EVALUATION OF BRATS 2021 WINNG MODEL

FINAL PRESENTATION

TEAM

Filip Szlingiert

Krzysztof Tkaczyk

Michał Zajączkowski

MOTIVATIONS

BraTS 2021 challenge - focuses on the evaluation of state-of-the-art methods for (Task 1) the segmentation of intrinsically heterogeneous brain glioblastoma sub-regions in mpMRI scans

There is a problem in that **MRI images vary significantly from hospital to hospital** and models learned from examples from one hospital may give **completely different results** on images from another hospital

RESEARCH QUESTIONS

Can the winning model from the BRATS 2021 challenge perform equally well on datasets from BRATS Africa and BRATS 2023?

How does the size of detected tumors affect the model's performance on these new datasets?

LITERATURE REVIEW

- **"How we won BraTS 2023 Adult Glioma challenge? Just faking it! Enhanced Synthetic Data Augmentation and Model Ensemble for brain tumour segmentation"** - https://arxiv.org/abs/2402.17317

- **"Assessing Versatile Machine Learning Models for Glioma Radiogenomic Studies across Hospitals"** - https://www.researchgate.net/publication/353260272_Assessing_Versatile_Machine_Learning_Models_for_Glioma_Radiogenomic_Studies_across_Hospitals

- **"Optimizing Brain Tumor Segmentation with MedNeXt: BraTS 2024 SSA and Pediatrics"** - https://arxiv.org/abs/2411.15872

