Fix direction

Reference

[Neural intersection function]

Dataset

300000 rays:
import format:

```
{
        "point_sph": [
            1.208280545917858,
            0.6489211456489756
        ],
        "rgb": [
            12,
            12,
            1
        ]
    }
```

Hardware

graphics card:NVIDIA GeForce RTX 4060 Laptop GPU

hyperparameter

batch size:4096
learning rate:0.1
echo:1
feature num:3
grid size(only for gridnet):512x512

Others

optimizer:Adam(default parameters)
loss:MSELoss

Improved Gridnet

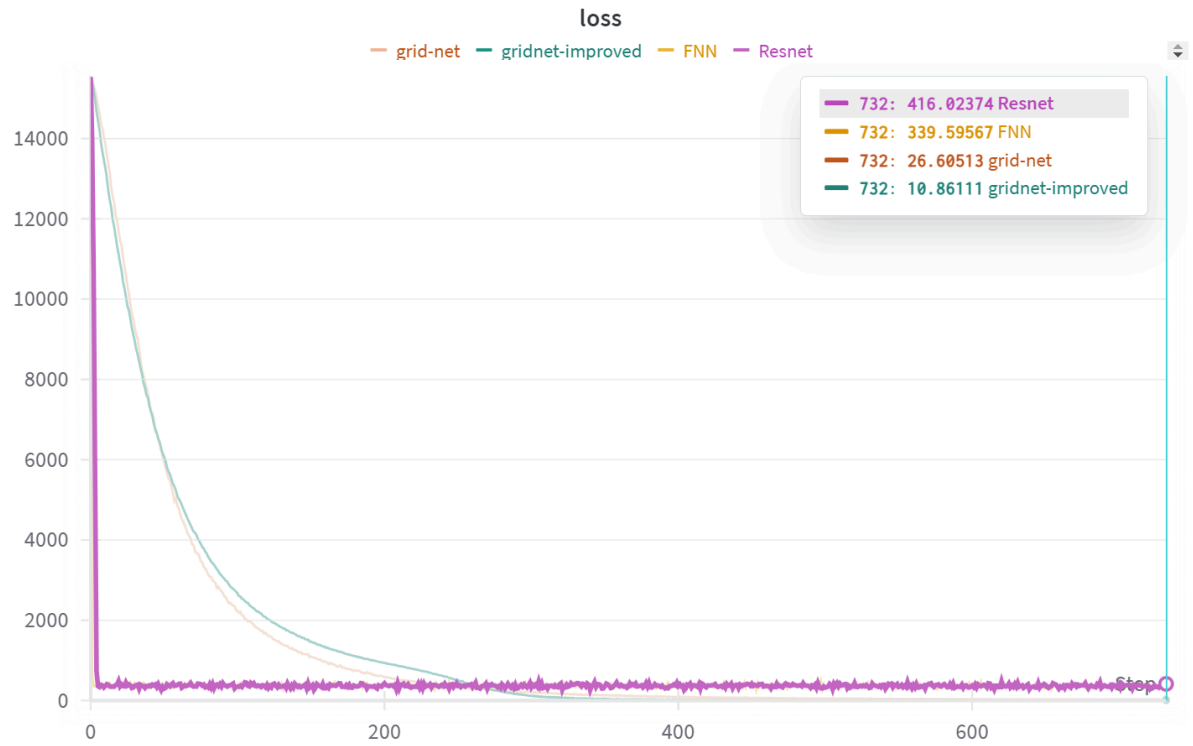
first,I give up bilinear interpolation and try to learn a matrix to express the relationship between neighboring vectors
second, I consider neighboring vectors in the range 7×7 instead of 2×2

Third, I use a threshold to reduce noise.

