Comparison of physiologic FDG PET uptake in CT-based vs PET-corrected organ contours in non-small cell lung cancer patients

Ojaswita Lokre, Amy J Weisman, Timothy G Perk

AIQSolutions

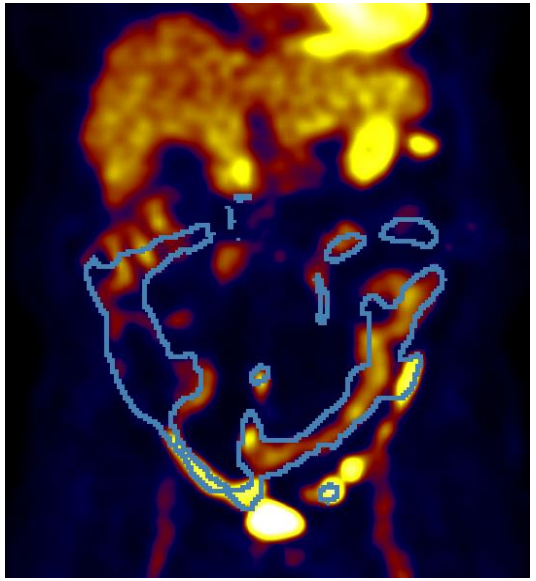
Disclosure: All authors are employed by AIQ Solutions.

Background

- Quantifying functional activity of organs on PET/CT images may provide clinically meaningful information for patient management.
- This is complex to automate due to **spillover artifacts** and **patient motion**.

Segment on CT

Quantify on PET

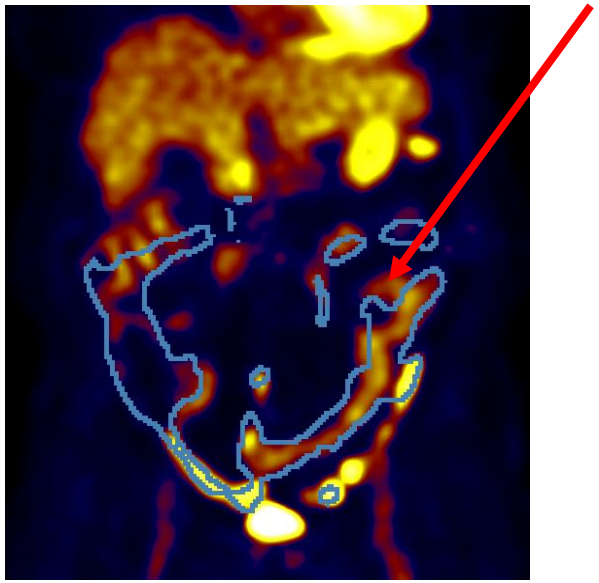


Background

- At AIQ solutions, we quantify organs to analyze patient toxicity, healthy tissue, disease spread and more.
- Here, we assess the differences in quantification between organ contours generated on the CT alone compared to those corrected for spillover on PET.

