



“Fission detection in the Active-Target Time Projection Chamber using latent space from PointNet model”



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Physics behind the project

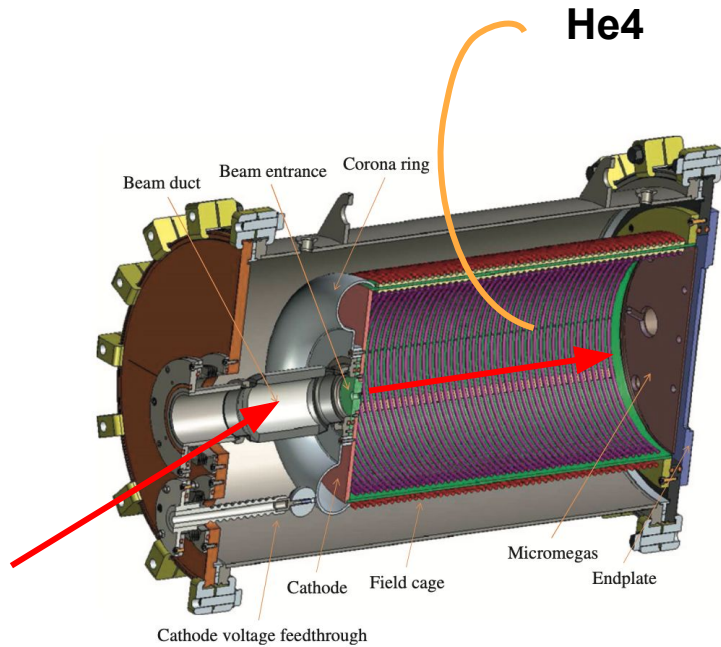


Fig.4 AT-TPC detector

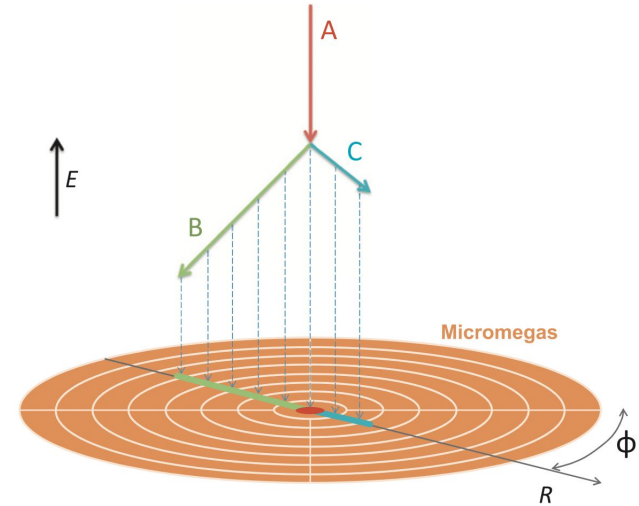


Fig.5 Illustration of tracking.

