

## Generative AI for Aortic Imaging – the Promise and Perils

Elsie Ross, MD, MSc  
University of California, San Diego

UC San Diego  
November 22, 2024

# Disclosures


No relevant financial disclosures

UC San Diego

## Generative AI

Large Language Models (LLM) & Large Vision Models (LVM)

ChatGPT – Open AI  
Llama - Meta  
DALL•E – Open AI  
LLaVA-Med - MSFT

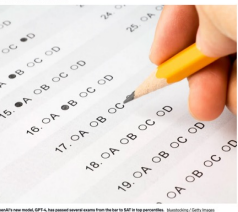



UC San Diego

OpenAI just announced GPT-4o, an updated chatbot that can do everything from a bar exam to AP Biology. Here's a list of dif exams both AI versions have passed.

Google Releases Bard, Its Competitor in the Race to Create A.I. Chatbots

The internet giant will grant users access to a chatbot after years of cautious development, chasing openly debated from rivals OpenAI and Microsoft.

UC San Diego

News > Research

## Deloitte: Hollywood Still Cautious Over Implementing Generative AI

By Tom Butts published 4 hours ago

TV, film studios apprehensive over costs, liability and tech maturity

UC San Diego

Menlo Ventures  
Wed, November 20, 2024 at 11:30 AM PST - 4 min read

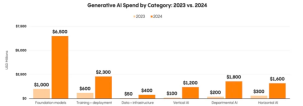
# MENLO VENTURES

Menlo Ventures

Enterprise AI Spending Hits \$13.8B and Anthropic Doubles Market Share While OpenAI Shows Sharp Decline According to New Market Research From Menlo Ventures

Generative AI Spend by Category

Generative AI Spend by Category: 2023 vs. 2024



UC San Diego

### How is Generative AI different than Regular AI?

**Traditional Medical Models**  
# parameters: 10s

**"Regular" AI Models**  
# parameters: 1,000s

**Generative AI Models**  
# parameters: 1,000,000,000s

UC San Diego

### ChatGPT – Generative Pre-trained Transformer

**Attention Is All You Need**

UC San Diego



### Lab Research

UC San Diego

### Detecting arterial structures

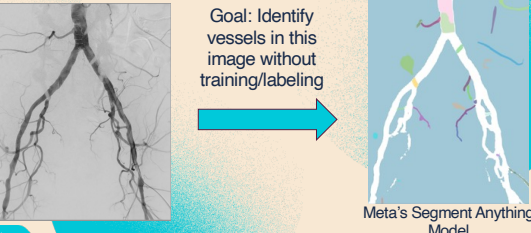
UC San Diego

### Typical model building pipeline

UC San Diego

### Zero Shot Learning

Goal: Identify vessels in this image without training/labeling



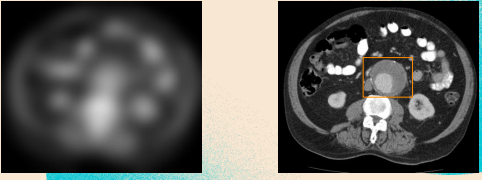
Meta's Segment Anything Model

UC San Diego

# Image data extraction

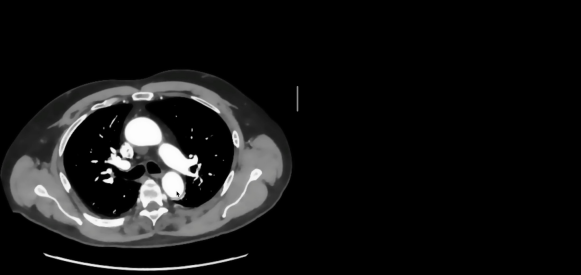
UC San Diego

### Segmentation



UC San Diego

### CTA Predicted Mask



UC San Diego

# Detecting aortic pathology

UC San Diego

### Vascular & AI Bots 1.0

**JVS** Journal of Vascular Surgery **SVS** Society for Vascular Surgery

Articles Publish Topics Multimedia CME About Contact

OTHER - Volume 68, Issue 4, Issue, October 2018 - Open Archive

#### Performance of ChatGPT on Fictional Vascular Surgery Consult Queries: A Potential Artificial Intelligence-Assisted Tool

Quang Li<sup>1</sup>, Michael Amodeo<sup>2\*</sup>

**Evaluating the progression of artificial intelligence and large language models in medicine through comparative analysis of ChatGPT-3.5 and ChatGPT-4 in generating vascular surgery recommendations**

