



# You Point, I Learn: Online Adaptation of Interactive Segmentation Models for Handling Distribution Shifts in Medical Imaging

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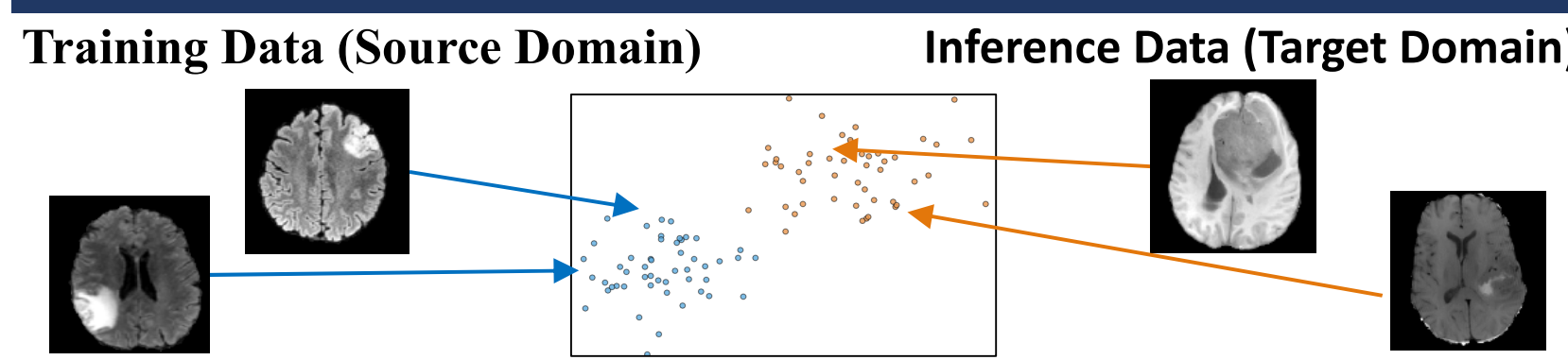
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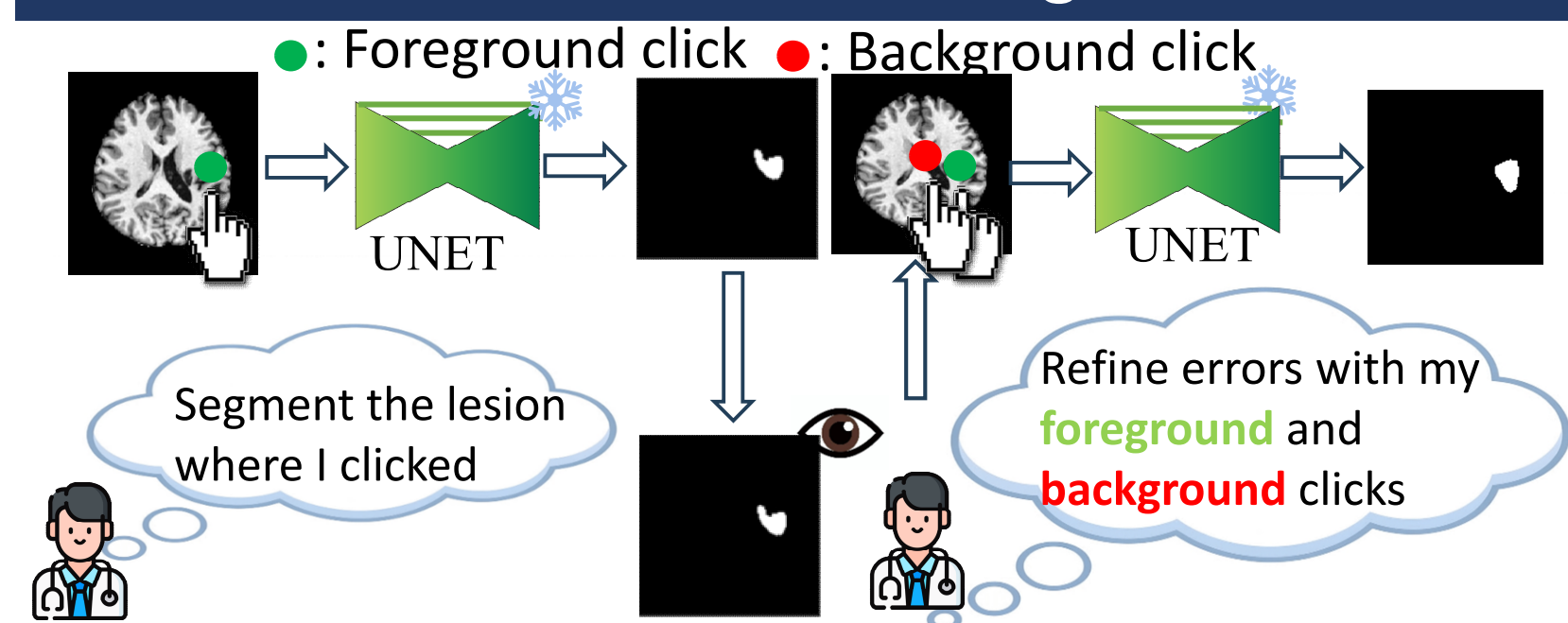
## OVERVIEW