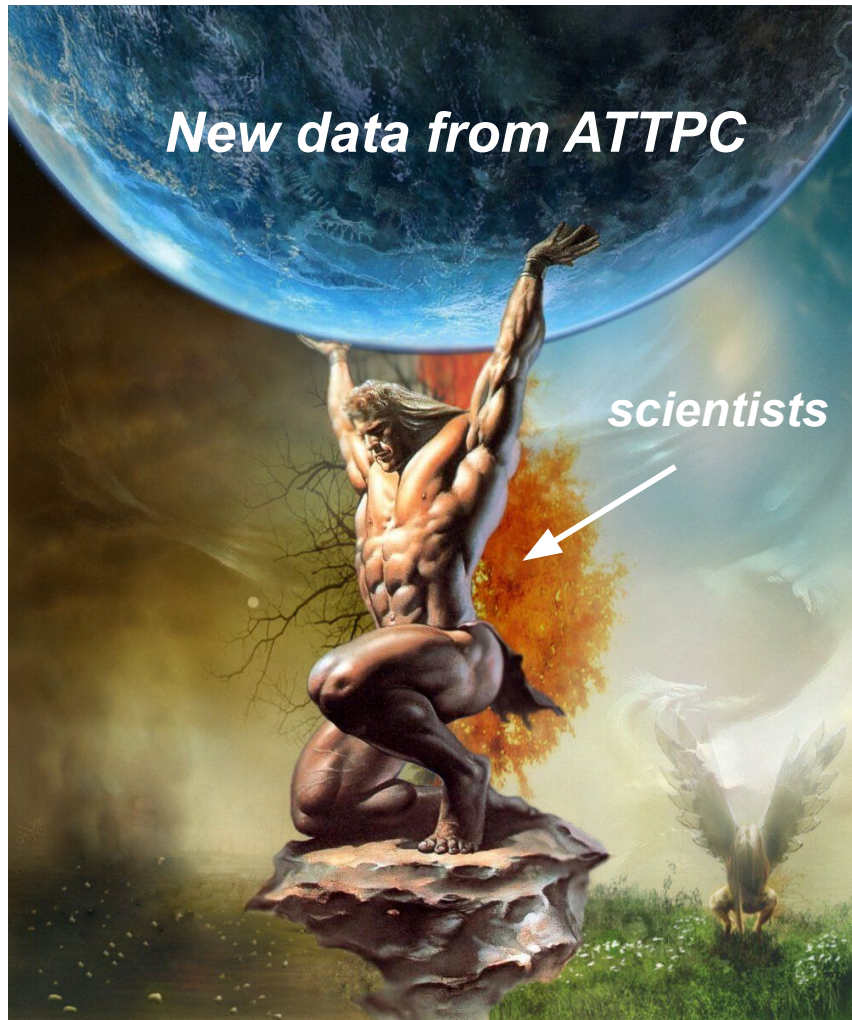
A - beam,

B, C - products of reaction

dashed lines - ionizations electrons

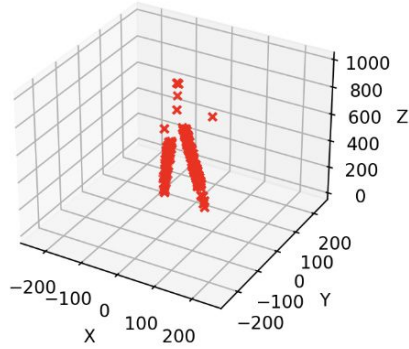
New data from ATTPC

scientists

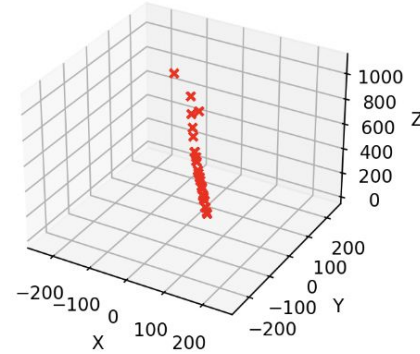


Project goal: event classification

3% Fission



97% non- Fission



Unlabeled data

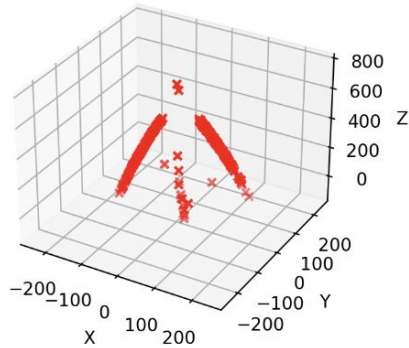


Fig.3 Fission events

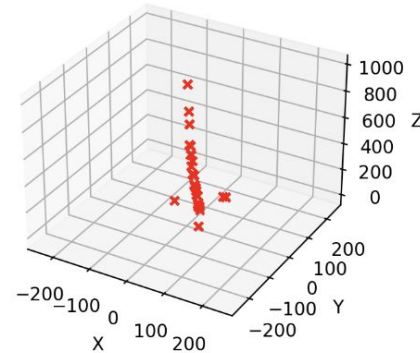
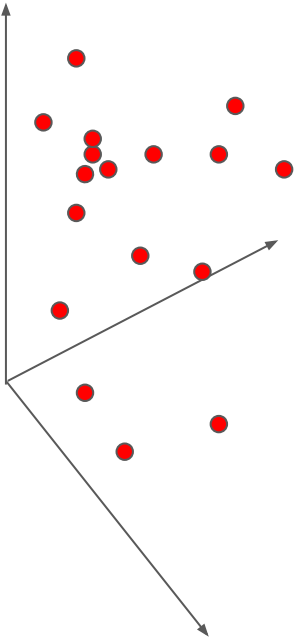