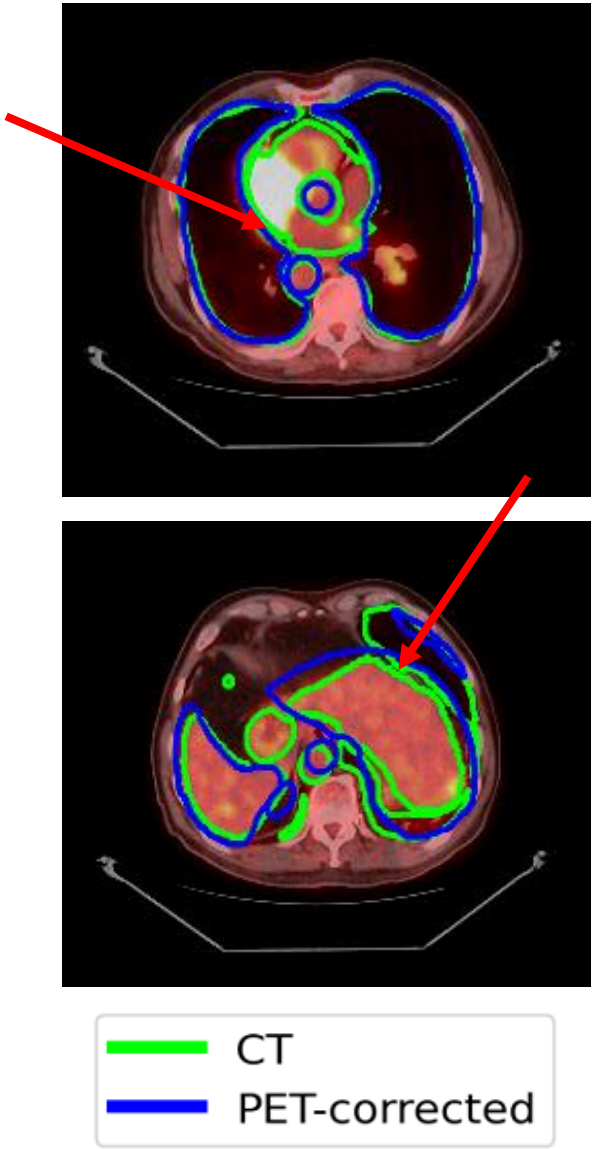
Segment on CT

Quantify on PET



Patient Population

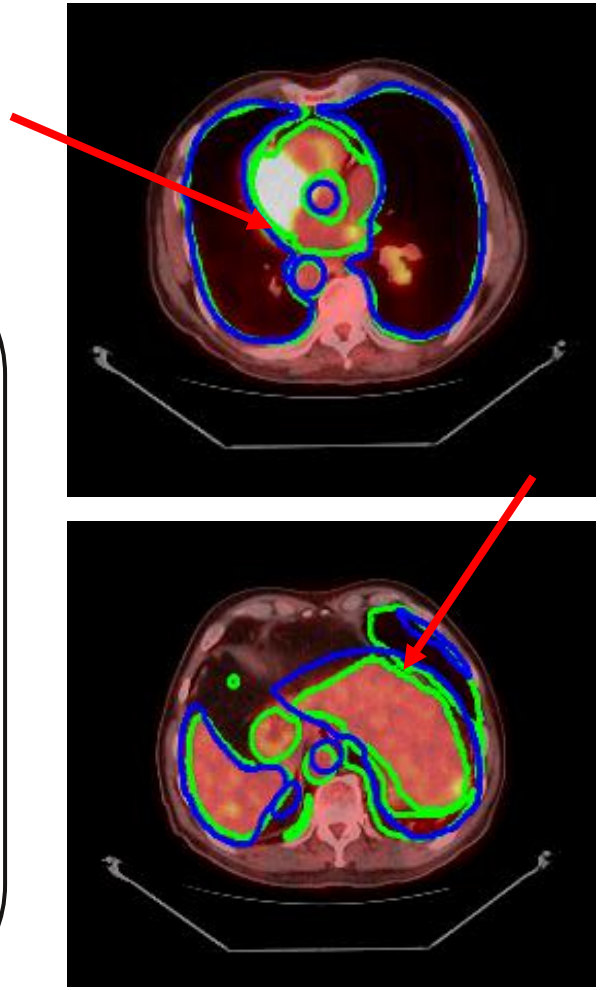
- FDG PET/CT images of 94 patients with non-small cell lung cancer were gathered.
- Ten structures were manually contoured on the CT images;
  (liver, spleen, thyroid, kidneys, pancreas, bladder, aorta, bowel, stomach and heart)
- After which the structure contours were manually corrected for spillover using the PET images.



