

Automated classification of glioma treatment response: benchmarking via modality selection and coarse tumor detection

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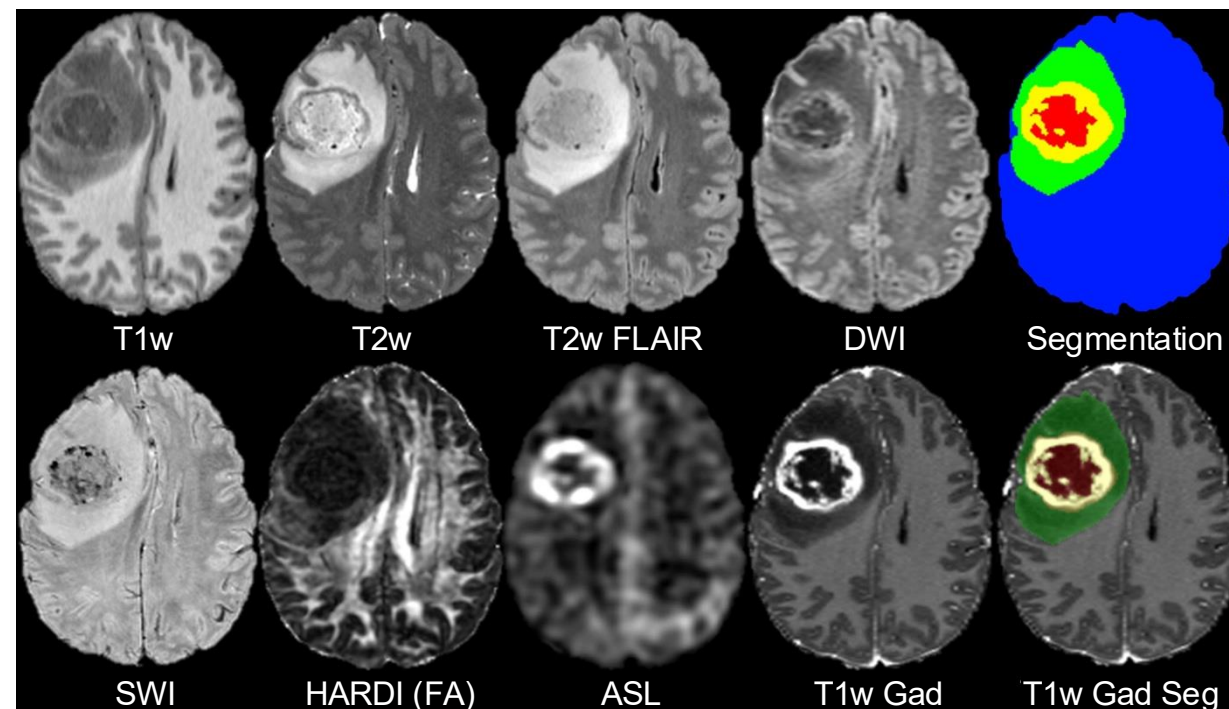
Introduction - Glioblastoma

➡ Prevalence: ~3/100 000 per year¹

➡ Poor prognosis²

- Average survival: 9 months
- 41% survival after 1 years
- 13% survival after 2 years

➡ Frequent MRI scans to assess treatment



Glioblastoma on different MRI modalities

Response Assessment
in Neuro-Oncology
(RANO) criteria³

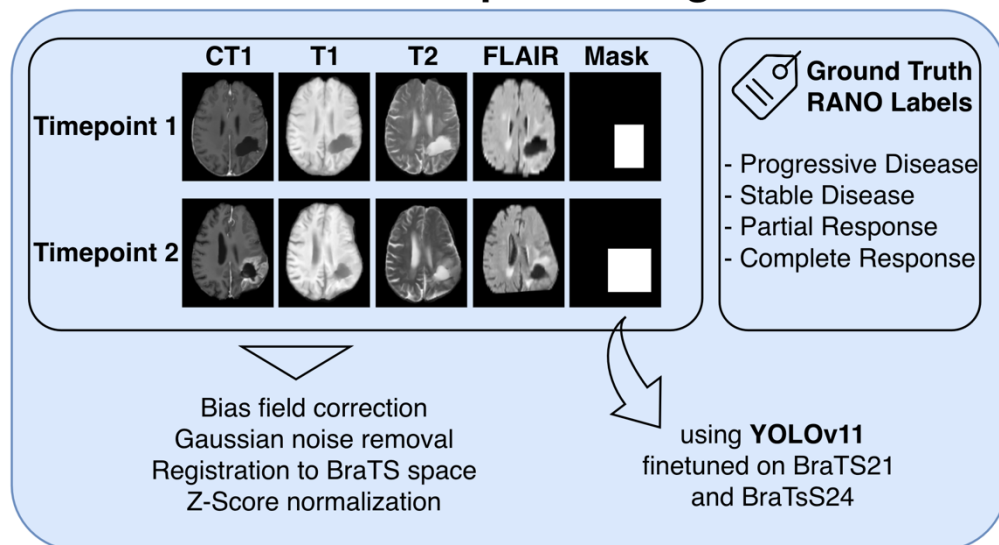
Complete Response
Partial Response
Stable Disease
Progressive Disease



GOAL: To compare the use of **different modalities** and the use of a **tumor detection model** for the automatic classification of **RANO criteria**

