Model Card of ECG Diagnosis

Model Details

• The ECG Diagnosis model provided by Group 5, trained to predict the likelihood that an ECG beat contains any of 5 heart conditions: Normal ECG, Myocardial Infarction, ST/T Change, Conduction Disturbance, and Hypertrophy

• Deep Learning 1D-Convolutional Neural Network with Residual Connections.

• Developed by Group 5 in 2024.

Intended Use

• Enhanced Diagnostic Accuracy: Helps doctors and nurses quickly and accurately diagnose cardiac conditions using sophisticated ECG analysis.

• Operational Efficiency: Automates complex ECG interpretation to boost clinical efficiency, enabling medical staff to concentrate more on patient care.

Factors

• Sensitive Identity Terms: Pays special attention to terms related to frequently targeted groups like those defined by sexual orientation, gender identity, and race.

• Bias Monitoring: Actively monitors and audits outputs to detect and address biases, especially against vulnerable groups.

Metrics

• AUC (Area Under the Curve): Measures the model's overall prediction accuracy.

• Confusion Matrix and Classification Report: Provides detailed insights into accuracy, recall, and precision for each label, helping identify specific cardiac conditions accurately

Ethical Considerations

• **Ethical Guidelines**: Adhering to ethical guidelines that forbid the use of predictive technologies to discriminate or make decisions that negatively impact individuals based on their membership in protected classes.

• **Transparency and Accountability**: Maintaining transparency about how data is used, how decisions are made, and providing clear channels for feedback and corrections of inaccuracies in model predictions.

Training Data

• **PTB-XL Dataset**

- Multi-labeled dataset of 21799 clinical 12-lead ECGs from 18869 patients
- Data is labeled with 5 heart conditions: Normal ECG, Myocardial Infarction, ST/T Change, Conduction Disturbance, and Hypertrophy
- Resampled at a rate of 500 Hz

• **MIT-BIH Dataset**

- Multi-class dataset comprised of ECG recordings from 47 subjects, recorded between 1975 and 1979
- Chosen at random from a set of 4000 recordings
- Resampled at a rate of 360 Hz

• "[MI, CD, STTC, HYP, NORM]" is the output label as an abbreviation for the condition of the heartbeat.

Caveats and Recommendations

• the dataset used for fine-tuning suffered from mislabeling of extracted beats requiring human review, it would achieve higher accuracy if fine-tuned on a more refined Dataset.

Quantitative Analyses

	Precision	recall	F1-score	Support
CD	0.73	0.77	0.75	9075
HYP	0.37	0.71	0.49	2981
MI	0.53	0.74	0.62	5740
NORM	0.80	0.89	0.84	12317
STTC	0.62	0.80	0.70	8991
Micro Avg	0.65	0.81	0.72	39014
Macro Avg	0.61	0.78	0.68	39014
Weighted Avg	0.67	0.81	0.73	39014
Samples Avg	0.69	0.82	0.72	39014
Per Label Accuracy	0.85			
ROC-AUC	0.90