

A Appendix of MEDBind: Unifying Language and Multimodal Medical Data Embeddings

Table A.1. Labels and prompts used for zero-shot evaluation for each dataset. We denote $\{\text{LABEL}\}$ as the label associated with the patient case. For PTB-XL and ICBEB, $\{\text{LABEL}\}$ were used to generate prompts. Since there are no available clinical reports for COVID dataset, we generated text prompts similar to MedCLIP [29] to include some radiological findings. We randomly selected 10 out of 20 generated prompts per label for COVID dataset and calculated the average cosine distance in zero-shot settings.

Dataset	Labels	Prompts
COVID	COVID-19, Normal	COVID-19: [<i>“Multifocal bilateral opacities.”, “Atypical pneumonia with peripheral distribution and sparing of the lung apices.” ...</i>] Normal: [<i>“Heart size is normal and the lungs are clear.”, “The heart is normal in size and contour.” ...</i>]
RSNA	Pneumonia, Normal	Pneumonia: [<i>“Findings suggesting pneumonia.”</i>] Normal: [<i>“No evidence of pneumonia.”</i>]
PTB-XL	Hypertrophy, Myocardial Infarction, STT Changes, Conduction disturbance, Normal sinus rhythm	<i>“This ECG shows $\{\text{LABEL}\}$.”</i>
ICBEB	First-degree atrioventricular block, atrial fibrillation, complete left/right bundle branch block, normal sinus rhythm, premature atrial contraction, ST-segment depression, ST-segment elevated	<i>“This ECG shows $\{\text{LABEL}\}$.”</i>

Table A.2. Generated text for MIMIC-ECG and MIMIC-IV. Inputs are incorporated into the **Generated Text Format**. Each ECG contains a list of machine reports (i.e. `report_0`) for each ECG. MIMIC-IV-generated texts were used for mortality.

Datasets	Inputs	Generated Text Format
MIMIC-ECG	[<code>report_0</code> , <code>report_1</code> , ..., <code>report_17</code>]	<i>“ECG presents $\{\text{report}_0\}$. Additional findings include the following: $\{\text{report}_1, \dots, \text{report}_{17}\}$.”</i>
MIMIC-IV	[<code>gender</code> , <code>anchor_age</code> , <code>admission_type</code> , <code>admission_location</code>]	<i>“$\{\text{gender}\}$ patient, who is at the age of $\{\text{anchor_age}\}$, was admitted as $\{\text{admission_type}\}$. Location: $\{\text{admission_location}\}$.”</i>

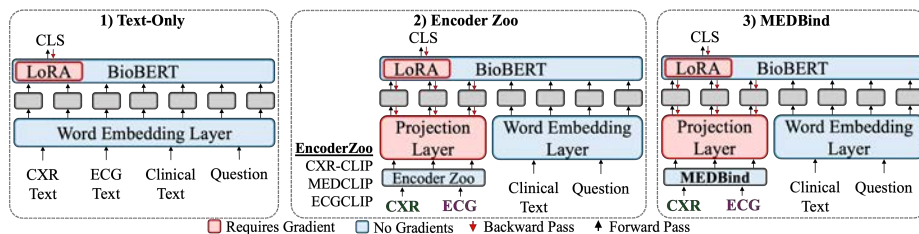


Fig. A.1. Three different training paradigms for downstream LLM tasks. 1) Text-only: Traditional method of prompt tuning using LoRA [8] to tune weights of BioBERT [17]. 2) Encoder Zoo: AnyMAL [22] paradigm for fine-tuning, which incorporates multiple modalities by inputting CXR and ECG tokens—generated either from CXR-CLIP [30] and ECG-CLIP or MedCLIP [29] and ECG-CLIP alongside clinical text. 3) MEDBind: which is a unified model for multimodal binding.

Table A.3. Rule-based method to label MIMIC-ECG data using clinical text. We label each class based on the expert-generated keywords found in [28] (**Keywords**) and excluded ECG if the associated clinical text contained content presented in **Disallowed Content**, which represents poor quality data.

Class	Disallowed Content	Keywords
Normal (NORM)		[normal ecg, no issues found, normal ekg, normal heart tracing, <u>within normal limits</u>]
Hypertrophy (HYP)	[borderline ecg, poor quality, without knowing patient, error,	[hypertrophy, left atrial enlargement, LVH, LAO, overload, enlargement]
STT Changes (STTC)	pediatric, warning: data quality, missing lead, unsuitable for analysis, motion artifacts,	[ST elevation, T wave changes, nonspecific T abnormalities, ST changes, T changes, ventricular premature complex, VPC, PVC, ST change]
Myocardial Infarction (MI)	requires manual review, technical difficulties, possibly, probable]	[myocardial ischemia, inferior infarct, anterior infarct, septal infarct]
Conduction Disorder (CD)		[degree A-V block, PAC, prolonged PR interval, conduction delay, left axis deviation, bundle branch block, pacemaker, atrial pacing, rBB, LAFB, PVC]

Table A.4. MIMIC-ECG class distribution using our rule-based approach. The table highlights the number of ECG cases in MIMIC-ECG detected. *N/A column represents ECGs that our approach could not label and were excluded from our study.

NORM	HYP	STTC	MI	CD	N/A*
34,097	11,305	28,918	19,242	31,438	670,939