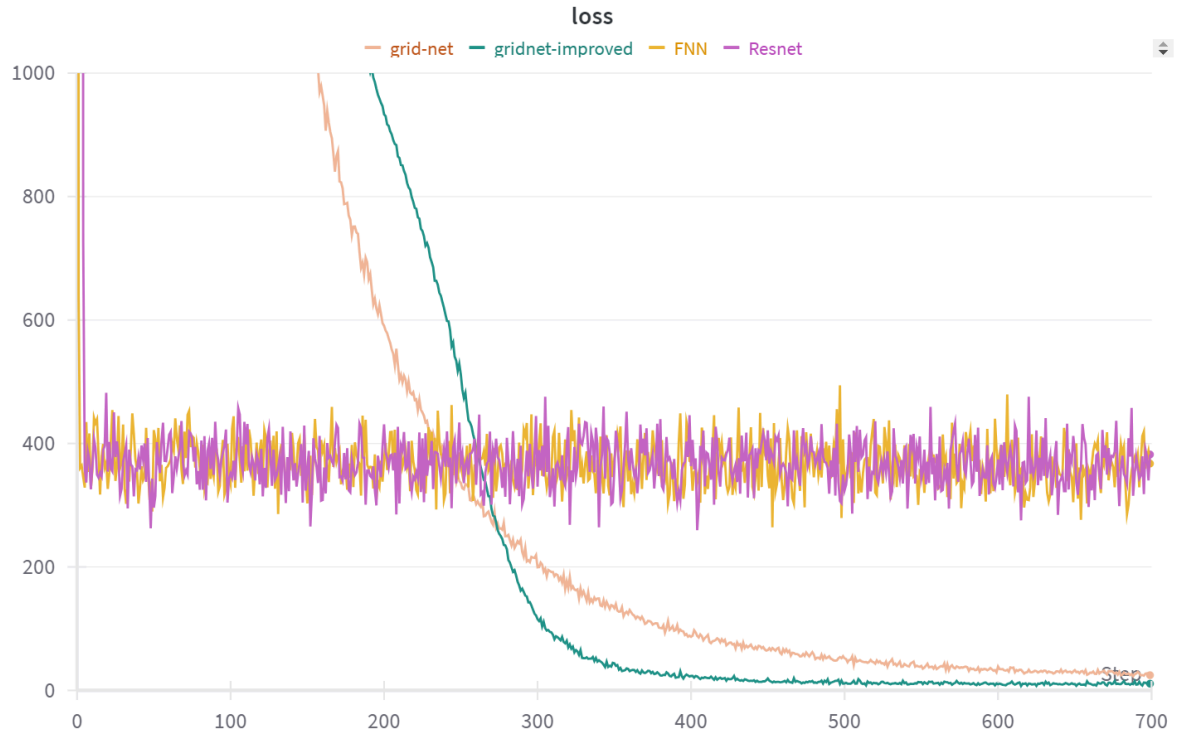
Results

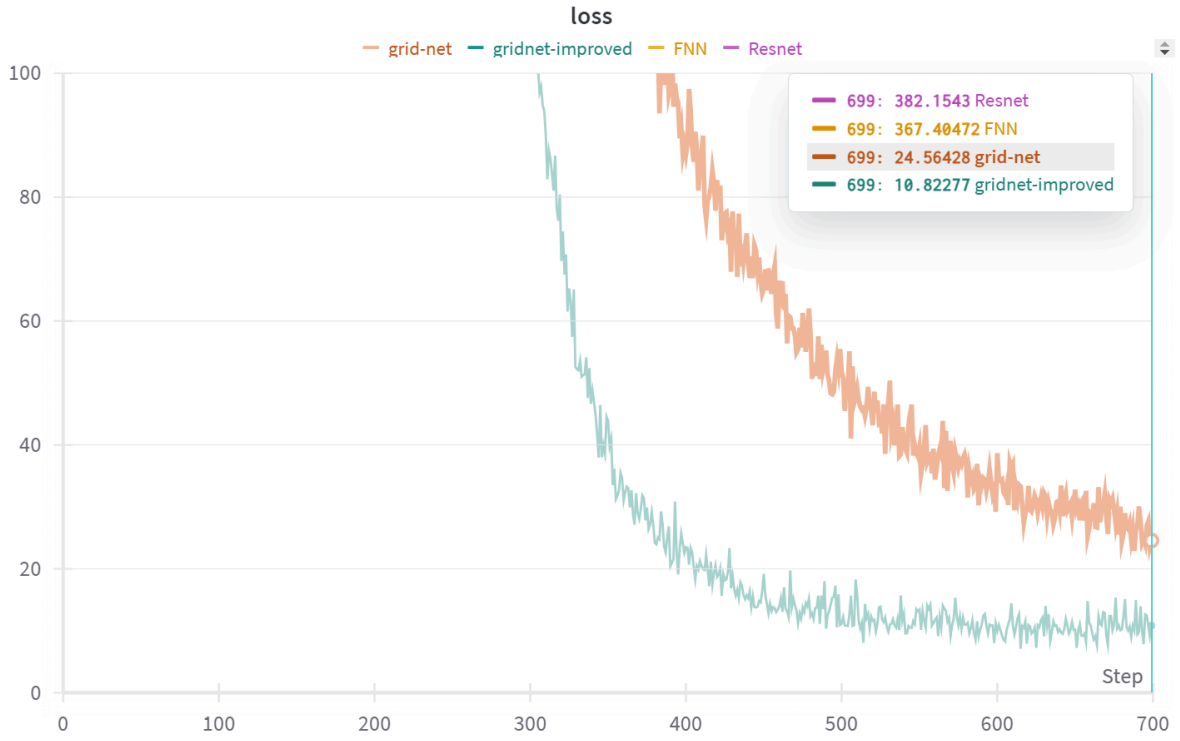
Different Networks

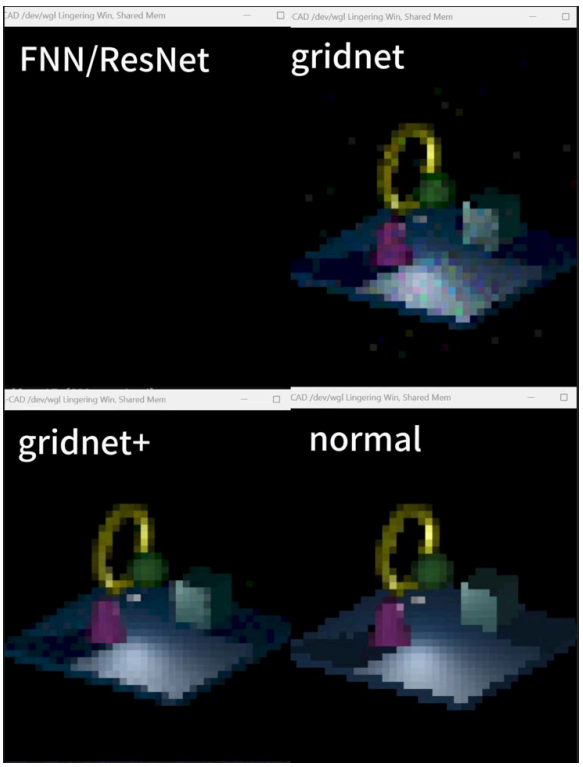
feed-forward neural network (FNN) and residual network(Resnet) are quickly converging



Improved gridnet converge faster than gridnet and end up with better results


loss
grid-net
gridnet-improved
FNN
Resnet
1000
800
600
400
200
0
0
100
200
300
400
500
600
700
Step

