Label-Free Liver Tumor Segmentation

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Talk Code Paper

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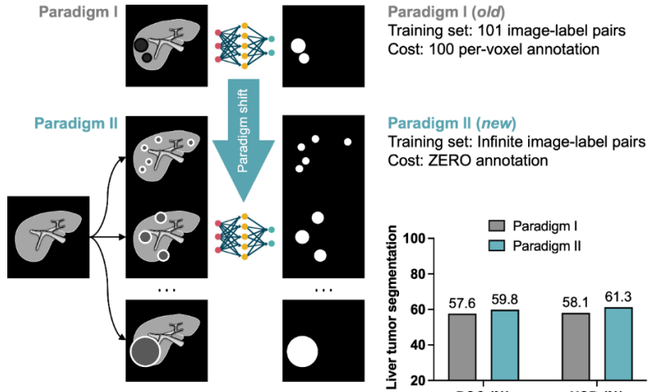
Tumor segmentation paradigm shift from label-intensive to label-free.



Paradigm I (*old*)
Training set: 101 image-label pairs
Cost: 100 per-voxel annotation

Paradigm II (*new*)
Training set: Infinite image-label pairs
Cost: ZERO annotation

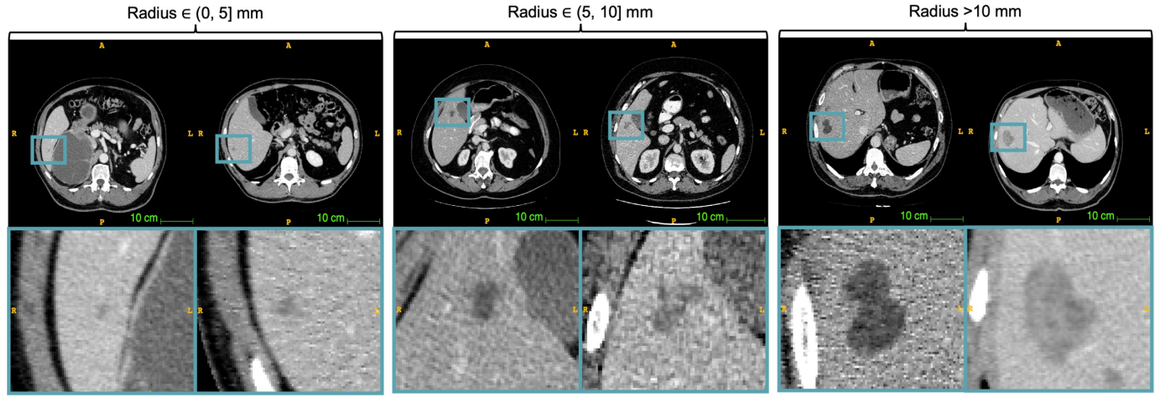
Paradigm I (old)

- **Per-voxel** annotations.
- Time-consuming, expansive.
- Requires *extensive* medical expertise.

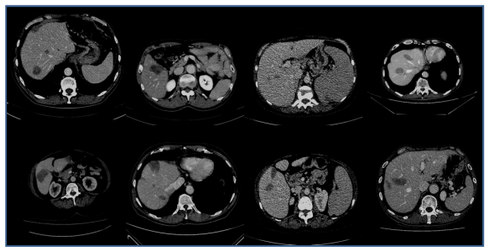
Paradigm II (new)

- **ZERO** annotations.
- Infinite training pairs
- Similar performance.

Can you tell which liver tumors are real and which are fake?



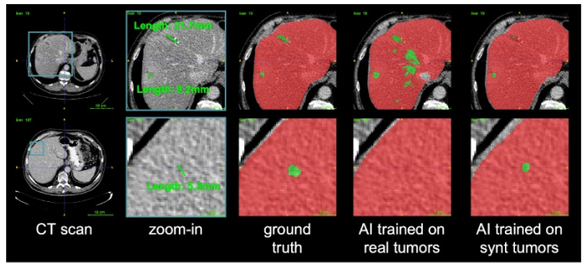
Even ***professionals*** can't distinguish synthetic tumors from



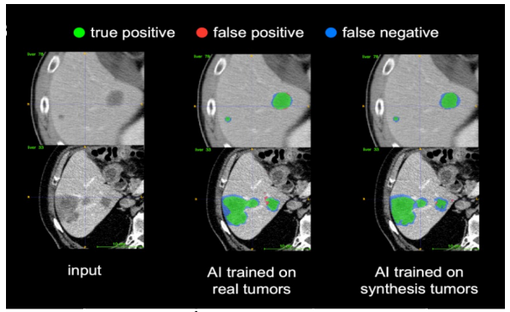
		junior professional		senior professional	
		real (P)	synt (N)	real (P)	synt (N)
truth	real (P)	5	15	10	2
	synt (N)	21	8	7	12

[1]The junior professional achieves an Accuracy, Sensitivity, and Specificity of 26.5%, 27.6%, and 25.0%. One CT scan is marked *unsure*.
[2]The senior professional achieves an Accuracy, Sensitivity, and Specificity of 71.0%, 63.2%, and 83.3%. 19 CT scans are marked *unsure*.

Synthetic tumor can ***benefit*** small tumor detection.

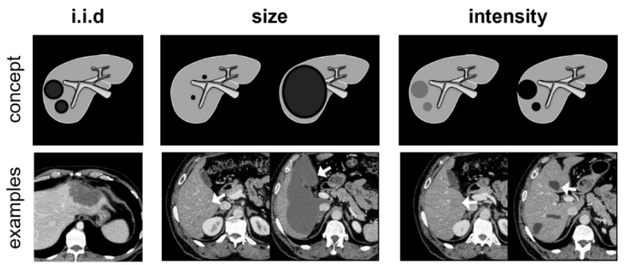


Synthetic tumor is ***efficient*** for real tumor segmentation.



tumors	DSC (%)	NSD (%)
real	57.6	58.7
synt	59.8	61.3

Synthetic tumor can provide ***benchmark*** for AI model.



	size			intensity		
	$\mu\pm\sigma$	$\mu\pm2\sigma$	$\mu\pm3\sigma$	$\mu\pm\sigma$	$\mu\pm2\sigma$	$\mu\pm3\sigma$
UNet++	68.45	63.01	9.27	90.16	75.58	26.99
nnU-Net	80.23	59.55	5.39	91.60	83.61	30.53
Swin UNETR	82.62	65.95	26.08	88.95	79.36	12.87

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