Fig.4 Not fission events

Road Map

Raw Data



PointNet

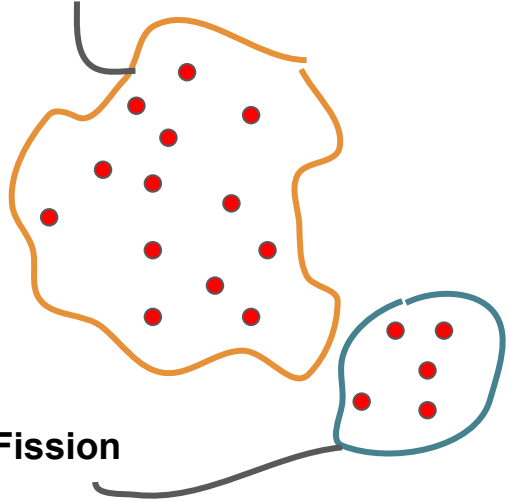
Latent Space

12
65
21
.
.
.
12
0
8

n-dimensional vector

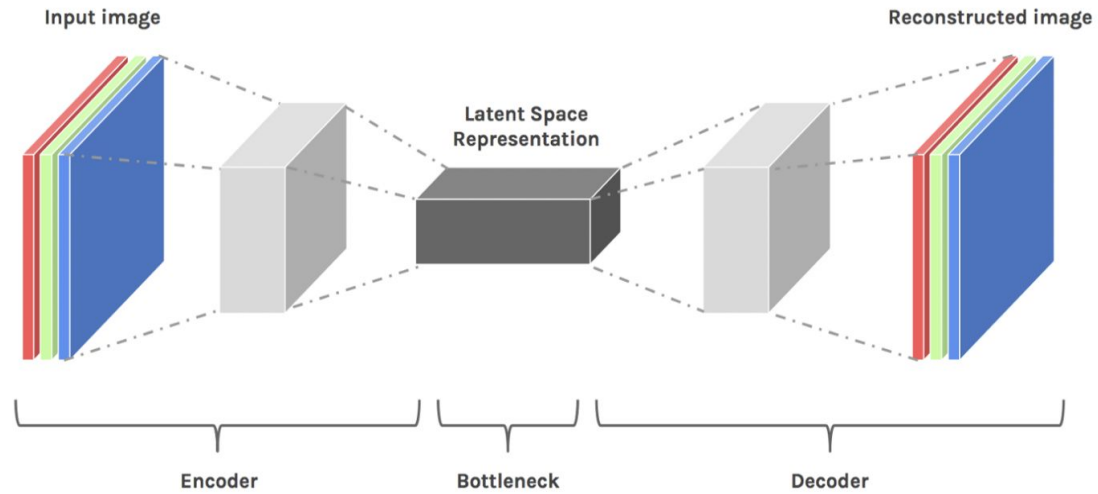
SVM

non-Fission



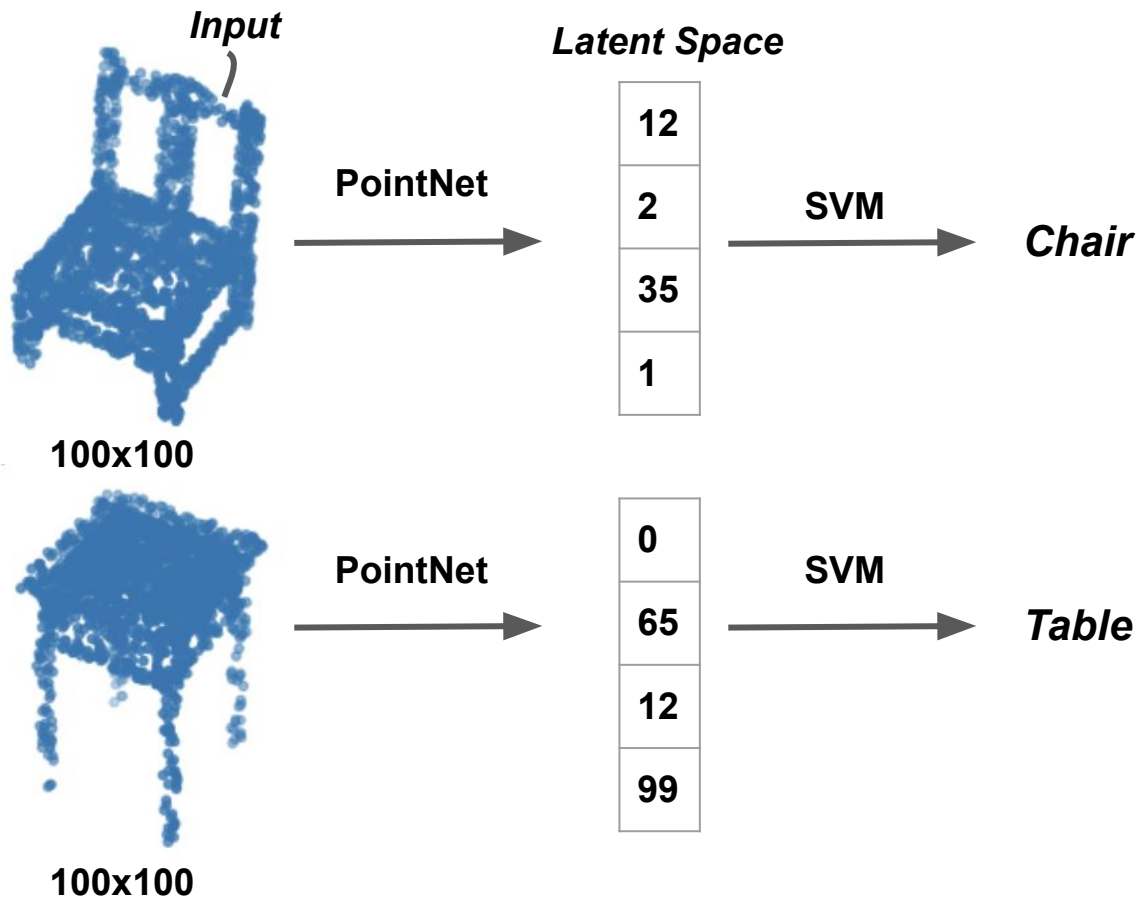
Fission

Latent Space



picture from: Faust 2013

Latent Space

