a

multi-modal single-cell data
(indices for RNA and protein)
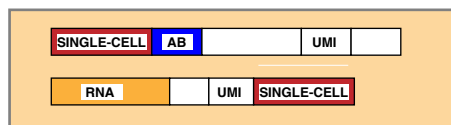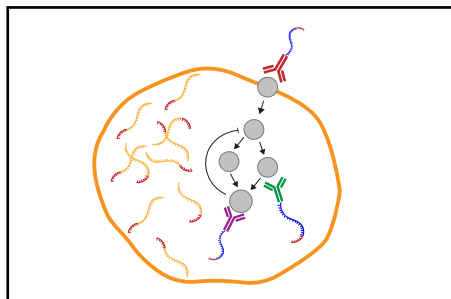
combinatorial indexing data
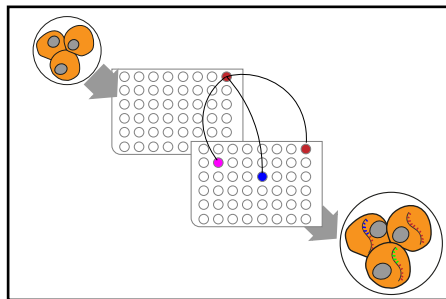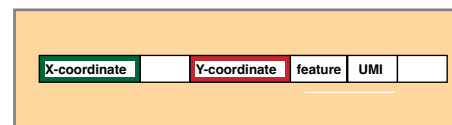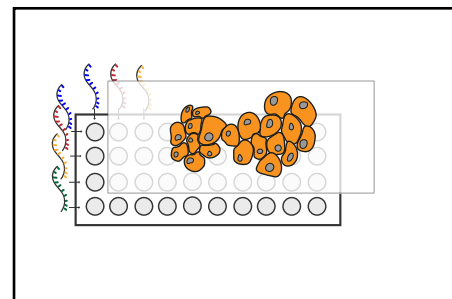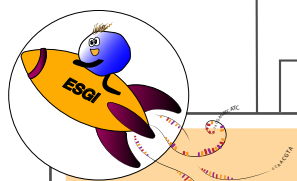(array of indices for single-cells)
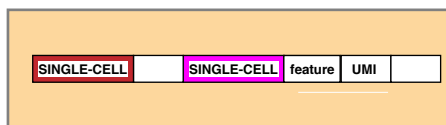
spatial single-cell data
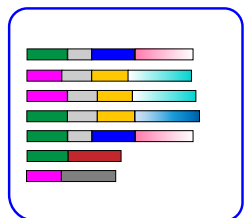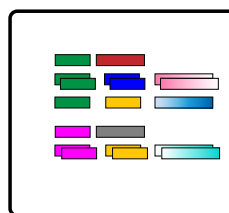(indices for x/y-coordiantes)

SINGLE-CELL | AB | | UMI
RNA | | UMI | SINGLE-CELL

SINGLE-CELL | SINGLE-CELL | feature | UMI

X-coordinate | Y-coordinate | feature | UMI

b

ESGI

Input

FASTQ

demultiplex
debarcode fastq-reads
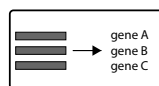
singe-cell | feature | UMI

singe-cell | hash-tag

count
single-cell features (collapse UMIs)

STAR
map RNA-sequence to reference genome

gene A
gene B
gene C

Output

features

cells

untreated

treated

RNA

protein