Methods

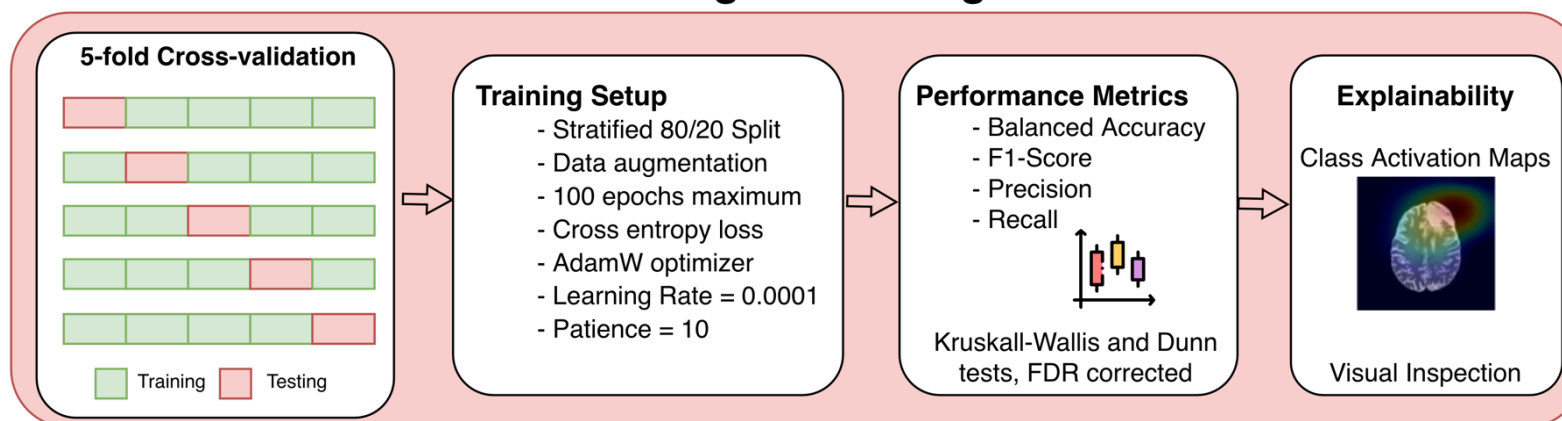
Data Preprocessing



Data Selection

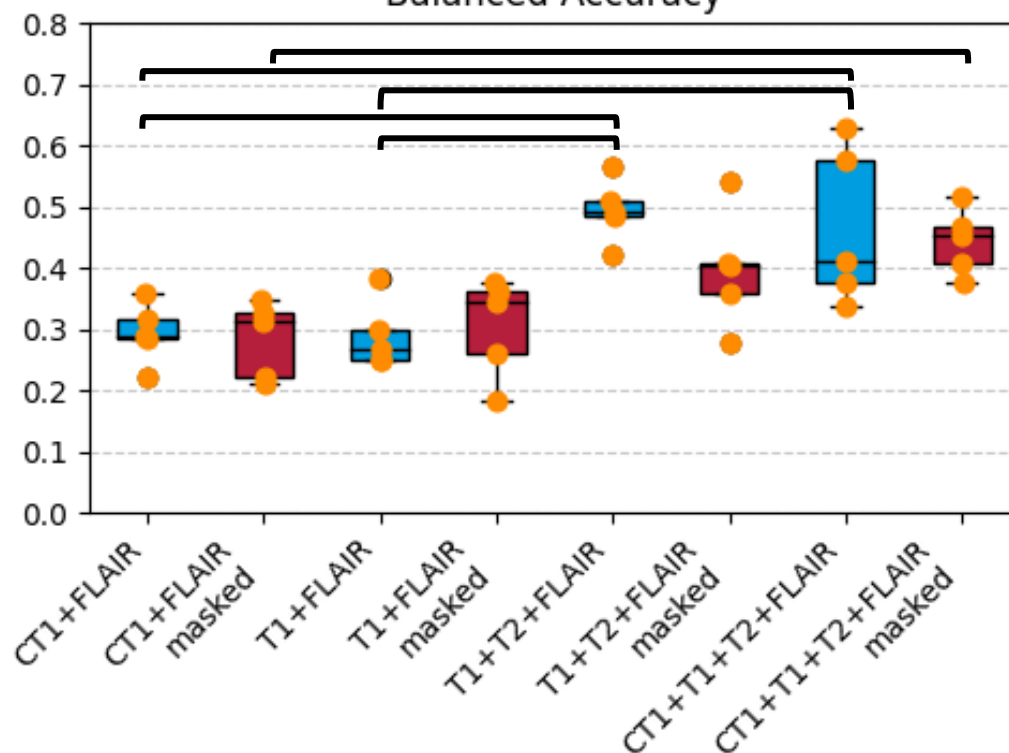
Modality Combinations	Number of timepoints	Classes Distribution			
CT1+T1+T2+FLAIR	337	228	66	20	23
T1+T2+FLAIR	338	229	66	20	23
T1+FLAIR	338	229	66	20	23
CT1+FLAIR	344	235	66	20	23

