mean Smoothness               24. Worst Area
B. Wine                                  6. Mean Compactness              25. Worst Smoothness
    1. Alcohol                           7. Mean Concavity                26. Worst Compactness
    2. Malic Acid                        8. Mean Concave Points           27. Worst Concavity
    3. Ash                               9. Mean Symmetry                 28. Worst Concave Points
    4. Alcalinity of Ash                10. Mean Fractal Dimension        29. Worst Symmetry
    5. Magnesium                        11. Radius Error                  30. Worst Fractal Dimension
    6. Total Phenols                    12. Texture Error
    7. Flavanoids                       13. Perimeter Error
    8. Non Flavanoid Phenols            14. Area Error
    9. Proanthocyanis                   15. Smoothness Error
   10. Color Intensity                  16. Compactness Error
   11. Hue                              17. Concavity Error
   12. OD280/OD315 of Diluted Wines     18. Concave Points Error
   13. Proline                          19. Symmetry Error

Contoh Input: C 4 25
Input dataset yang diinginkan: B 1 13
```

Output



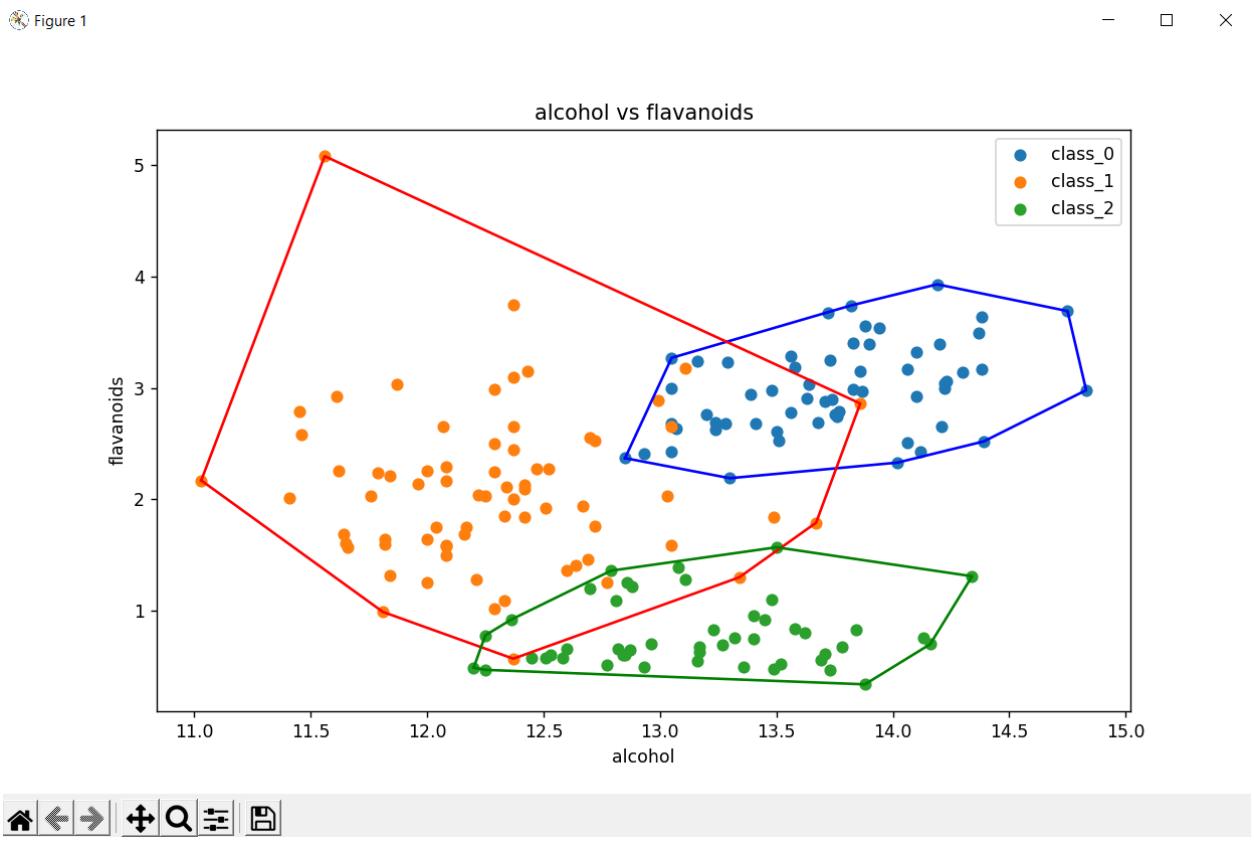
Test Case 5 (Dataset Wine – Alcohol vs Flavanoids)

Input

