graph

August 9, 2025

```
[1]: # !pip install numpy matplotlib pandas tqdm
```

```
[ ]: import json

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

```
[ ]: with open("metrics.json", encoding="utf-8") as f:
         data = json.load(f)
```

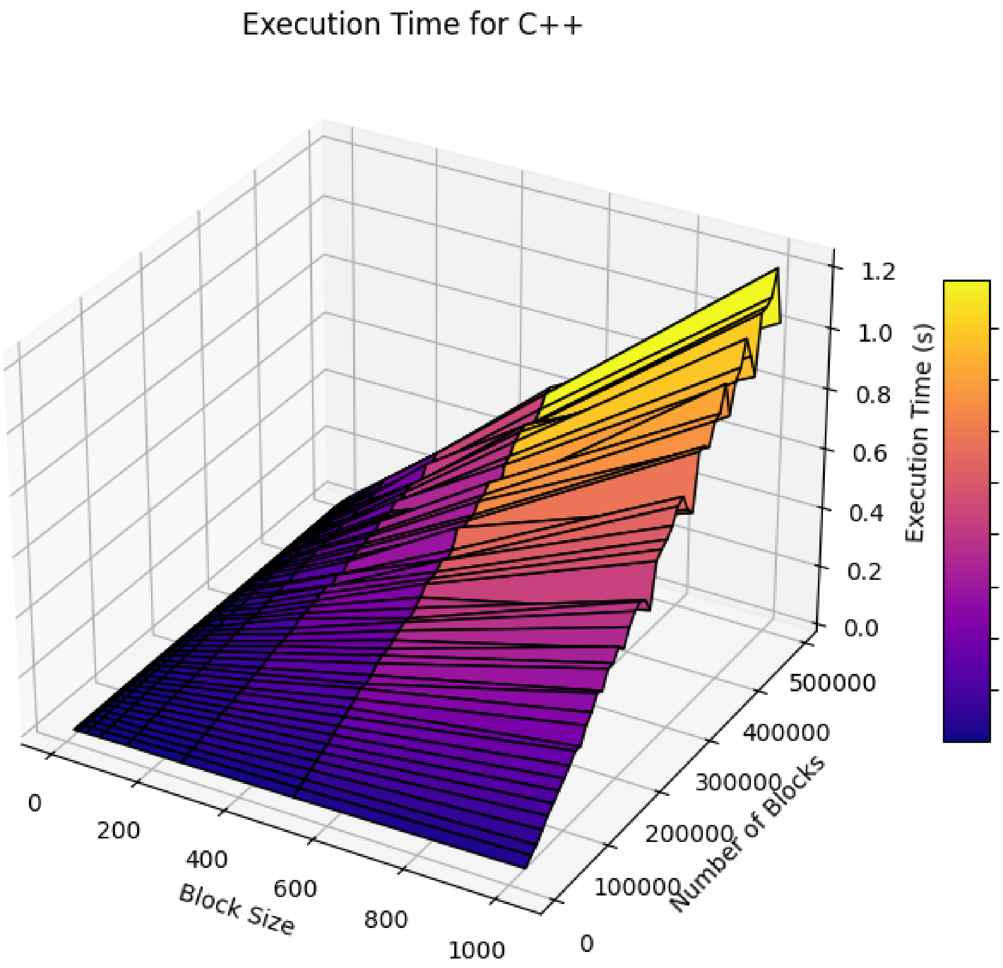
```
[4]: df = pd.DataFrame(data)
     df["size"] = df["count"] * df["block_size"]
     df.sort_values("duration", ascending=False)
```

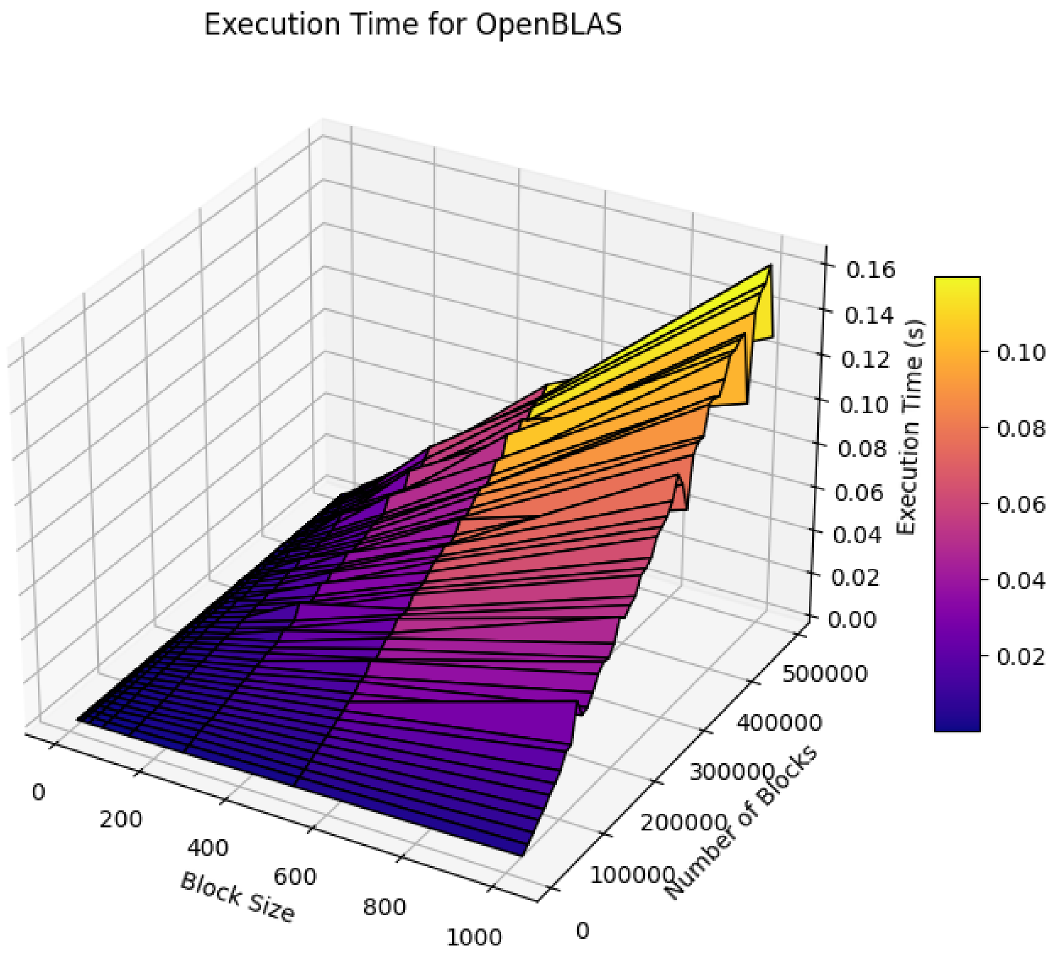
```
[4]:       duration     value  block_size   count           runtime  \
     1582  3.033495  1.501752        1024  440000  OpenCL Reduction
     1762  2.782132  1.672394        1024  490000  OpenCL Reduction
     1618  1.516498  1.535884        1024  450000  OpenCL Reduction
     1150  1.425981  1.092214        1024  320000  OpenCL Reduction
     1724  1.229098  0.250000        1024  480000               C++
     …            …         …           …       …                 …
     9     0.000030  0.000532          16   10000          OpenBLAS
     109   0.000020  0.000532           4   40000          OpenBLAS
     37    0.000012  0.000266           4   20000          OpenBLAS
     5     0.000011  0.000266           8   10000          OpenBLAS
     1     0.000009  0.000133           4   10000          OpenBLAS