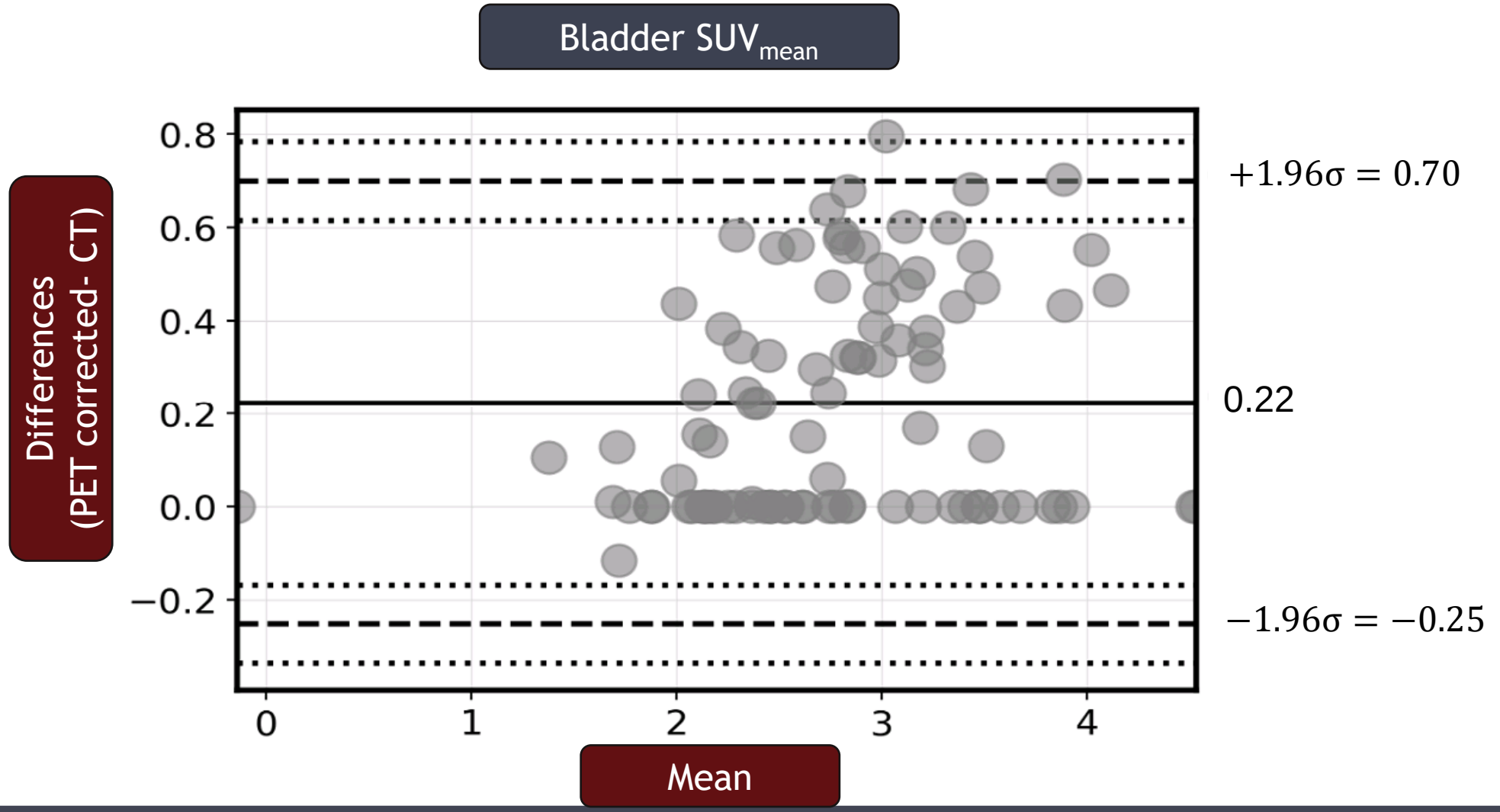
Evaluation Methods

- The following features were extracted from the images using both sets of contours:
  - SUV_{mean}
  - SUV_{max}
  - Volume

