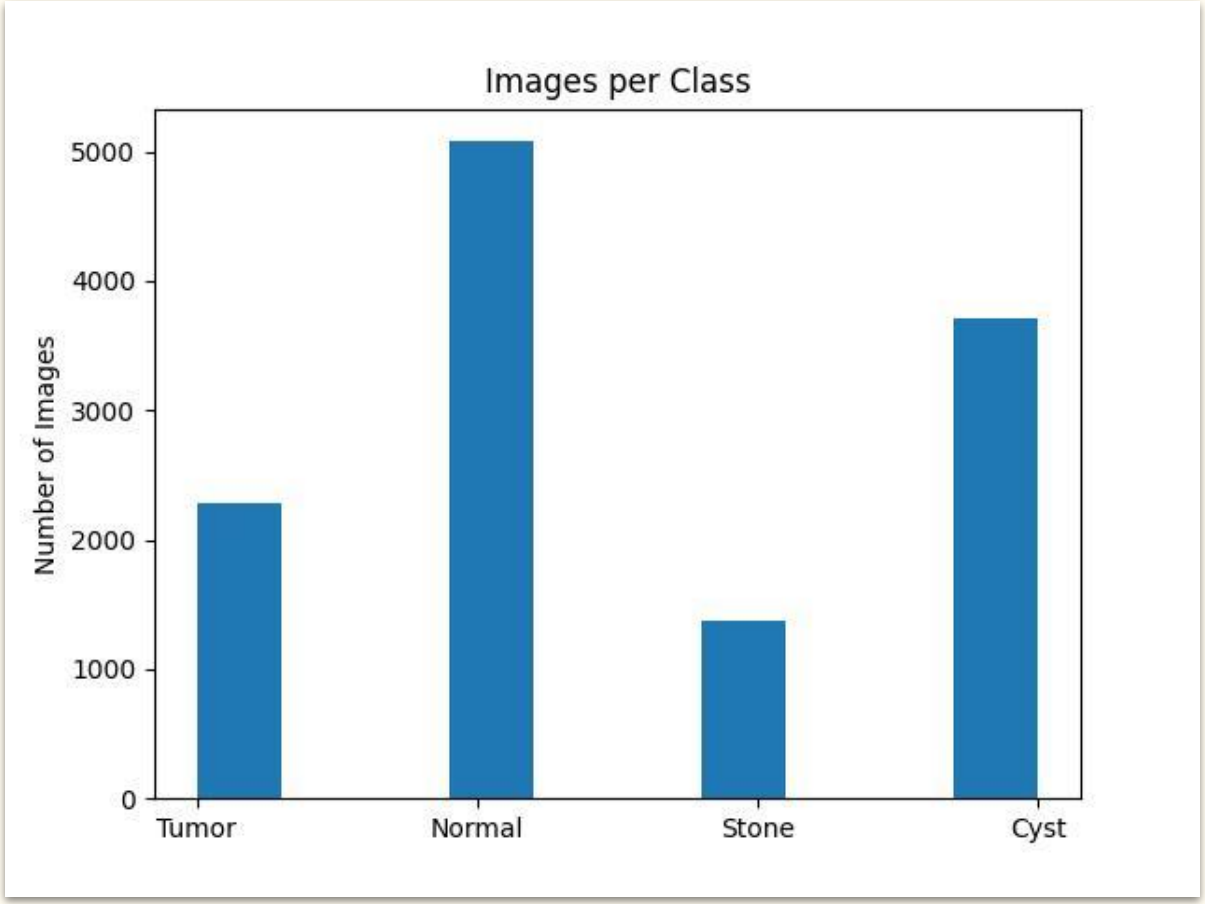
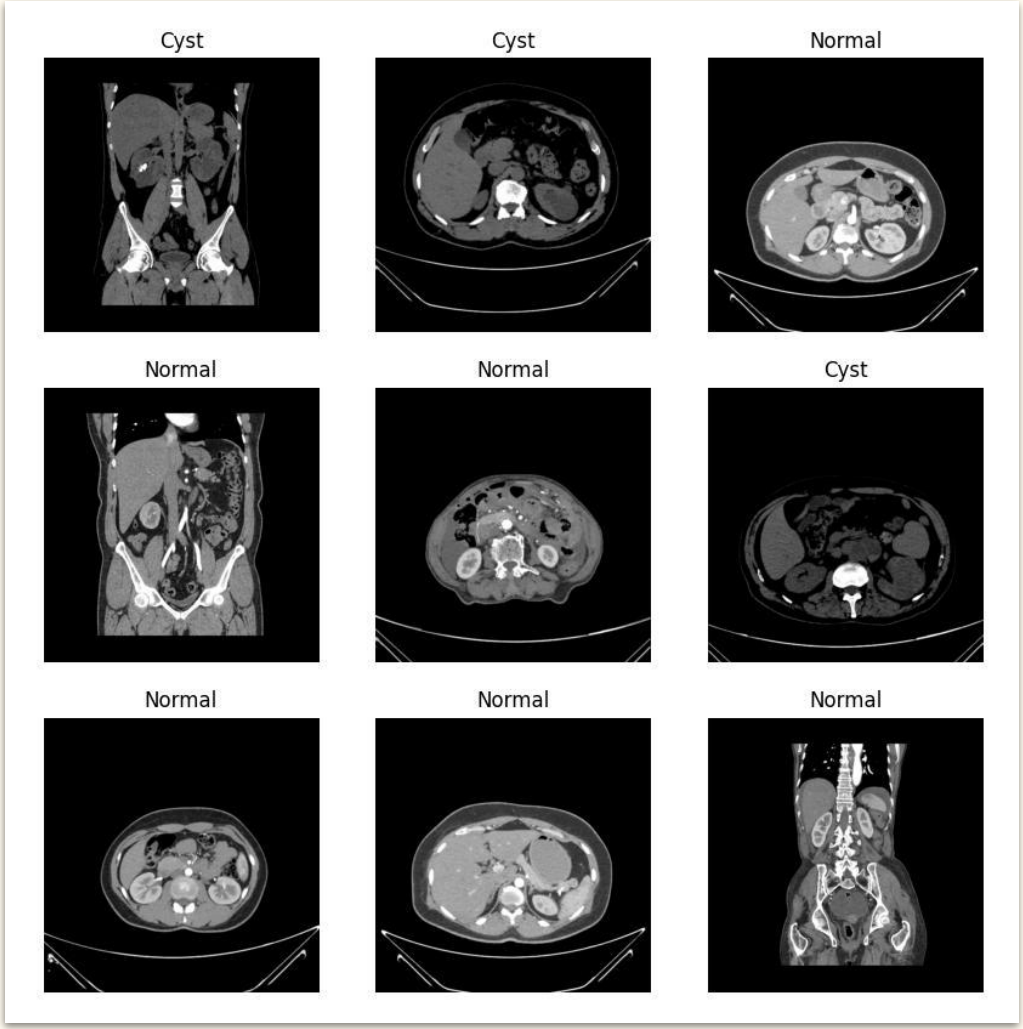
Kidneys