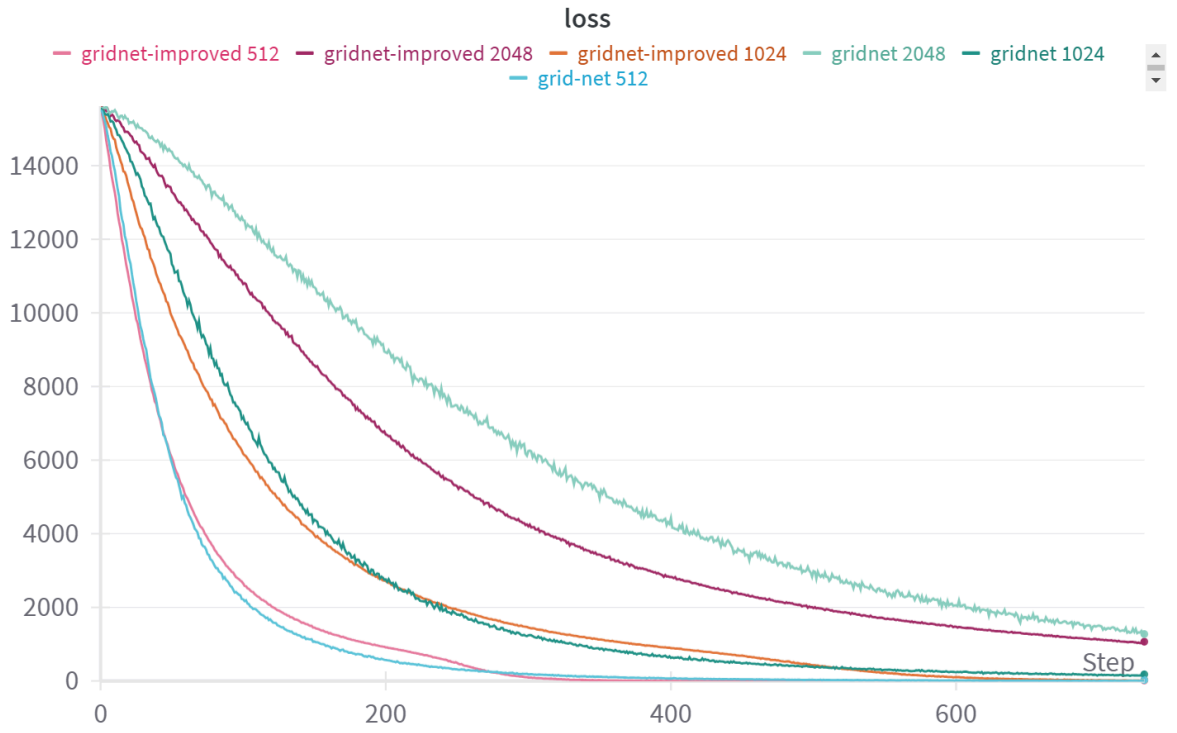

loss
grid-net
gridnet-improved
FNN
Resnet
699: 382.1543 Resnet
699: 367.40472 FNN
699: 24.56428 grid-net
699: 10.82277 gridnet-improved
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Step

