Pretraining ECG Data with Adversarial Masking Improves Model Generalizability for Data-Scarce Tasks

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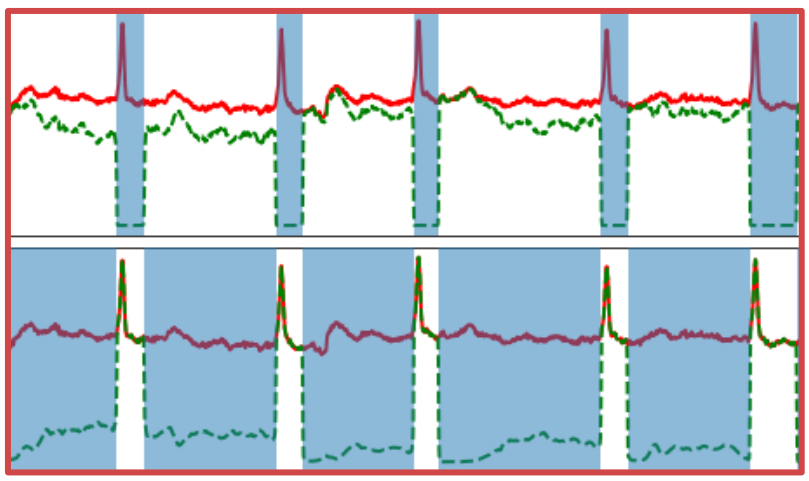
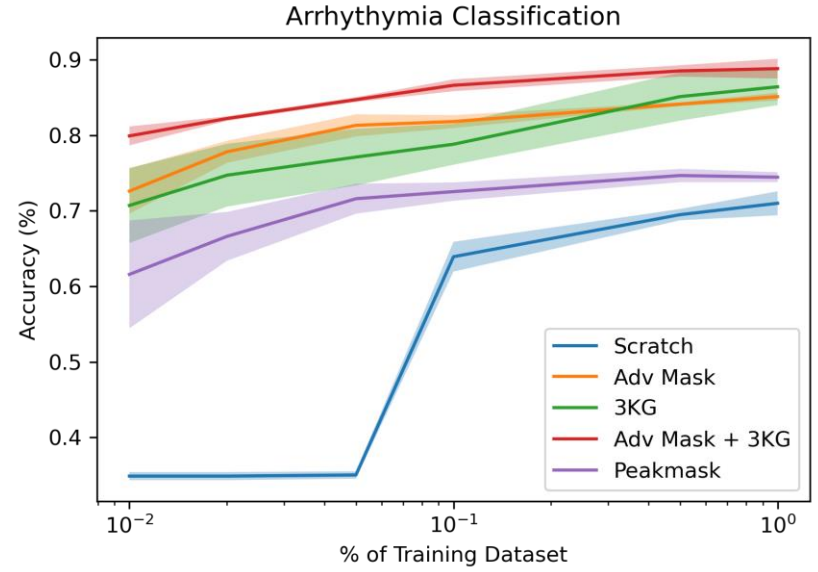
Abstract

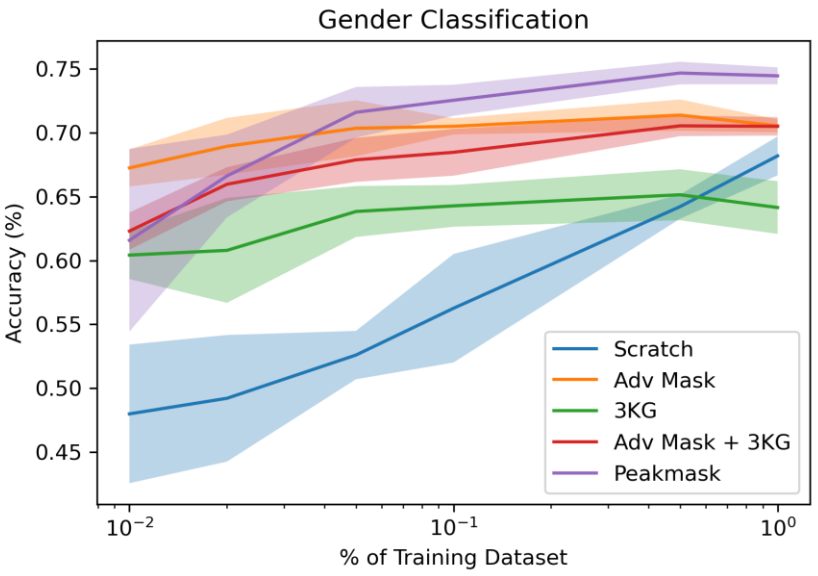
Self-supervised pretraining with adversarial masking (**Adv Mask**) as data augmentations improves model **generalizability** in **data-scarce** downstream tasks.

