Figure 1: Schematic representation of the proposed UNREAL framework. Colored nodes indicate labeled instances. The GNN Model and classifier parameters are concurrently trained on the current training set.

Further detailed information regarding UNREAL is provided below (if you're looking for a quick overview):

- **DPAM:** Predicated on a theoretical analysis of pseudo-label quality as determined by classifiers and employing the "DualPath PseudoLabeler" for generating bifurcated pseudo-labels, we propose the DualPath Alignment Mechanism (DPAM). This mechanism is specifically designed to select unlabeled nodes that exhibit alignment in their pseudo-labels, ensuring a more coherent and accurate pseudo-labeling process.

- **Node-Reordering:** Stemming from our analysis on the decoupling of representation and classifier, we introduce the concept of Node-Reordering. This approach integrates information at both the classifier and representation levels to prioritize unlabeled nodes, thereby enhancing the model's learning efficacy. Notably, we theoretically substantiate that Node-Reordering elevates the prominence of representation-level information, fostering a more nuanced understanding and utilization of unlabeled data.

- **DHS:** Building on our theoretical insights, we put forth a simple yet effective metric for identifying hard samples at the representation level (within a hyper-sphere), allowing for a targeted approach in the selection of unlabeled nodes. This metric enables the specialized handling of challenging nodes, further refining the model's learning process.