

PROYEK 1
Metode Numerik (B)

Gauss Elimination



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1. Naive Gauss Elimination Function

1. Naive Gauss Elimination

```
# Naive Gauss Elimination
import numpy as np

def gauss_elimination(x, y):
    n = len(y)

    # Matriks gabungan [x |y]
    xy = np.concatenate((x.astype(float), y.reshape(n, 1).astype(float)), axis=1)

    for i in range(n):
        # Mencari baris dengan elemen terbesar pada kolom i
        max_row = i
        for j in range(i+1, n):
            if abs(xy[j, i]) > abs(xy[max_row, i]):
                max_row = j

        # Menukar baris maksimum dengan baris i
        xy[[i, max_row], :] = xy[[max_row, i], :]

        # Eliminasi Gauss
        for j in range(i+1, n):
            ratio = xy[j, i] / xy[i, i]
            xy[j, :] -= ratio * xy[i, :]

    # Substitusi mundur
    z = np.zeros(n)
    for i in range(n-1, -1, -1):
        z[i] = (xy[i, -1] - np.dot(xy[i, :-1], z)) / xy[i, i]

    return z
```

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Contoh Penggunaan Naive Gauss Elimination pada Matrix:

```
✓ 0s [3] # Deklarasi Matrix:
x = np.array([[0.02,0.01,0,0], [1,2,1,0], [0,1,2,1],[0,0,100,200]])
y = np.array([0.02,1,4,800])

# 1. Naive Gauss Elimination
naive_gauss_elim = gauss_elimination(x,y)

print("Naive Gauss Elimination: ", naive_gauss_elim)

Naive Gauss Elimination: [1. 0. 0. 4.]
```

Contoh Penggunaan Naive Gauss Elimination pada Matrix Lainnya:

```
✓ 0s # Deklarasi Matrix:
x = np.array([[1,2,3], [4,5,6], [7,8,9]])
y = np.array([6,15,24])

# 1. Naive Gauss Elimination
naive_gauss_elim = gauss_elimination(x,y)

print("Naive Gauss Elimination: ",naive_gauss_elim)

Naive Gauss Elimination: [0. 3. 0.]
```

2. Naive Gauss Elimination Pivoting Function

2. Naive Gauss Elimination With Pivoting

```
# Naive Gauss Elimination with Pivoting
import numpy as np

def gauss_elimination_pivot(x, y):
    n = len(y)

    # Matriks gabungan [x | y]
    xy = np.concatenate((x.astype(float), y.reshape(n, 1).astype(float)), axis=1)

    for i in range(n):
        # Pivoting
        max_row = i
        max_val = abs(xy[i, i])
        for j in range(i+1, n):
            if abs(xy[j, i]) > max_val:
                max_row = j
                max_val = abs(xy[j, i])

        xy[[i, max_row], :] = xy[[max_row, i], :]

        # Eliminasi Gauss
        for j in range(i+1, n):
            ratio = xy[j, i] / xy[i, i]
            xy[j, :] -= ratio * xy[i, :]

    # Substitusi mundur
    z = np.zeros(n)
    for i in range(n-1, -1, -1):
        z[i] = (xy[i, -1] - np.dot(xy[i, :-1], z)) / xy[i, i]

    return z
```

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Contoh Penggunaan Gauss Elimination Pivoting pada Matrix:

```
# Deklarasi Matrix:
x = np.array([[0.02,0.01,0,0], [1,2,1,0], [0,1,2,1],[0,0,100,200]])
y = np.array([0.02,1,4,800])

# 2. Naive Gauss Elimination With Pivoting
naive_gauss_pivot = gauss_elimination_pivot(x,y)

print("\nNaive Gauss Elimination With Pivoting:", naive_gauss_pivot)
```



Naive Gauss Elimination With Pivoting: [1. 0. 0. 4.]

Contoh Penggunaan Gauss Elimination Pivoting pada Matrix Lain:

```
# Deklarasi Matrix:
x = np.array([[1,2,3], [4,5,6], [7,8,9]])
y = np.array([6,15,24])

# 2. Naive Gauss Elimination With Pivoting
naive_gauss_pivot = gauss_elimination_pivot(x,y)

print("\nNaive Gauss Elimination With Pivoting:", naive_gauss_pivot)
```

Naive Gauss Elimination With Pivoting: [0. 3. 0.]

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3. Determinan Naive Gauss Elimination Function

3. Determinant Naive Gauss Elimination

```
# Determinant Naive Gauss
import numpy as np

def det_gauss_elimination_pivot(x):
    z = len(x)

    xy = x.astype(float)
    det_sign = 1.0 # Untuk melacak perubahan tanda determinan

    for i in range(z):
        # Pivoting
        max_row = i
        max_val = abs(xy[i, i])
        for j in range(i+1, z):
            if abs(xy[j, i]) > max_val:
                max_row = j
                max_val = abs(xy[j, i])

        if max_row != i:
            xy[[i, max_row], :] = xy[[max_row, i], :]
            det_sign *= -1.0 # Mengubah tanda determinan setelah pertukaran baris

        # Eliminasi Gauss
        for j in range(i+1, z):
            ratio = xy[j, i] / xy[i, i]
            xy[j, :] -= ratio * xy[i, :]

    # Menghitung determinan
    det = det_sign
    for i in range(z):
        det *= xy[i, i]

    return det
```

Contoh Penggunaan Determinant Naive Gauss Elimination pada Matrix:

```
[6] # Deklarasi Matrix:
x = np.array([[0.02,0.01,0,0], [1,2,1,0], [0,1,2,1],[0,0,100,200]])

# 3. Determinant Naive Gauss Elimination:
determinant = det_gauss_elimination_pivot(x);

# round untuk pembulatan nilai determinan
print("\nDeterminan Naive Gauss Elimination:", round(determinant));
```

Determinan Naive Gauss Elimination: 5

Contoh Penggunaan Determinant Naive Gauss Elimination pada Matrix Lain:

```
# Deklarasi Matrix:
x = np.array([[1,2,3], [4,5,6], [7,8,9]])

# 3. Determinant Naive Gauss Elimination:
determinant = det_gauss_elimination_pivot(x);

# round untuk pembulatan nilai determinan
print("\nDeterminan Naive Gauss Elimination:", round(determinant));
```

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