```
(venv) PS C:\Users\Asus\desktop\github\Tucil-2-Stima-13520131\src> py main.py
List dataset yang tersedia:
A. Iris                                C. Breast Cancer
    1. Sepal Length                        1. Mean Radius                    20. Fractal Dimension Error
    2. Sepal Width                         2. Mean Teture                    21. Worst Radius
    3. Petal Length                        3. Mean Perimeter                 22. Worst Texture
    4. Petal Width                         4. Mean Area                      23. Worst Perimeter
                                           5. Mean Smoothness                24. Worst Area
B. Wine                                    6. Mean Compactness               25. Worst Smoothness
    1. Alcohol                             7. Mean Concavity                 26. Worst Compactness
    2. Malic Acid                          8. Mean Concave Points            27. Worst Concavity
    3. Ash                                 9. Mean Symmetry                  28. Worst Concave Points
    4. Alcalinity of Ash                  10. Mean Fractal Dimension         29. Worst Symmetry
    5. Magnesium                          11. Radius Error                   30. Worst Fractal Dimension
    6. Total Phenols                      12. Texture Error
    7. Flavanoids                         13. Perimeter Error
    8. Non Flavanoid Phenols              14. Area Error
    9. Proanthocyanis                     15. Smoothness Error
   10. Color Intensity                    16. Compactness Error
   11. Hue                                17. Concavity Error
   12. OD280/OD315 of Diluted Wines       18. Concave Points Error
   13. Proline                            19. Symmetry Error

Contoh Input: C 4 25
Input dataset yang diinginkan: B 1 7
```

Output



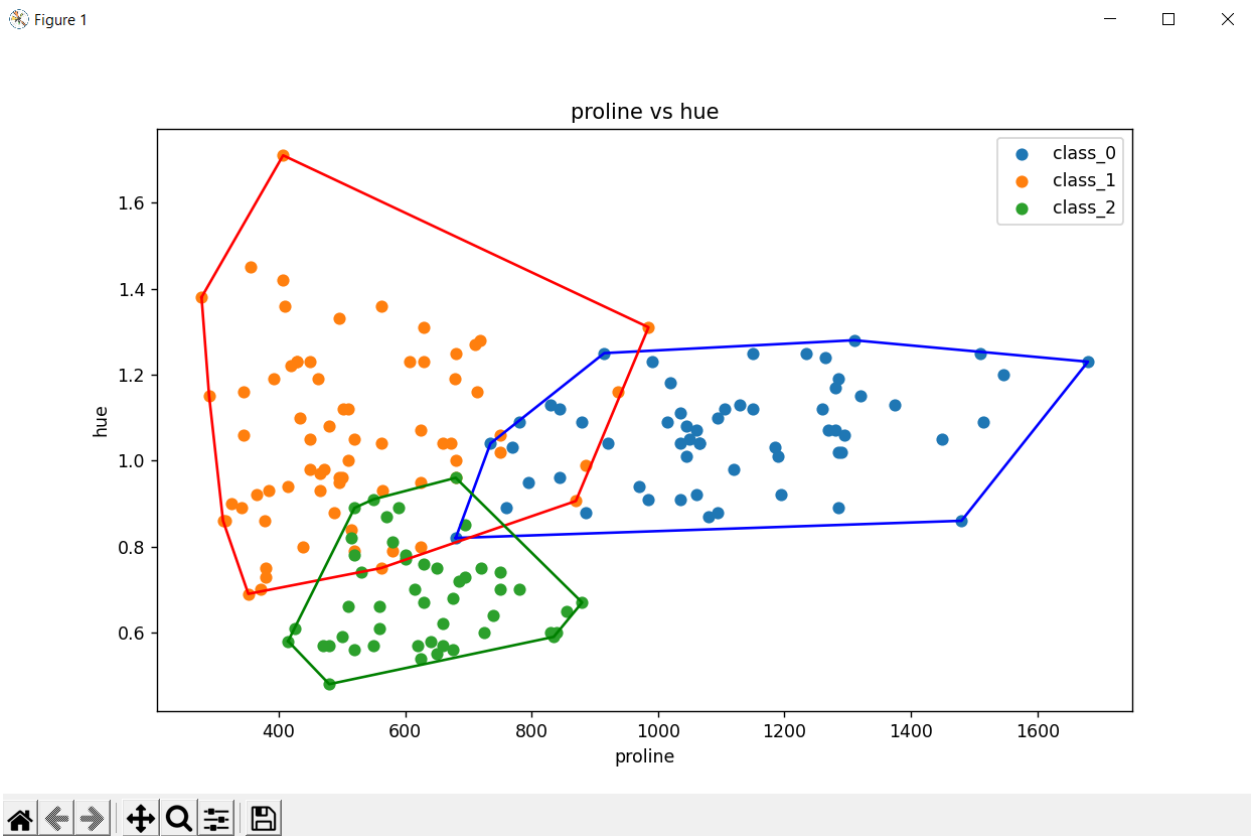
Test Case 6 (Dataset Wine – Proline vs Hue)

Input

