What do we maximize in SSL

Background

Continuous Piecewise ~~Affine~~ mapping (CPA)

Given a partition Ω of Domain $\mathbb{R}^d$

$$w \in \Omega$$

boundary of polynomial k spline.

k-dimensional affine Spline f produces.

$$f(z) = \sum_{w \in \Omega} \left(A_w z + b_w \right) \mathbb{1}_{\{z \in w\}}$$

↑ sum of them.

single Stage NN with no nonlinearity

input $z \in \mathbb{R}^d$

pre-region

slope $A_w \in \mathbb{R}^{k \times d}$

offset $b_w \in \mathbb{R}^k$

VICReg setting:

Two embedding batch:

$$Z = \begin{bmatrix} f(x_1), \dots, f(x_N) \end{bmatrix} \in \mathbb{R}^{N \times K}$$

$$z' = \left[f(x'_1) \quad \dots\dots \quad f(x'_m) \right]$$

$C \in \mathbb{R}^{K \times K}$ co-variance matrix.

Viking loss

$$\mathcal{L} = \frac{1}{K} \sum_{k=1}^{K} \left(\alpha \max\left(0, \gamma - \sqrt{C_{k,k} + \epsilon}\right) + \beta \sum_{k' \neq k} \left(C_{k,k'}\right)^2 \right) + \gamma \, \| z - z' \|_F^2$$

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