

Objectives:

- Radiomics extract quantitative information from images
- This information can be utilised to help predict treatment response or aid diagnosis
- Prior to clinical implementation, radiomic features require assessment of repeatability
- Temporal repeatability remains under researched [1]
- **This study aims to assess temporal repeatability of MR-derived radiomic features**

Materials/Methods:

Materials

- Ten patients with locally advanced cervical cancer
- Three visits, weeks 1, 3 and 5 of treatment
- Two T2W MRI scans acquired per visit
- Cervix-uterus and visible tumour delineated on each scan

Radiomic Feature Extraction

- Pre-processing was achieved via histogram matching normalisation
- Radiomic Features were extracted using PyRadiomics (v3.0.1a)
 - An IBSI compliant open-source software

Repeatability Assessment

- Repeatability was assessed via intra-class correlation coefficient; ICC[2,1]
- With scans as targets and contours as raters

Cervix Uterus	ICC < 0.5	0.5 ≤ ICC < 0.75	0.75 ≤ ICC < 0.9	ICC ≥ 0.9
Visit 1	1	7	31	68
Visit 2	1	7	23	76
Visit 3	1	2	8	96
Visible Tumour	ICC < 0.5	0.5 ≤ ICC < 0.75	0.75 ≤ ICC < 0.9	ICC ≥ 0.9
Visit 1	2	17	29	59
Visit 2	1	7	36	63
Visit 3	3	15	30	59

Table 1: Agreeability measure of radiomic features extracted from two T2W scans acquired twenty minutes apart. Features were extracted from the cervix-uterus and visible tumour at three visits.

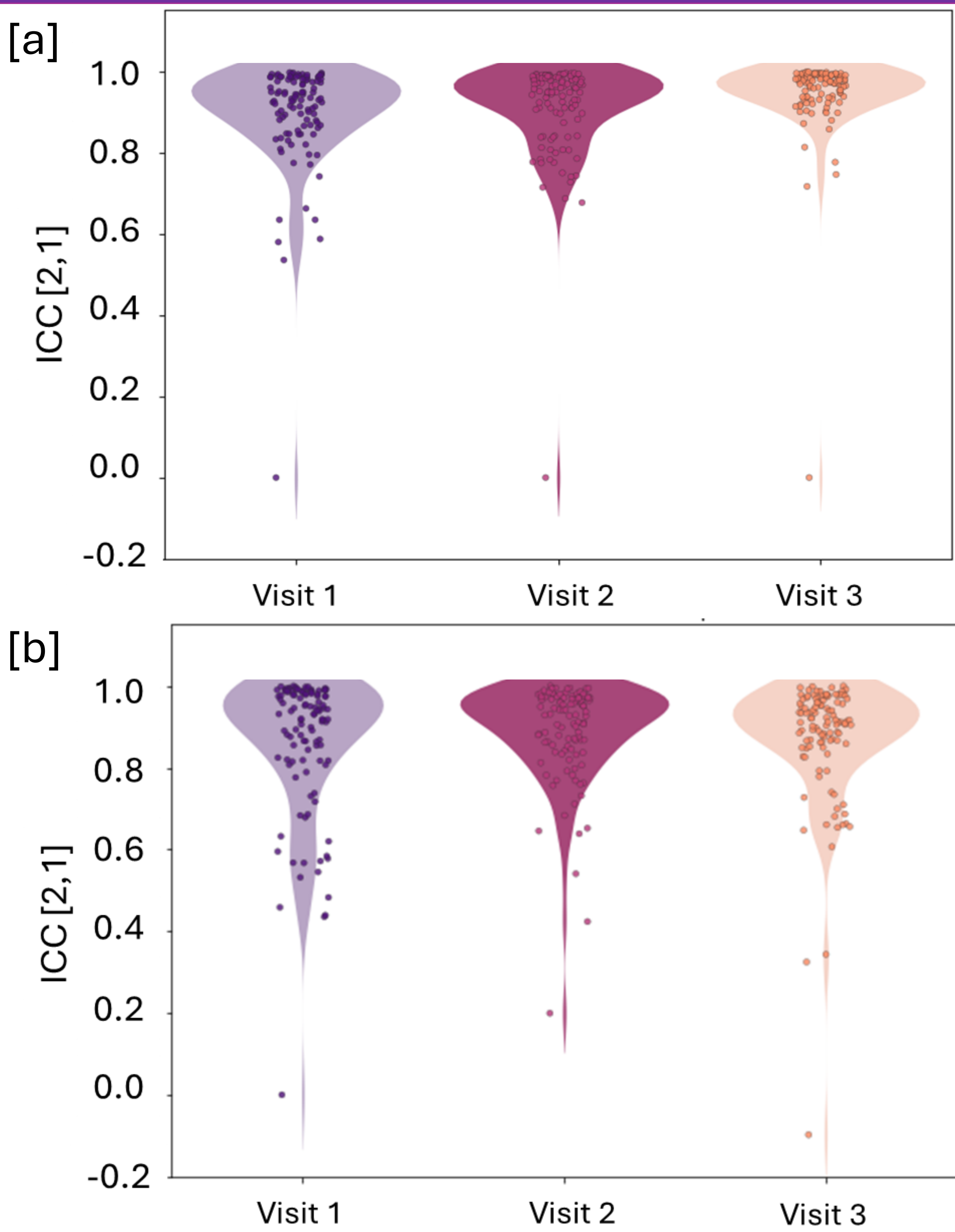


Figure 1: Violin Plot of radiomic feature repeatability, represented by intra-class correlation coefficient ICC[2,1] value distribution over three visits. a) cervix-uterus derived features b) visible tumour derived features. ICC; intra-class correlation coefficient.

Results:

Across all visits;

- 74.8% (cervix-uterus) 56.4%(visible tumour) of features showed excellent reliability (ICC > 0.9)
- 20.9% (cervix-uterus) 29.6%(visible tumour) good (0.75–0.9) 5.0% (cervix-uterus) 11.5% (visible tumour) moderate (0.5–0.75)
- 0.9% (cervix-uterus) 1.9% (visible tumour) features were labelled as poorly reliable

Systematic increases in repeatability across time were noted for the cervix-uterus, but not for the visible tumour, Table 1, Figure 1

Discussion/Future Work:

- The majority (>90%) radiomic features are repeatable; denoted by an ICC > 0.5, Table 1
- Features derived from the tumour less repeatable than those derived from the cervix-uterus
- Radiomic feature repeatability changes across the treatment timeline, Figure 1
- Longitudinal increase in cervix-uterus feature repeatability is theoretically driven by the shrinkage of the tumour
- Future work for this project will establish an alternate feature selection pipeline which incorporates temporal information

References

[1] Traverso, A. et al. (2020)
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