```
(venv) PS C:\Users\Asus\desktop\github\Tucil-2-Stima-13520131\src> py main.py
List dataset yang tersedia:
A. Iris                                C. Breast Cancer
    1. Sepal Length                        1. Mean Radius                    20. Fractal Dimension Error
    2. Sepal Width                         2. Mean Teture                    21. Worst Radius
    3. Petal Length                        3. Mean Perimeter                 22. Worst Texture
    4. Petal Width                         4. Mean Area                      23. Worst Perimeter
                                           5. Mean Smoothness                24. Worst Area
B. Wine                                    6. Mean Compactness               25. Worst Smoothness
    1. Alcohol                             7. Mean Concavity                 26. Worst Compactness
    2. Malic Acid                          8. Mean Concave Points            27. Worst Concavity
    3. Ash                                 9. Mean Symmetry                  28. Worst Concave Points
    4. Alcalinity of Ash                  10. Mean Fractal Dimension         29. Worst Symmetry
    5. Magnesium                          11. Radius Error                   30. Worst Fractal Dimension
    6. Total Phenols                      12. Texture Error
    7. Flavanoids                         13. Perimeter Error
    8. Non Flavanoid Phenols              14. Area Error
    9. Proanthocyanis                     15. Smoothness Error
   10. Color Intensity                    16. Compactness Error
   11. Hue                                17. Concavity Error
   12. OD280/OD315 of Diluted Wines       18. Concave Points Error
   13. Proline                            19. Symmetry Error