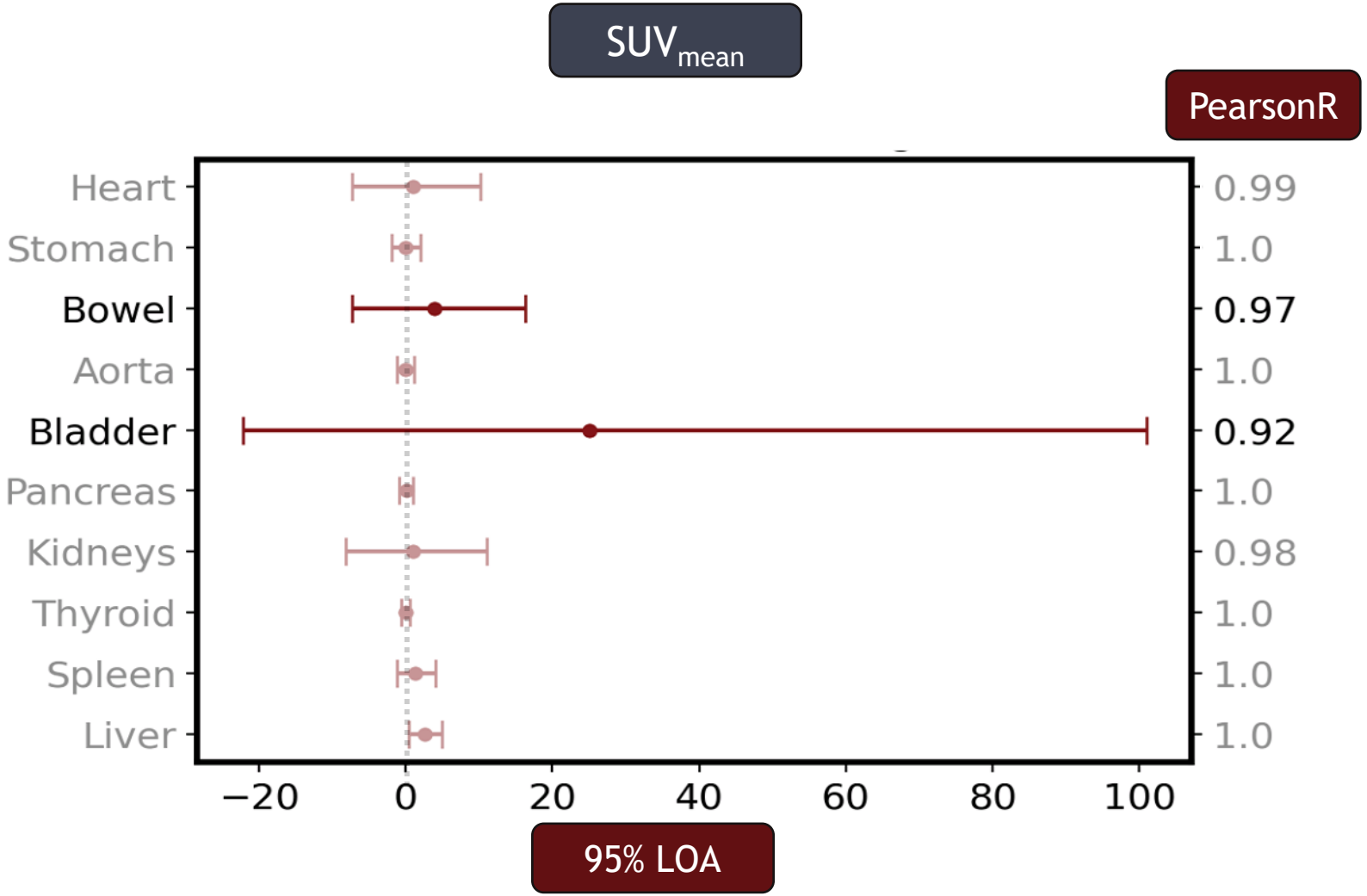
- The extracted features were then compared using Pearson's correlation coefficient (R) and Bland-Altman's analysis of 95% limits of agreement (LOA) on log-transformed data.