                             device       size
     1582  Intel(R) Arc(TM) Graphics  450560000
     1762  Intel(R) Arc(TM) Graphics  501760000
     1618  Intel(R) Arc(TM) Graphics  460800000
     1150  Intel(R) Arc(TM) Graphics  327680000
     1724  Intel(R) Arc(TM) Graphics  491520000
     …                            …          …
     9     Intel(R) Arc(TM) Graphics     160000
     109   Intel(R) Arc(TM) Graphics     160000
     37    Intel(R) Arc(TM) Graphics      80000
```

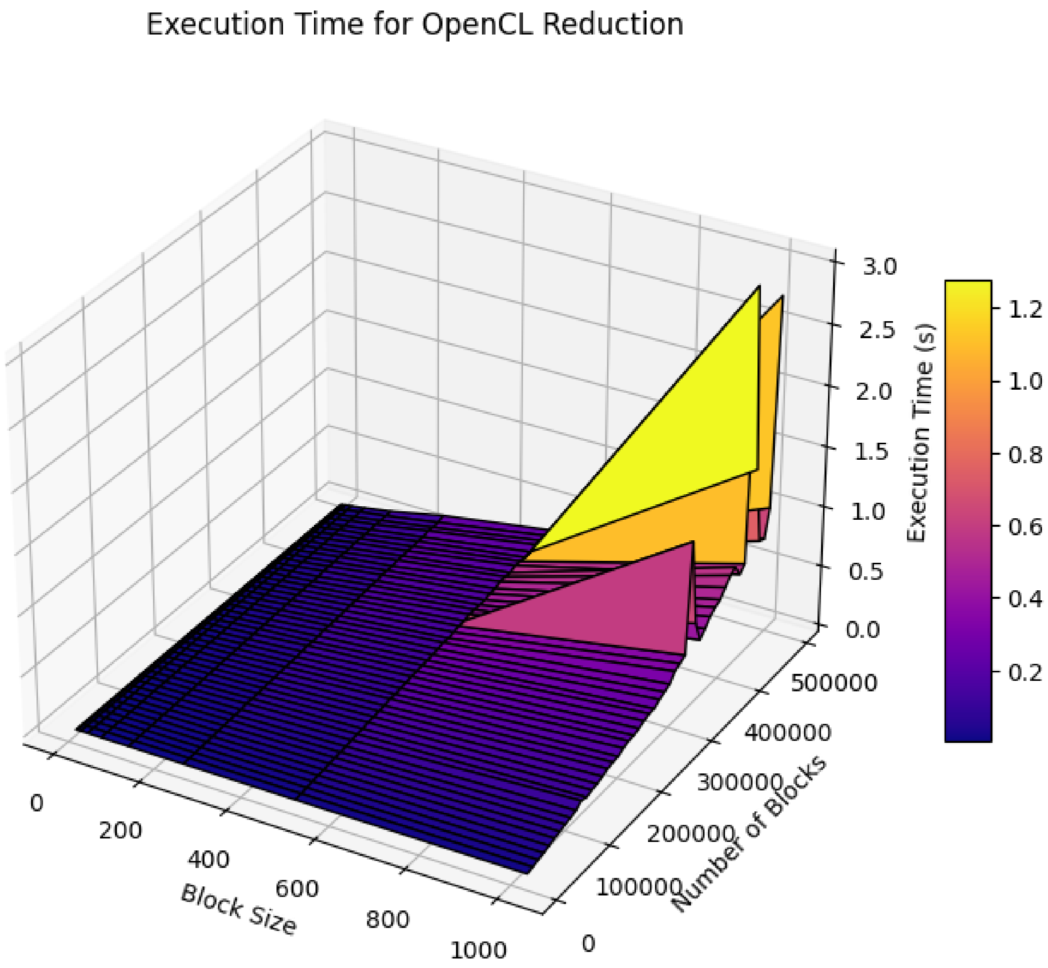
```
5     Intel(R) Arc(TM) Graphics      80000
1     Intel(R) Arc(TM) Graphics      40000