METHODOLOGY

For our experiments, we used the pre-trained model released by the
BRATS 2021 challenge winners.
 Rather than retraining, we directly evaluated this model's generalization
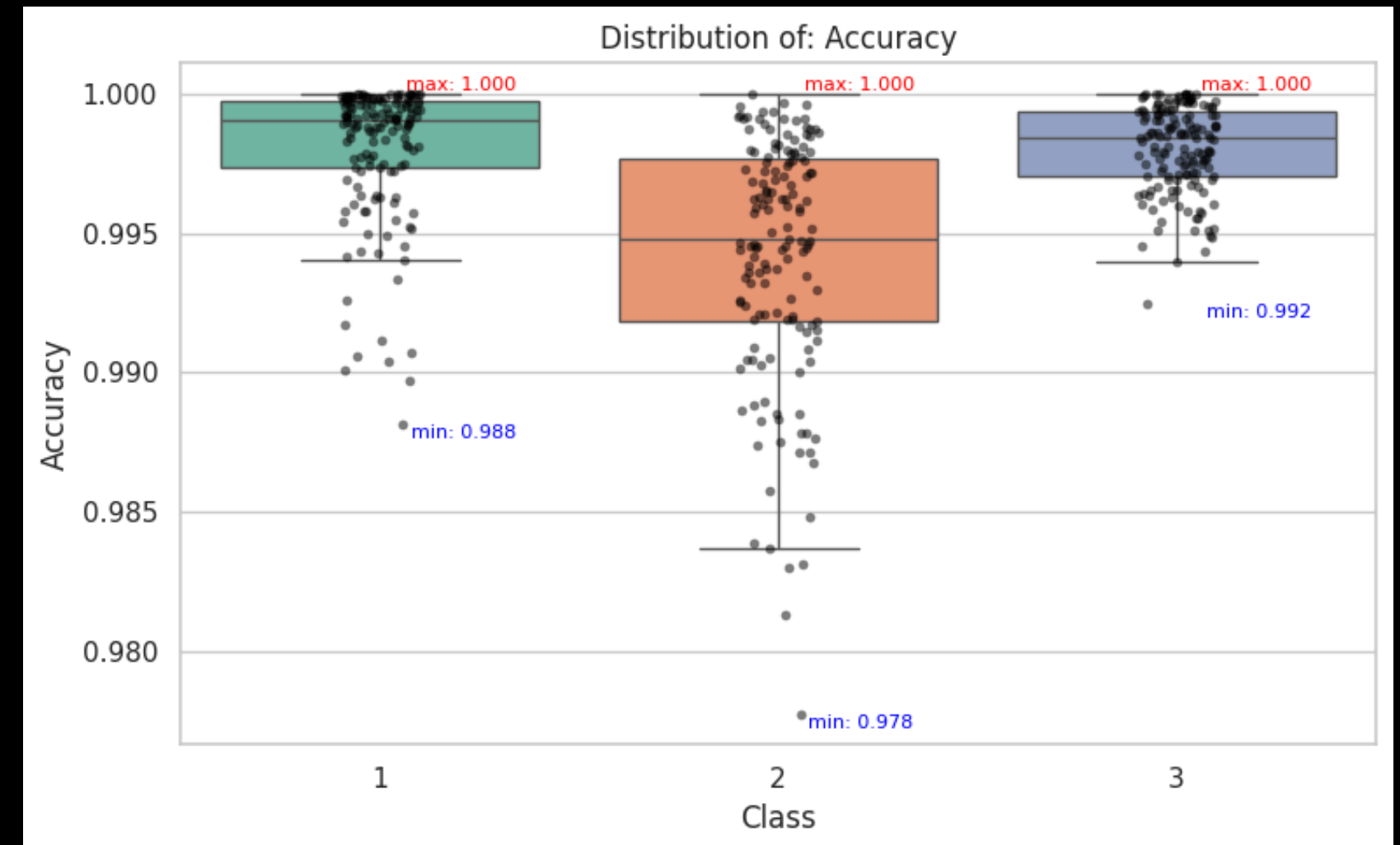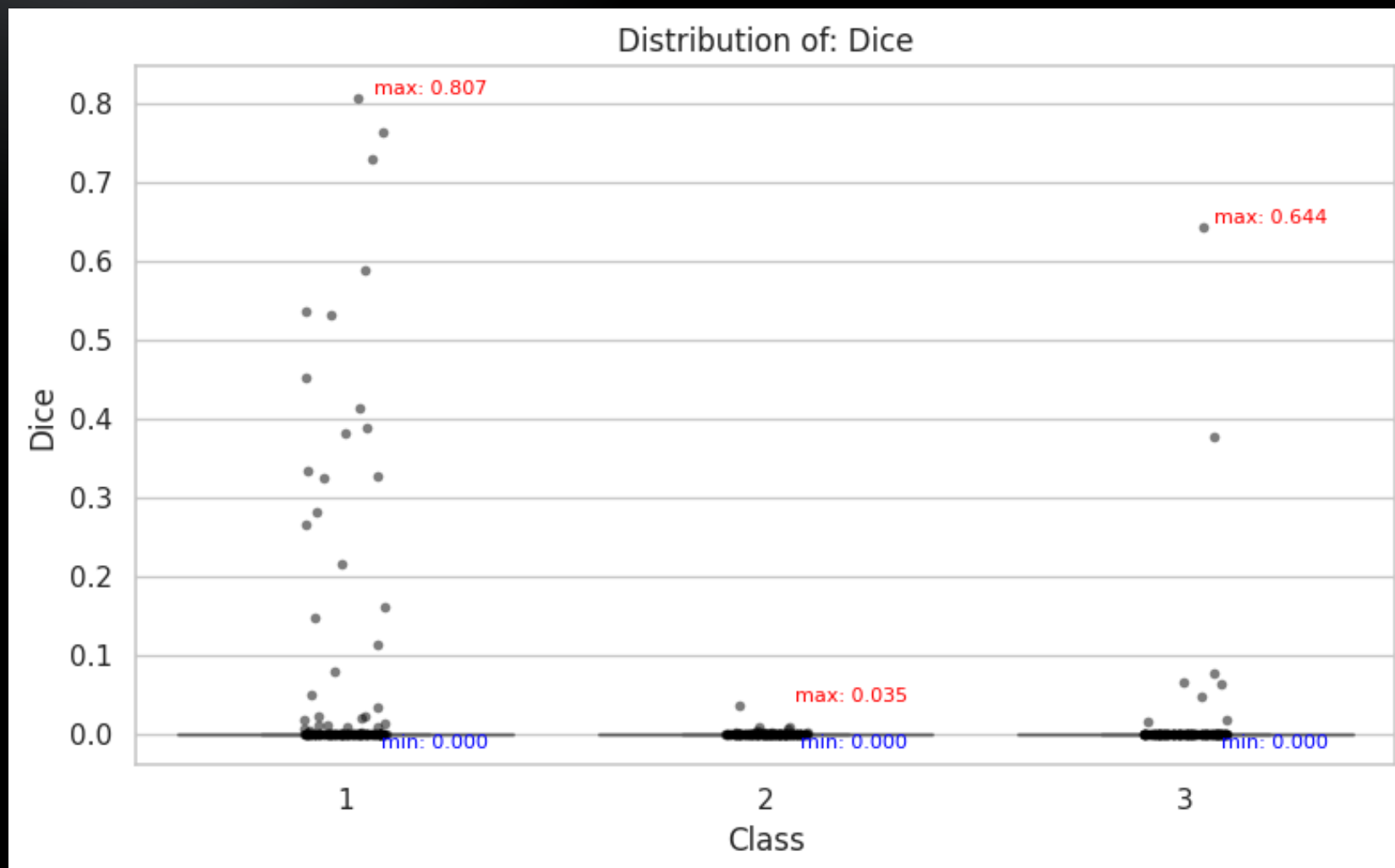capabilities on new, unseen datasets.

