

# Med3DVLM: An Efficient Vision-Language Model for 3D Medical Image Analysis

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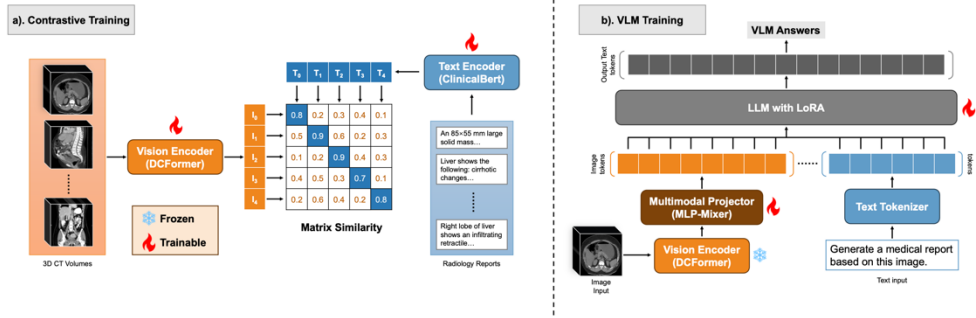


Figure 1: Overview of our Med3DVLM model.

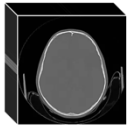
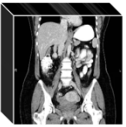
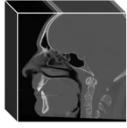

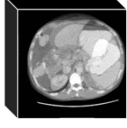
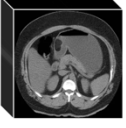
Open-ended visual question answering	Closed-ended visual question answering
 <p>&lt;Question&gt;: What plane is the image in? &lt;Ground Truth&gt;: Axial &lt;M3D-LaMed&gt;: Axial &lt;Med3DVLM&gt;: Axial</p>	 <p>&lt;Question&gt;: Where is the pleural effusion located? A. Left lung B. Right lung C. Both lung D. Unclear &lt;Ground Truth&gt;: B. Right lung &lt;M3D-LaMed&gt;: A. Left lung &lt;Med3DVLM&gt;: B. Right lung</p>
 <p>&lt;Question&gt;: Where is the lesion located? &lt;Ground Truth&gt;: right middle cranial fossa &lt;M3D-LaMed&gt;: Posterolateral wall of left maxillary antrum &lt;Med3DVLM&gt;: Posterior aspect of the right nasal passage</p>	 <p>&lt;Question&gt;: What is the nature of the anomaly found in the stomach? A. Adenocarcinoma B. Hemorrhage C. Mass lesion D. Tuberculosis &lt;Ground Truth&gt;: C. Mass lesion &lt;M3D-LaMed&gt;: A. Adenocarcinoma &lt;Med3DVLM&gt;: C. Mass lesion</p>
 <p>&lt;Question&gt;: Which organ has a mass lesion? &lt;Ground Truth&gt;: Liver &lt;M3D-LaMed&gt;: Pancreas &lt;Med3DVLM&gt;: Liver</p>	 <p>&lt;Question&gt;: What is the CT phase of the image? A. Non-contrast B. Contrast C. Arterial phase D. Portal venous phase &lt;Ground Truth&gt;: D. Portal venous phase &lt;M3D-LaMed&gt;: B. Contrast &lt;Med3DVLM&gt;: D. Portal venous phase</p>

Figure 3: An example of generated radiology reports by Med3DVLM and M3D-LaMed. Med3DVLM demonstrates improved alignment with clinical findings, while M3D-LaMed generates irrelevant or incorrect content.

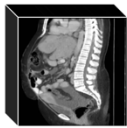
Report Generation	
	<p>&lt;Ground Truth&gt;: Liver shows the following: cirrhotic changes with surface nodularity and hypertrophied caudate lobe multiple bi-lobar patches of low attenuation (&lt;10 HU attenuation in the non contrast phase and &lt;25 HU in the portal venous phase), suggestive of hepatic steatosis right hepatic lobe segment VI and left hepatic lobe segment IV a patches of contrast enhancement showing contrast enhancement at the early enhancement at the arterial and portal phases with no contrast wash out at the delayed phase, likely inflammatory in nature signs of fibrosis evident by surface nodularity, widened preportal and gallbladder fossae Portal hypertension and splenomegaly. Mild abdominal and pelvic ascites.</p> <p>&lt;M3D-LaMed&gt;: Multiple venous varicosities were seen in bilateral para uterine/parametrial regions, more dilated on the left side. The largest diameter of the left para-uterine vein measures 1.0cm. Bilateral ovarian veins are enlarged, measuring up to 0.9cm. There are duplications of bilateral ovarian veins which are the common normal variants. Left ovarian vein drains into left renal vein. Right ovarian vein drains into inferior vena cava. Reduced aortic-SMA angle where significant compression onto left renal vein between superior mesenteric artery (SMA) and aorta (nutcracker phenomenon) -mid part of left renal vein.</p> <p>&lt;Med3DVLM&gt;: Multifocal hepatic mass lesions seen involving the right and left lobes of the liver. Scattered calcifications within the lesions. No evidence of intrahepatic gas. Large right and left portal vein thrombosis. Occlusive filling defects seen within the left and right main portal veins. Multiple right and left iliac lymph nodes. Left iliac arteriovenous malformation. Left atretic ureter with a polypoidal bladder diverticulum seen at the left VUJ. Left hydronephrosis and hydronephrosis. Left renal cortical thinning. No left renal vein opacification. Occluded left proximal common iliac vein. Occlusion of the left external iliac artery with a left peroneal flap artery. Small volume pelvic free fluid. Left scrotal edema.</p>

Figure 4: Examples of open-ended and closed-ended VQA results by Med3DVLM and M3D-LaMed.