PAL : Pretext-based Active Learning

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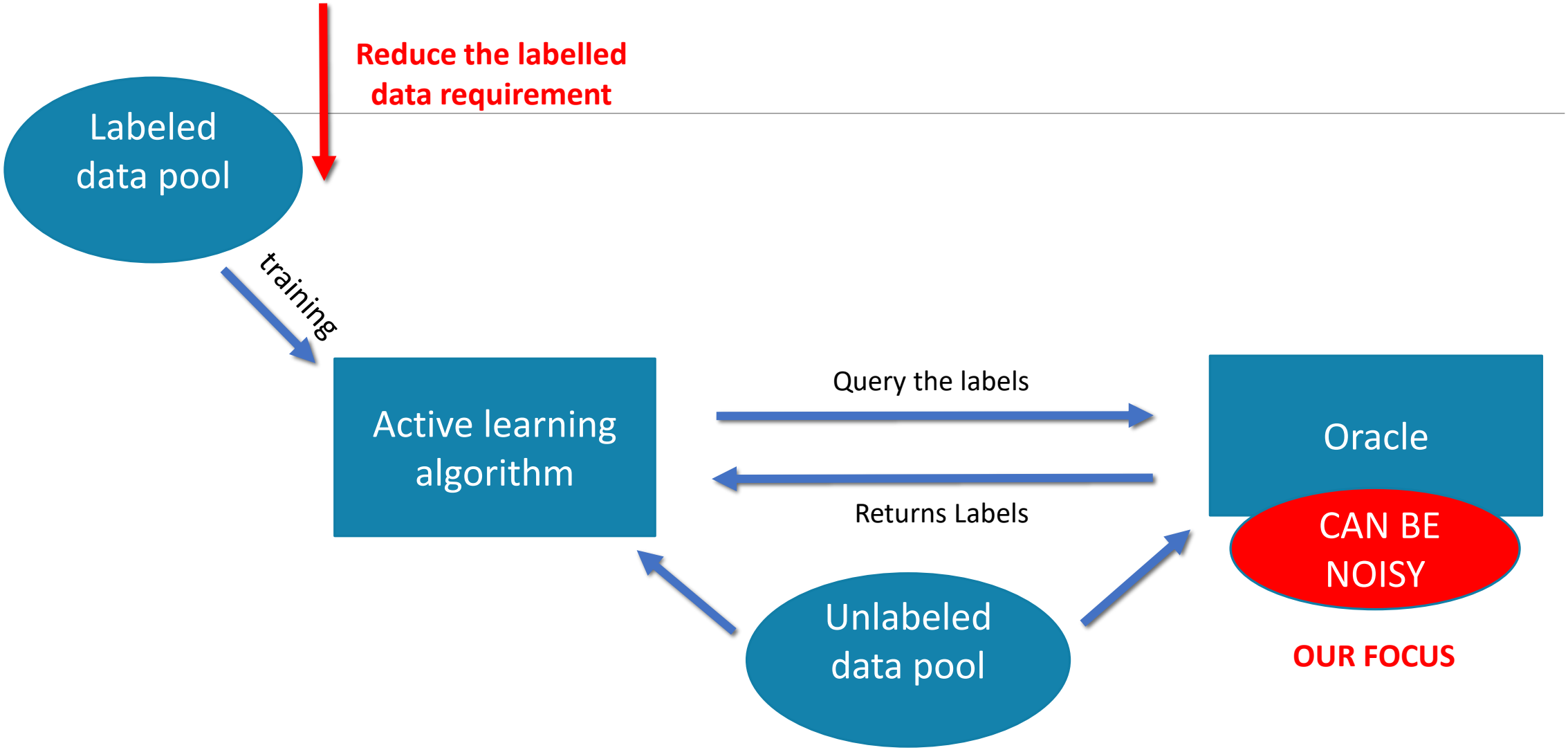
Active Learning Setup



Self-Supervision

Labelled Data Pool

Apply Transforms

Class 1

Class 2

Class 3

. . . .