Contoh Input: C 4 25
Input dataset yang diinginkan: B 13 11
```

Output



Test Case 7 (Dataset Breast Cancer – Mean Radius vs Mean Texture)

Input

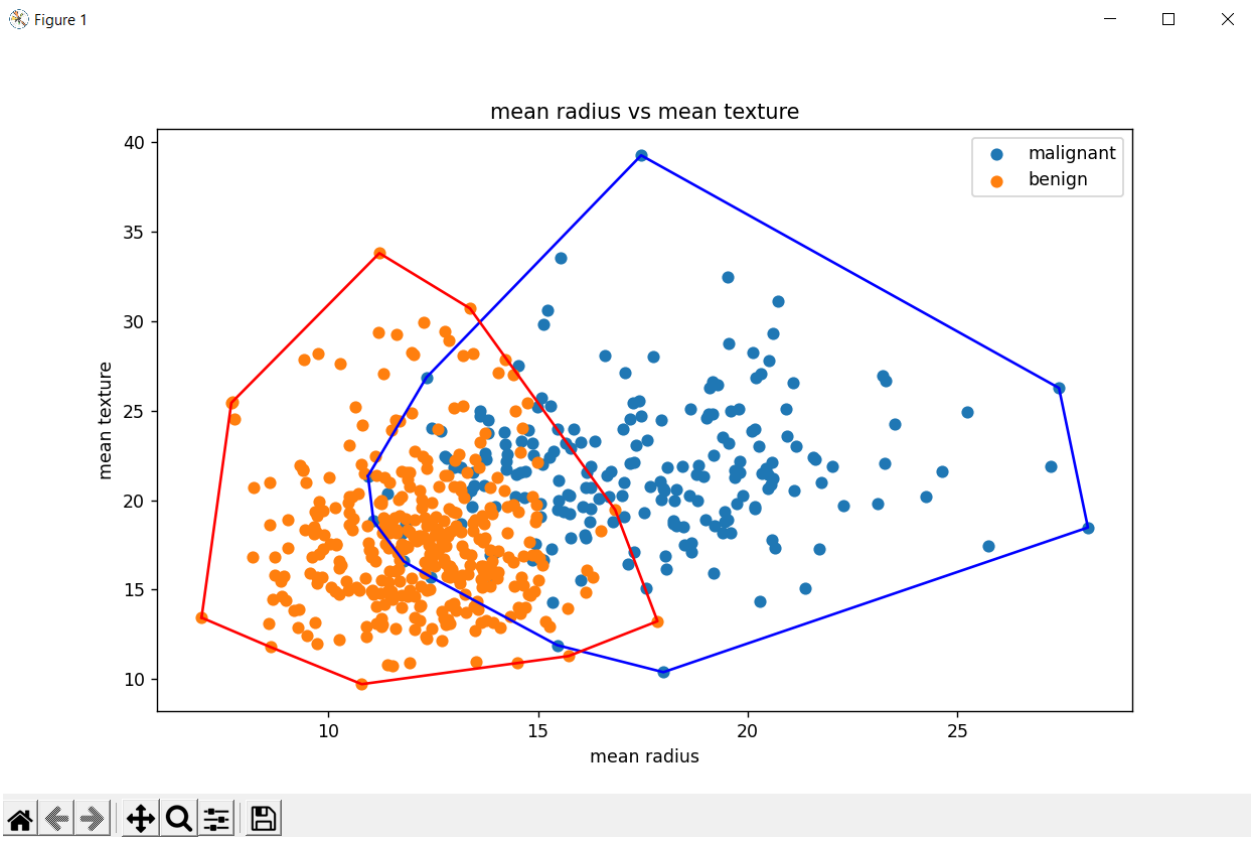
```
(venv) PS C:\Users\Asus\desktop\github\Tucil-2-Stima-13520131\src> py main.py
List dataset yang tersedia:
A. Iris
    1. Sepal Length
    2. Sepal Width
    3. Petal Length
    4. Petal Width

B. Wine
    1. Alcohol
    2. Malic Acid
    3. Ash
    4. Alcalinity of Ash
    5. Magnesium
    6. Total Phenols
    7. Flavanoids
    8. Non Flavanoid Phenols
    9. Proanthocyanis
   10. Color Intensity
   11. Hue
   12. OD280/OD315 of Diluted Wines
   13. Proline

C. Breast Cancer
    1. Mean Radius
    2. Mean Texture
    3. Mean Perimeter
    4. Mean Area
    5. Mean Smoothness
    6. Mean Compactness
    7. Mean Concavity
    8. Mean Concave Points
    9. Mean Symmetry
   10. Mean Fractal Dimension
   11. Radius Error
   12. Texture Error
   13. Perimeter Error
   14. Area Error
   15. Smoothness Error
   16. Compactness Error
   17. Concavity Error
   18. Concave Points Error
   19. Symmetry Error
   20. Fractal Dimension Error
   21. Worst Radius
   22. Worst Texture
   23. Worst Perimeter
   24. Worst Area
   25. Worst Smoothness
   26. Worst Compactness
   27. Worst Concavity
   28. Worst Concave Points
   29. Worst Symmetry
   30. Worst Fractal Dimension