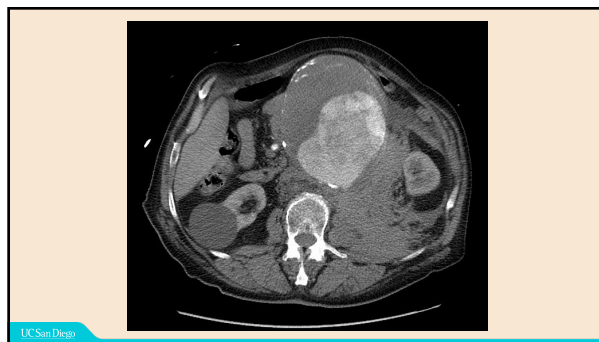
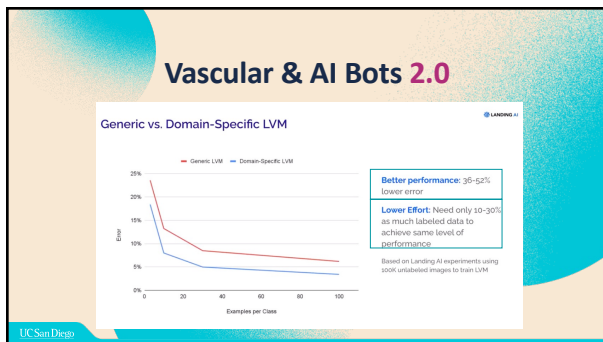
Ashish P. Savdani, MD, MSc,<sup>1</sup> Tamr Fakhoury, MD, PhD,<sup>2</sup> Lauren Gordon, MD, PhD,<sup>3</sup> and Sean A. Crawford, MD, PhD,<sup>1,4</sup> Toronto, ON, Canada

**Testing ChatGPT's Ability to Provide Accurate Patient and Physician Information on Abdominal Aortic Aneurysm in Alignment with Society for Vascular Surgery Practice Guidelines**

Daniel Bergan, MD<sup>1</sup>, Salvatore T. Scall, MD<sup>2</sup>, Adam W. Beck, MD<sup>3</sup>, Marc Schemmerhorn, MD<sup>4</sup>, Mark K. Eskandar, MD<sup>5</sup>, Jens Eitrop-Jorgensen<sup>6</sup>, Robyn Quinto, MD<sup>1</sup>, Mead Ferris, MD<sup>7</sup>, Andy Stanley, MD<sup>8</sup>, Georg Steinthorsson, MD<sup>9</sup>

<sup>1</sup>University of Vermont Medical Center, Burlington, VT, USA, <sup>2</sup>University of Florida, Gainesville, FL, USA, <sup>3</sup>University of Alabama at Birmingham, Birmingham, AL, USA, <sup>4</sup>Beth Israel Deaconess Medical Center, Boston, MA, USA, <sup>5</sup>Northwestern Medicine, Chicago, IL, USA, <sup>6</sup>Maine Medical Center, Portland, ME, USA

UC San Diego



What is in this image?

This is an axial CT scan image of the abdomen. Based on the image:

- There is a large, well-circumscribed mass visible in the region of the left kidney.
- The mass has heterogeneous density, suggesting the possibility of necrosis or hemorrhage within it.
- The surrounding structures, including the vertebrae and bowel, are displaced by the mass.

This appearance is consistent with a renal mass, potentially a renal cell carcinoma (RCC). However, further clinical correlation, imaging sequences, and possible biopsy may be required for diagnosis. If you have specific clinical details, I can provide a more targeted assessment.

UC San Diego

Is there a ruptured aneurysm in this image?

This image does not show clear evidence of a ruptured aneurysm. Key findings that suggest a ruptured aneurysm include:

1. Active extravasation of contrast (if the image is from a contrast-enhanced CT), which would indicate active bleeding.
2. Retroperitoneal hematoma or blood collection, often surrounding the aorta or extending into adjacent tissues.
3. Irregularity or discontinuity in the aortic wall, indicating rupture.

UC San Diego

## Domain-specific LVMs

### CT Aortic Analyzer

by Gisele Garing A

Analyzes CT images for ruptured aortic aneurysms.

What are the key signs of AAA on a CT scan?

How do I identify a retroperitoneal hematoma on...

What phases of CT imaging are most important fo...

Can you describe the features of a contained rupture...

UC San Diego

What is in this image?

This CT image appears to show an abdominal aortic aneurysm (AAA) with signs suggestive of rupture or impending rupture. Key features include:

1. Large aneurysmal dilation of the abdominal aorta.
2. Hyperattenuating crescent sign: A high-density area within the aneurysmal wall indicating blood dissection into the mural thrombus, suggestive of impending rupture.
3. Surrounding retroperitoneal stranding or hematoma: The hazy density around the aneurysm suggests possible rupture with extravasation of blood into the retroperitoneum.

These findings are consistent with a life-threatening vascular emergency requiring immediate clinical evaluation and potential intervention such as endovascular aneurysm repair (EVAR) or open surgical repair.

If you'd like, I can provide more details on these features or their clinical significance.

UC San Diego

# The future

- ## Generative AI to assist in all aspects of surgical decision making
- Rapid detection of aortic pathology
  - Feature extraction
  - Pre-procedure planning
  - Intra-operative image guidance
  - Anticipation of post-operative events
  - Patient Chatbots/care companions
  - & more

# Pitfalls

## Patient Rights & PRIVACY!

Everyone: AI art will make designers obsolete  
AI accepting the job:



Schizophrenia

EDITORIAL OPEN  
ChatGPT: these are not hallucinations – they're fabrications and fabrications

no contact mimer @weirdstallie

## Getting to the future

Share Data    Implement & Evaluate    Expand our imagination



## Thank you!

email: [efross@ucsd.edu](mailto:efross@ucsd.edu)  
X: @tyingwithpolish  
Bluesky: @tyingwithpolish



UC San Diego

DALL-E 2024: Ruptured AAA