

Motivation

- Manually segmenting new regions of medical images is tedious and time-consuming
- Interactive segmentation** tools seek to alleviate this burden

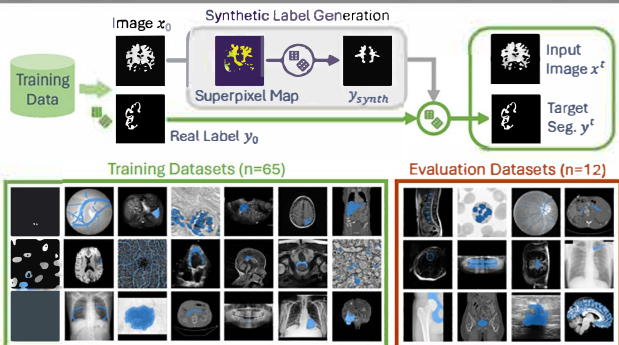
ScribblePrompt

- enables users to rapidly and accurately **accomplish any biomedical image segmentation task**, outperforming existing interactive models
- is **flexible to different annotation styles**, including bounding boxes, clicks, *and* scribbles
- is **computationally efficient**, enabling real-time inference, even on a single CPU

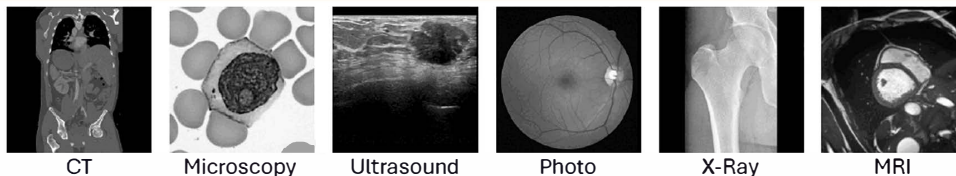
Approach

- Train on a **diverse collection of biomedical imaging datasets** with real and synthetic labels
- Simulate **realistic combinations of user interactions** during training, including scribbles
- Use a **lightweight architecture** optimized for efficient inference

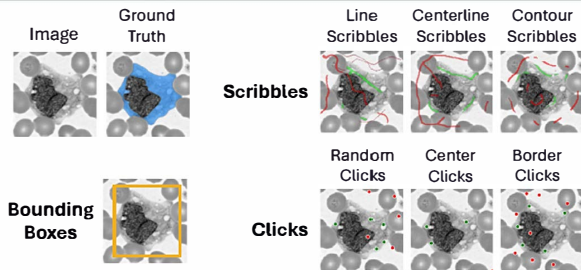
Data



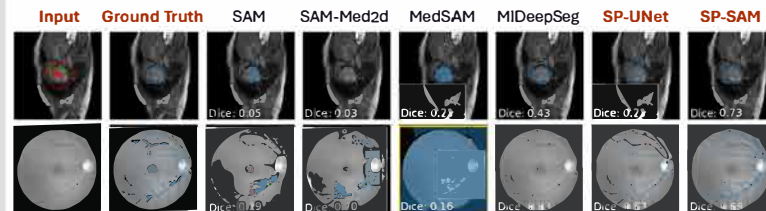
ScribblePrompt enables users to segment *new* structures in new biomedical images using a few bounding boxes, clicks or scribbles



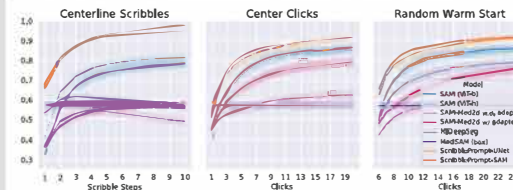
Simulated Interactions



Comparison to Existing Methods



Evaluation

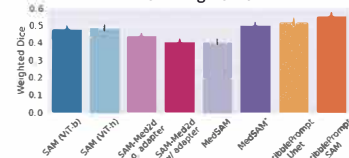


ScribblePrompt outperforms state-of-the-art models on *unseen* labels and image types

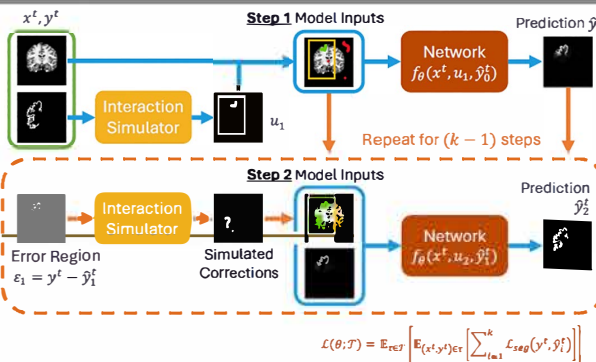
Manual Scribbles

Model	Param.	CPU Runtime (sec)	↑ Dice Score
SAM (ViT-h)	641M	130.79 ± 7.96	0.42 ± 0.02
SAM (ViT-l)	94M	13.59 ± 0.77	0.20 ± 0.01
SAM-Med2d w/o. adapter	91M	0.63 ± 0.02	0.16 ± 0.01
SAM-Med2d w/ adapter	271M	1.23 ± 0.07	0.17 ± 0.02
MIDeepSeg	3M	0.08 ± 0.02	0.73 ± 0.01
MedSAM (hox)	94M	13.59 ± 0.77	0.70 ± 0.02
ScribblePrompt-SAM	94M	13.59 ± 0.77	0.77 ± 0.01
ScribblePrompt-UNet	4M	0.27 ± 0.04	0.84 ± 0.01

Bounding Boxes



Iterative Training



scribbleprompt.csail.mit.edu

hallee@mit.edu

User Study: ScribblePrompt vs. SAM

- ScribblePrompt reduced annotation time by 28% while increasing Dice by 15%
- 15 out of 16 study participants preferred ScribblePrompt (1 had no preference)