Erin De Pree, Ph.D.

Dataset

- 12,446 images
- 4 classifications:
  - Cysts
  - Normal
  - Stones
  - Tumors
- Bangladesh
- Kaggle



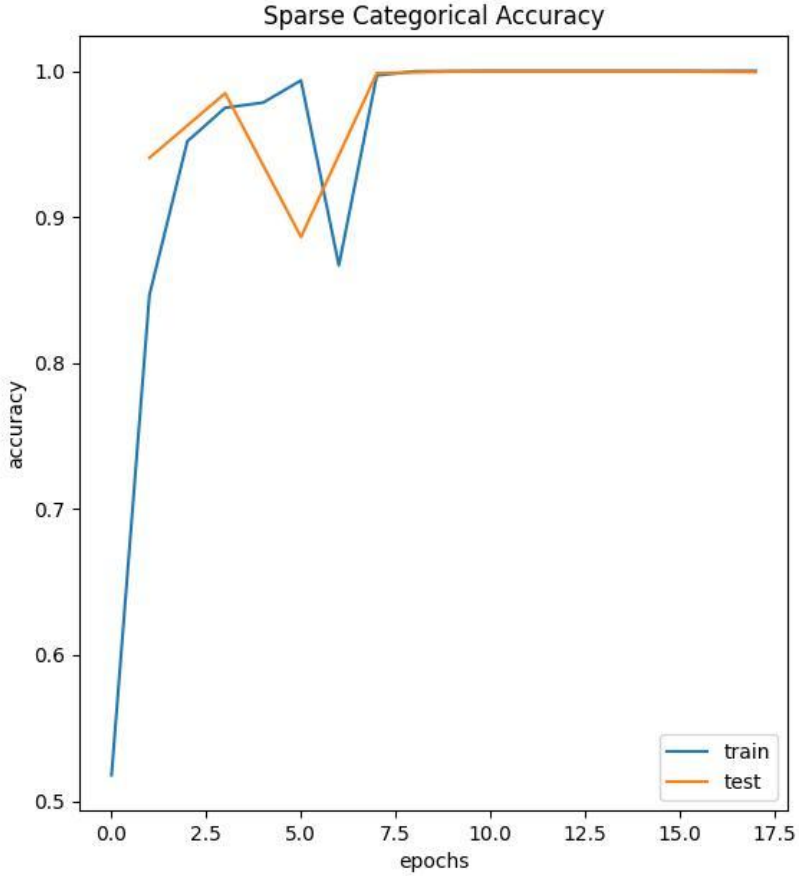


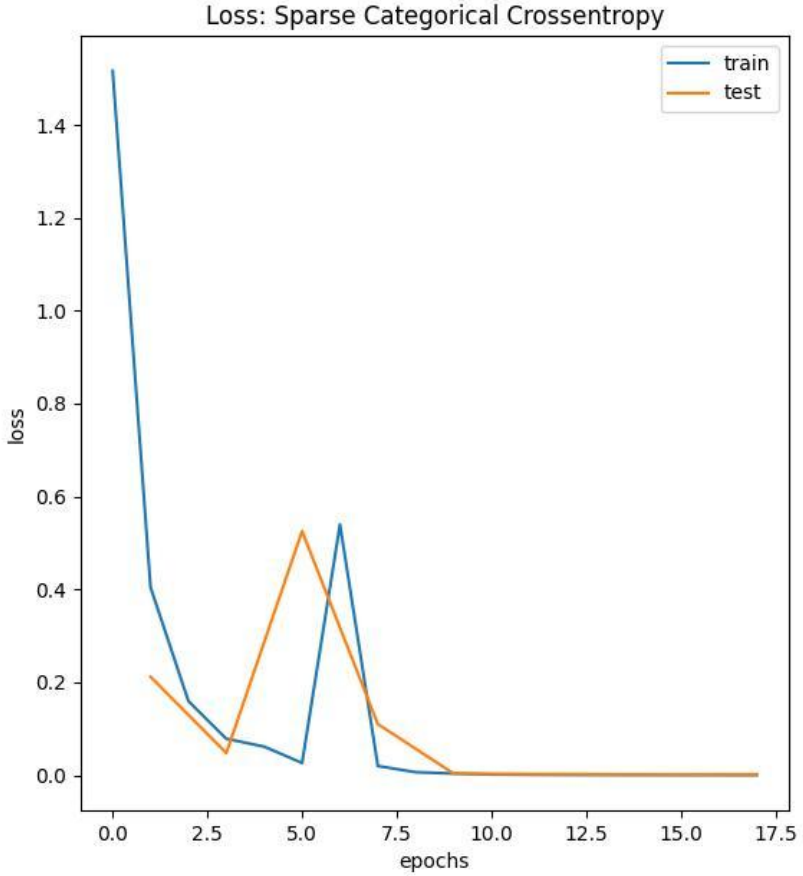
Sample Images

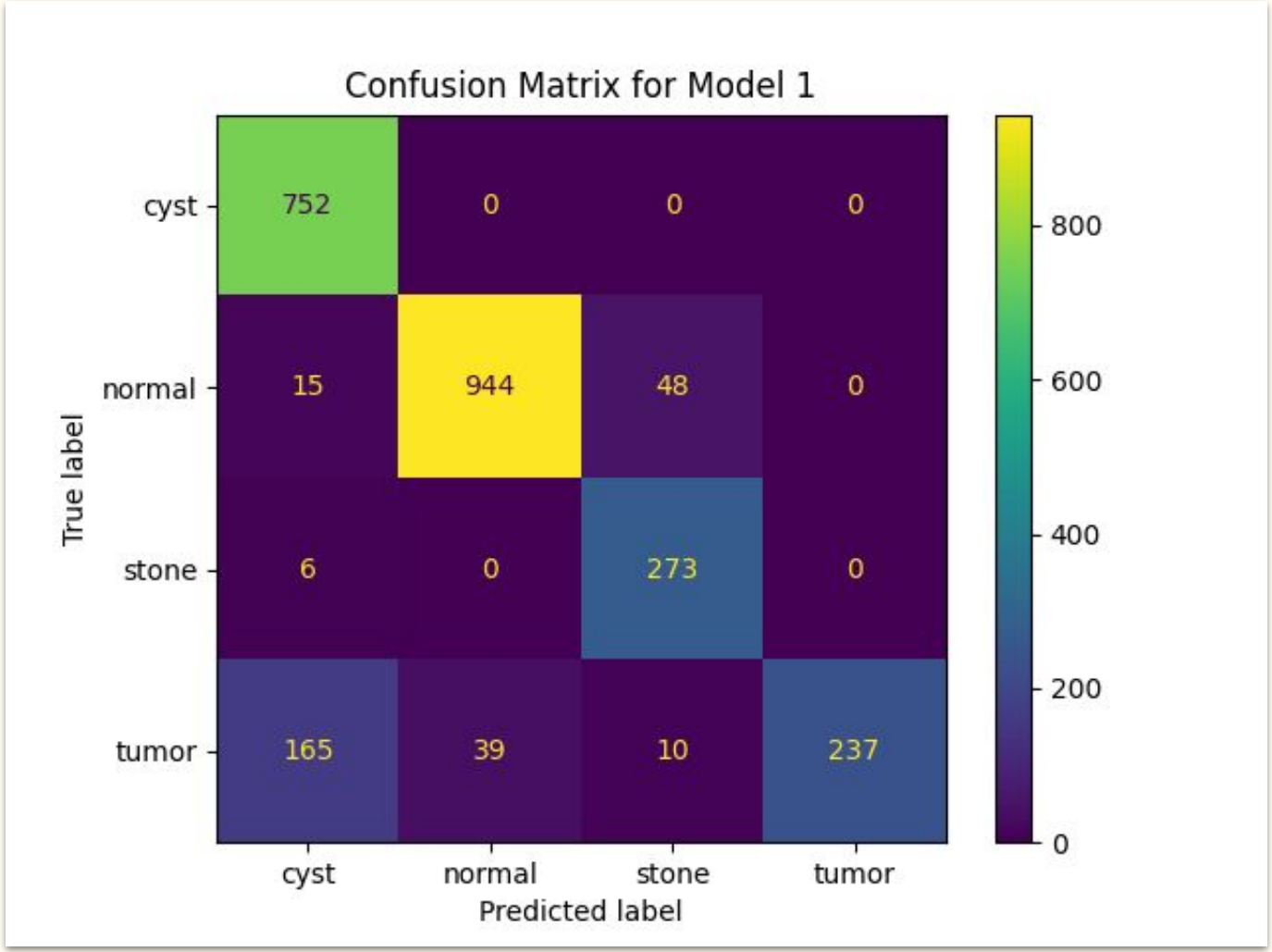
Model