Results - Bland Altman Plot

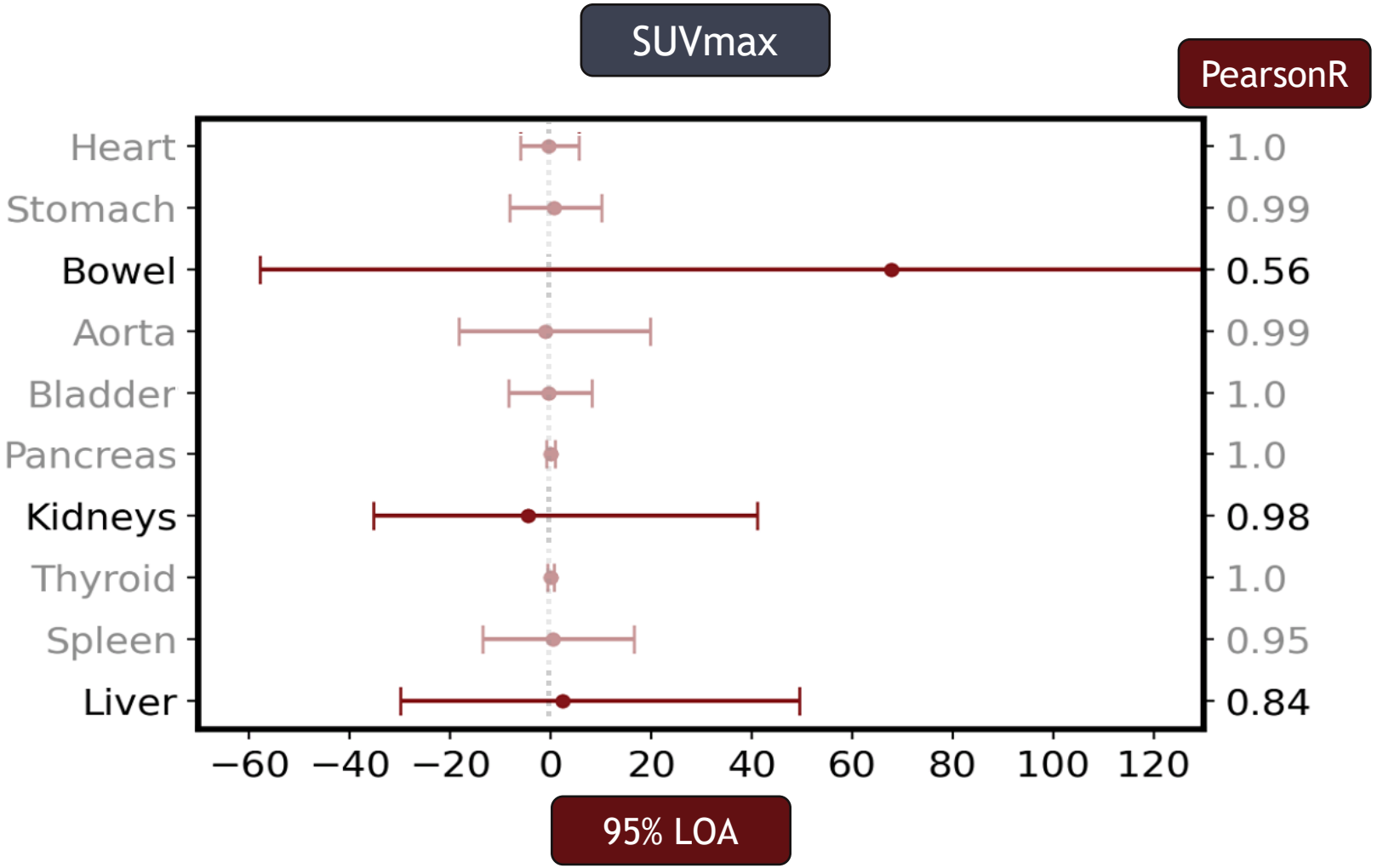


Results - 95% Limits of Agreement (LOA)



SUV_{mean} showed moderate changes in all structures and large changes in bladder and bowel.

