

# Preoperative non-invasive grading of parotid gland cancer malignancy using radiomic MR features

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## INTRODUCTION

The malignancy grade of parotid gland cancer (PGC) can be assessed using fine needle aspiration cytology (FNAC) <sup>1</sup>. However, wide experience levels of the pathologists could lead to the intra- and inter-observer variabilities of FNAC results <sup>2</sup>. Therefore, more accurate approaches are required for the diagnosis of PGC malignancy grade.

## AIM

To develop non-invasive grading models of PGC malignancy based on radiomic features in preoperative magnetic resonance (pMR) images using five conventional machine learning (cML) and five deep convolutional neural network (DCNN).

## METHOD

**Cases:** 39 PGC patients (High grade: 20 cases, Intermediate/low grades: 19 cases)

**Images:** 849 preoperative MR images (T1WI and T2WI)

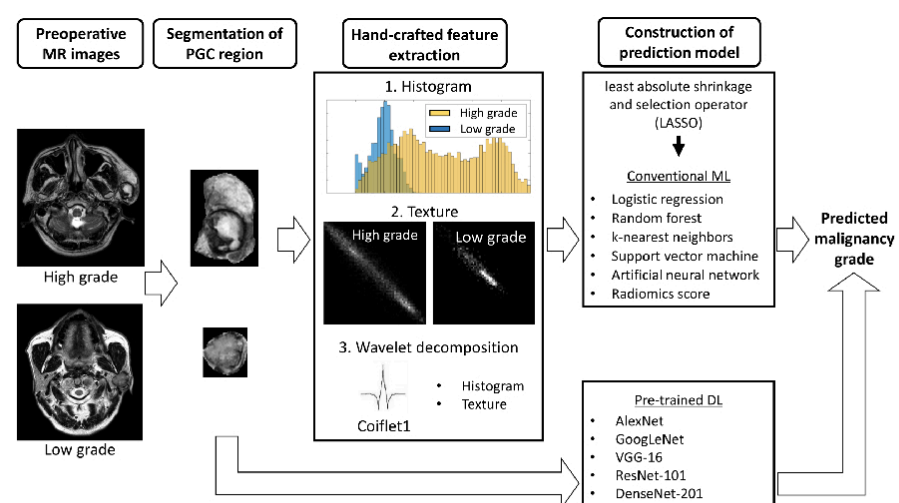


Fig.1 Overall scheme.