Contoh Input: C 4 25
Input dataset yang diinginkan: C 1 2
```

Output



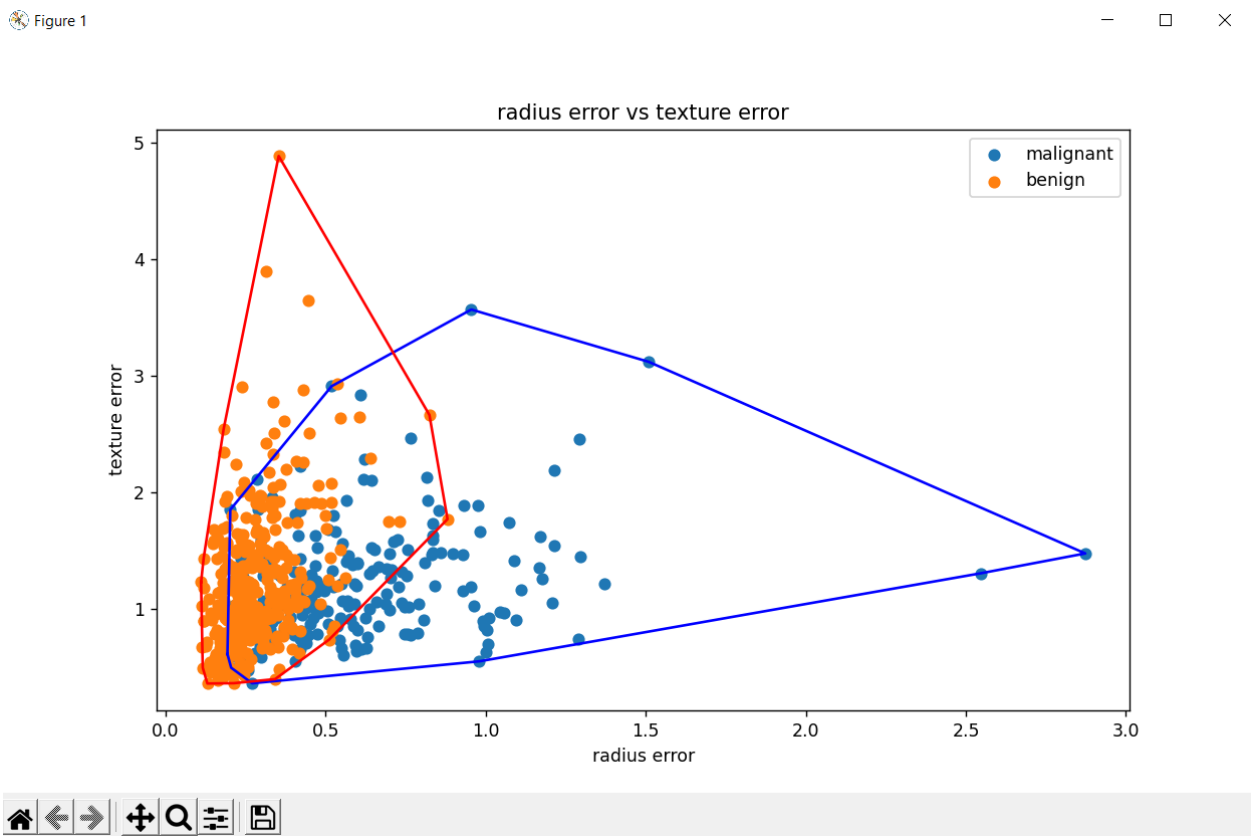
Test Case 8 (Dataset Breast Cancer – Radius Error vs Texture Error)

Input

```
(venv) PS C:\Users\Asus\desktop\github\Tucil-2-Stima-13520131\src> py main.py
List dataset yang tersedia:
A. Iris                              C. Breast Cancer
    1. Sepal Length                      1. Mean Radius                   20. Fractal Dimension Error
    2. Sepal Width                       2. Mean Texture                  21. Worst Radius
    3. Petal Length                      3. Mean Perimeter                22. Worst Texture
    4. Petal Width                       4. Mean Area                     23. Worst Perimeter
                                         5. Mean Smoothness               24. Worst Area
B. Wine                                  6. Mean Compactness              25. Worst Smoothness
    1. Alcohol                           7. Mean Concavity                26. Worst Compactness
    2. Malic Acid                        8. Mean Concave Points           27. Worst Concavity
    3. Ash                               9. Mean Symmetry                 28. Worst Concave Points
    4. Alcalinity of Ash                10. Mean Fractal Dimension        29. Worst Symmetry
    5. Magnesium                        11. Radius Error                  30. Worst Fractal Dimension
    6. Total Phenols                    12. Texture Error
    7. Flavanoids                       13. Perimeter Error
    8. Non Flavanoid Phenols            14. Area Error
    9. Proanthocyanis                   15. Smoothness Error
   10. Color Intensity                  16. Compactness Error
   11. Hue                              17. Concavity Error
   12. OD280/OD315 of Diluted Wines     18. Concave Points Error
   13. Proline                          19. Symmetry Error