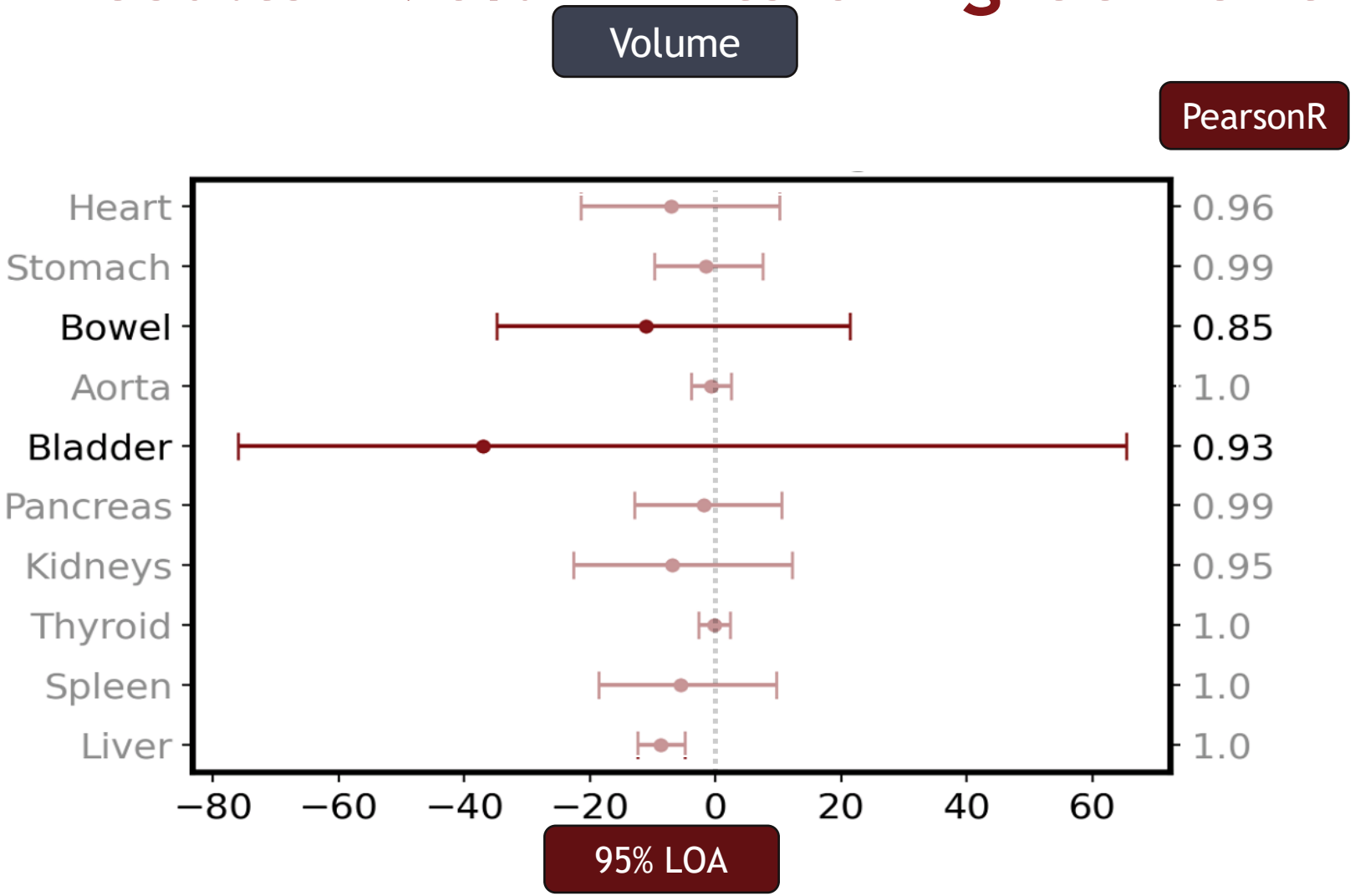
Results - 95% Limits of Agreement (LOA)



SUV_{max} showed a large impact on liver, kidneys and bowel.

*Bowel has been truncated from +570%

Results - 95% Limits of Agreement (LOA)



Volume showed moderate changes in kidneys and heart; substantial changes in bowel and bladder.

Summary

- PET correction impacted each organ and each feature differently, this could be explained by several factors:
  - Spillover
  - Patient motion
  - Partial Volume effects;

- For CT based contours, SUV_{mean} may be a more reliable measure compared to SUV_{max}.

- In the future if you want to use SUV_{max}, contouring with the PET and the CT together might be useful.

For further questions, contact:
ojaswita.lokre@aiq-solutions.com