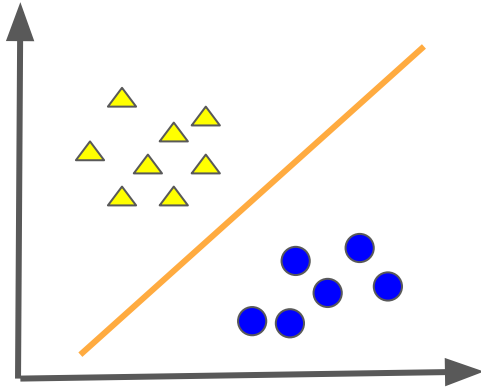


***Some representation of the latent space
from our experiment***



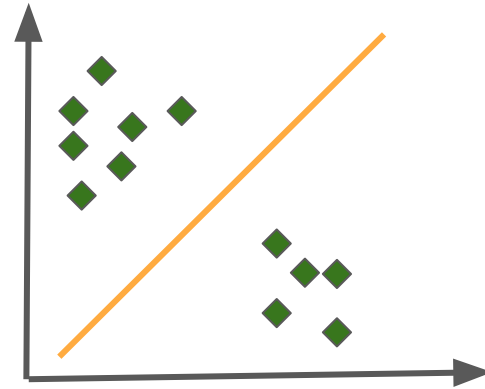
SVM(Support Vector Machine)

Supervised



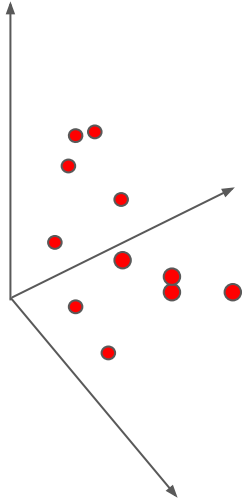
Two class SVM

Unsupervised

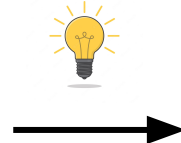
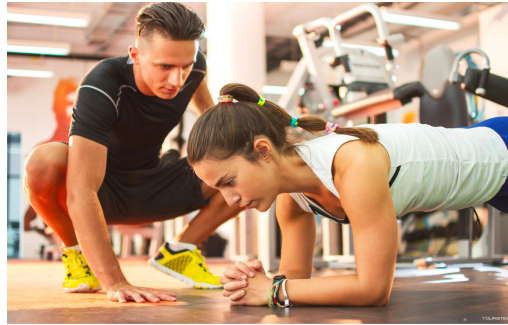