Training and Testing



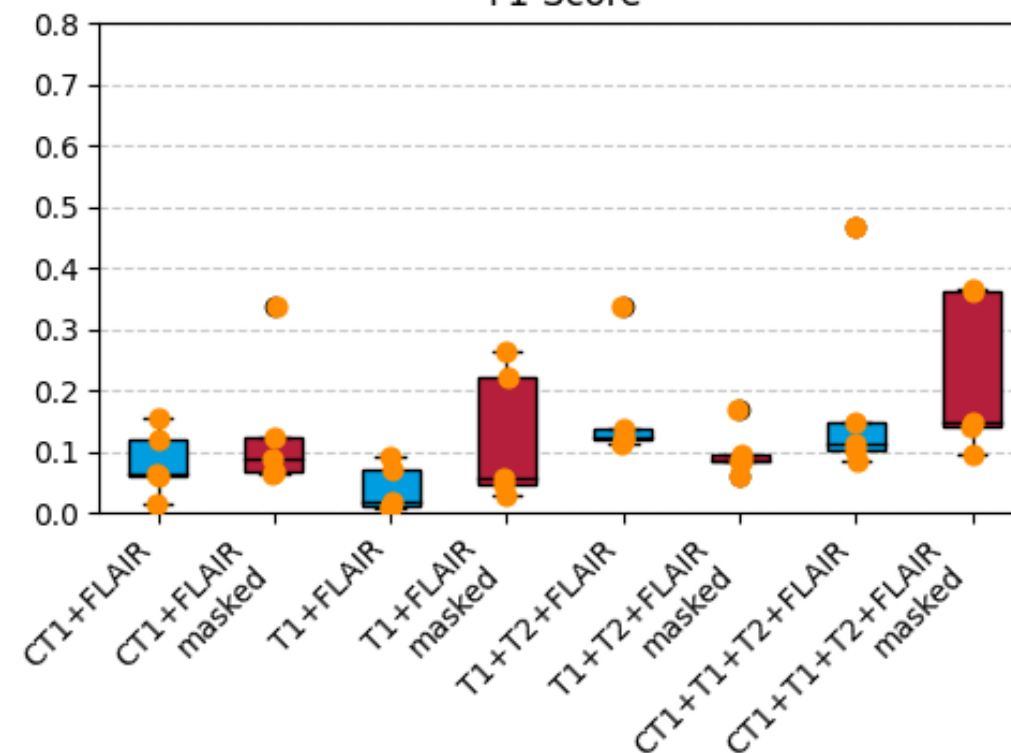
Results and Discussion

Balanced Accuracy



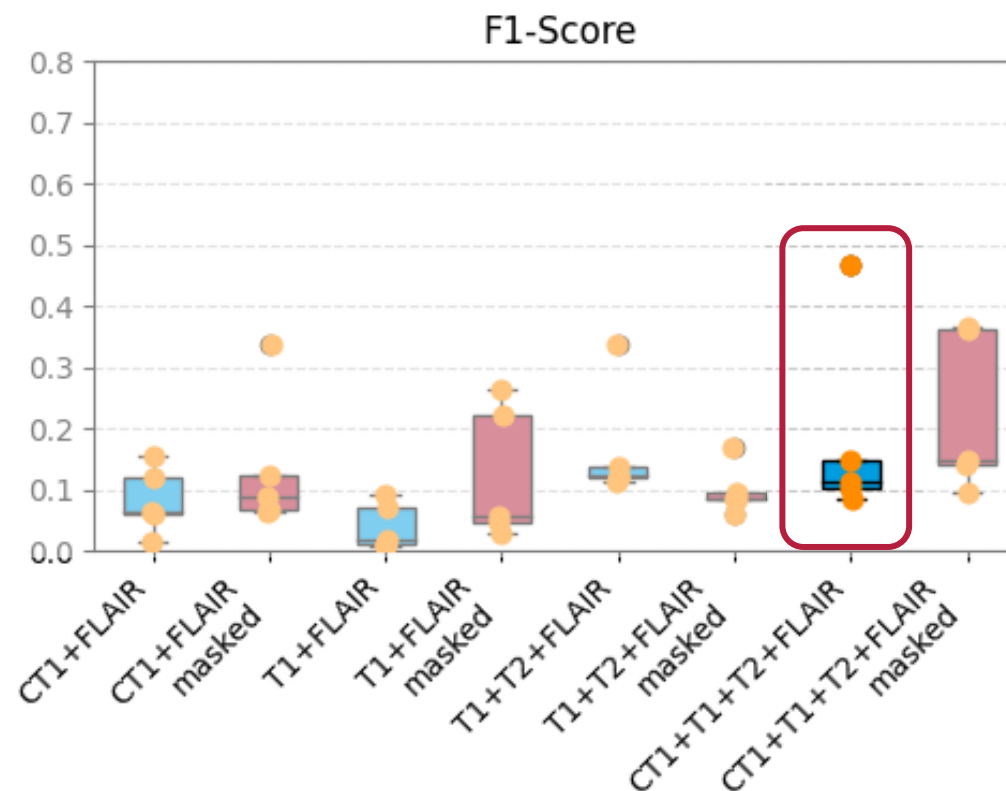
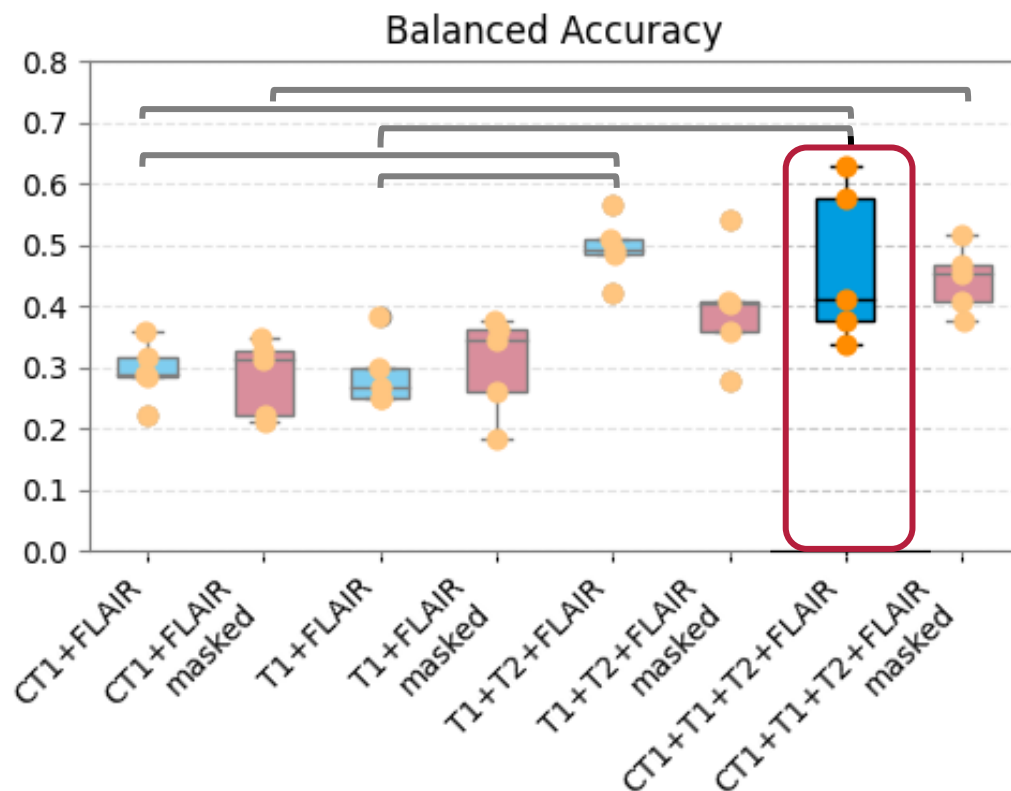
Significant results highlighted with brackets ■ Unmasked ■ Masked