Solve self-supervised (SS) N Class Classification task

Neural Network

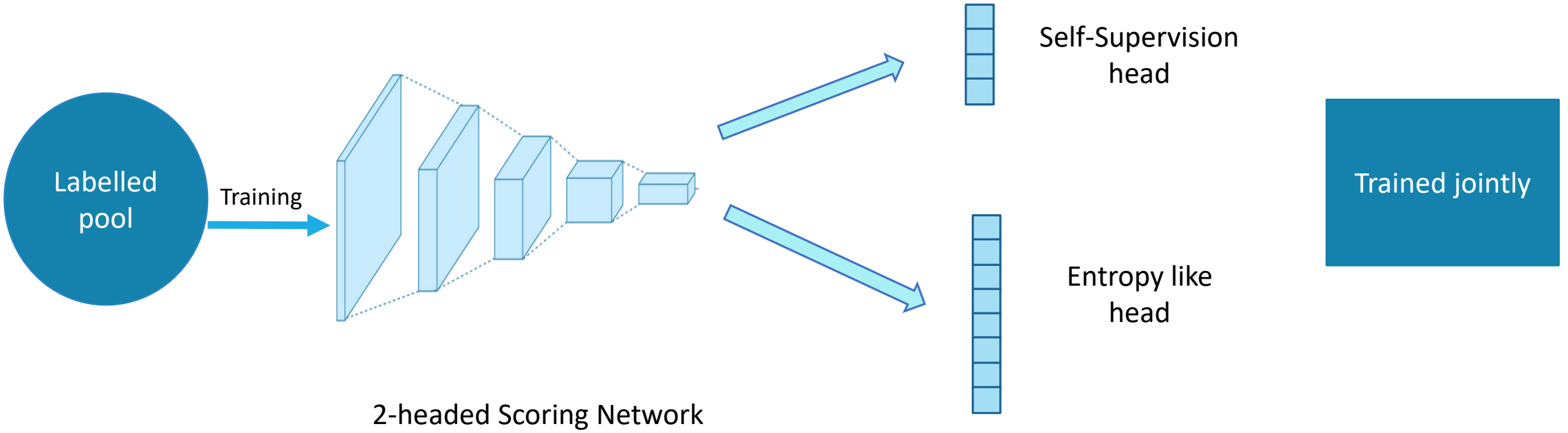
Network needs to learn data distribution to solve the SS Task

Characterize distance of unlabelled sample from the distribution !!

[1] Gidaris et al. RotNet, ICLR 2018

The Scoring Network

Training Phase



2-headed Scoring Network

Score informs us of the novelty of the sample

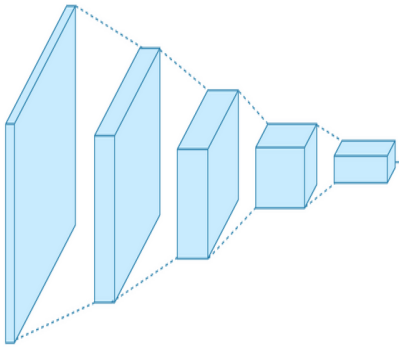
The Scoring Network

Inference Phase

Scores

Unlabelled pool

Inference



Scoring model

Self-Supervision head

$$S_S(\mathbf{x}_u) = -\sum_{i\epsilon\{0,1,2,3\}} g_\phi(\mathrm{rot}_{90i}(\mathbf{x}_u))_i,$$