One class SVM

Unlabeled point cloud

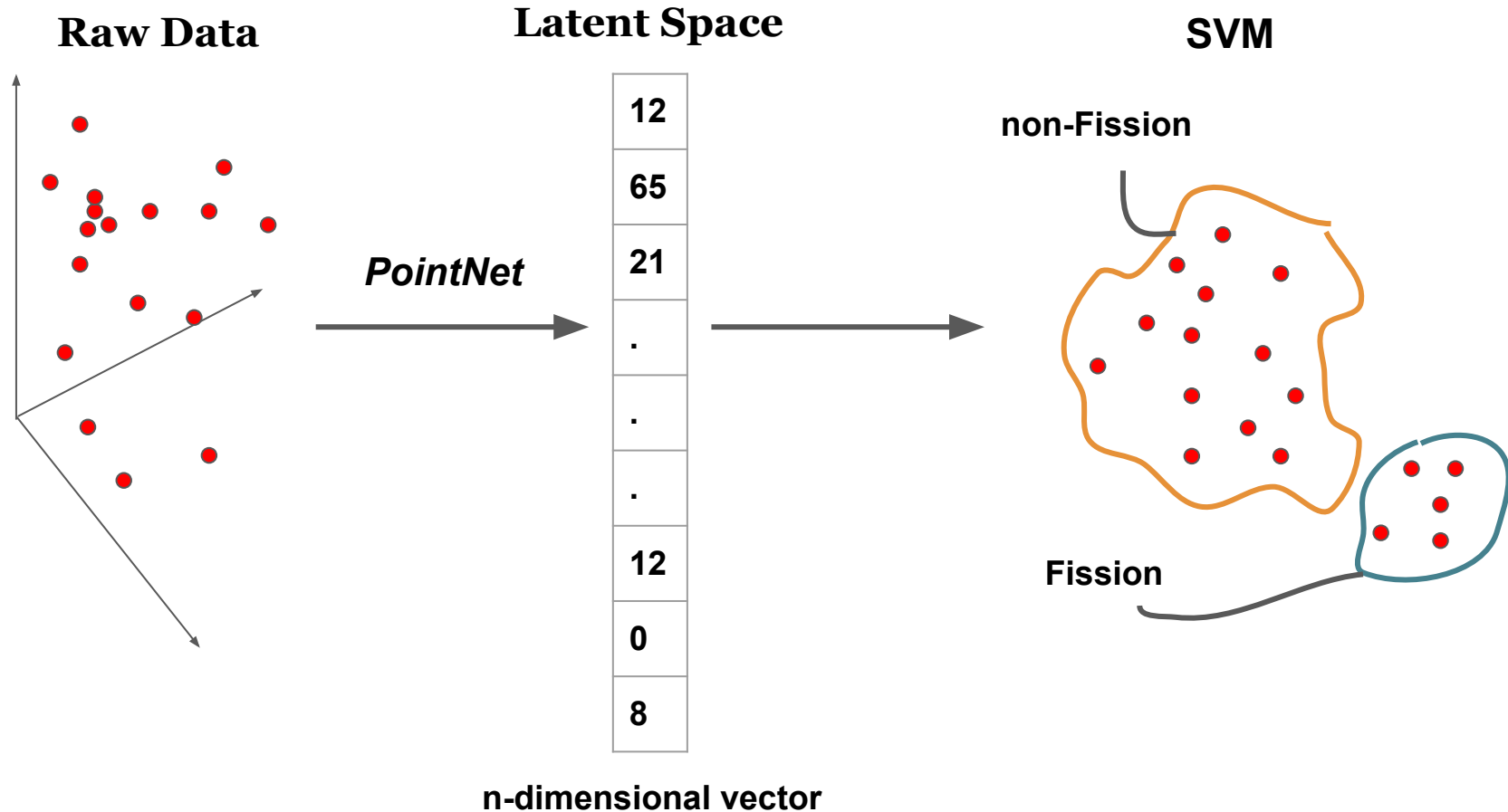


We can't train the model



Use already trained model

Road Map



What is PointNet model?

