



Cross-radiotracer generalizability of automated lesion detection via CNN: pilot study in ^{64}Cu -and ^{68}Ga -DOTATATE PET/CT

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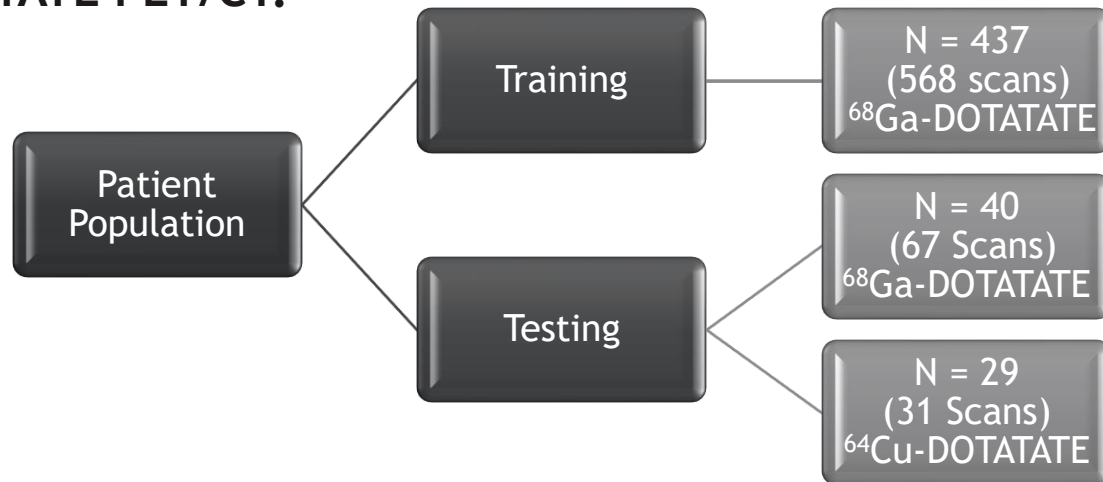
Session Number: SS48

