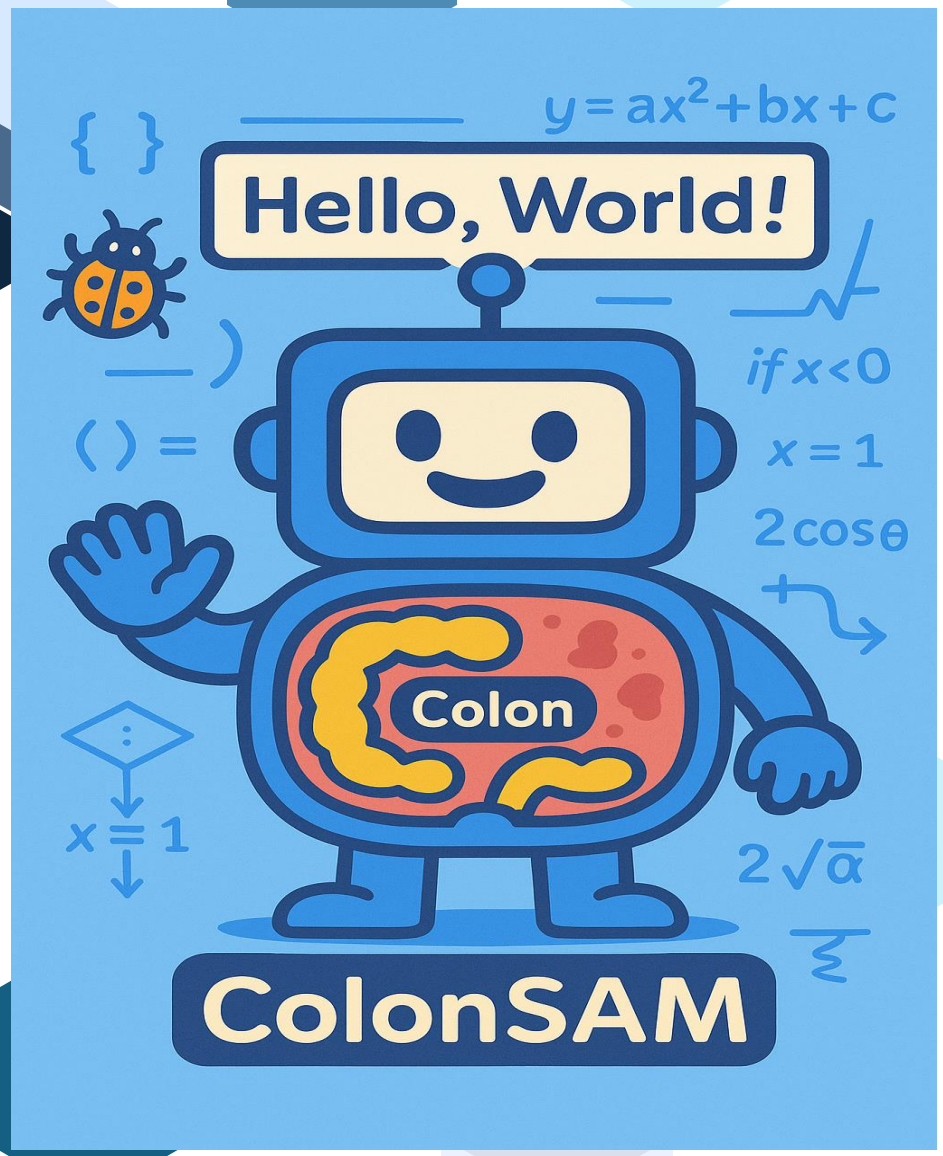
CRCV REU 2025

Week 7

Mentor: Dr. Tian
Student: Syn Nguyen



ColonSAM

Goal:

Develop prompt free model to segment polyps (other organs)

Why:

Colorectal cancer survival rate: 91% (stage I and II), 13% (stage IV)

Contribution:

SOTA, light-weight prompt-free segmentation model

02

Proposed approach



Reinforcement Learning

- Generate initial mask using DINOv2/Yolo
- Add bounding box or positive/negative point
- Evaluate new prompt with reward function
- Agent will add/remove/restore

Challenges

- Adapting to 3D dataset
- Finding a code space for semantic SAM
  - Missing code
  - No code provided
  - Require data preparation

3

Completed



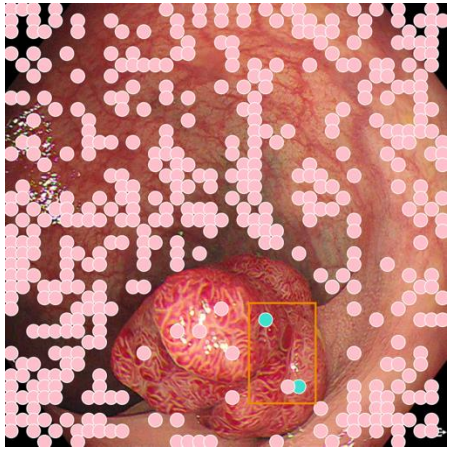
What have been done

- Understand, and analyze 6 papers

- Set up code spaces:
  - https://github.com/XueyuLiu/PPO
  - https://github.com/IDEA-Research/Grounded-SAM-2
  - https://github.com/Duojun-Huang/AlignSAM-CVPR2024
  - https://github.com/tianrun-chen/SAM-Adapter-PyTorch
  - https://github.com/ClaudiaCuttano/SAMWISE