- Models often fail on new data distributions.
- Users can correct errors through interactive segmentation.
- Instead of freezing the model, it can learn from corrections.
- Online adaptation can sequentially improve the model.

## BACKGROUND: Data Distribution Shift



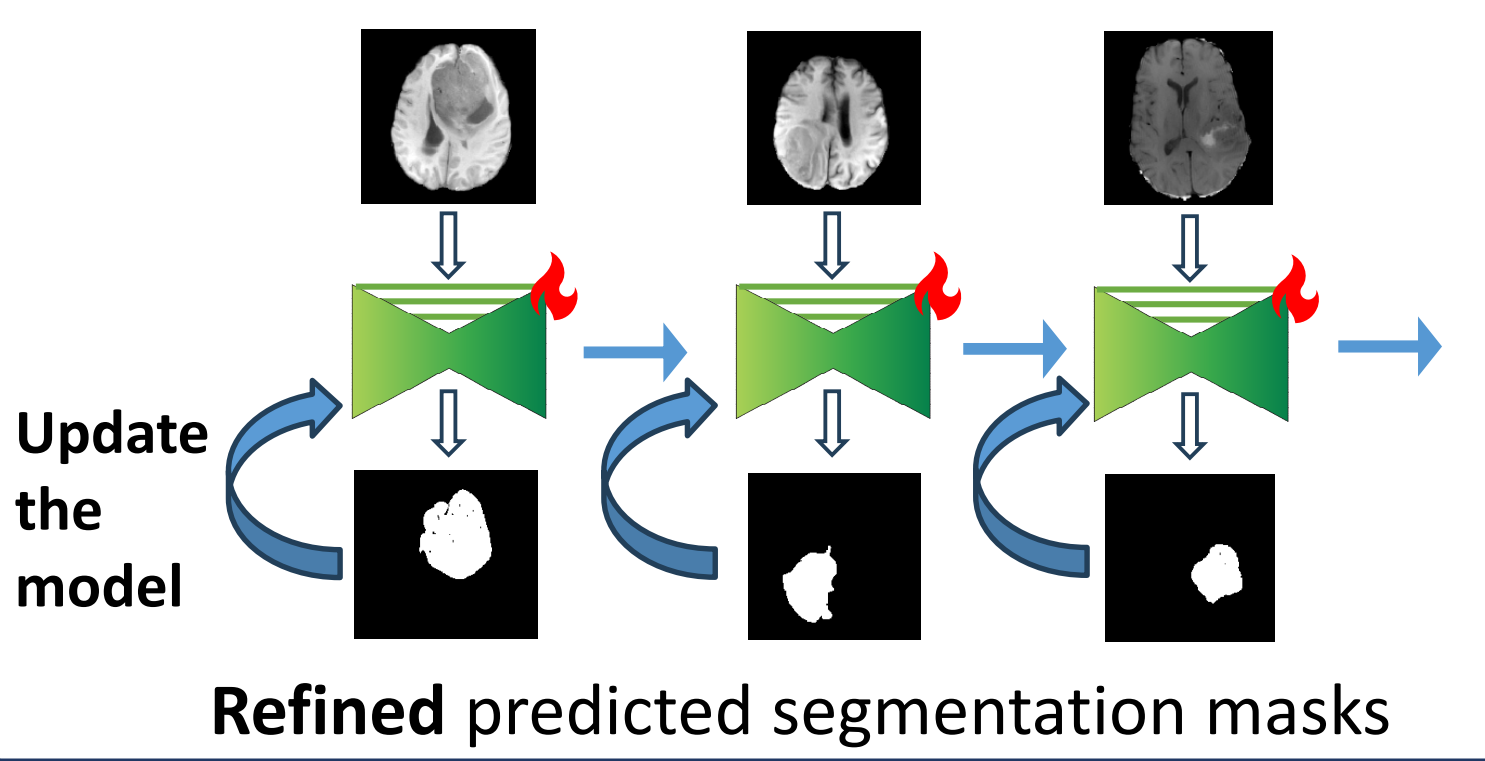
## BACKGROUND: Interactive Segmentation



Can the model parameters adapt to the new distribution?