Classification Network

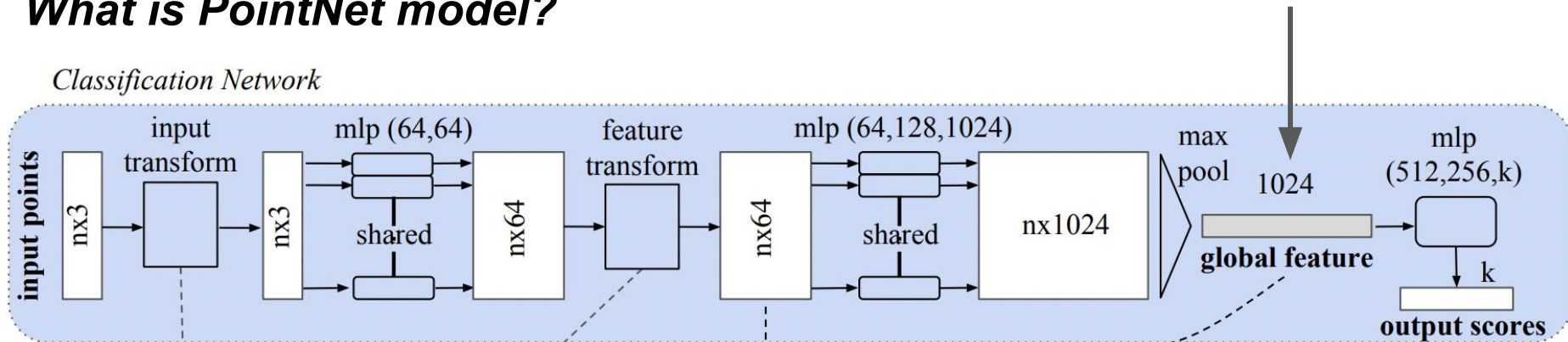
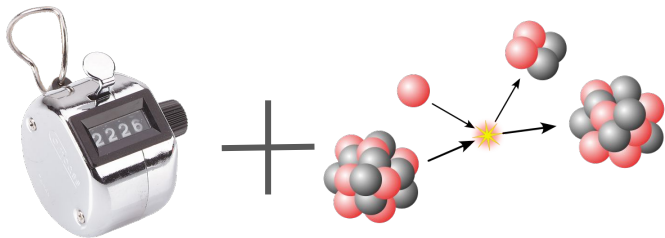