Entropy like head

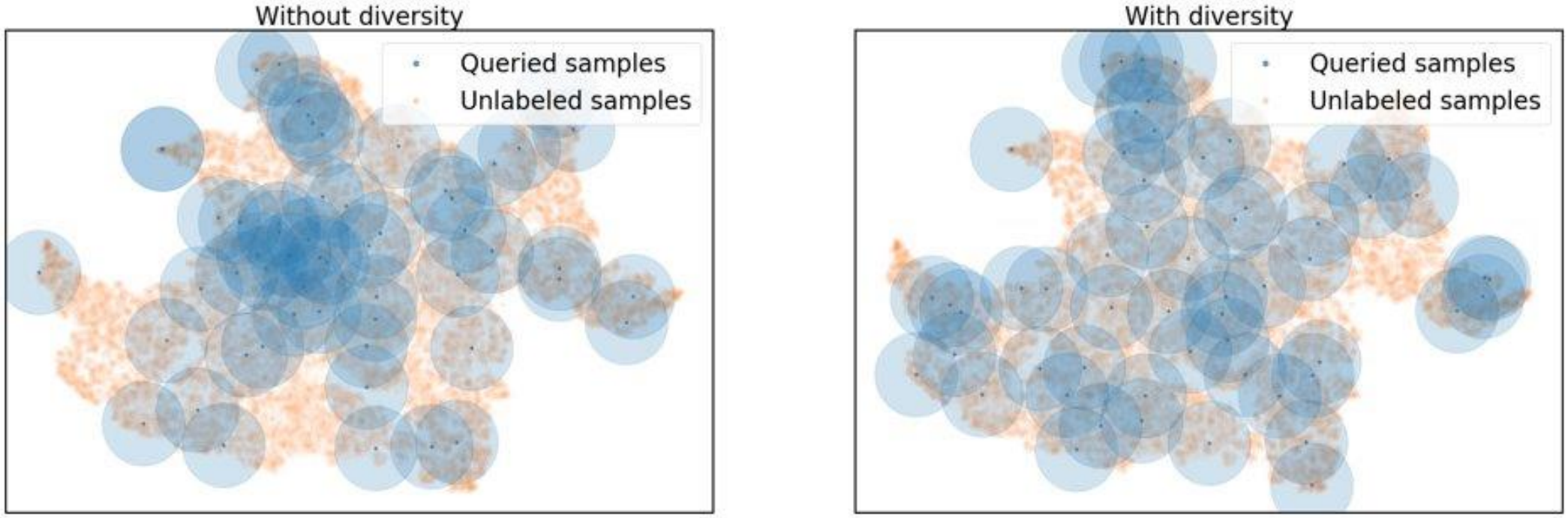
$$S_C(\mathbf{x}_u) = -\mathrm{KL}(U \mid\mid h_\psi(\mathbf{x}_u))$$