F1-Score



Results and Discussion

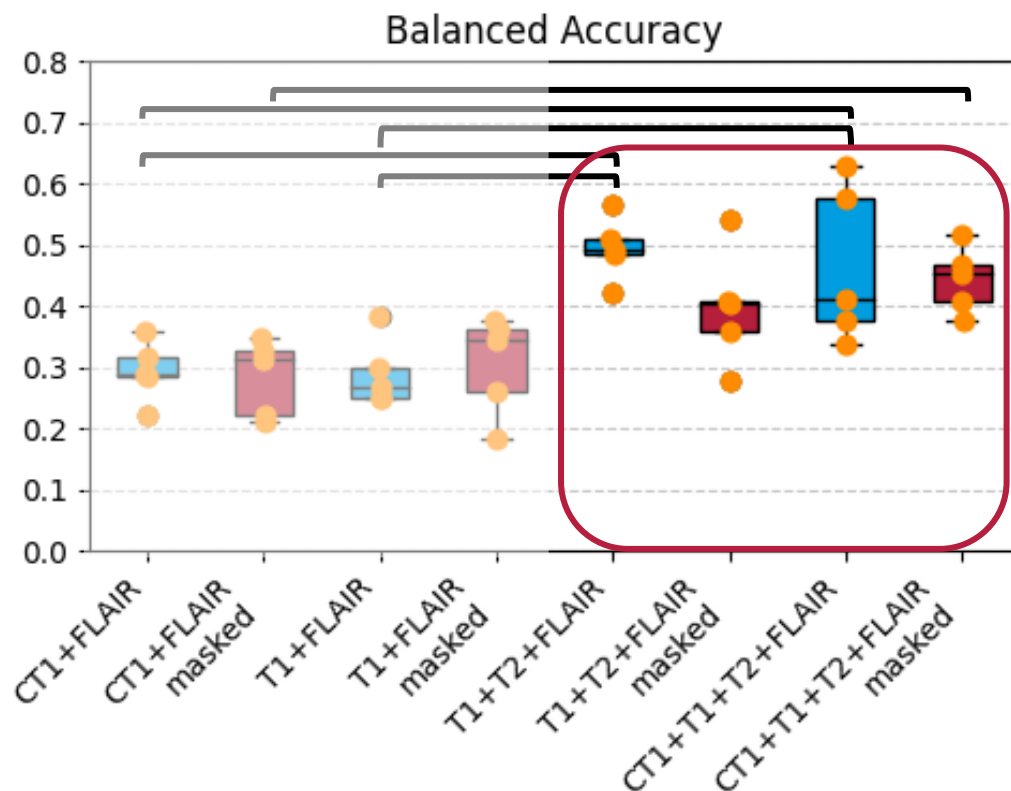
Significant results highlighted with brackets ■ Unmasked ■ Masked