- Image preprocessing
- Convolution Blocks
- Dense Layers

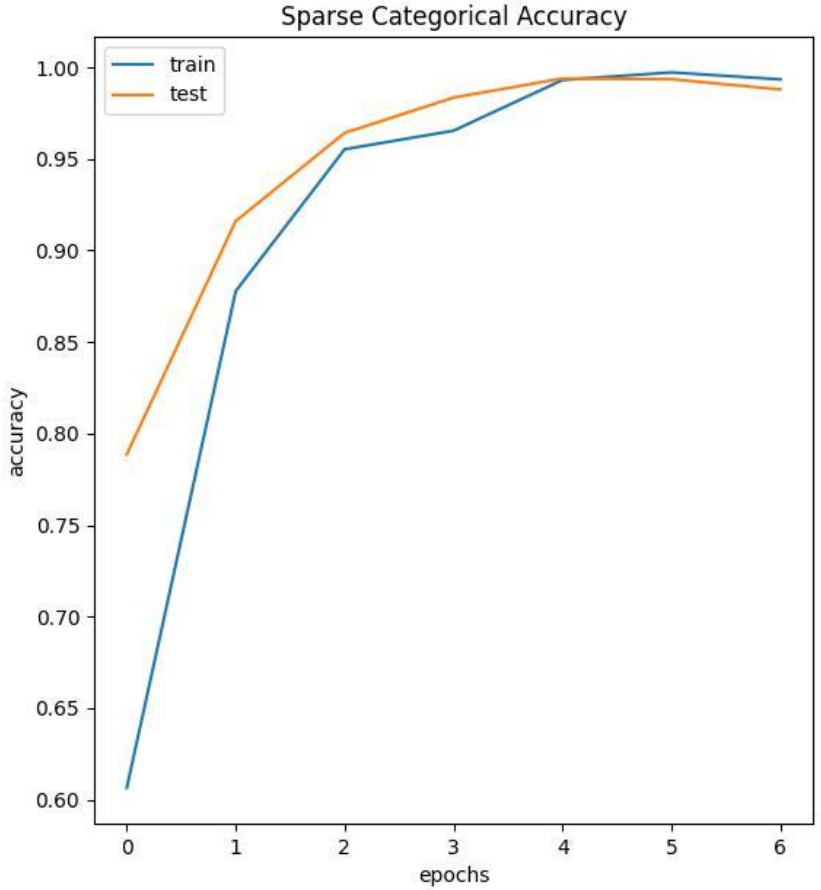
Model 1

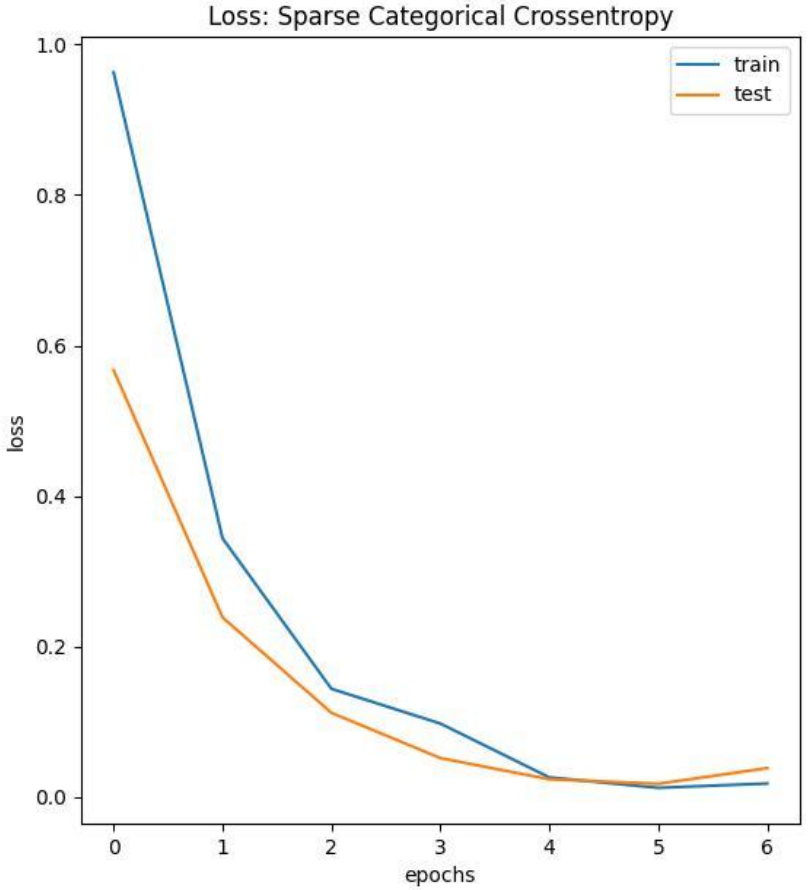

Sparse Categorical Accuracy
accuracy
epochs
train
test
1.0
0.9
0.8
0.7
0.6
0.5
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5