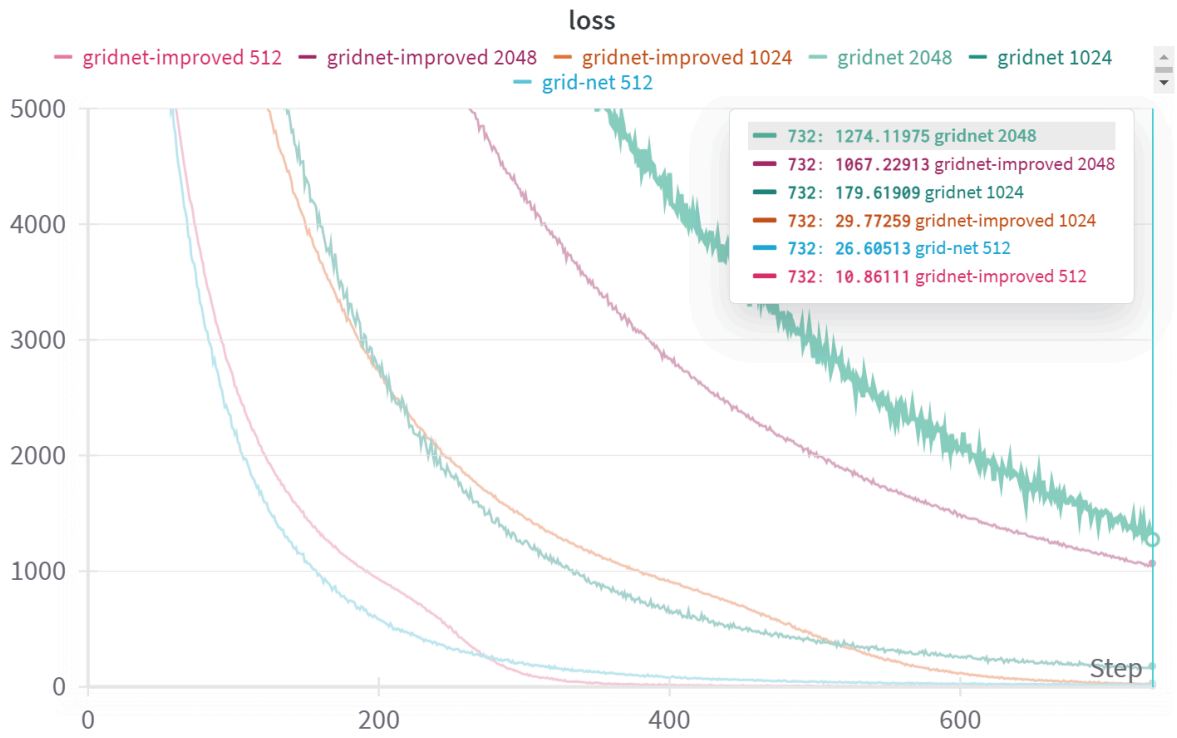


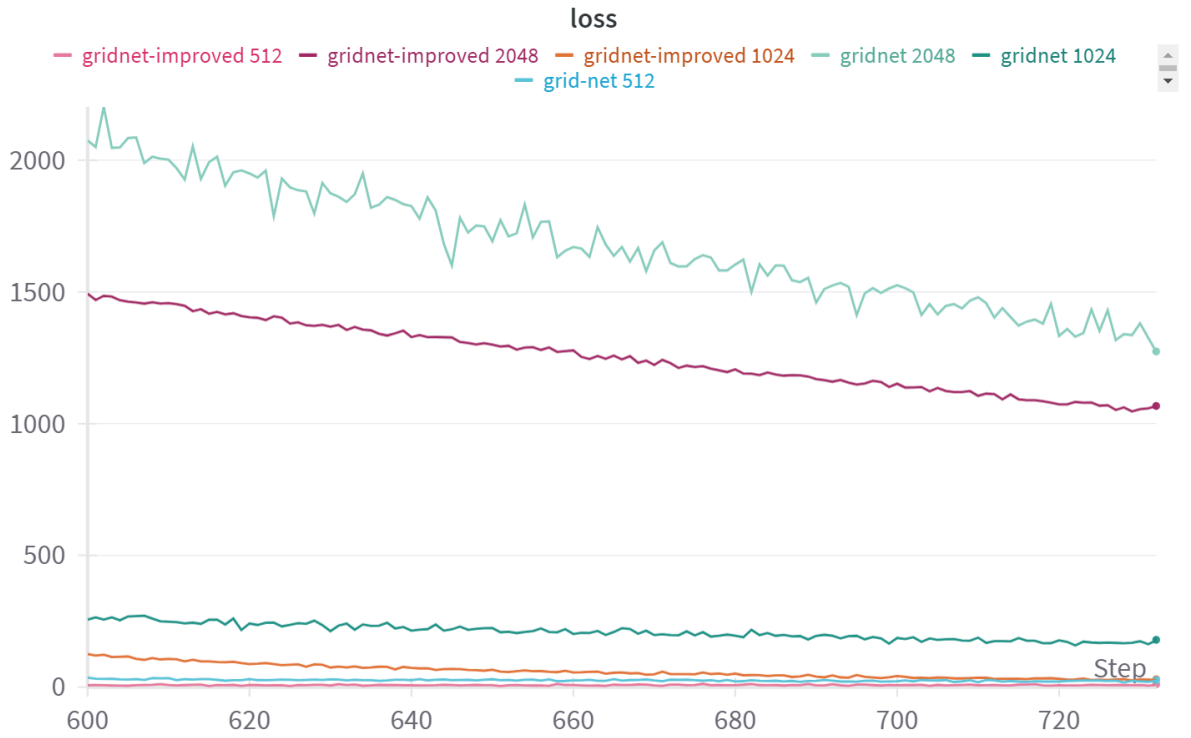
	FNN	Resnet	gridnet	improved-gridnet
Time to train	51s	65s	49s	58s
model size	16KB	546KB	3084KB	4327KB