Contoh Input: C 4 25
Input dataset yang diinginkan: C 11 12
```

Output



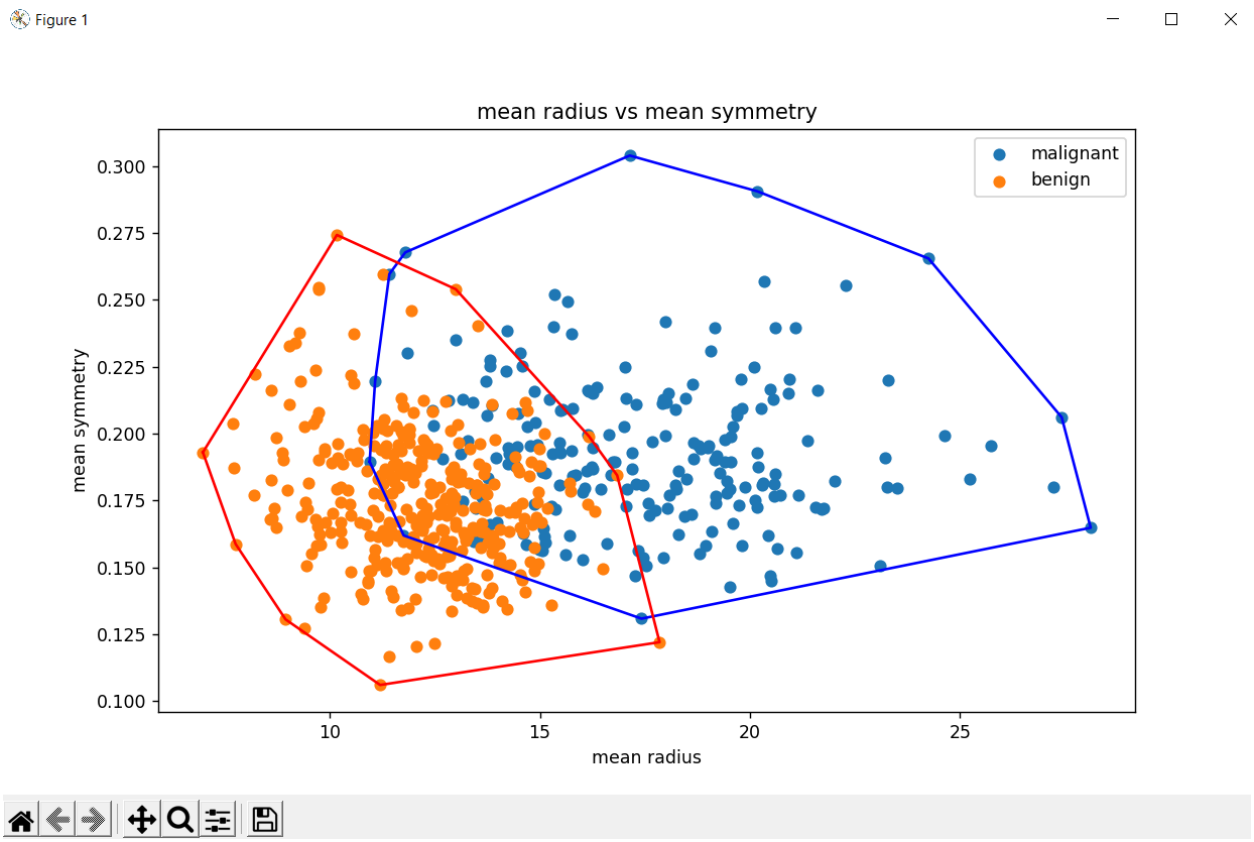
Test Case 9 (Dataset Breast Cancer – Mean Radius vs Mean Symmetry)

Input

