# Abstract #10541

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Title
The Image Biomarker Standardisation Initiative (IBSI) On Reproducible Convolutional Radiomics

Preferred Presentation Format
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Topic
Artificial Intelligence & Machine Learning

Support programme applications
none

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## Body

Purpose or Learning Objective
Convolutional filters are used to quantify characteristics in medical imaging, such as tissue heterogeneity and tissue structures. Though powerful, such filters lack reproducibility. The purpose is to standardise the computation of convolutional image filters for radiomics analyses.

Methods or Background
A reference manual and digital phantoms were provided to participating teams who develop radiomics software. We defined 36 tests covering common convolutional filters. Participants provided response maps (RM) for each implemented test after applying a filter to a digital phantom. We aggregated RMs into a consensus-based response map (CRM) by iteratively removing outlying contributions. Strength of consensus was classified into 4 categories (weak, moderate, strong, very strong) based on the number of RMs matching the candidate CRM (<3, 3-5, 6-9, ≥10). Moreover, candidate CRMs required an absolute majority (>50% RMs) to be accepted.

Results or Findings
Forty-two researchers from fourteen teams participated in this work. Over the course of 12 months, we observed an improved consensus (very strong, 0/36 to 12/36; strong, 4/36 to 8/36; moderate, 14/36 to 1/36; weak, 5/36 to 0/36). Currently (Oct. 2021), 15/36 tests do not show a majority consensus.

Conclusion
This work demonstrates that radiomics analyses utilizing convolutional filtering can significantly differ due to implementation decisions. Through increase in participation and by resolving ambiguities, we managed to improve consensus between software packages for several filter families. However, a comprehensive standardised radiomics workflow including convolutional filters is not yet fully achieved.

Limitations
We did not obtain CRMs for Gabor and Riesz transform filter tests, indicating their current lack of reproducibility. Moreover, integration of convolutional filtering into a radiomics workflow is currently being assessed, with pending results.

Ethics committee approval
Not required.

Funding for this study
No extramural funding declared.

# Multicategories

Area of Interest
Artificial Intelligence, Computer applications

Imaging Technique
Image manipulation / Reconstruction

Procedure
Computer Applications-General, Technical aspects

Special Focus
Quality assurance

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