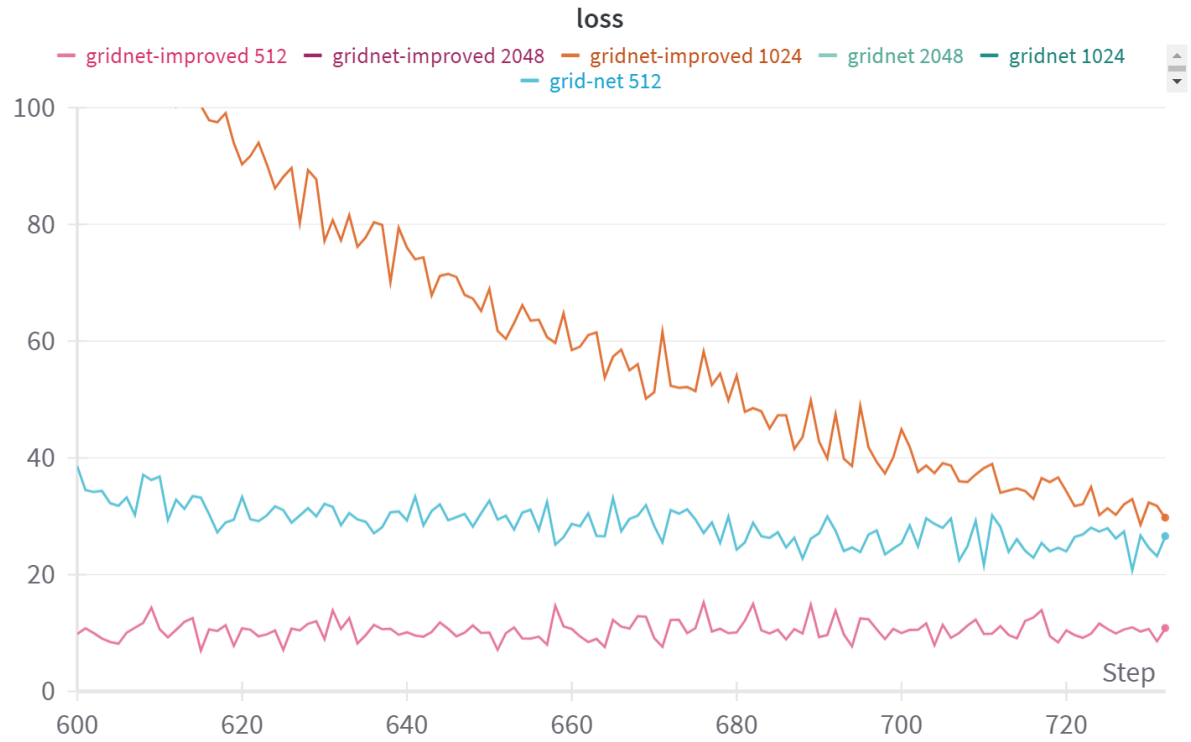
Different grid size

Networks with smaller grid size converges faster


loss
gridnet-improved 512
gridnet-improved 2048
gridnet-improved 1024
gridnet 2048
gridnet 1024
grid-net 512
14000
12000
10000
8000
6000
4000
2000
0
0
200
400
600
Step


loss
gridnet-improved 512
gridnet-improved 2048
gridnet-improved 1024
gridnet 2048
gridnet 1024
grid-net 512
5000
4000
3000
2000
1000
0
0
200
400
600
Step
732: 1274.11975 gridnet 2048
732: 1067.22913 gridnet-improved 2048
732: 179.61909 gridnet 1024
732: 29.77259 gridnet-improved 1024
732: 26.60513 grid-net 512
732: 10.86111 gridnet-improved 512


loss
gridnet-improved 512
gridnet-improved 2048
gridnet-improved 1024
gridnet 2048
gridnet 1024
grid-net 512
2000
1500
1000
500
0
Step
600
620
640
660
680
700
720


loss
gridnet-improved 512
gridnet-improved 2048
gridnet-improved 1024
gridnet 2048
gridnet 1024
grid-net 512
100
80
60
40
20
0
Step
600
620
640
660
680
700
720

Any direction

Reference

[Instant neural graphics primitives with a multiresolution hash encoding]

Dataset

300000 rays:


```
{
        "dir_sph": [
            2.0071286397934793,
            -2.5307274153917776
        ],
        "point_sph": [
            1.208280545917858,
            0.6489211456489756
        ],
        "hit": [
            0
        ]
    }
```