- We obtained the pre-trained segmentation model provided by the
  original authors.
- We downloaded two external datasets from Synapse:
  - BRATS Africa
  - BRATS 2023
- The model was then run inference on these datasets without any
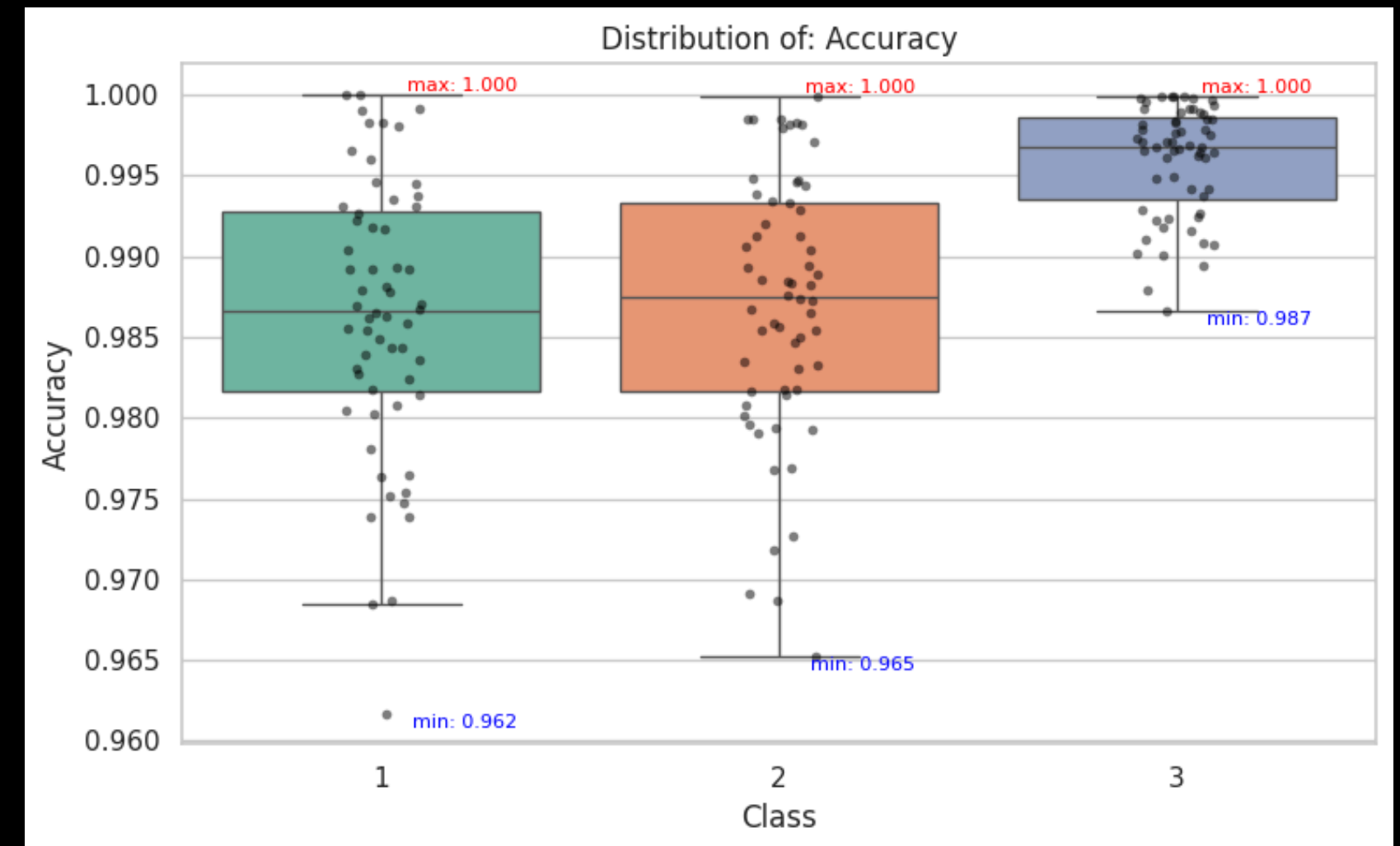 fine-tuning or additional training.
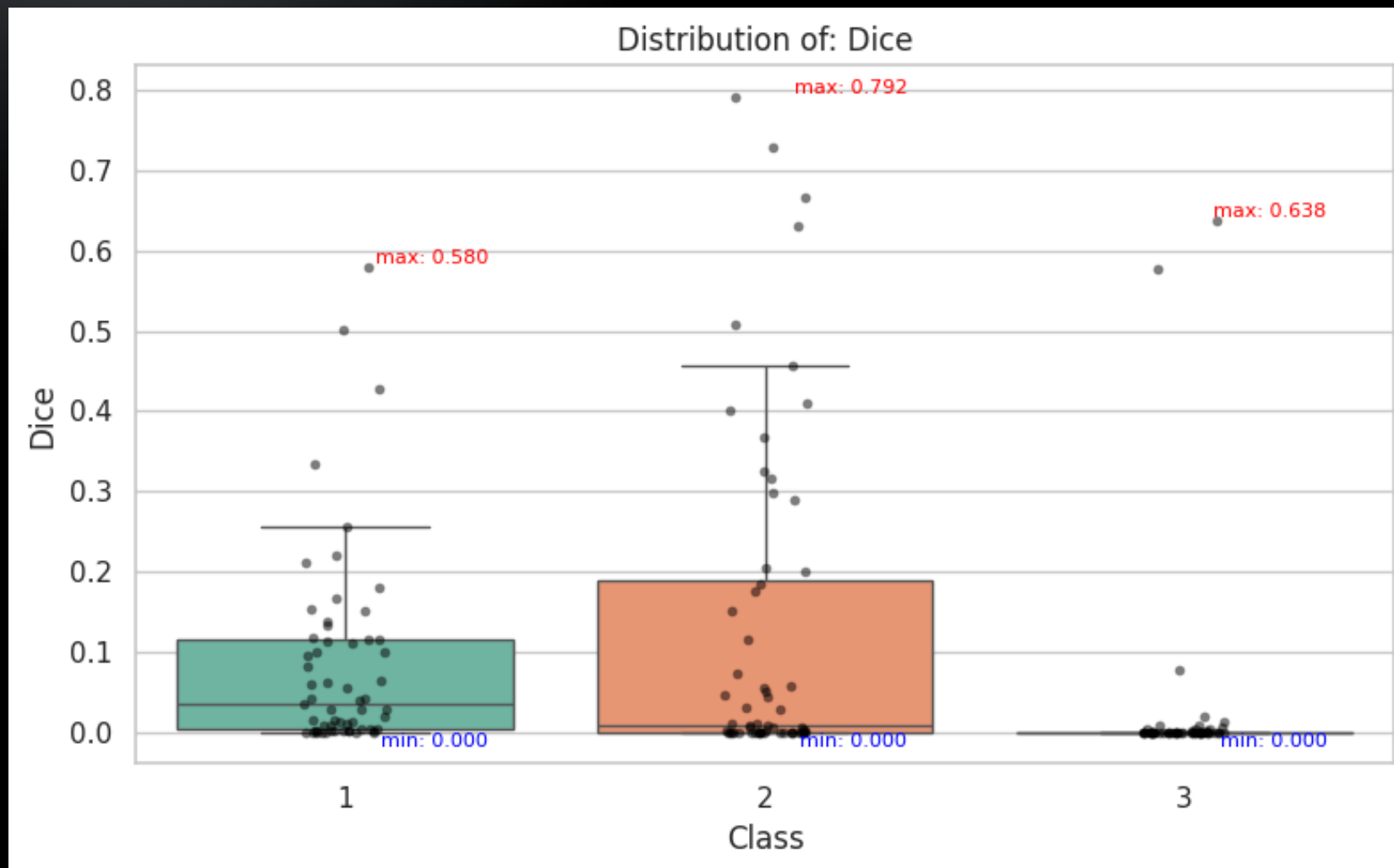
OVERALL RESULTS ON NEW DATA