Session Title: Data Sciences: Multimodal Image Analysis

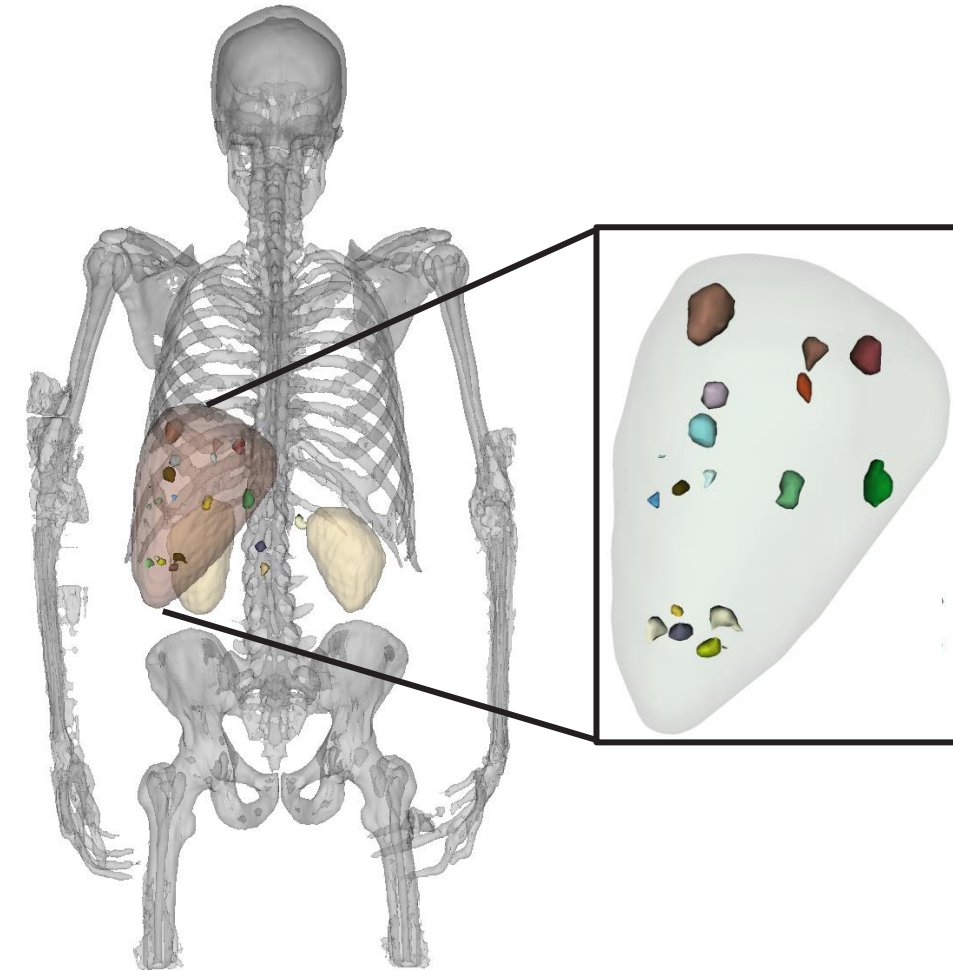
Session Time: 3:30PM-4:45PM

Methods

- Both ^{68}Ga -DOTATATE and ^{64}Cu -DOTATATE are used to detect and track disease in patients with advanced neuroendocrine tumors (NETs). However, it is unknown whether AI models generalize well across radiotracers.
- ^{68}Ga - and ^{64}Cu -DOTATATE PET/CT images with NETs were collected, lesions were manually contoured by an expert and reviewed by a clinician.
- A Retina U-net was trained to detect lesions on ^{68}Ga -DOTATATE PET/CT and test model generalizability to ^{64}Cu -DOTATATE PET/CT.



AI Lesion Detection



Results

- ⁶⁸Ga-DOTATATE performance:

Lesions	Sensitivity	FPs/Image	Sensitivity	FPs/Image	Sensitivity	FPs/Image
Median [range]	All Lesions		Lesions with SUV _{max} >5		Lesions with SUV _{max} > 10	
17 [0, 178]	0.89 [0.58, 1.0]	5.0 [2.5, 7.0]	0.94 [0.83, 1.0]	3.0 [0.0, 4.0]	1.0 [0.95, 1.0]	1.0 [0.0, 2.0]