Hybrid score

$$S(\mathbf{x}_u) = S_S(\mathbf{x}_u) + \lambda S_C(\mathbf{x}_u)$$

The Scoring Network

Introducing Diversity



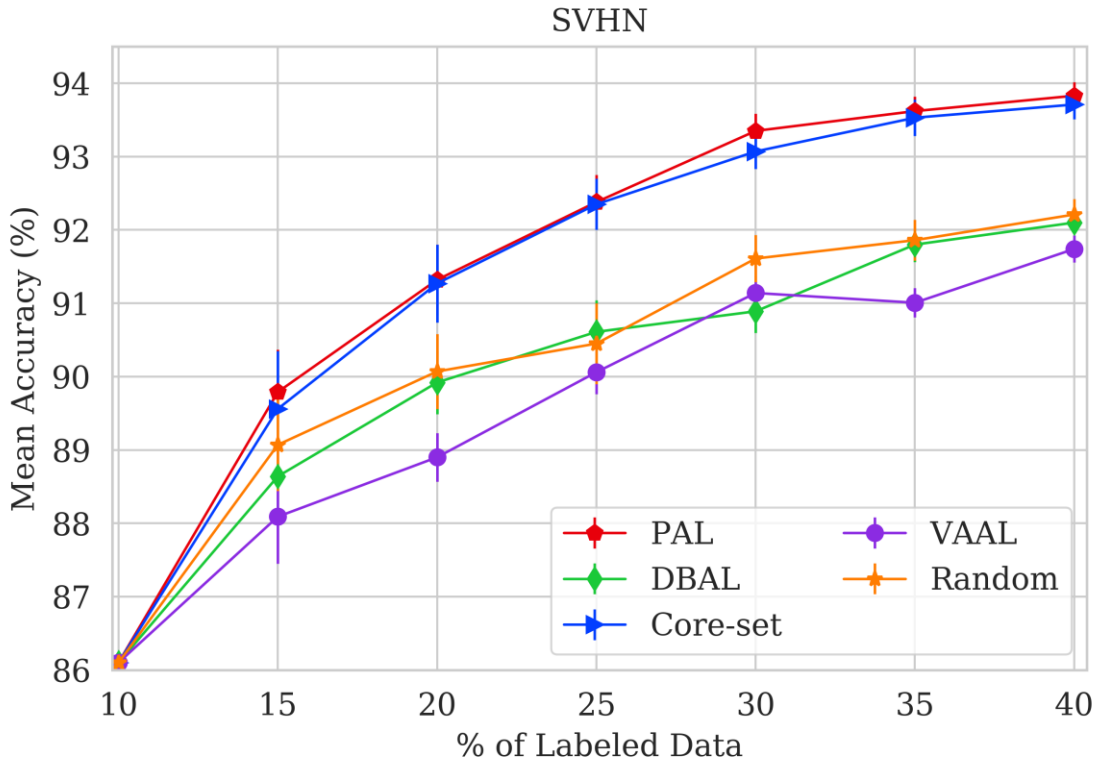
Improved Hybrid score

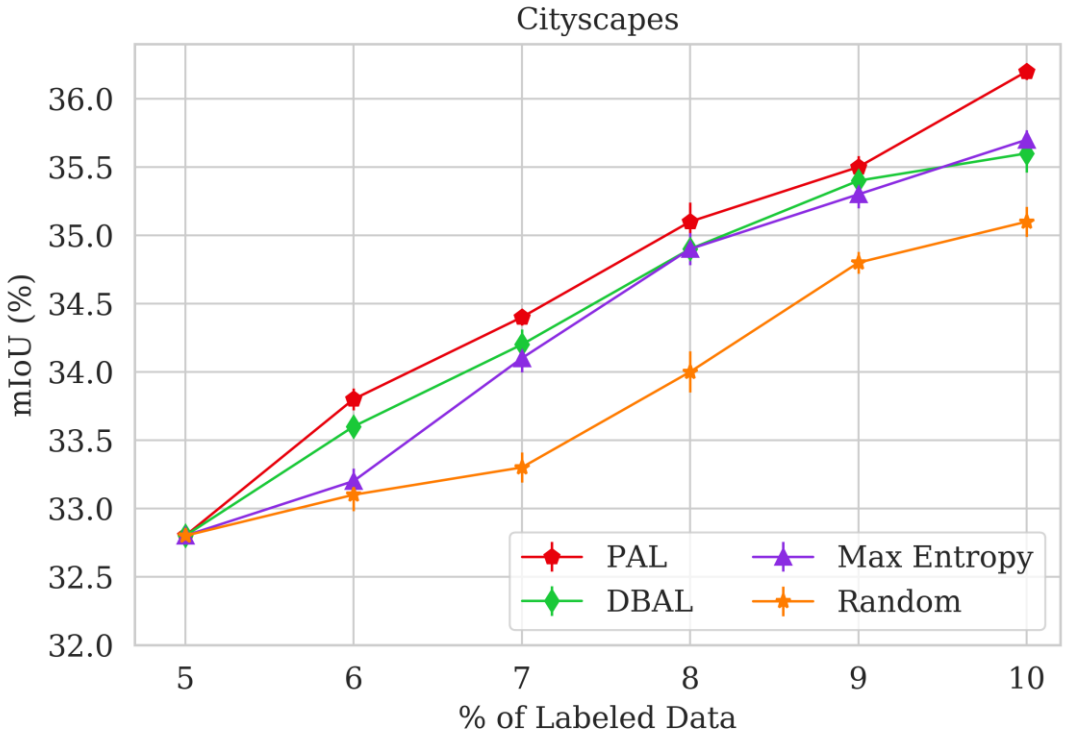
$$S(\mathbf{x}_u) = S_S(\mathbf{x}_u) + \lambda_1 S_C(\mathbf{x}_u) + \lambda_2 S_D(\mathbf{x}_u)$$

More Details in Paper !