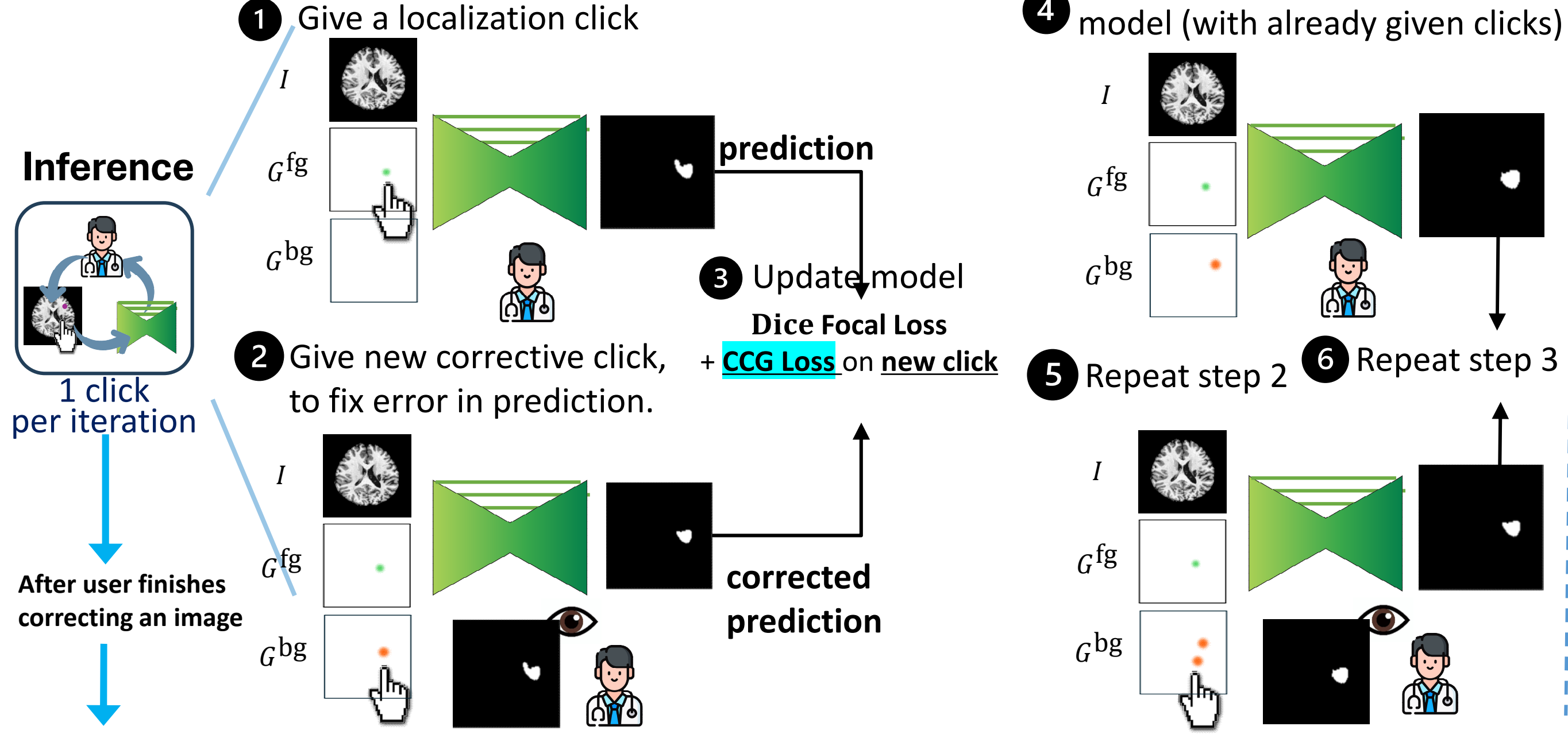
## BACKGROUND: Online Adaptation

Images come in sequence and appear once