Fig.8 PointNet Architecture

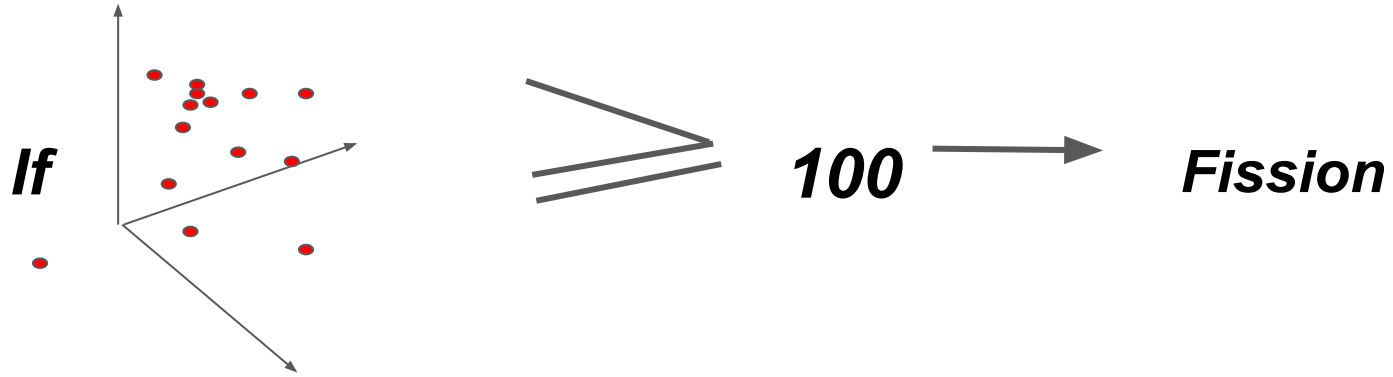
Model A



Model B



Validation of the Results



16
168
202
48
99



0
1
1
0
0

Results for Model A

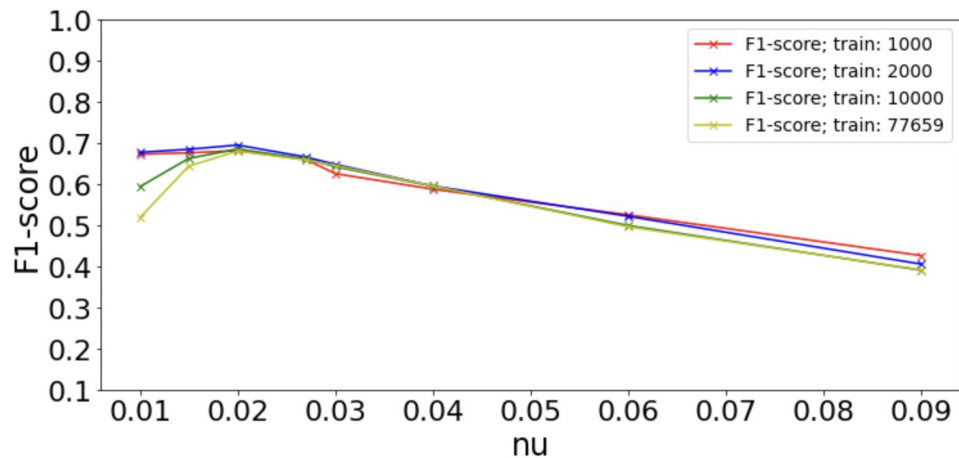


Fig.9 F1-score(nu)

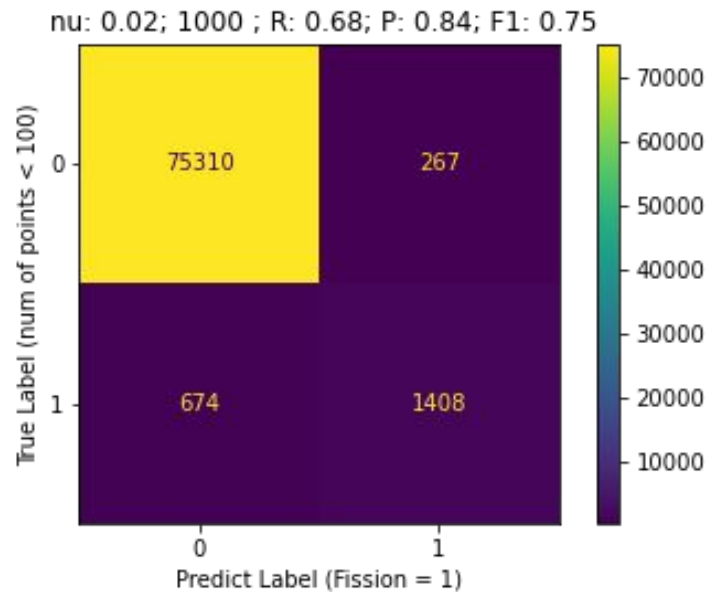


Fig.10 Best confusion matrix for model A

Results for Model B

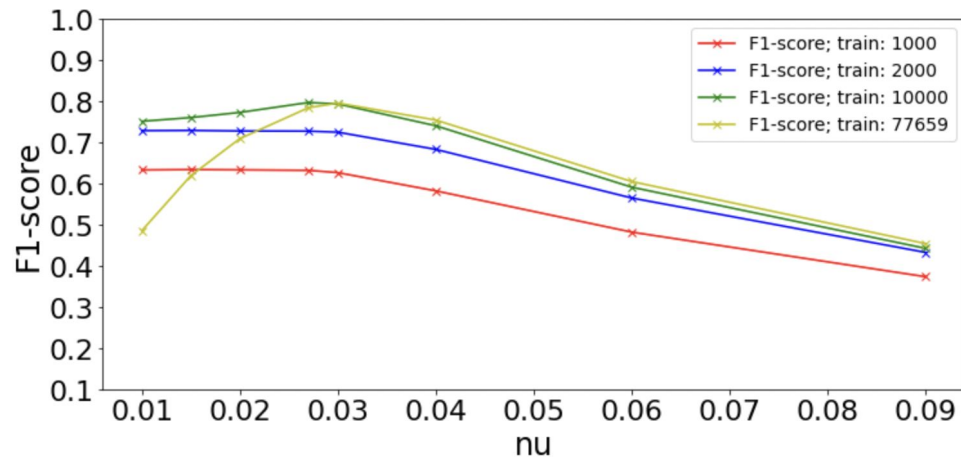


Fig.11 F1-score(ν)