```
(venv) PS C:\Users\Asus\desktop\github\Tucil-2-Stima-13520131\src> py main.py
List dataset yang tersedia:
A. Iris                              C. Breast Cancer
    1. Sepal Length                      1. Mean Radius                   20. Fractal Dimension Error
    2. Sepal Width                       2. Mean Texture                  21. Worst Radius
    3. Petal Length                      3. Mean Perimeter                22. Worst Texture
    4. Petal Width                       4. Mean Area                     23. Worst Perimeter
                                         5. Mean Smoothness               24. Worst Area
B. Wine                                  6. Mean Compactness              25. Worst Smoothness
    1. Alcohol                           7. Mean Concavity                26. Worst Compactness
    2. Malic Acid                        8. Mean Concave Points           27. Worst Concavity
    3. Ash                               9. Mean Symmetry                 28. Worst Concave Points
    4. Alcalinity of Ash                10. Mean Fractal Dimension        29. Worst Symmetry
    5. Magnesium                        11. Radius Error                  30. Worst Fractal Dimension
    6. Total Phenols                    12. Texture Error
    7. Flavanoids                       13. Perimeter Error
    8. Non Flavanoid Phenols            14. Area Error
    9. Proanthocyanis                   15. Smoothness Error
   10. Color Intensity                  16. Compactness Error
   11. Hue                              17. Concavity Error
   12. OD280/OD315 of Diluted Wines     18. Concave Points Error
   13. Proline                          19. Symmetry Error

Contoh Input: C 4 25
Input dataset yang diinginkan: C 1 9
```

Output



Test Case 10 (Dataset random)

Input & Output

```
(venv) PS C:\Users\Asus\desktop\github\Tucil-2-Stima-13520131\src> py main.py
List dataset yang tersedia:
A. Iris                                C. Breast Cancer
    1. Sepal Length                        1. Mean Radius                      20. Fractal Dimension Error
    2. Sepal Width                         2. Mean Texture                     21. Worst Radius
    3. Petal Length                        3. Mean Perimeter                   22. Worst Texture
    4. Petal Width                         4. Mean Area                        23. Worst Perimeter
                                           5. Mean Smoothness                  24. Worst Area
B. Wine                                    6. Mean Compactness                 25. Worst Smoothness
    1. Alcohol                             7. Mean Concavity                   26. Worst Compactness
    2. Malic Acid                          8. Mean Concave Points              27. Worst Concavity
    3. Ash                                 9. Mean Symmetry                    28. Worst Concave Points
    4. Alcalinity of Ash                  10. Mean Fractal Dimension           29. Worst Symmetry
    5. Magnesium                          11. Radius Error                     30. Worst Fractal Dimension
    6. Total Phenols                      12. Texture Error
    7. Flavanoids                         13. Perimeter Error
    8. Non Flavanoid Phenols              14. Area Error
    9. Proanthocyanis                     15. Smoothness Error
   10. Color Intensity                    16. Compactness Error
   11. Hue                                17. Concavity Error
   12. OD280/OD315 of Diluted Wines       18. Concave Points Error
   13. Proline                            19. Symmetry Error

Contoh Input: C 4 25
Input dataset yang diinginkan: A 999 -1
Dataset tidak tersedia
```

Test Case 11 (Dataset random)

Input & Output

```
(venv) PS C:\Users\Asus\desktop\github\Tucil-2-Stima-13520131\src> py main.py
List dataset yang tersedia:
A. Iris                                C. Breast Cancer
    1. Sepal Length                        1. Mean Radius                      20. Fractal Dimension Error
    2. Sepal Width                         2. Mean Texture                     21. Worst Radius
    3. Petal Length                        3. Mean Perimeter                   22. Worst Texture
    4. Petal Width                         4. Mean Area                        23. Worst Perimeter
                                           5. Mean Smoothness                  24. Worst Area
B. Wine                                    6. Mean Compactness                 25. Worst Smoothness
    1. Alcohol                             7. Mean Concavity                   26. Worst Compactness
    2. Malic Acid                          8. Mean Concave Points              27. Worst Concavity
    3. Ash                                 9. Mean Symmetry                    28. Worst Concave Points
    4. Alcalinity of Ash                  10. Mean Fractal Dimension           29. Worst Symmetry
    5. Magnesium                          11. Radius Error                     30. Worst Fractal Dimension
    6. Total Phenols                      12. Texture Error
    7. Flavanoids                         13. Perimeter Error
    8. Non Flavanoid Phenols              14. Area Error
    9. Proanthocyanis                     15. Smoothness Error
   10. Color Intensity                    16. Compactness Error
   11. Hue                                17. Concavity Error
   12. OD280/OD315 of Diluted Wines       18. Concave Points Error
   13. Proline                            19. Symmetry Error