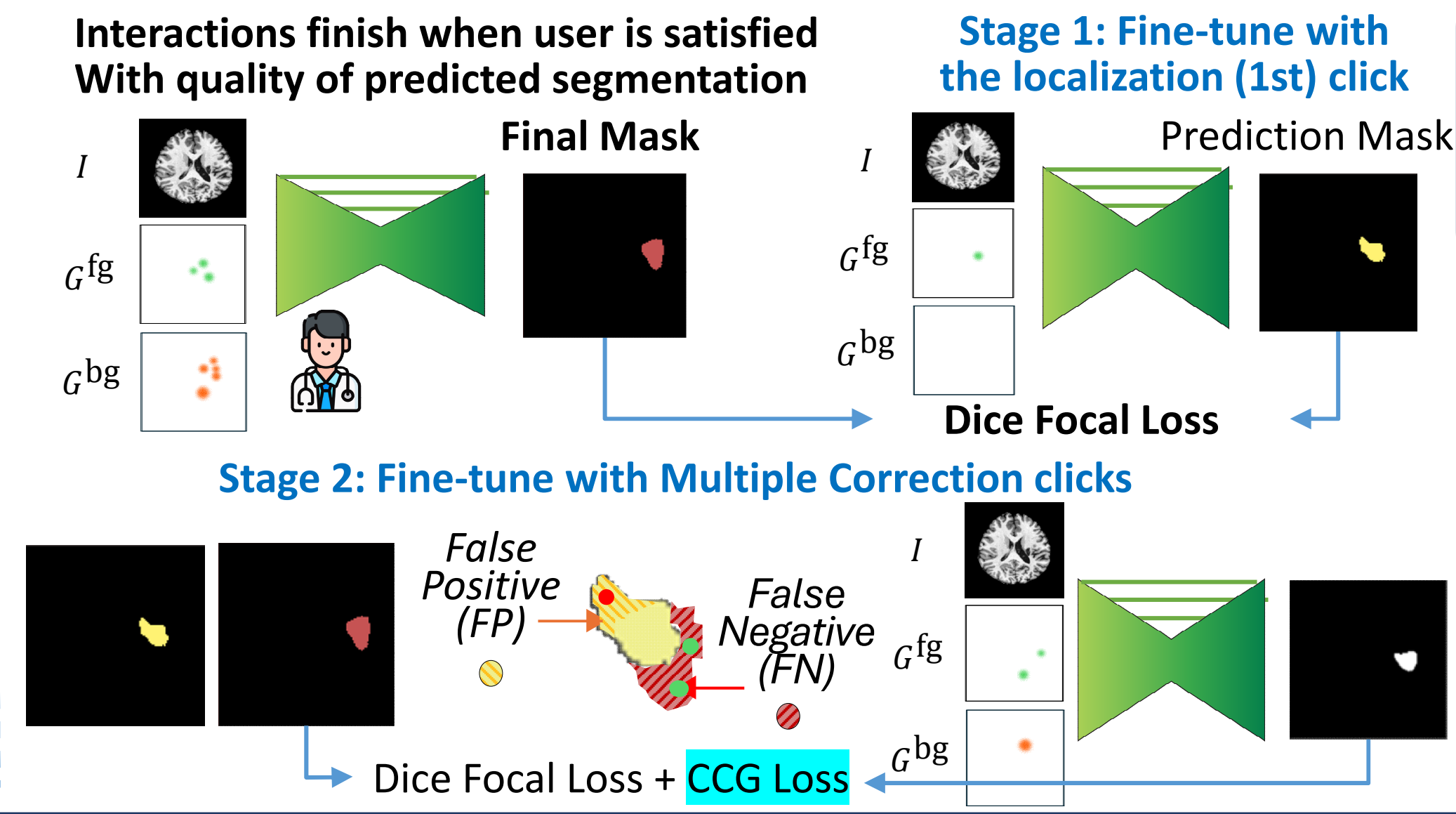
## METHOD: Mid-Interaction Adaptation

The model is updated after each prompt (click):