Results

Ideal Oracle

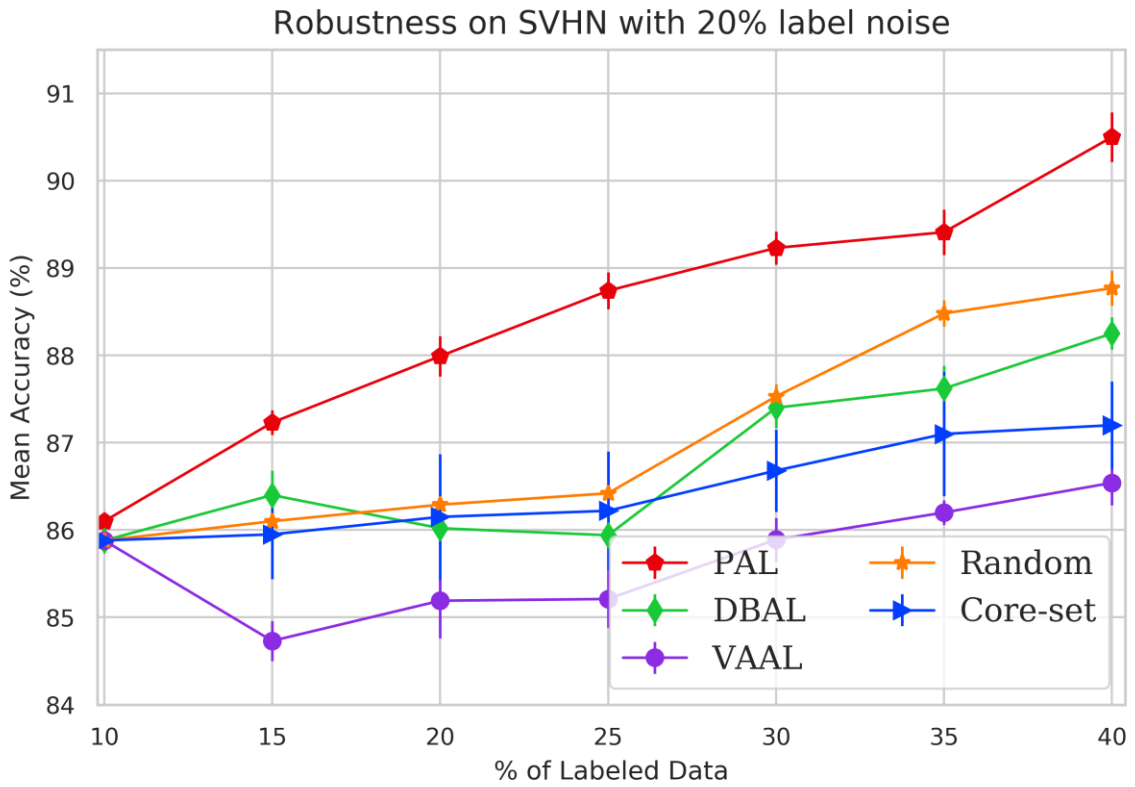




PAL performs strongly on both classification and segmentation in comparison to other active learning baselines

Results

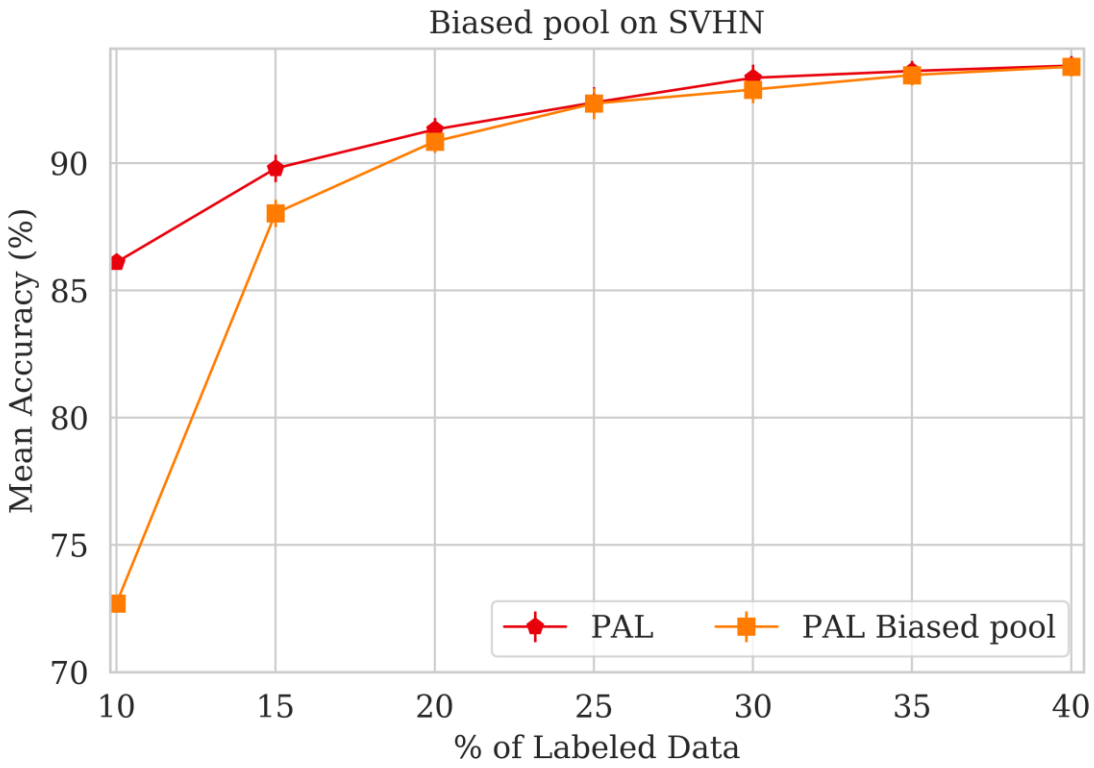
Noisy Oracle : A new baseline in Active Learning Community