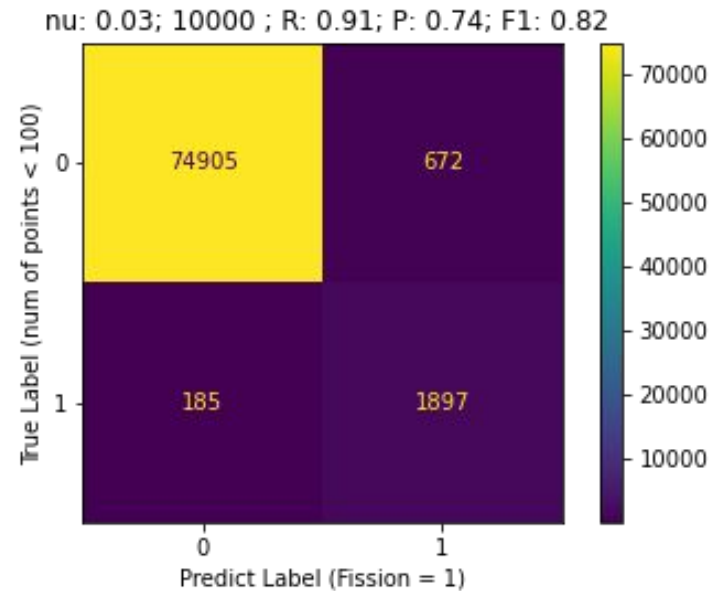


Fig.12 Best confusion matrix for model B

Comparing the Results

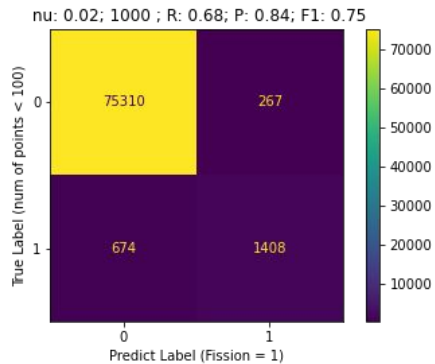


Fig.13 Best confusion matrix for model A

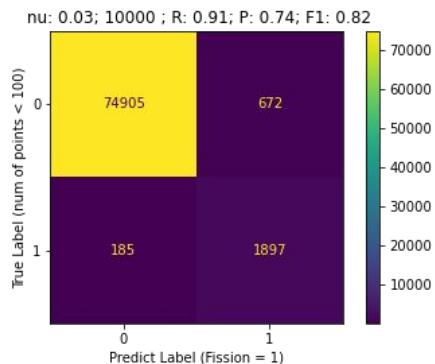


Fig.14 Best confusion matrix for model B

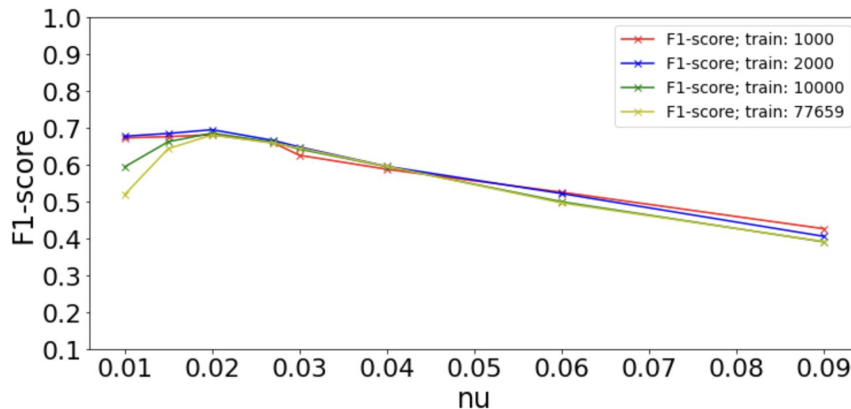


Fig.15 F1-score(nu), Model A

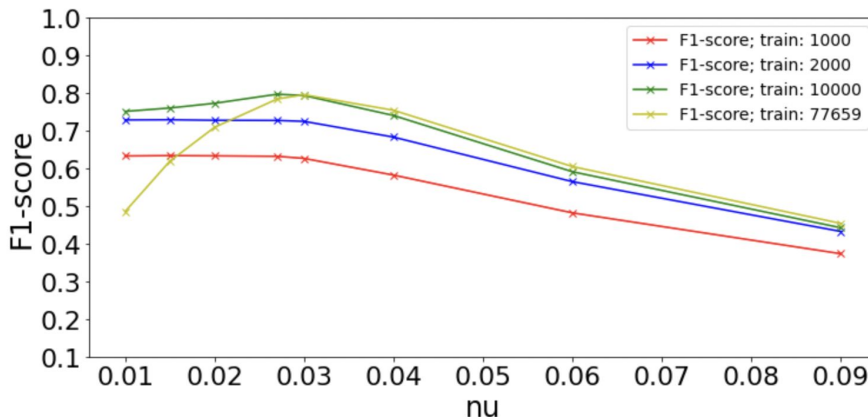


Fig.16 F1-score(nu), Model B

Acknowledgments



Alpha group meeting

bugs

Acknowledgments