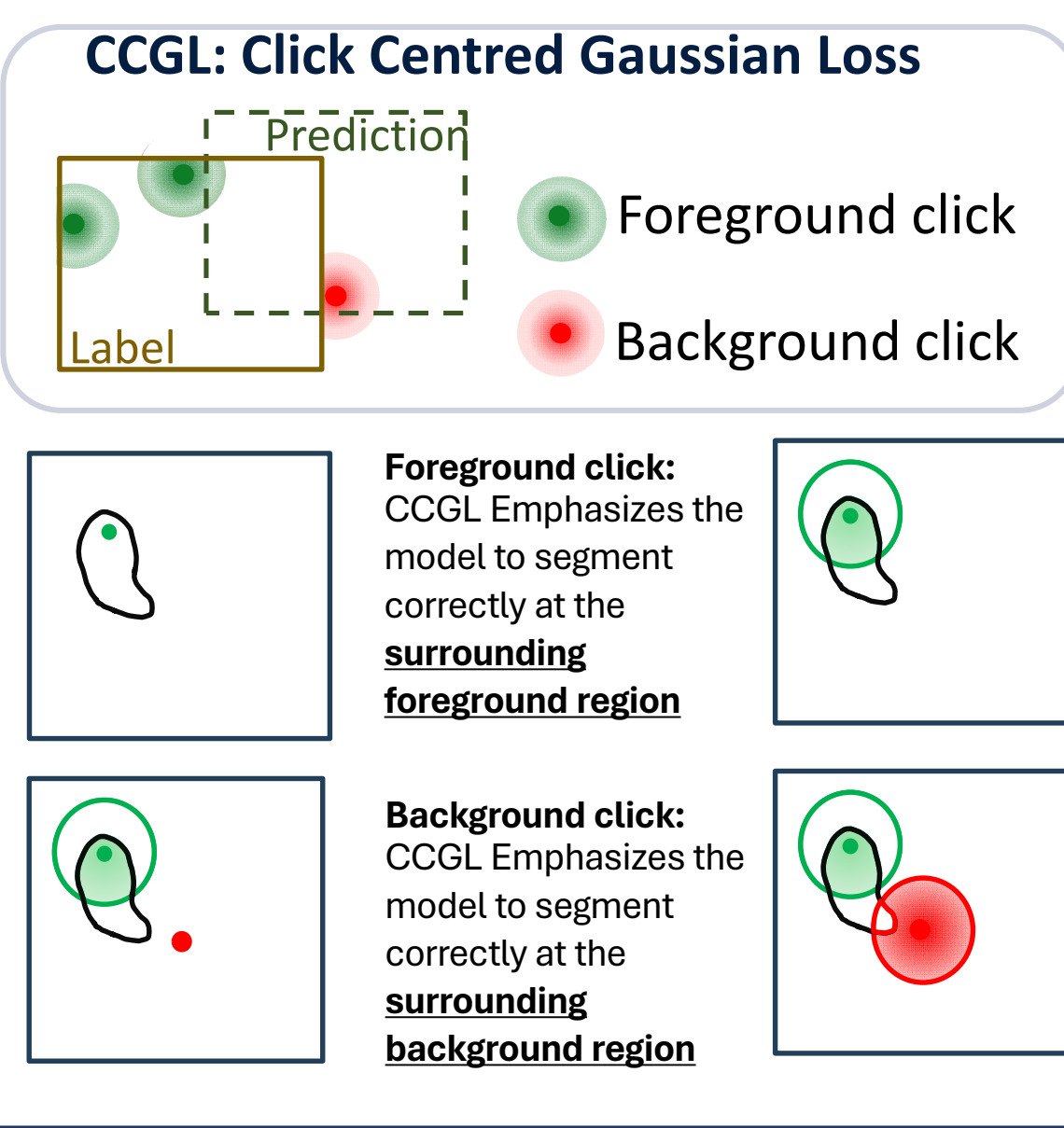


## METHOD: Post-Interaction Adaptation

The model is updated after all corrections are done for one image:

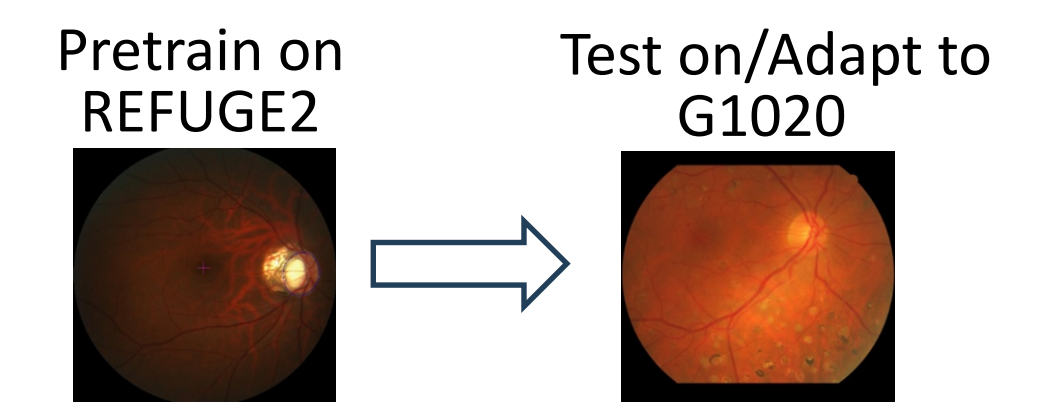


## Click Centred Gaussian Loss



## EXPERIMENTS

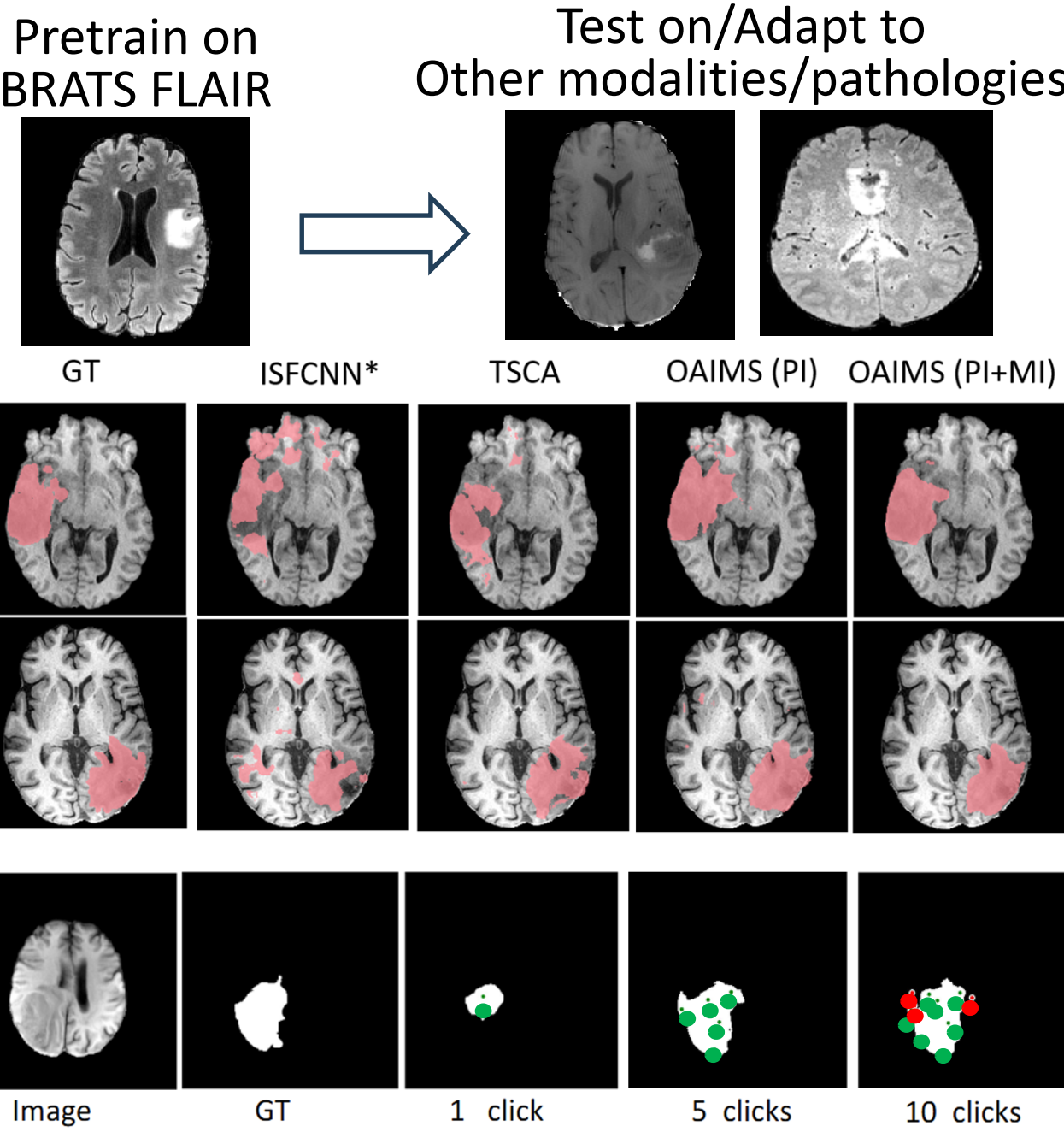
Segmentation in Eye Fundus Imaging



No. Cl	G1020		
	1	5	10
ICNN*	89.4/77.4	93.1/83.1	95.1/88.0
Med-SA	72.2/56.1	75.3/58.6	75.6/58.6
IA+SA	90.5/77.8	94.3/84.5	96.1/90.3
TSCA	89.9/77.6	94.2/85.0	96.1/90.7
PI	93.5/81.9	95.9/88.5	97.0/92.2
PI+MI	93.6/82.2	96.4/90.0	97.5/92.7

Baselines – No adaptation  
Baselines – With adaptation  
Our method

Segmentation of Cancer in Brain MRI



Do errors accumulate from initial bad predictions, because they are used as pseudo-labels in our method?

Huge domain gap

No. Clicks	1 click	3 clicks	10 clicks