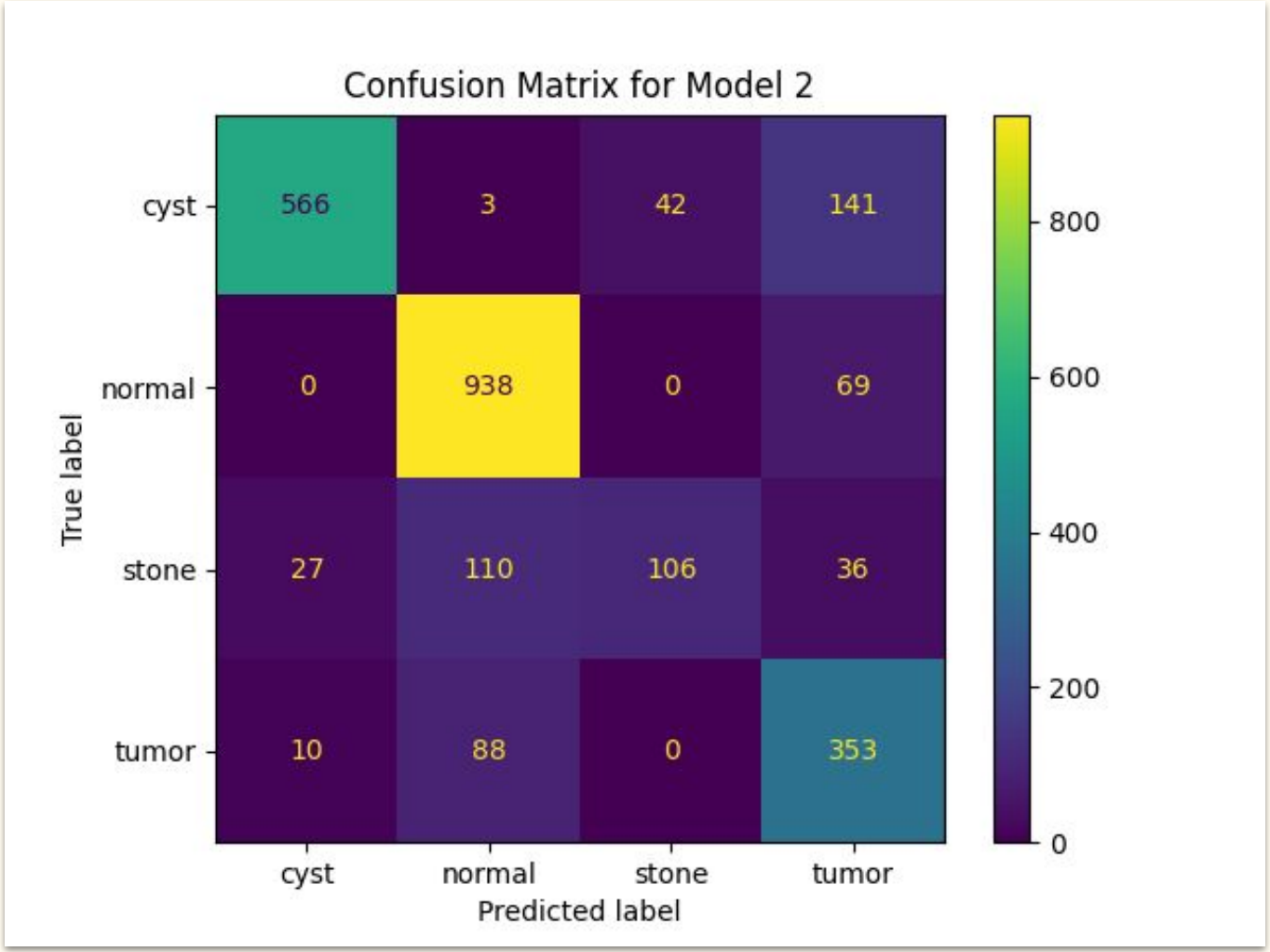

Loss: Sparse Categorical Crossentropy
loss
epochs
train
test
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5


Confusion Matrix for Model 1
cyst
normal
stone
tumor
True label
752
0
0
0
15
944
48
0
6
0
273
0
165
39
10
237
cyst
normal
stone
tumor
Predicted label
800
600
400
200
0