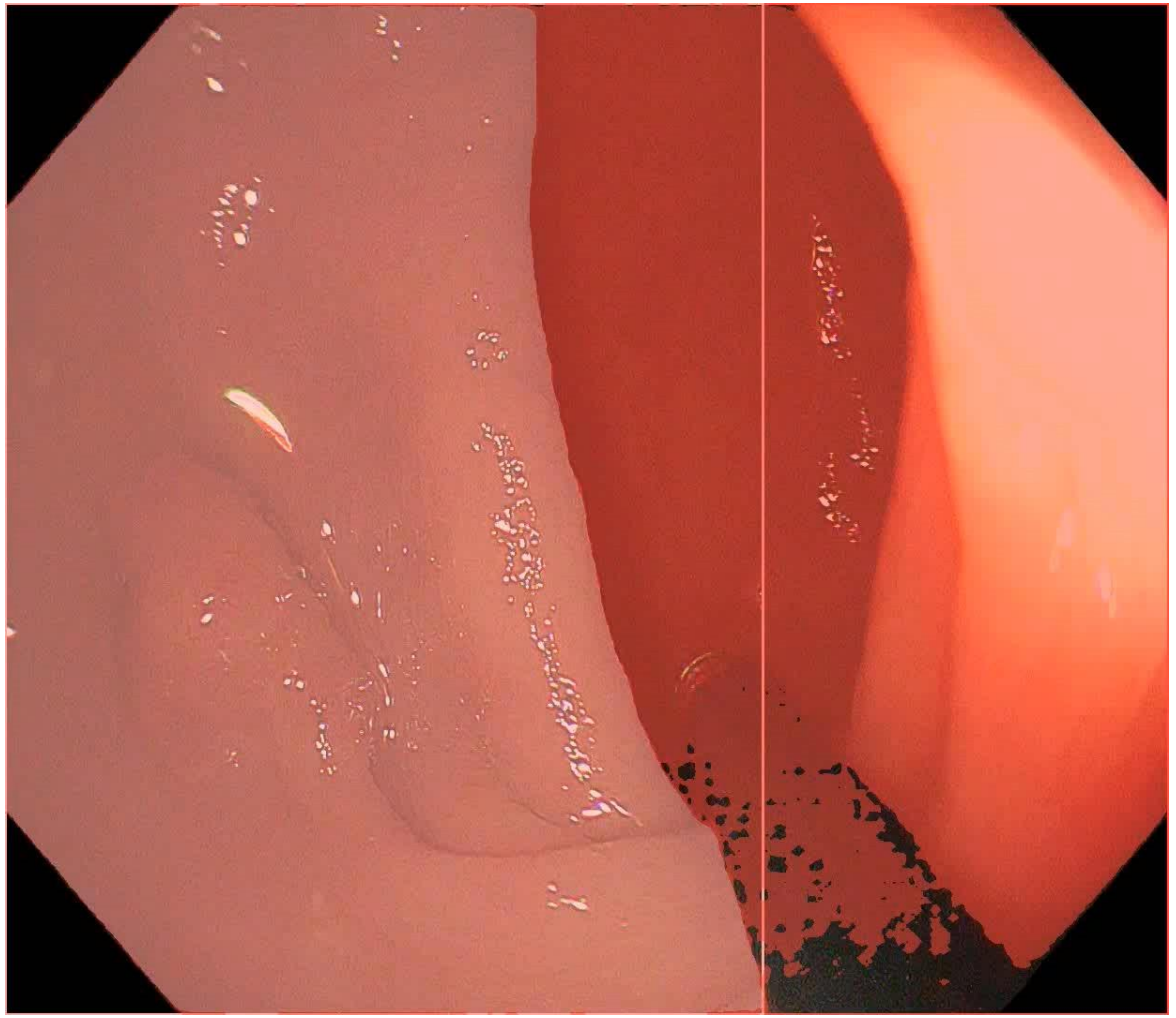
Challenges

- PPO: Missing code
- GroundedSAM2: No training code
- AlignSAM: No code provided
- SAM-Adapter: Poorly maintain
- SAM-Wise: Require data annotation



Result

case90_3.mp4



4

Plan



More codespace...

- CRISP-SAM2: https://github.com/YU-deep/CRISP_SAM2
- Align-SAM unofficial: https://github.com/shantanusingh16/AlignSAM-CVPR2024-Unofficial-
- SAM2-Unet: https://github.com/WZH0120/SAM2-UNet
- mmGroudingDino: https://github.com/open-mmlab/mmdetection
- Self-prompt-SAM: https://github.com/PeterYYZhang/few-shot-self-prompt-SAMSemantic-SAM: https://github.com/UX-Decoder/Semantic-SAM
- De-LightSAM: https://github.com/xq141839/De-LightSAM

Self implement

- Generate initial mask using DINOv2/Yolo
- Utilize reinforcement learning to refine the mask
- Semantic awareness on 3D medical dataset

References

Kirillov, Alexander, et al. *Segment Anything*. 2023. arXiv, https://arxiv.org/abs/2304.02643.

Ravi, Nikhila, et al. *SAM 2: Segment Anything in Images and Videos*. 2024. arXiv, https://arxiv.org/abs/2408.00714.

Ma, Jun, et al. "Segment Anything in Medical Images." *Nature Communications*, vol. 15, no. 1, Jan. 2024, https://doi.org/10.1038/s41467-024-44824-z.

Zhu, Jiayuan, et al. *Medical SAM 2: Segment Medical Images as Video via Segment Anything Model 2*. 2024. arXiv, https://arxiv.org/abs/2408.00874.

Wang, Haoxiang, et al. *SAM-CLIP: Merging Vision Foundation Models towards Semantic and Spatial Understanding*. 2024. arXiv, https://arxiv.org/abs/2310.15308.

Ji, Ge-Peng, et al. "Video Polyp Segmentation: A Deep Learning Perspective." *Machine Intelligence Research*, vol. 19, no. 6, Nov. 2022, pp. 531–549. Springer Science and Business Media LLC, https://doi.org/10.1007/s11633-022-1371-y.

Chen, Zhen, et al. *UN-SAM: Universal Prompt-Free Segmentation for Generalized Nuclei Images*. 2024. arXiv, https://arxiv.org/abs/2402.16663.

THANK YOU!

