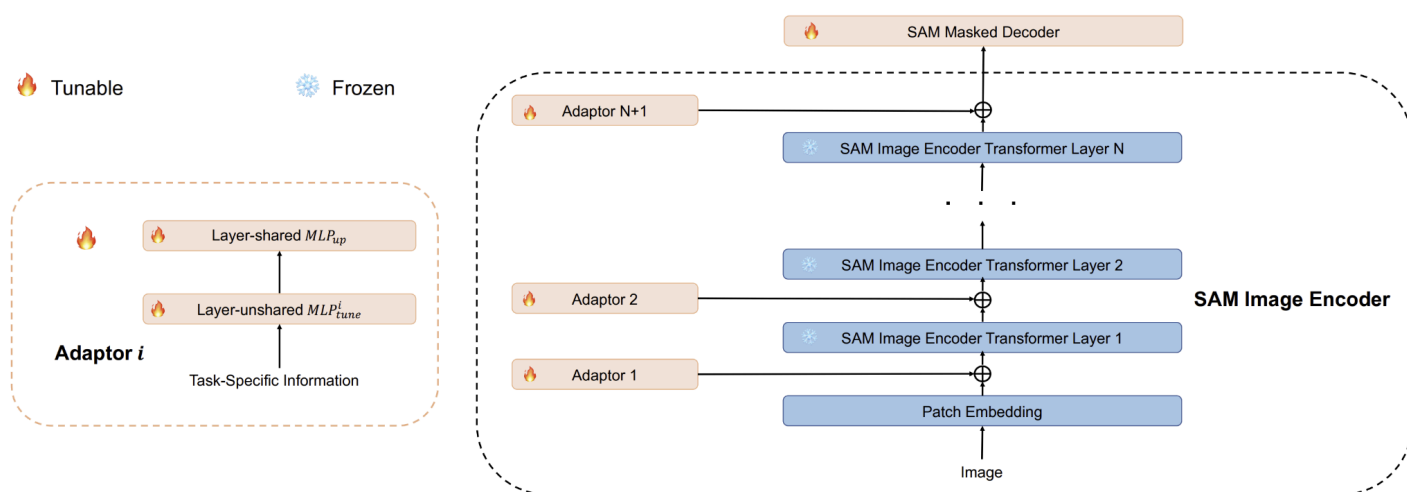# CSE 252D Week 7

## SAM-Adapter: Adapting SAM in Underperformed Scenes

**Viswa Subramanian**
**Loay Rashid**
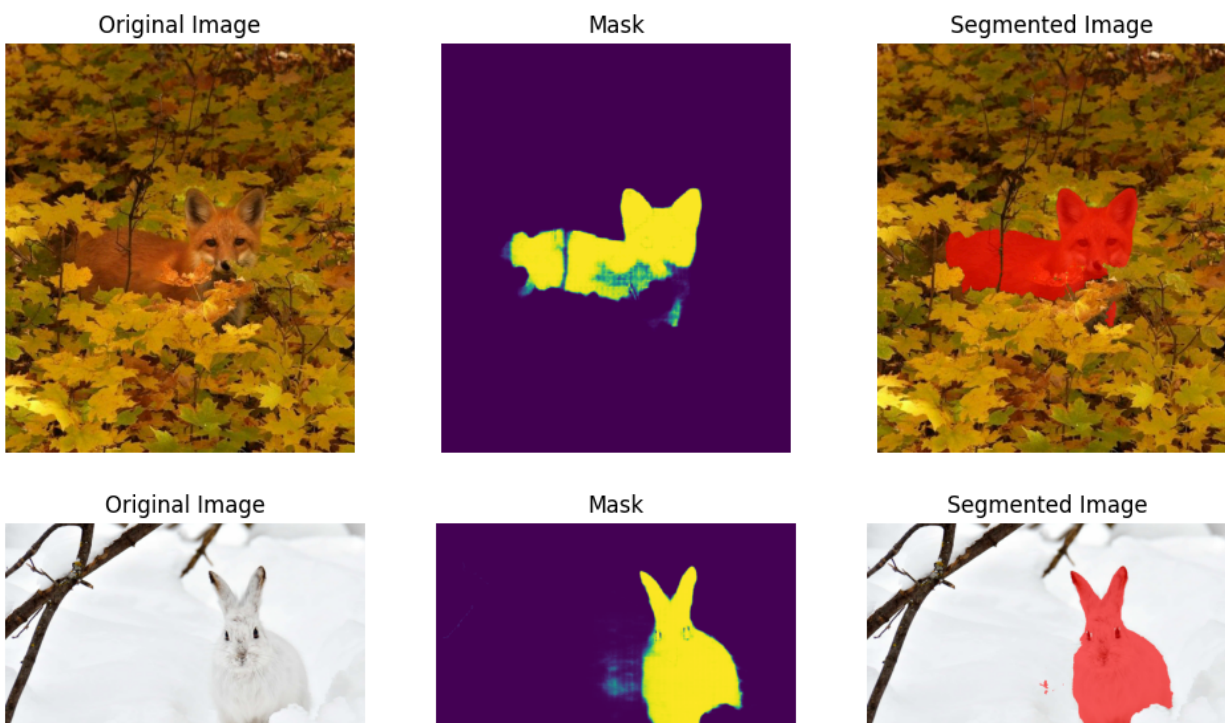**Nishant Rajadhyaksha**
**Sathvik Bhaskarpandit**

## Summary:

Segment Anything Model (SAM) (Meta AI, 2023) is a foundational, promptable segmentation model designed for zero-shot generalization across diverse tasks. Trained on 11 million images and 1 billion masks from the SA-1B dataset, SAM uses a ViT-based image encoder, prompt encoder (for points/boxes/text), and a lightweight mask decoder to generate high-quality object masks in real time. While highly versatile for broad applications, SAM's computational demands and occasional struggles with fine-grained boundaries limit its out-of-the-box performance in specialized domains like medical imaging or satellite analysis.

SAM Adapter addresses these limitations by enabling efficient domain-specific adaptation without full retraining. By inserting lightweight trainable modules (e.g., LoRA or CNN adapters) into SAM's frozen backbone, SAM Adapter fine-tunes <1% of parameters, making it ideal for tasks like medical tumor segmentation or drone imagery analysis. This approach retains SAM's generalization while drastically reducing training costs, achieving near-original inference speeds and improved performance on niche datasets. Together, SAM and its adapters represent a shift toward scalable, modular AI for segmentation.

**Camouflaged images:**

| Original Image | Mask | Segmented Image |
| --- | --- | --- |
| | | |

| Original Image | Mask | Segmented Image |
| --- | --- | --- |
| | | |

**Shadow images:**

| Original Image | Mask | Segmented Image |
| --- | --- | --- |
| | | |

| Original Image | Mask | Segmented Image |
| --- | --- | --- |
| | | |