ISG: I can See Your Gene Expression
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PROBLEM OVERVIEW
Gene expression prediction from slide images:
- Slide images have a large resolution amounting to $10^5 \times 10^5$
- Features of slide images are sparse and non-uniformly distributed.

NETWORK ARCHITECTURE
Shannon Selection module
$$h(x) = -\log \sum_{p \in P} 2^{-d(x)} \approx -\log 2^d(x) = K(x),$$

With a preset threshold, we select patches with abundant features.

Feature Extraction network
$$\mathcal{L}_{total} = \min_{\mathbf{D}, \mathbf{E}, \mathbf{C}} \mathbb{E}_x \left[ \mathcal{L}_C + \mathcal{L}_{PS} + \mathcal{L}_C \right].$$

We extract low-dimensional patch-wise features by a style-based architecture as it can capture versatile feature representations.

Dual Attention network
We adaptively calibrate model attention to regions of interest.

EXPERIMENTAL RESULTS
(a) Comparison of gene expression predictions with SOTA methods
(b) Comparison of patch selection methods
(c) Ablation of selection threshold
(d) Clinic usage application.

SLIDE IMAGE SAMPLE