Supplemental Materials for

Channel Embedding for Informative Protein Identification from Highly Multiplexed Images

1 Calculation of Ground Truth Importance

We define a ground truth importance of a target i as

$$g_i = \frac{1}{\mu_i^1} \left(\left| \mu_i^1 - \mu_i^2 \right| + \left| \mu_i^2 - \mu_i^3 \right| + \left| \mu_i^3 - \mu_i^1 \right| \right), \tag{1}$$

where μ_i^t is the average intensity of target i across all single cells of a tumor grade t.

2 More Quantitative Results on the Synthetic Dataset

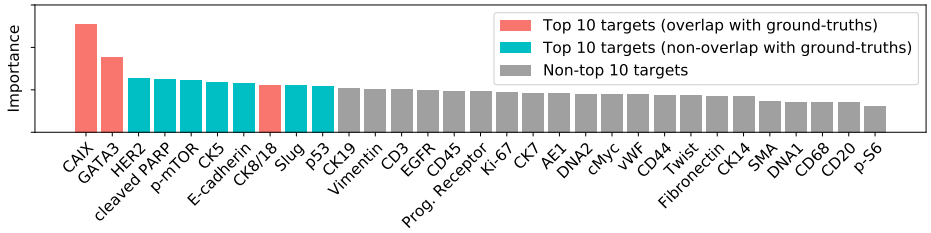
We report the Recall@K for different values of K *i.e.*, different number of target proposals from an informative channel identification method. Table 1 compares informative channel identification methods in terms of Recall@K. It is observable that our method outperforms the other approaches for all values of K.

Table 1: Quantitative comparison on the synthetic dataset.

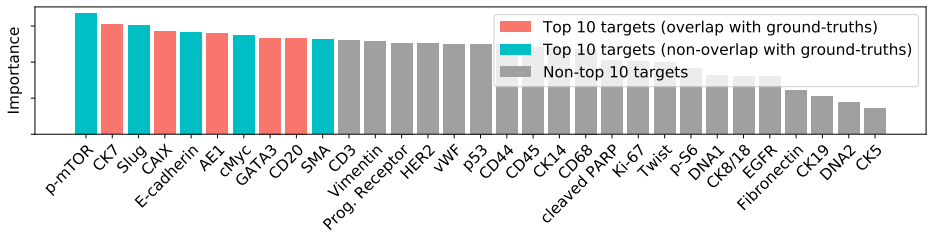
	Recall@K							
Method	K=6	K=7	K=8	K=9	K=10	K=11	K=12	K=13
ResNet50 [4]	50.0	50.0	66.7	66.7	66.7	66.7	66.7	83.3
ResNet3D-18 [20]	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
BSN [10]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ours	**83.3**	**83.3**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

3 Target Importance for Tumor Grade Classification

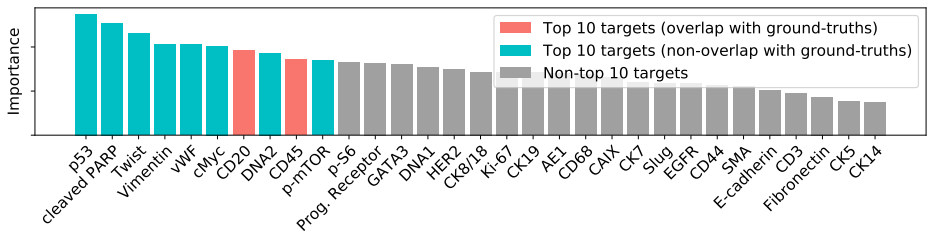
Fig. 1 shows the measured target importance for tumor grade classification on the breast cancer dataset [5]. While the conventional methods [4, 10, 20] combined with interpretation techniques [15, 18] detect only up to five targets among the top-10, seven targets identified by our pipeline overlap with the top-10 single cell derived ground-truth.



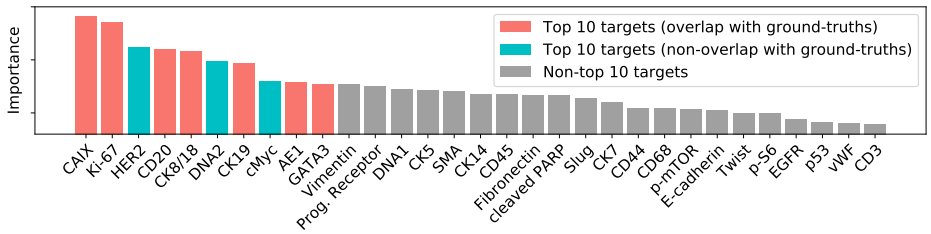
(a) ResNet50



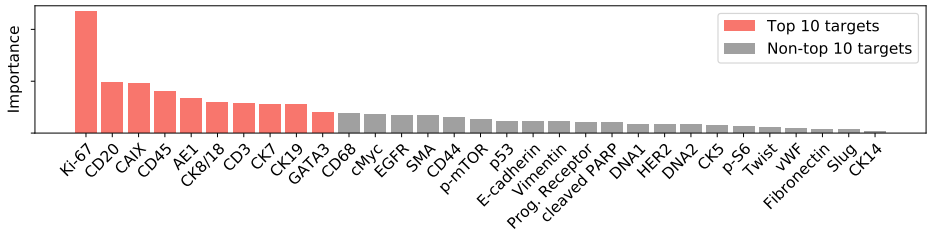
(b) ResNet3D-18



(c) BSN



(d) Ours



(e) Single-cell derived ground-truth

Fig. 1: Measured target importance for tumor grade classification on the breast cancer dataset [5], ordered by importance. We highlight the top 10 targets.

4 More Quantitative Results for Tumor Grade Classification

To fairly reflect the quality of our method, we report the Spearman correlation among the top-K channels for varying values of K. In practice, clinicians prioritize the accuracy among the top-K important channels. As shown in Table 2, for all values of K, our model outperforms baseline methods.

Table 2: Quantitative comparison for tumor grade classification.

	Spearman Coeff. among top-K				
Method	K=10	K=15	K=20	K=25	K=30
ResNet50 [4]	-37.0	23.6	-13.5	-15.6	9.7
ResNet3D-18 [20]	-1.8	12.9	-6.8	29.7	27.3
BSN [10]	26.1	41.4	-6.8	-12.5	-10.0
Ours	**62.4**	**61.1**	**56.1**	**24.2**	**38.7**