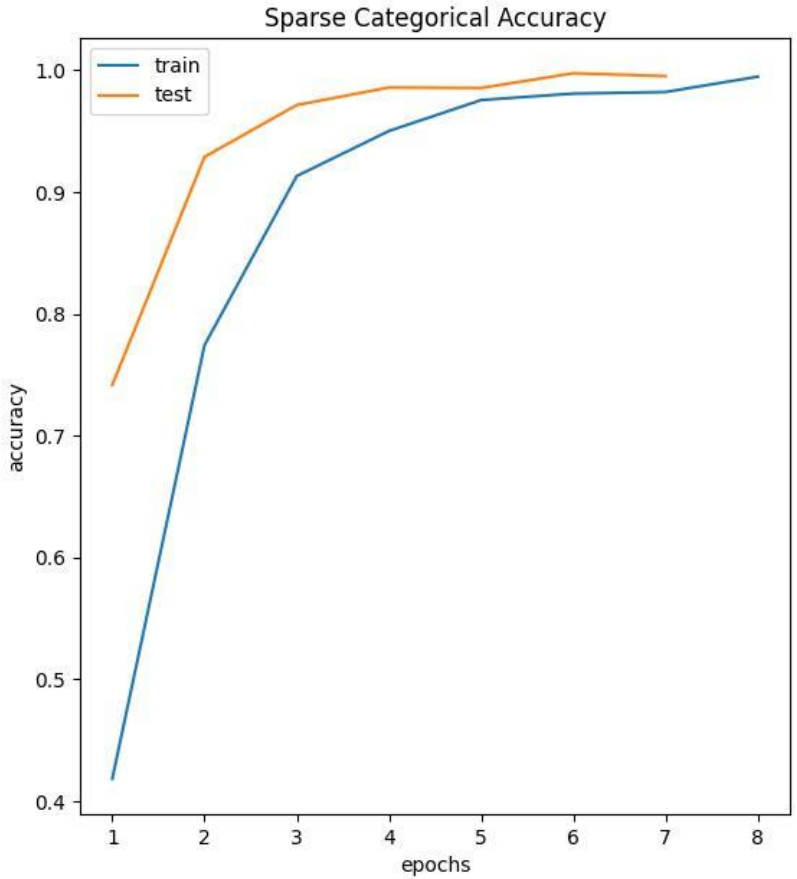
Model 2

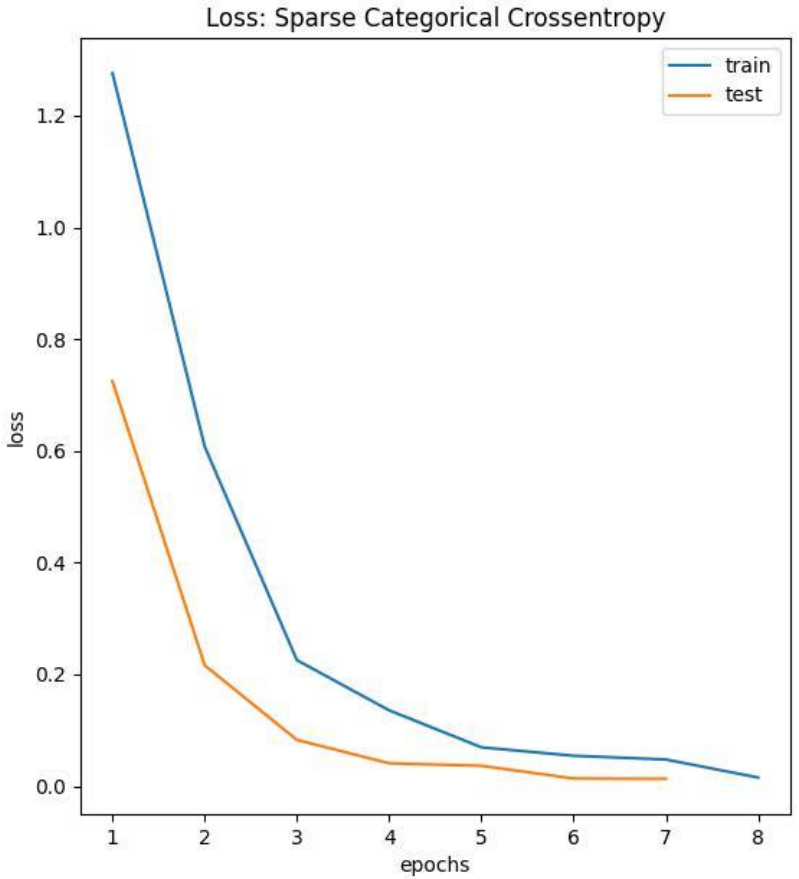

Sparse Categorical Accuracy
train
test
accuracy
epochs
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0
1
2
3
4
5
6

