

Deep Imbalanced Regression

Yang Y, Zha K, Chen Y, Wang H, Katabi D

ICML 2021

Presenter: Gianmarco Midena

26 November 2024

Deep Imbalanced Regression

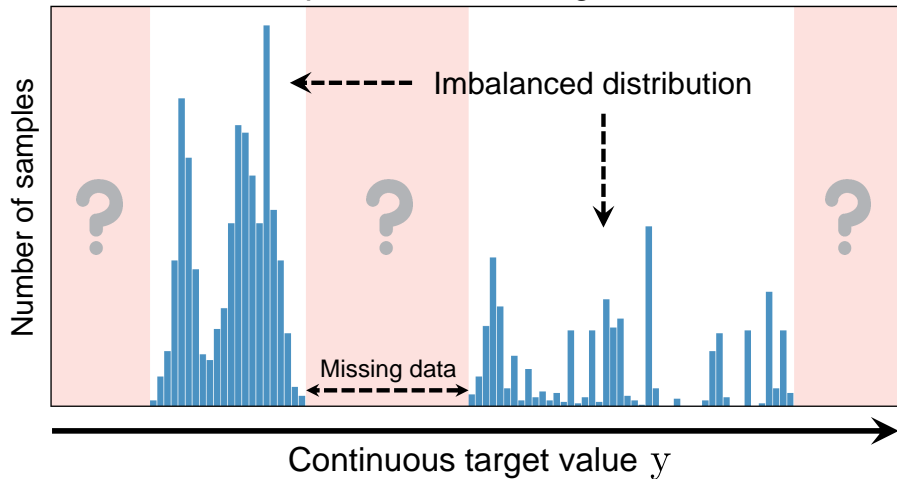
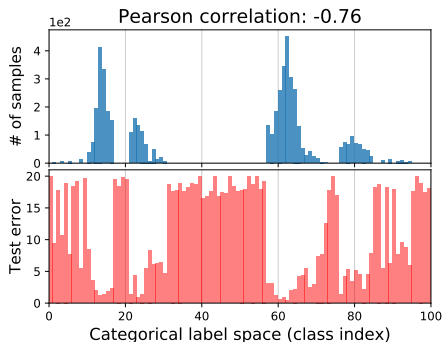
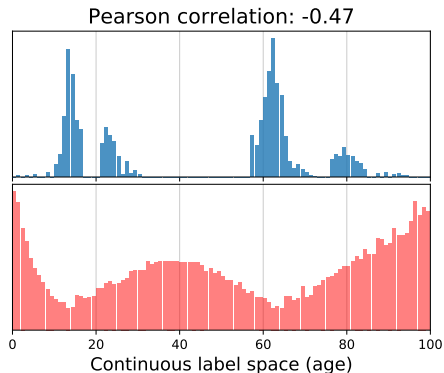


Image credit: [Yang et al. \(2021\)](#)

Test Error on Categorical vs. Continuous Label Space



(a) CIFAR-100 (subsamped)



(b) IMDB-WIKI (subsamped)

Image credit: [Yang et al. \(2021\)](#)

Problem Settings

- $\{(\mathbf{x}_i, y_i)\}_{i=1}^N$: training set
- $\mathbf{x}_i \in \mathbb{R}^d$: input
- $y_i \in \mathcal{Y}$: continuous label or target
- $b_i \in \mathcal{B}$: discrete label or target
- $\mathcal{Y} \subset \mathbb{R}$: continuous label space
- $\mathcal{B} = \{1, \dots, M\} \subset \mathbb{Z}^+$: index space
 - ▶ divides \mathcal{Y} into M groups (bins) with equal intervals $[t_j, t_{j+1})$
 - ▶ $\{[t_0, t_1), \dots, [t_{M-1}, t_M)\}$: discrete label space
 - ▶ $t_k \in \mathcal{Y}$
 - ▶ minimum resolution
 - ★ e.g., $\delta y \triangleq t_{j+1} - t_j = 1$ in age estimation
- $\hat{y}_i = g(\mathbf{z}_i) \in \mathbb{R}$: predicted continuous label
- $\mathbf{z}_i = f(\mathbf{x}_i; \theta) \in \mathbb{R}^{d'}$: learned representation
- θ : trainable model parameters

Label Distribution Smoothing

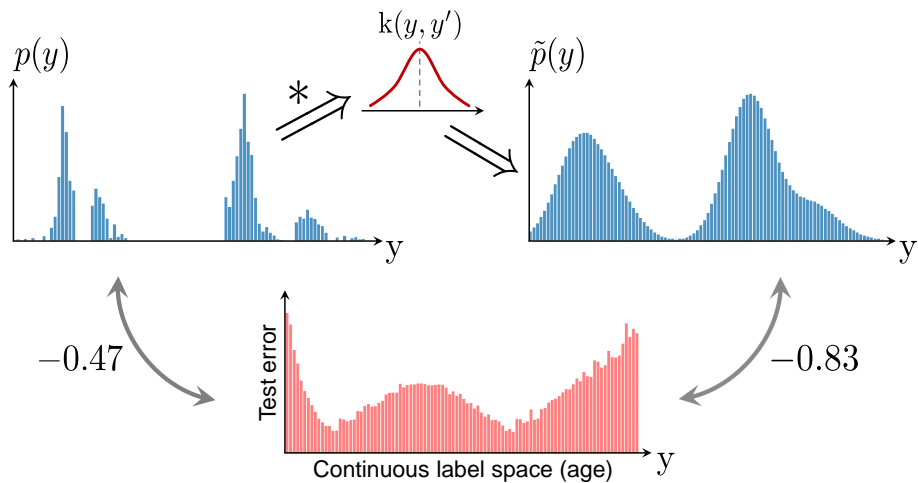


Image credit: [Yang et al. \(2021\)](#)

Feature Distribution Smoothing

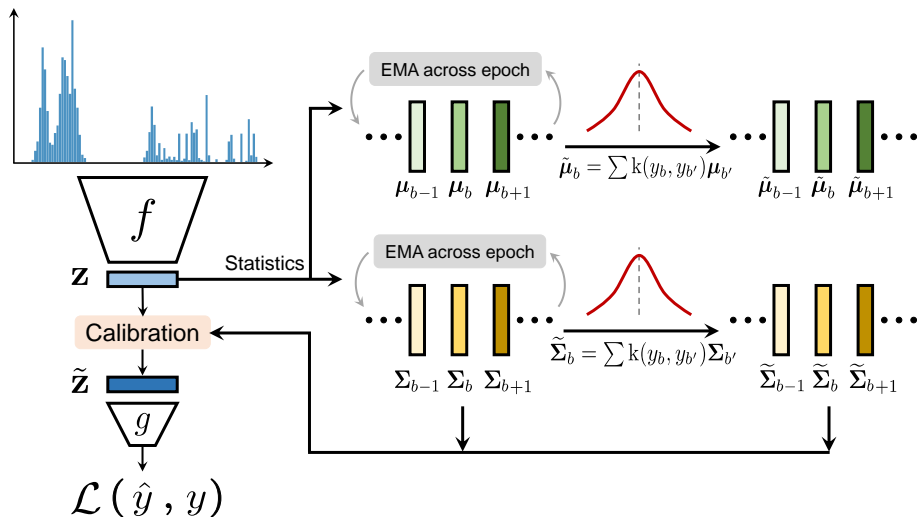


Image credit: [Yang et al. \(2021\)](#)

References

Yang, Yuzhe et al. (2021). “Delving into deep imbalanced regression”. In: *International conference on machine learning*. PMLR, pp. 11842–11851.