Fig. 1. Multiplex visual search engine QuPath user interface (UI). The central image shows an example of Panel 3 molecular markers, with green regions indicating retrieval results from the community search. A built-in channel control panel is shown on the left. (a) Unified Cell Search identifies cells similar to a query cell by combining selectable molecular markers, morphological descriptors, and neighborhood profiles, and exports matched-cell coordinates together with a similarity-matrix summary.(b) Single-Cell Similarity Search retrieves the top N matches by computing cosine similarity on precomputed high-dimensional features, accompanied by top retrieval viewers.(c) Phenotype Finder highlights curated cell classes using subtype/status filters, tunable spatial tolerance, and color-coded overlays, and summarizes marker patterns with heatmaps.(d) Microenvironment (Patch) Search detects all patches within the same community as the query patch, with the results displayed in a viewer below.(e) Community Profiling aggregates mean marker expression across a patch region and renders comparative heatmaps for molecular characterization.