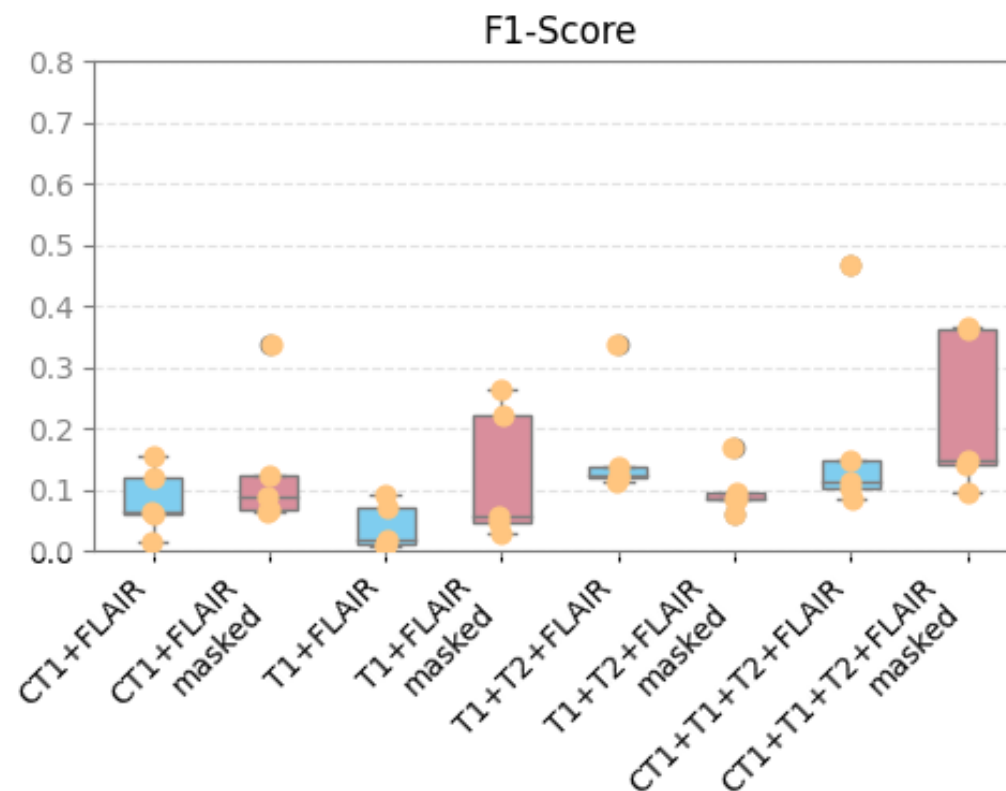
➤ Using **all modalities unmasked** yielded the **best performance**:

Balanced Accuracy = 62%

Results and Discussion



Significant results highlighted with brackets ■ Unmasked ■ Masked

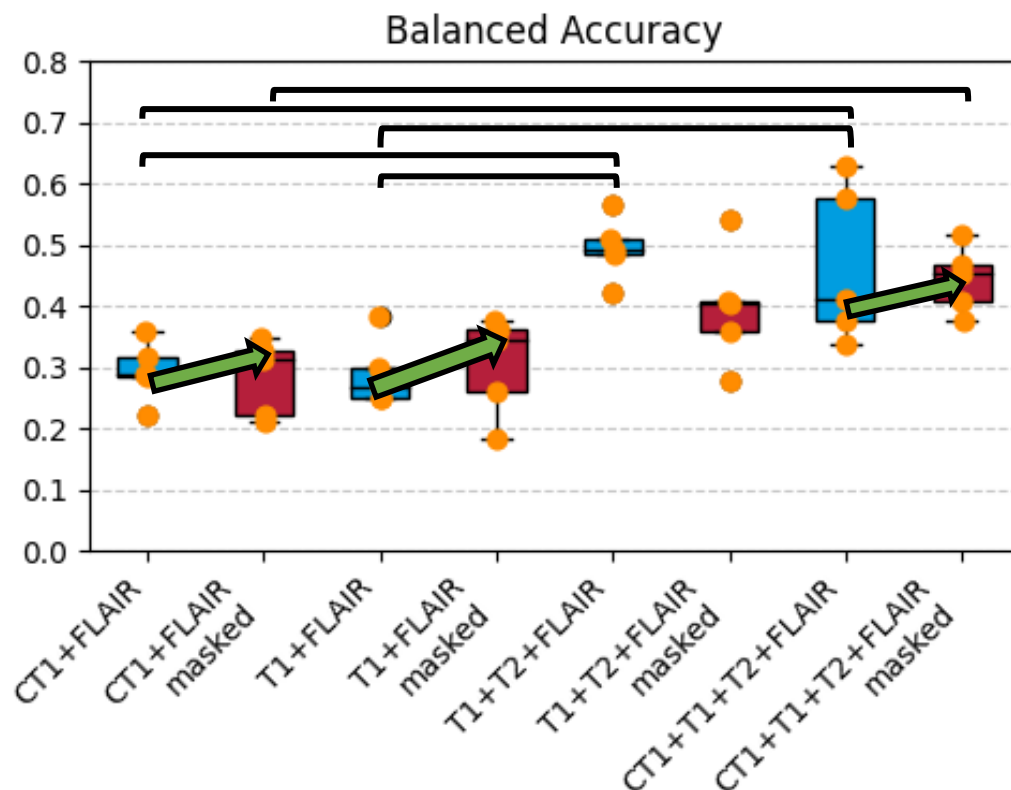


➤ Using **all modalities unmasked** yielded the **best performance**:

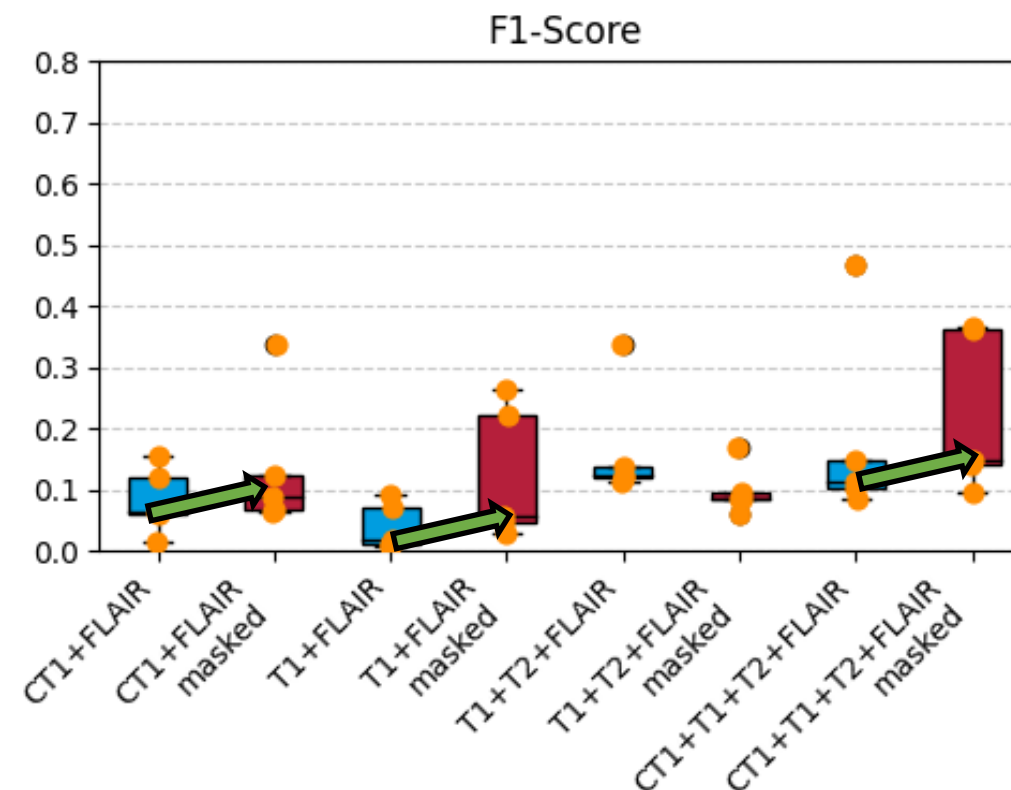
Balanced Accuracy = 62%

➤ No significant difference between using all modalities and **T1+T2+FLAIR**, which presented **higher median** values when unmasked