We demonstrate this with 12-lead electrocardiogram (ECG) data on downstream tasks of **arrythmia classification** and **gender classification**.

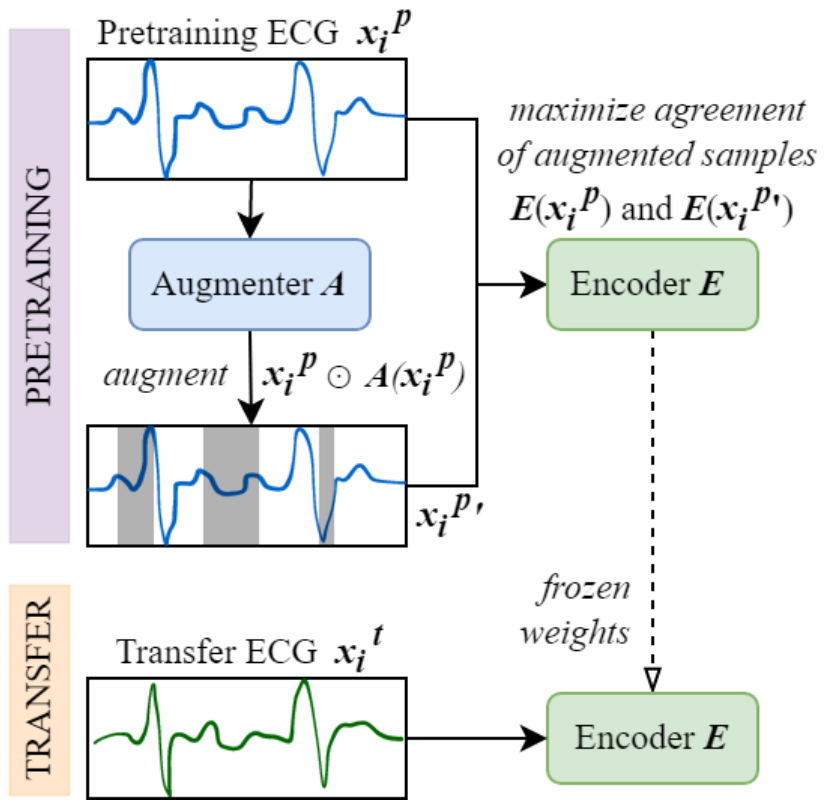


Transfer Results





Methods



Adv Mask Pretraining Objective

$$\min_{E} \max_{A} \mathcal{L}_{\text{SSL}}(E, A) - \mathcal{L}_{\text{sparse}}(A)$$

$$\mathcal{L}_{\text{SSL}}(x; E) = -\log \frac{\exp(sim(h_i, h'_i))}{\sum_{i \neq j} \exp(sim(h_i, h'_j))} \qquad \mathcal{L}_{\text{sparse}}(x; A) = \sin\left(\frac{\pi}{D} \sum_{d=1}^{D} m^d\right)^{-1}$$

	Pretraining	Transfer
Architecture	***E:*** 1D ResNet-18 ***A:*** 1D UNet	Linear evaluation
Dataset	12-lead PhysioNet CinC 2021	12-lead Chapman-Shaoxing

Discussion

Adv Mask exhibits peak-finding behaviour, masking out diagnostically-relevant areas of the ECG.

Adv Mask has strong advantages in low-data regimes and contributes orthogonal benefits to state-of-art *3KG.*

References

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