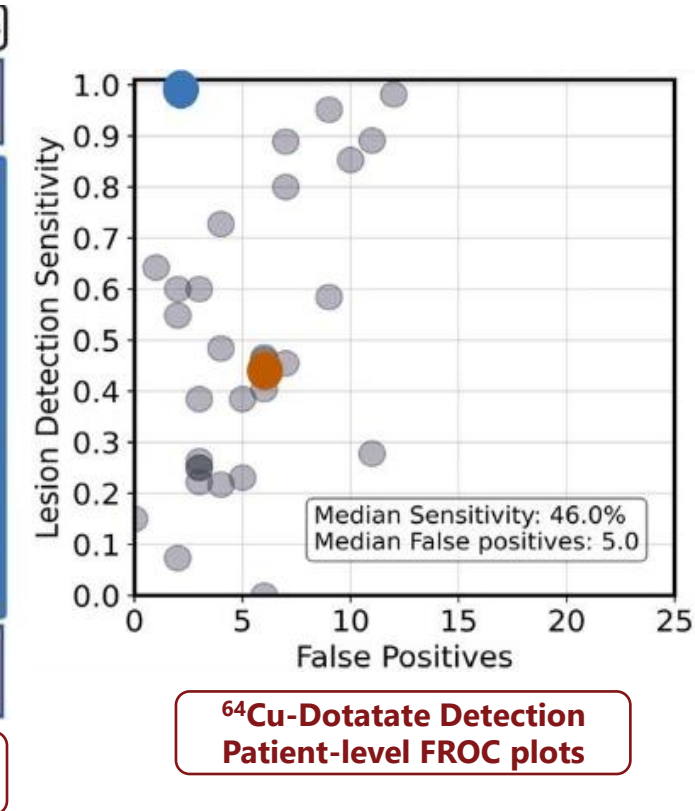
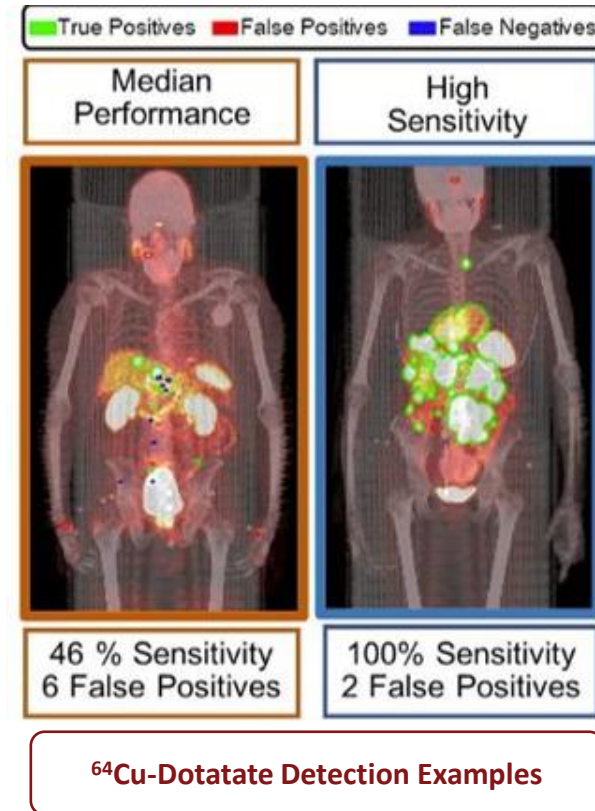
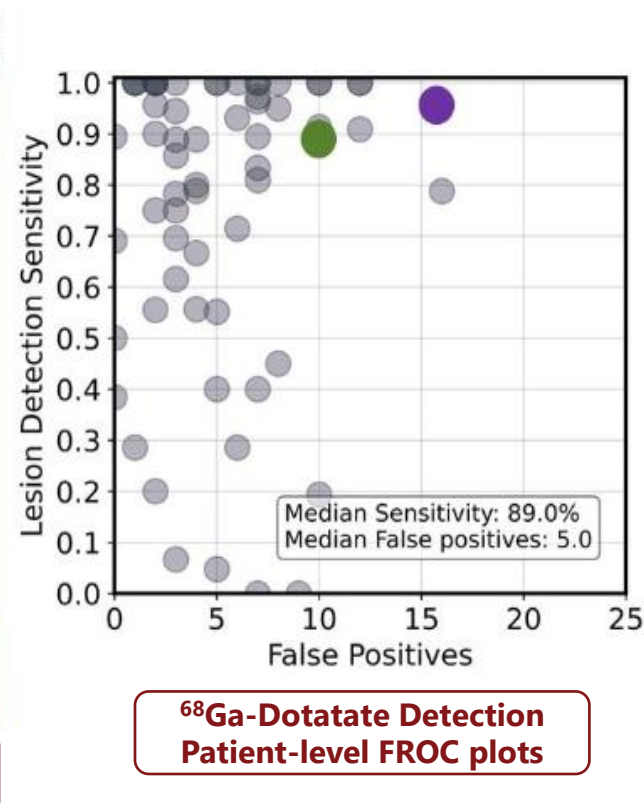
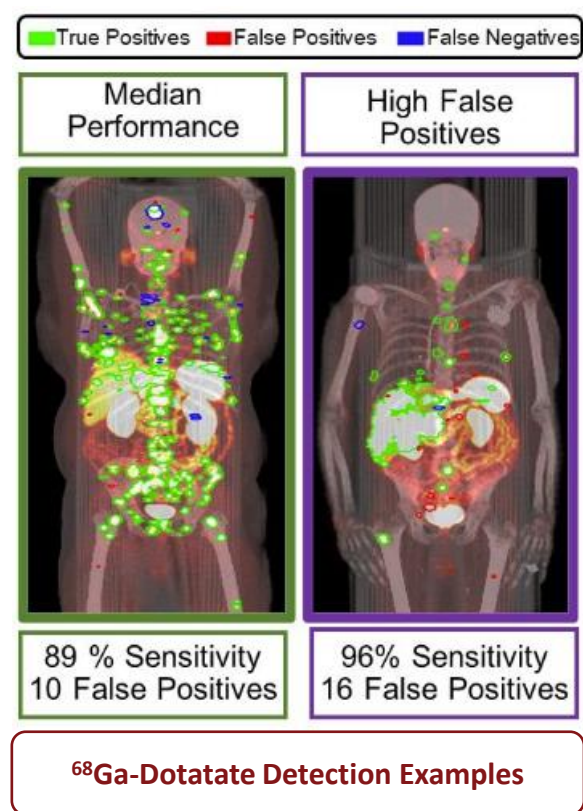
- Pearson correlation between SUV metrics calculated from automated vs expert contours were R = 0.69 for SUV_{max}, R = 0.63 for SUV_{mean}, and R = **0.93** for SUV_{total}.

- ⁶⁴Cu-DOTATATE performance:

Lesions	Sensitivity	FPs/Image	Sensitivity	FPs/Image	Sensitivity	FPs/Image
Median [range]	All Lesions		Lesions with SUV _{max} >5		Lesions with SUV _{max} > 10	
17 [8, 308]	0.46 [0.26, 0.68]	5.0 [3.0, 7.0]	0.56 [0.42, 0.85]	2.0 [1.5, 4.5]	0.8 [0.5, 1.0]	1.0 [1.0, 2.5]

- Pearson correlation between SUV metrics calculated from automated vs expert contours were R =**0.92** for SUV_{max}, R =0.07 for SUV_{mean}, and R = **0.96** for SUV_{total}.

Summary



A CNN trained to detect lesions on ⁶⁸Ga-DOTATATE PET/CT achieved overall good detection performance when tested on ⁶⁸Ga-DOTATATE PET/CT and an overall moderate detection performance when tested on ⁶⁴Cu-DOTATATE PET/CT. Quantification performance correlation between CNN- and expert-derived SUV metrics was good with a few outliers for both. Lesion detection CNNs may be able to generalize across PET radiotracers, but performance may be impacted based on lesion uptake.