Results and Discussion

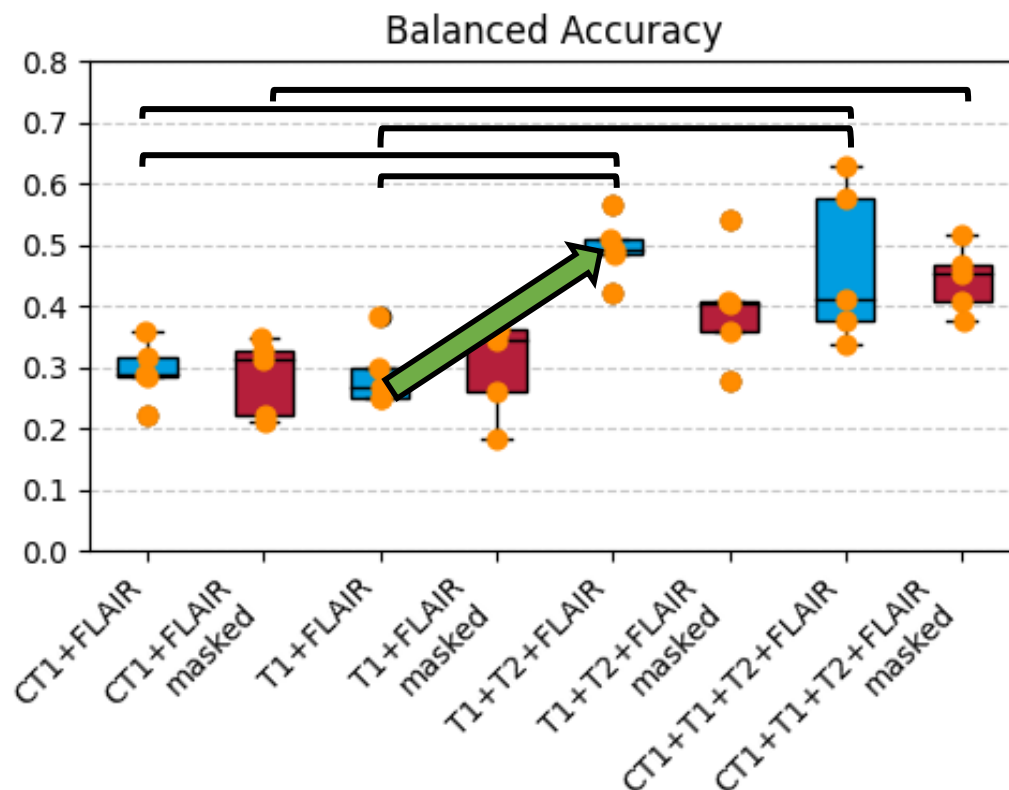


Significant results highlighted with brackets ■ Unmasked ■ Masked

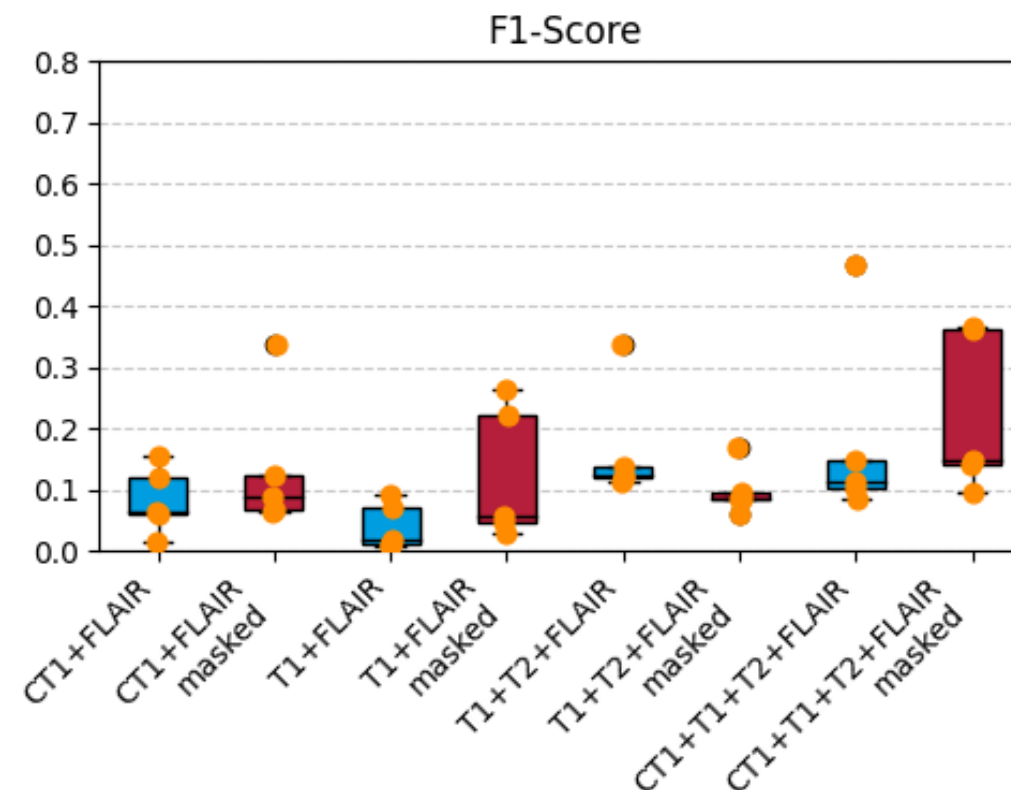


- Using **all modalities unmasked** yielded the **best performance**: **Balanced Accuracy = 62%**
- **Masking** the tumor region **generally improved classification robustness**
- No significant difference between using all modalities and **T1+T2+FLAIR**, which presented **higher median** values when unmasked

Results and Discussion



Significant results highlighted with brackets ■ Unmasked ■ Masked

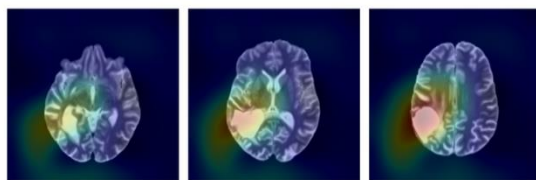


- Using **all modalities unmasked** yielded the **best performance**:
Balanced Accuracy = 62%
- No significant difference between using all modalities and **T1+T2+FLAIR**, which presented **higher median** values when unmasked
- **Masking** the tumor region **generally improved classification robustness**
- Adding **T2** significantly **improved performance** compared to T1w+FLAIR

Results and Discussion

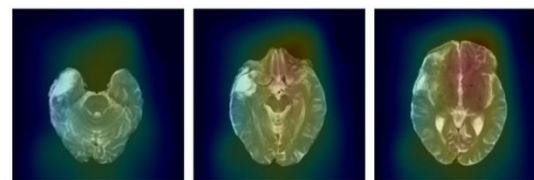
Unmasked

Progressive Disease



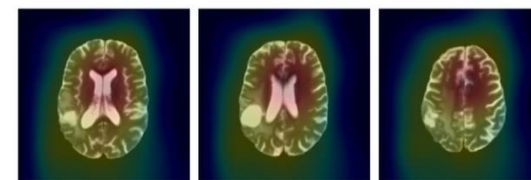
Classes	<u>PD</u>	SD	PR	CR
Probability (%)	21.3	55.5	3.4	19.8

Stable Disease



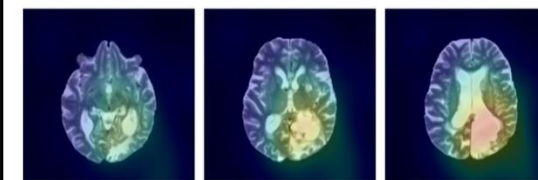
Classes	<u>PD</u>	<u>SD</u>	PR	CR
Probability (%)	32.1	24.7	39.7	3.6