Contoh Input: C 4 25
Input dataset yang diinginkan: A 1 1
Pilihan kolom harus berbeda
```

Test Case 12 (Dataset random)

Input & Output

```
(venv) PS C:\Users\Asus\desktop\github\Tucil-2-Stima-13520131\src> py main.py
List dataset yang tersedia:
A. Iris                                C. Breast Cancer
    1. Sepal Length                        1. Mean Radius                      20. Fractal Dimension Error
    2. Sepal Width                         2. Mean Texture                     21. Worst Radius
    3. Petal Length                        3. Mean Perimeter                   22. Worst Texture
    4. Petal Width                         4. Mean Area                        23. Worst Perimeter
                                           5. Mean Smoothness                  24. Worst Area
B. Wine                                    6. Mean Compactness                 25. Worst Smoothness
    1. Alcohol                             7. Mean Concavity                   26. Worst Compactness
    2. Malic Acid                          8. Mean Concave Points              27. Worst Concavity
    3. Ash                                 9. Mean Symmetry                    28. Worst Concave Points
    4. Alcalinity of Ash                  10. Mean Fractal Dimension           29. Worst Symmetry
    5. Magnesium                          11. Radius Error                     30. Worst Fractal Dimension
    6. Total Phenols                      12. Texture Error
    7. Flavanoids                         13. Perimeter Error
    8. Non Flavanoid Phenols              14. Area Error
    9. Proanthocyanis                     15. Smoothness Error
   10. Color Intensity                    16. Compactness Error
   11. Hue                                17. Concavity Error
   12. OD280/OD315 of Diluted Wines       18. Concave Points Error
   13. Proline                            19. Symmetry Error

Contoh Input: C 4 25
Input dataset yang diinginkan: D 1 2
Dataset tidak tersedia
```

Test Case 13 (Dataset random)

Input & Output

```
(venv) PS C:\Users\Asus\desktop\github\Tucil-2-Stima-13520131\src> py main.py
List dataset yang tersedia:
A. Iris                                C. Breast Cancer
    1. Sepal Length                        1. Mean Radius                      20. Fractal Dimension Error
    2. Sepal Width                         2. Mean Texture                     21. Worst Radius
    3. Petal Length                        3. Mean Perimeter                   22. Worst Texture
    4. Petal Width                         4. Mean Area                        23. Worst Perimeter
                                           5. Mean Smoothness                  24. Worst Area
B. Wine                                    6. Mean Compactness                 25. Worst Smoothness
    1. Alcohol                             7. Mean Concavity                   26. Worst Compactness
    2. Malic Acid                          8. Mean Concave Points              27. Worst Concavity
    3. Ash                                 9. Mean Symmetry                    28. Worst Concave Points
    4. Alcalinity of Ash                  10. Mean Fractal Dimension           29. Worst Symmetry
    5. Magnesium                          11. Radius Error                     30. Worst Fractal Dimension
    6. Total Phenols                      12. Texture Error
    7. Flavanoids                         13. Perimeter Error
    8. Non Flavanoid Phenols              14. Area Error
    9. Proanthocyanis                     15. Smoothness Error
   10. Color Intensity                    16. Compactness Error
   11. Hue                                17. Concavity Error
   12. OD280/OD315 of Diluted Wines       18. Concave Points Error
   13. Proline                            19. Symmetry Error

Contoh Input: C 4 25
Input dataset yang diinginkan: C 0 1
Dataset tidak tersedia
```

BAB IV
ALAMAT KODE PROGRAM

https://github.com/loopfree/Tucil-2-Stima-13520131

BAB V
TABEL PENILAIAN

Poin	Ya	Tidak
1. Pustaka MyConvexHull berhasil dibuat dan tidak ada kesalahan	√	
2. *Convex hull* yang dihasilkan sudah benar	√	
3. Pustaka MyConvexHull dapat digunakan untuk menampilkan *convex hull* dengan warna yang berbeda	√	
4. **BONUS:** program dapat menerima input dan menuliskan output untuk dataset lainnya.	√	