ICNN* (No Adapt)	9.3	12.8	24.3
TSCA	9.3	40.7	65.6
OAIMS (Ours)	25.6	57.9	80.0

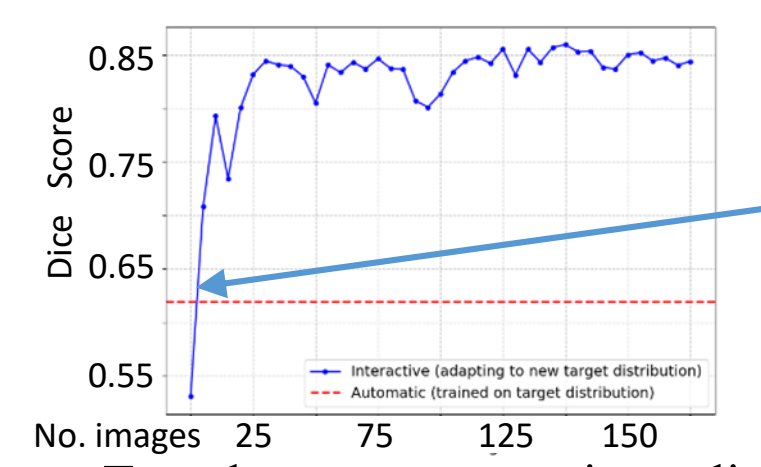
Hardest sample first

No. Clicks	1	10
OAIMS (Random Order)	67.5	86.0
OAIMS (Worst first)	66.4	85.3

Bad initial prediction

Errors do not significantly accumulate

## Data Efficiency



Average clicks required for 80% Dice score

Method	BRATS T1	BRATS T2
TSCA	10.60	3.63
PI+MI (Ours)	4.43	2.33

Performance on source domain after adapting to target

No. Clicks	1	5	10
ICNN*	93.4	95.6	96.4
OAIMS (No Re-adapt)	90.5	94.8	95.7
OAIMS (Re-adapt)	93.5	95.8	96.6

Tested on separate testing split during the online adaptation process