[1764 rows x 7 columns]
```

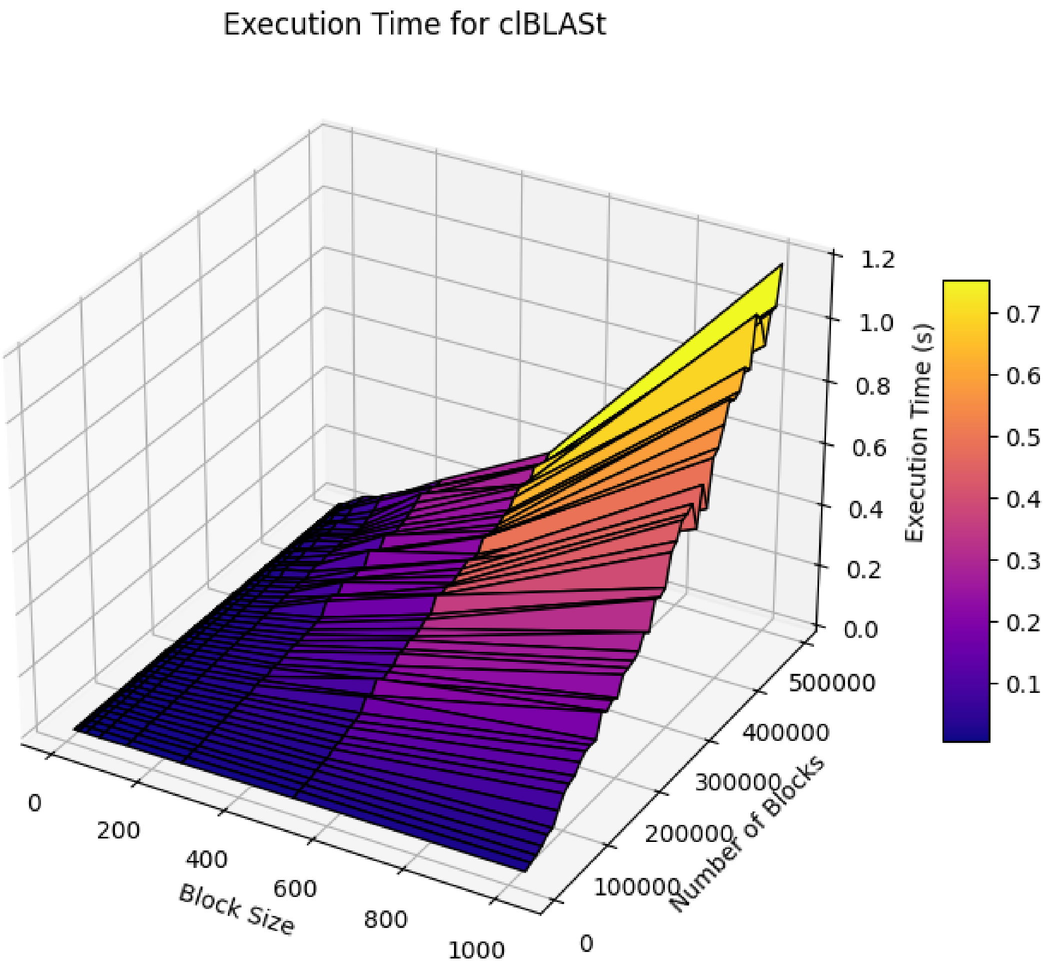
[10]:

