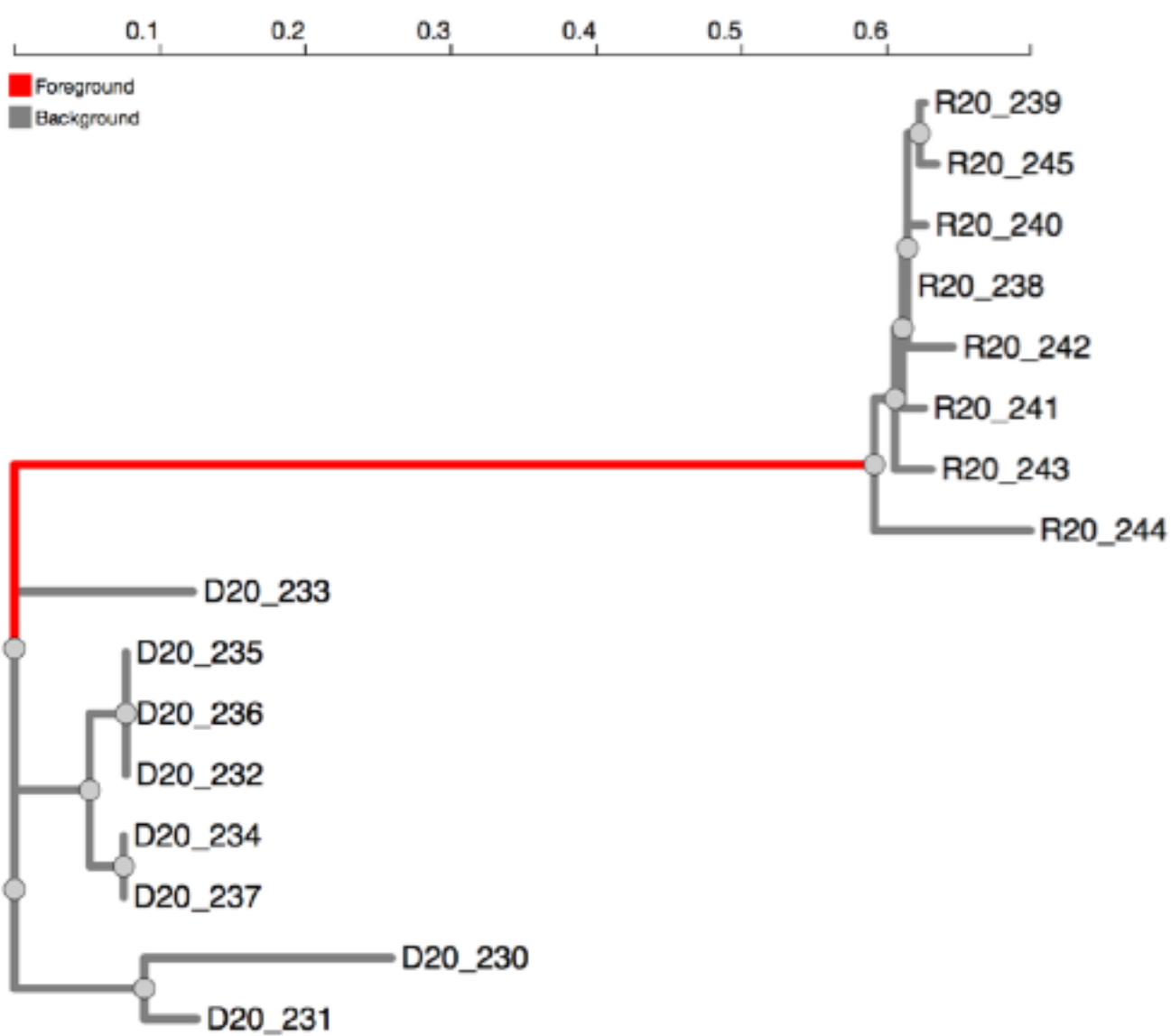


Branch testing; exploratory vs *a priori*

- aBSREL and BUSTED can test all branches for selection (exploratory), or apply the test to a set of branches defined *a priori* (e.g. defining a particular biological hypothesis).
- For BUSTED, *a priori* partitioning of branches can increase power, especially if selective regimes are markedly different on different parts of the tree.
- For example, BUSTED applied to the HIV dataset where the transmission branch is designated as foreground, found a greater proportion sites under stronger selection on this branch that the rest of the tree (8% vs 1%), and a lower **p-value**.



| | Background | Foreground |
|---------|-------------------------------|-------------------------------|
| Class 1 | $\omega = 0.51$ $p = 0.08$ | $\omega = 0.00$ $p = 0.92$ |
| Class 2 | $\omega = 0.72$ $p = 0.91$ | |
| Class 3 | $\omega = 116$ $p = 0.01$ | $\omega = 510$ $p = 0.08$ |

| Task | Test | Site strategy | Branch strategy | Complexity | Effective sample size | Parallelization | Pratical # sequences limit |
|---|--------------|----------------|-----------------|------------|----------------------------|-----------------|----------------------------|
| Gene-wide selection | BUSTED | Random Effects | Random Effects | Fixed | ~sites x taxa | SMP | ~2,000 |
| Site-level selection / episodic | MEME | Fixed Effects | Random Effects | Fixed | ~ taxa | SMP/MPI | ~25000 (cluster) |
| Site-level selection / pervasive | FEL | Fixed Effects | Fixed Effects | Fixed | ~ taxa | SMP/MPI | ~25000 (cluster) |
| Branch-level selection | aBSREL | Random Effects | Fixed Effects | Adaptive | ~ sites | SMP/MPI | ~ 1,000 |
| Compare selective regimes between sets of branches | RELAX | Random Effects | Mixed Effects | Fixed | ~sites x (branch set size) | SMP | ~ 1,000 |
| Compare selective pressure between sets of branches on individual sites | Contrast-FEL | Fixed Effects | Fixed Effects | Fixed | ~ branch set | SMP/MPI | ~25000 (cluster) |