Partial Response



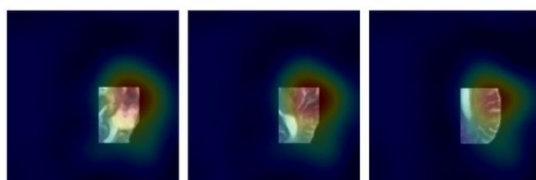
Classes	<u>PD</u>	SD	<u>PR</u>	CR
Probability (%)	27.4	21.0	48.2	3.4

Complete Response

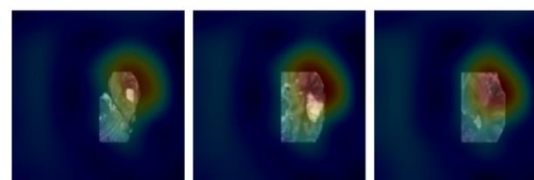


Classes	<u>PD</u>	SD	PR	<u>CR</u>
Probability (%)	5.3	10.9	13.3	70.5

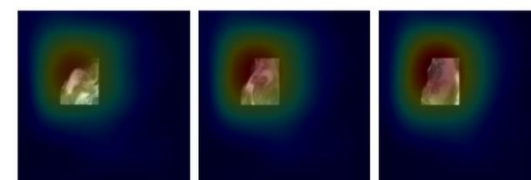
Masked



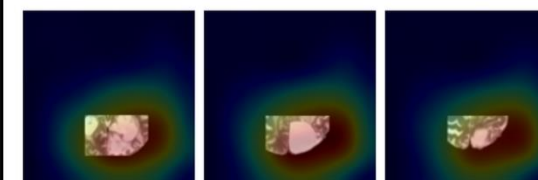
Classes	<u>PD</u>	SD	PR	CR
Probability (%)	20.9	48.5	19.0	11.5



Classes	<u>PD</u>	<u>SD</u>	PR	CR
Probability (%)	21.5	57.0	13.2	8.3



Classes	<u>PD</u>	SD	<u>PR</u>	CR
Probability (%)	9.1	13.1	75.6	2.2



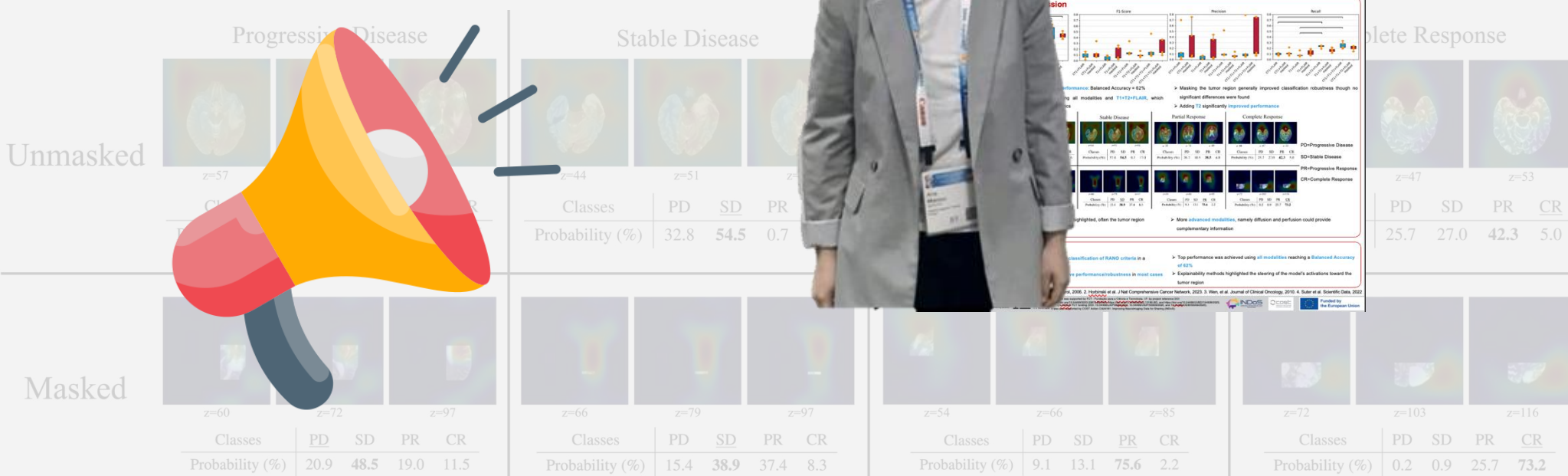
Classes	<u>PD</u>	SD	PR	<u>CR</u>
Probability (%)	0.2	0.9	25.7	73.2

➤ In most explainability images the tumor region was highlighted, especially when tumor detection is performed beforehand

Check out my Lightning Talk and Poster

Friday, 2nd of October: 15:45-15:48

Poster PG183



Acknowledgements



LaSEEB



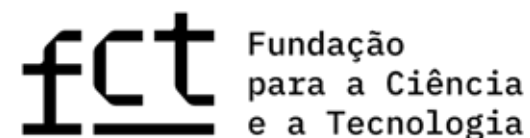
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