## RESULTS

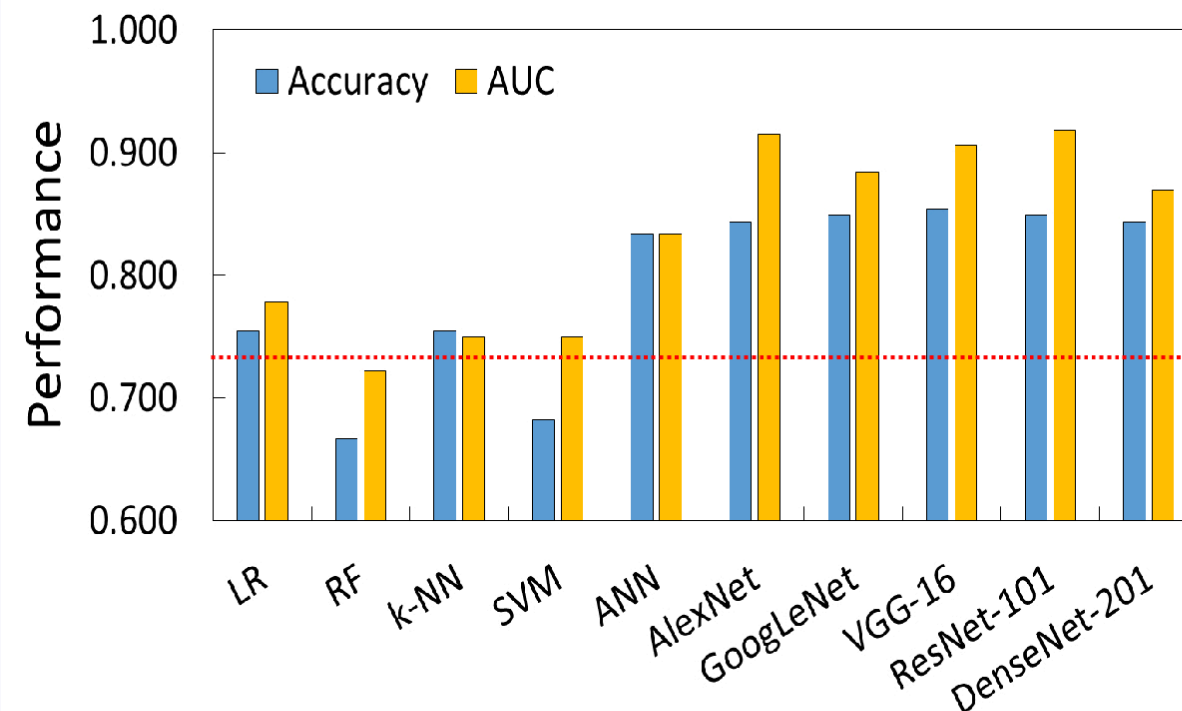


Fig.2 Accuracies and area under the receiver operating characteristic curves (AUCs) of 10 malignancy grading models for PGC based on radiomics.

Model	Accuracy	AUC	Sensitivity	Specificity
LR	0.750	0.778	<b>0.833</b>	0.667
RF	0.667	0.722	0.667	0.667
k-NN	0.750	0.750	<b>0.833</b>	0.667
SVM	0.667	0.750	<b>0.833</b>	0.500
ANN	0.833	0.833	<b>0.833</b>	0.833
AlexNet	0.844	0.890	0.717	<b>1.000</b>
GoogLeNet	0.849	0.884	0.726	<b>1.000</b>
VGG-16	<b>0.854</b>	0.911	0.736	<b>1.000</b>
ResNet-101	0.849	<b>0.918</b>	0.736	0.988
DenseNet-201	0.844	0.862	0.792	0.907

LR: logistic regression, RF: random forest, k-NN: k-nearest neighbor, SVM: support vector machine, ANN: artificial neural network, AUC: area under receiver operating characteristic curve

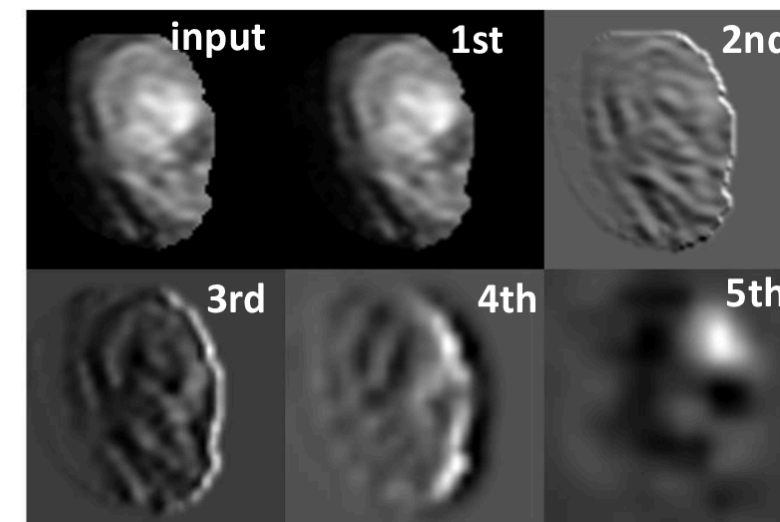


Fig.3 Activation images of each convolutional layer in VGG16.

VGG-16-based model demonstrated the best prediction performance among the 10 models.

All DCNN-based malignancy grading models showed the higher accuracy than the conventional histological diagnosis approach by FNAC of 73.7% in our hospital.

## CONCLUSIONS

The VGG-16-based model could be feasible for noninvasively grading of PGC malignancy using pMR images.

## REFERENCES

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## ACKNOWLEDGEMENTS

This work was supported by the Japan Society for the Promotion of Science (JSPS) KAKENHI Grant Number JP17K15808.

The authors express their gratitude to all members of the Arimura Laboratory (<http://www.shs.kyushu-u.ac.jp/~arimura>) for their valuable comments and helpful discussion.

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