DATASET	CLASS	AVG DICE
BraTS 2021 - Paper	enhancing tumour	0,882
	tumour core	0,926
	whole tumour	0,938
BraTs 2023 - Train	enhancing tumour	0,008
	tumour core	0,019
	whole tumour	0,108
BraTs Africa - Train	enhancing tumour	0,023
	tumour core	0,214
	whole tumour	0,782

DATASET	CLASS	AVG DICE
BraTS 2023	endema	0,055
	enhancing tumour	0,000
	non-enhancing tumor	0,009
BraTs Africa	endema	0.0997
	enhancing tumour	0.0110
	non-enhancing tumor	0.0000

BRATS 2023 DATASET

BRATS AFRICA DATASET

class	Accuracy	Dice
2	0.998517	0.791635
1	0.990441	0.000117
3	0.999881	0.000000
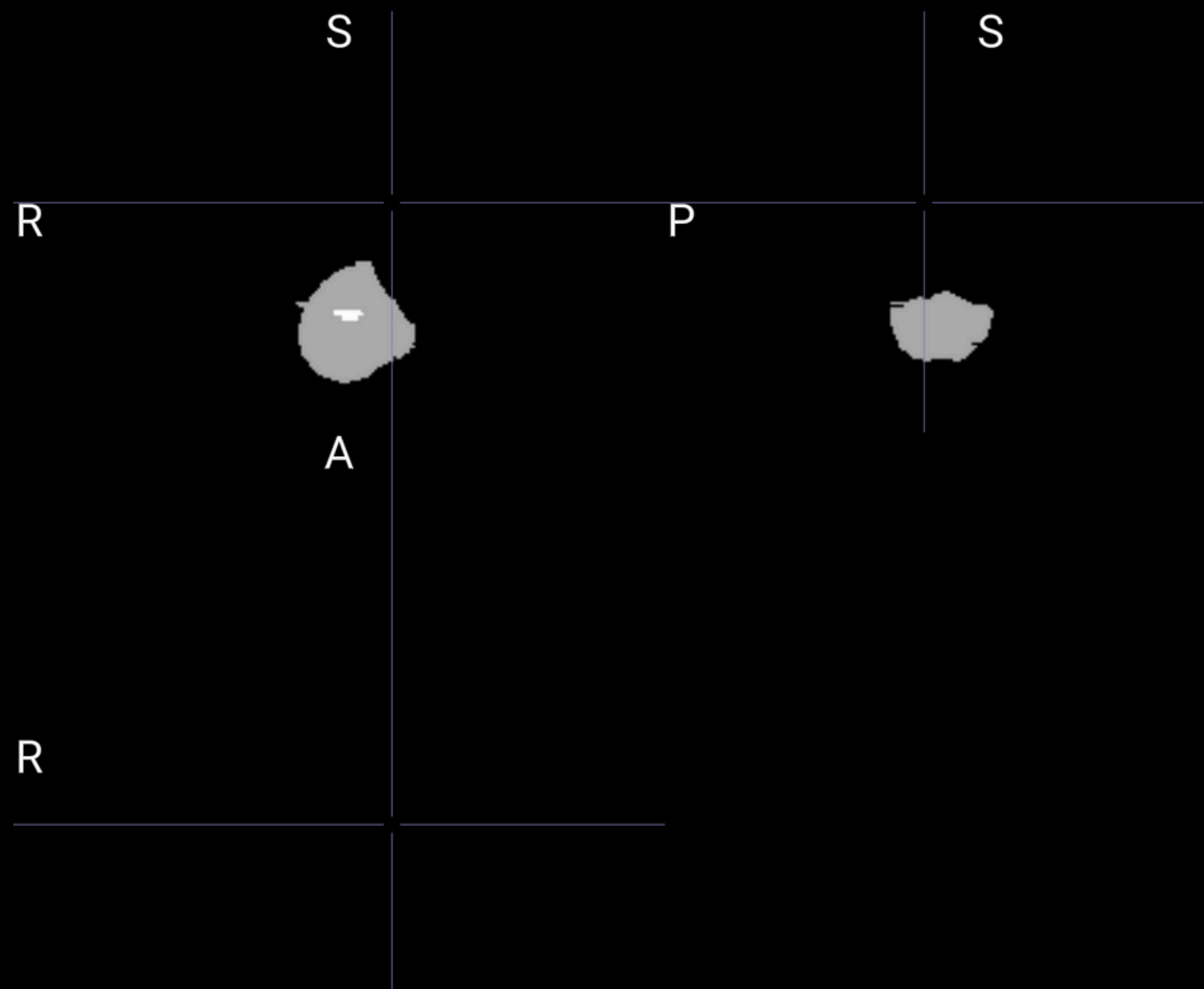
TUMOR SIZE VS PREDICTION QUALITY

Dice score vs % of image volume occupated by class

CONCLUSION