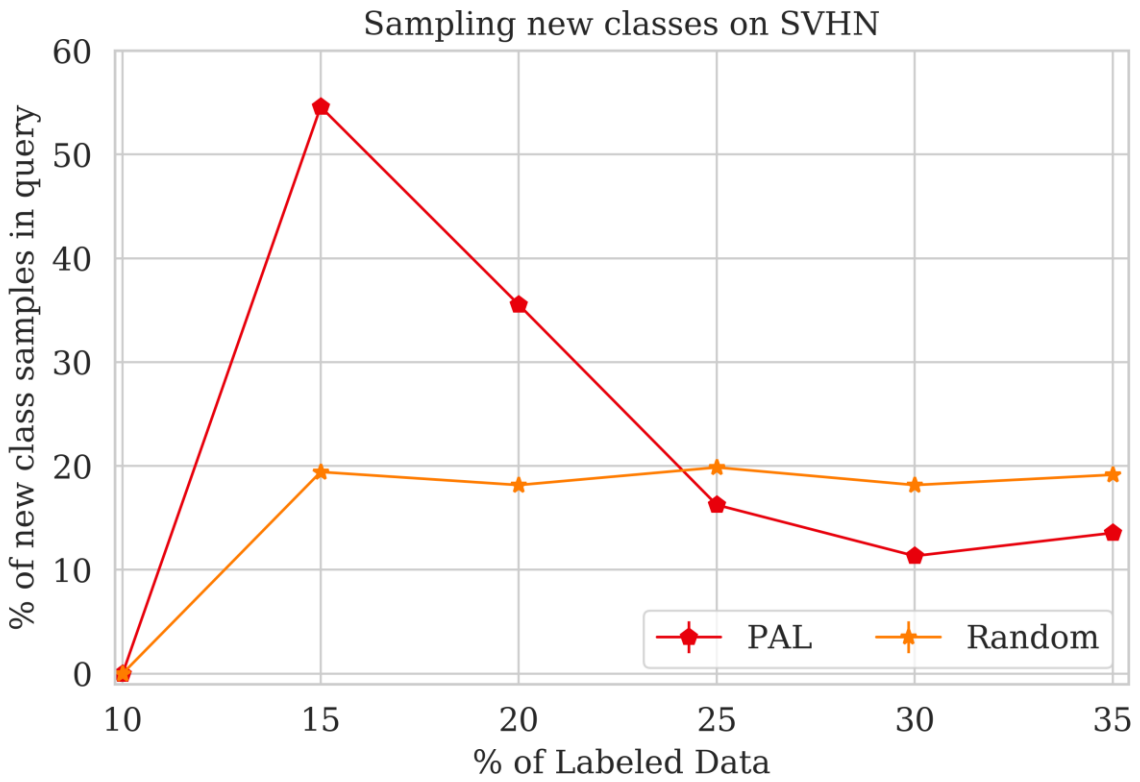


PAL outperforms other active learning baselines by 2-5 % in presence of label noise

Results

New classes





PAL with new classes added later catches up with it's own performance when trained with no missing classes quickly by oversampling data points from the missing classes

Thank you !!
Feel free to reach out for further questions and clarifications

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