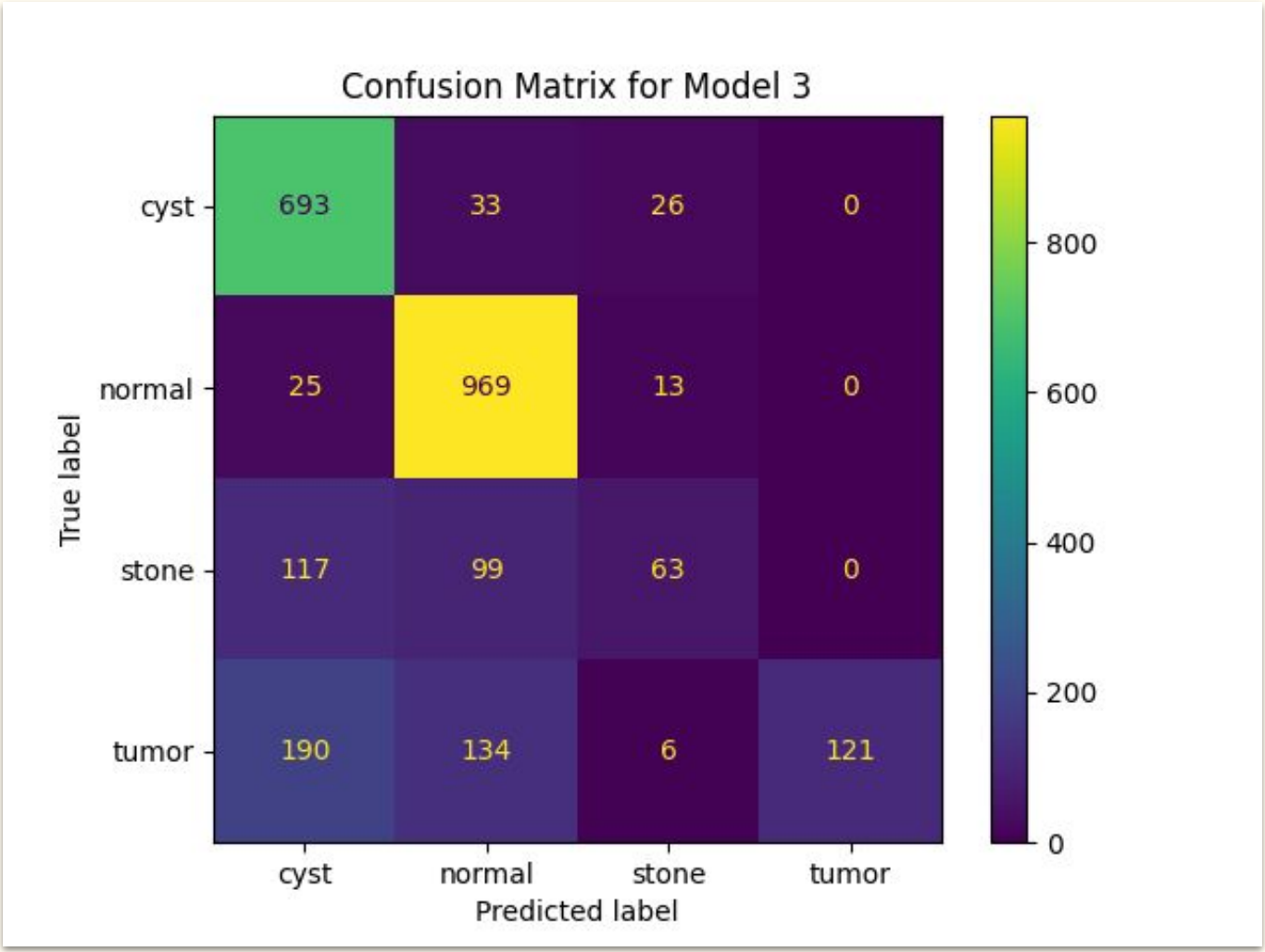

Loss: Sparse Categorical Crossentropy
train
test
loss
epochs
1.0
0.8
0.6
0.4
0.2
0.0
0
1
2
3
4
5
6


Confusion Matrix for Model 2
cyst
normal
stone
tumor
True label
566
3
42
141
0
938
0
69
27
110
106
36
10
88
0