Hardware

graphics card:NVIDIA GeForce RTX 4060 Laptop GPU

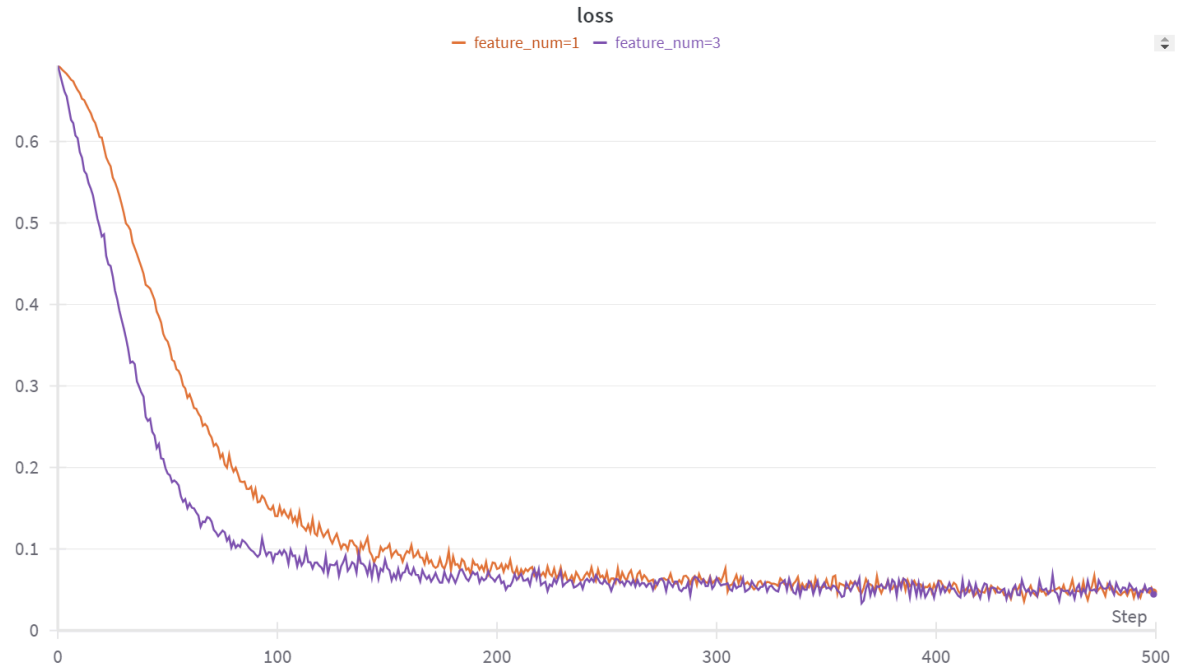
hyperparameter

batch size:4096
learning rate:0.1
echo:1
feature num:1
n_features_per_level:2
log2_hashmap_size:22
finest_resolution:2048*4
n_levels:22