```python
runtimes = df["runtime"].unique()

for target_runtime in runtimes:
    # target_runtime = 'OpenCL Reduction'
    df_filtered = df[df['runtime'] == target_runtime]

    block_sizes = sorted(df_filtered['block_size'].unique())
    counts = sorted(df_filtered['count'].unique())

    X, Y = np.meshgrid(block_sizes, counts)
    Z = np.zeros_like(X, dtype=float)

    for i, count in enumerate(counts):
        for j, block in enumerate(block_sizes):
            match = df_filtered[
                (df_filtered['block_size'] == block) &
                (df_filtered['count'] == count)
            ]
            if not match.empty:
                Z[i, j] = match['duration'].values[0]
            else:
                Z[i, j] = np.nan

    fig = plt.figure(figsize=(10, 7))
    ax = fig.add_subplot(111, projection='3d')
    surf = ax.plot_surface(X, Y, Z, cmap='plasma', edgecolor='k')

    ax.set_xlabel('Block Size')
    ax.set_ylabel('Number of Blocks')
    ax.set_zlabel('Execution Time (s)')
    ax.set_title(f'Execution Time for {target_runtime}')
    fig.colorbar(surf, shrink=0.5, aspect=10)

    plt.show()
```


Execution Time for C++
Block Size
0
200
400
600
800
1000
Number of Blocks
0
100000
200000
300000
400000
500000
Execution Time (s)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8


Execution Time for OpenBLAS
Block Size
0
200
400
600
800
1000
Number of Blocks
0
100000
200000
300000
400000
500000
Execution Time (s)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.02
0.04
0.06
0.08
0.10


Execution Time for OpenCL Reduction
0
200
400
600
800
1000
Block Size
0
100000
200000
300000
400000
500000
Number of Blocks
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Execution Time (s)
0.2
0.4
0.6
0.8
1.0
1.2


Execution Time for clBLASt
Block Size
0
200
400
600
800
1000
Number of Blocks
0
100000
200000
300000
400000
500000
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Execution Time (s)
0.1
0.2
0.3
0.4
0.5
0.6
0.7