353
cyst
normal
stone
tumor
Predicted label
800
600
400
200
0

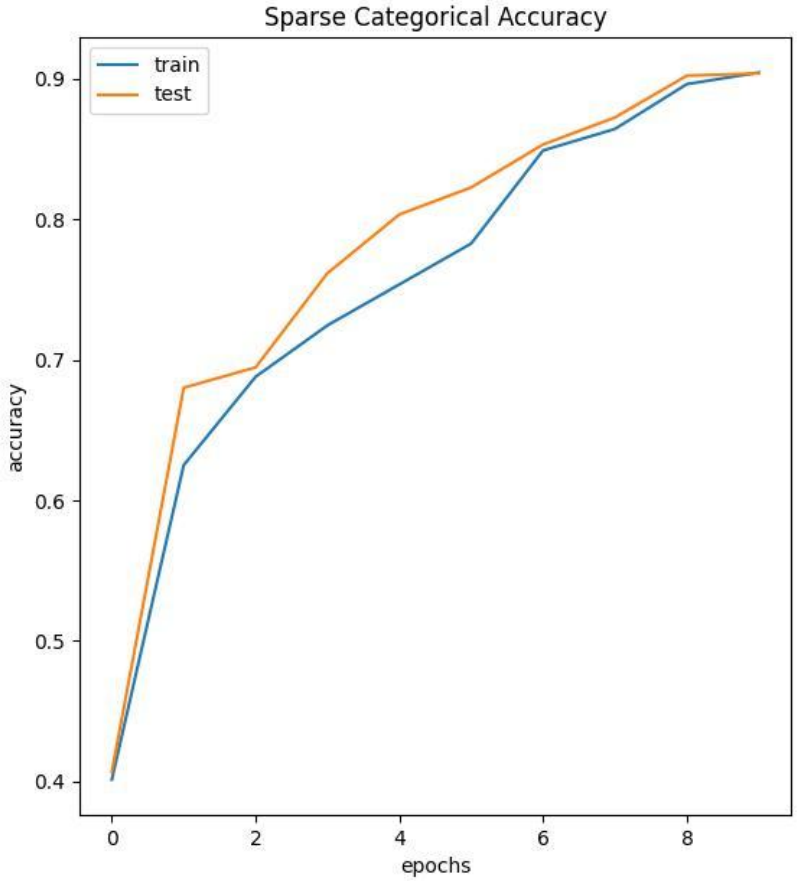
Model 3

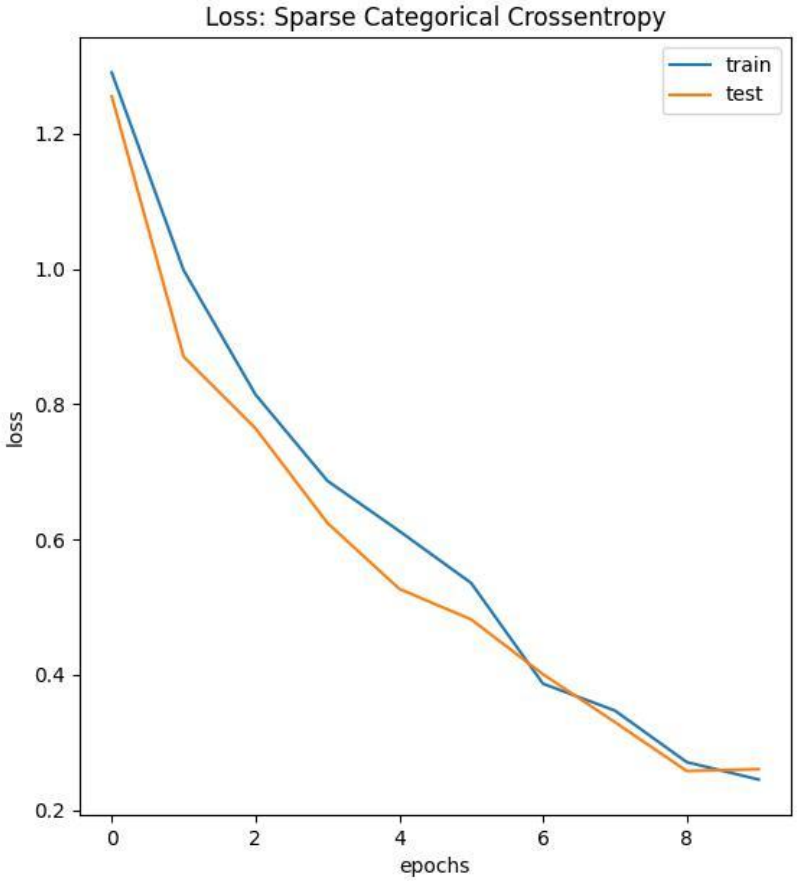

Sparse Categorical Accuracy
train
test
accuracy
epochs
1.0
0.9
0.8
0.7
0.6
0.5
0.4
1
2
3
4
5
6
7
8