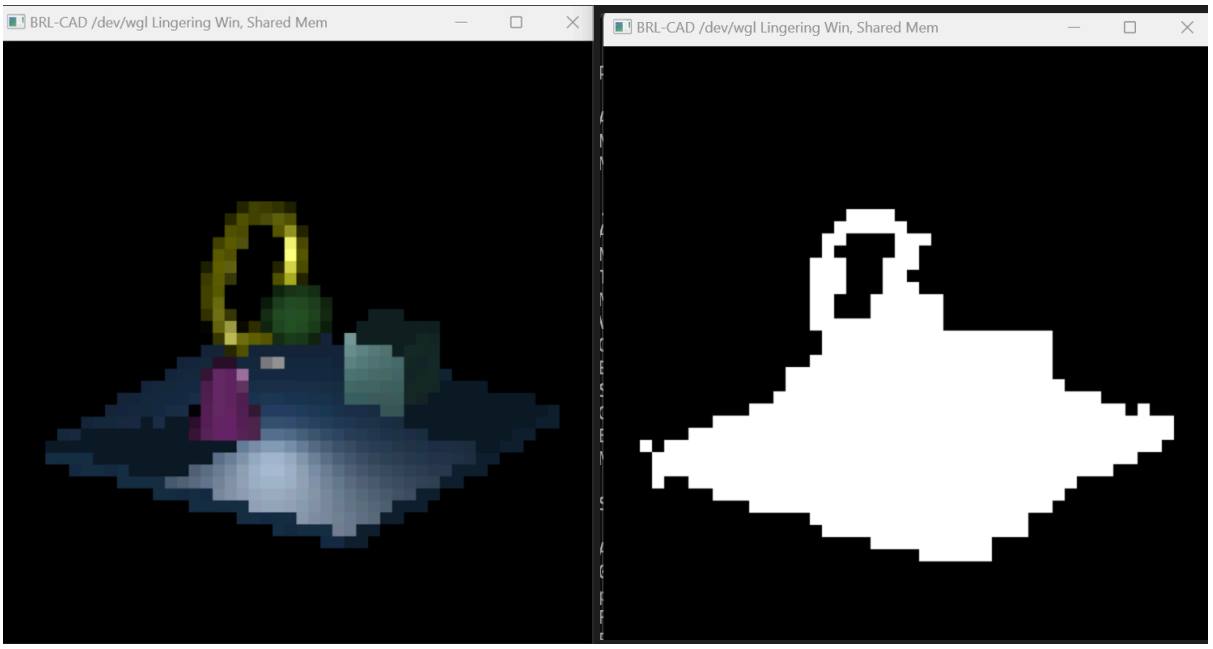
Others

optimizer:Adam(default parameters)
loss:BCELoss()

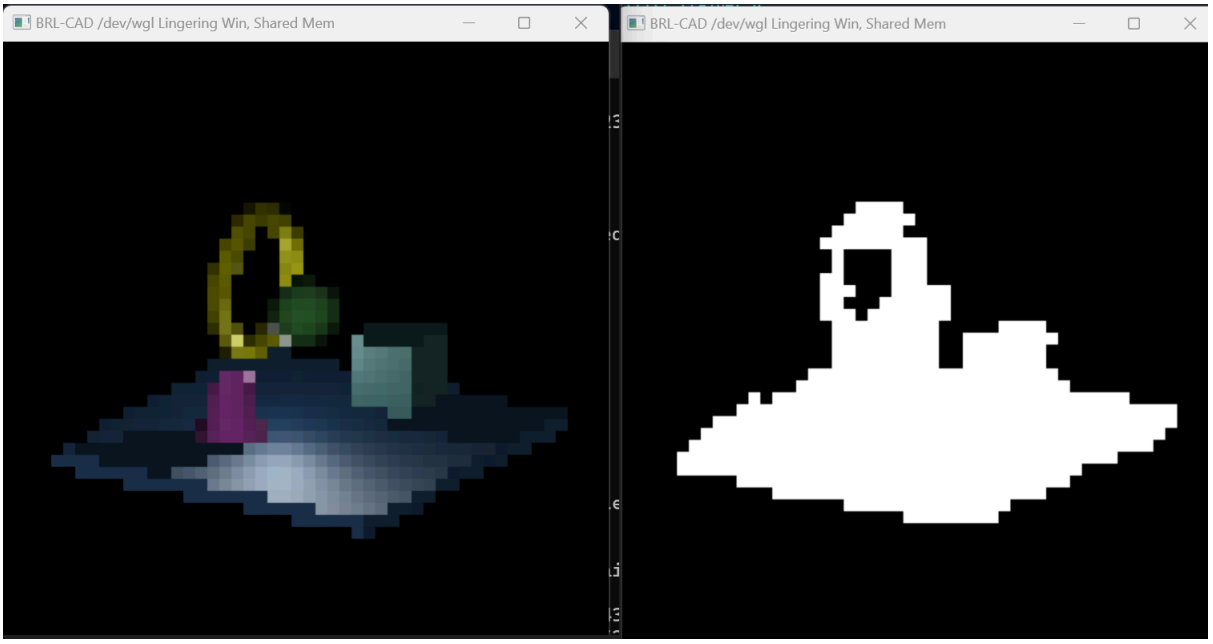
Results



azimuth=25
elevation=35



azimuth=20
elevation=32



Codes

Neural network:
[GitHub - Rainy-fall-end/Rendernn]
For brl-cad:
https://github.com/Rainy-fall-end/brlcad/tree/neural_rendering