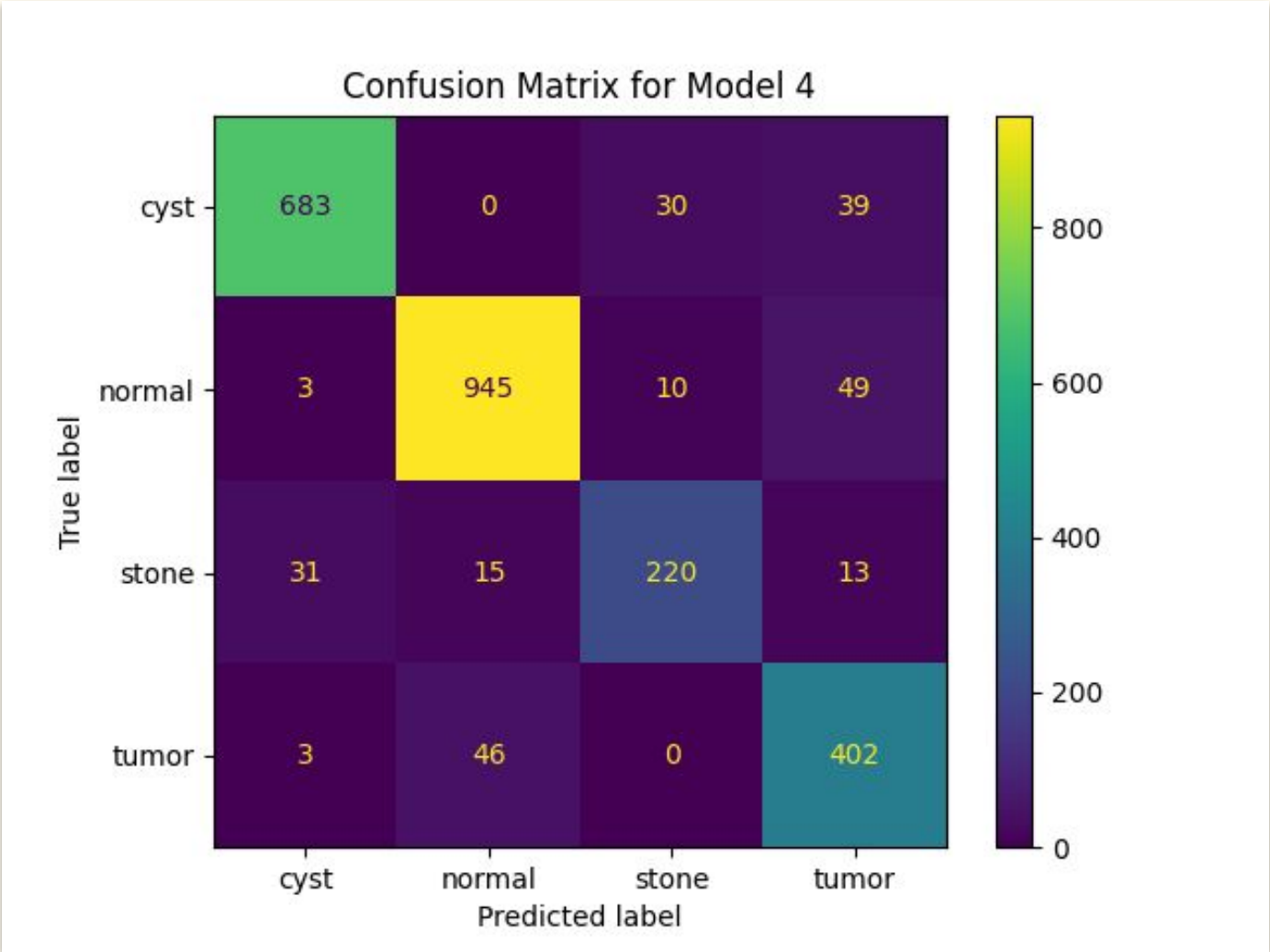

Loss: Sparse Categorical Crossentropy
train
test
loss
epochs
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1
2
3
4
5
6
7
8


Confusion Matrix for Model 3
cyst
normal
stone
tumor
True label
693
33
26
0
25
969
13
0
117
99
63
0
190
134
6
121
cyst
normal
stone
tumor
Predicted label
800
600
400
200
0

Model 4: Changing Learning Rate






Confusion Matrix for Model 4
cyst
normal
stone
tumor
True label
683
0
30
39
3
945
10
49
31
15
220
13
3
46
0
402
cyst
normal
stone
tumor
Predicted label
800
600
400
200
0

Statistics

Model	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Summary	Base	More layers	Dropouts	Variable learning rate
Accuracy	88.6%	78.9%	74.2%	90.4%
Precision	90.4%	80.4%	76.8%	90.6%
Recall	88.6%	78.9%	74.2%	90.4%
F1-Score	87.8%	78.4%	69.9%	90.4%

Conclusions

- Convolution blocks most important
- Not ready for implementation
- Need a serious server and backup battery

Thanks!