# Purpose-built models

- It is tempting to "hack" existing tools to answer questions that they are not designed to answer

- A recent example we tackled is a rigorous test for relaxation of selection (or more generally a difference in selective regimes) in a part of the tree, relative to the rest of the tree

- Typical approaches have been to estimate dN/dS rations from two sets of branches, and interpret an *elevation* in dN/dS as evidence of selective constraint relaxation

- Two problems with this approach

- An increase in mean dN/dS could also be caused by an **intensification** of selective forces.

- *Post-hoc* analyses (e.g., estimate branch-level dN/dS and then compare [t-test, etc] them as if they were observed quantities) discard a lot of information (e.g., variance of individual estimates), and make obviously wrong assumptions (e.g., estimates are uncorrelated).

Testing for selective relaxation

Branches

Sites
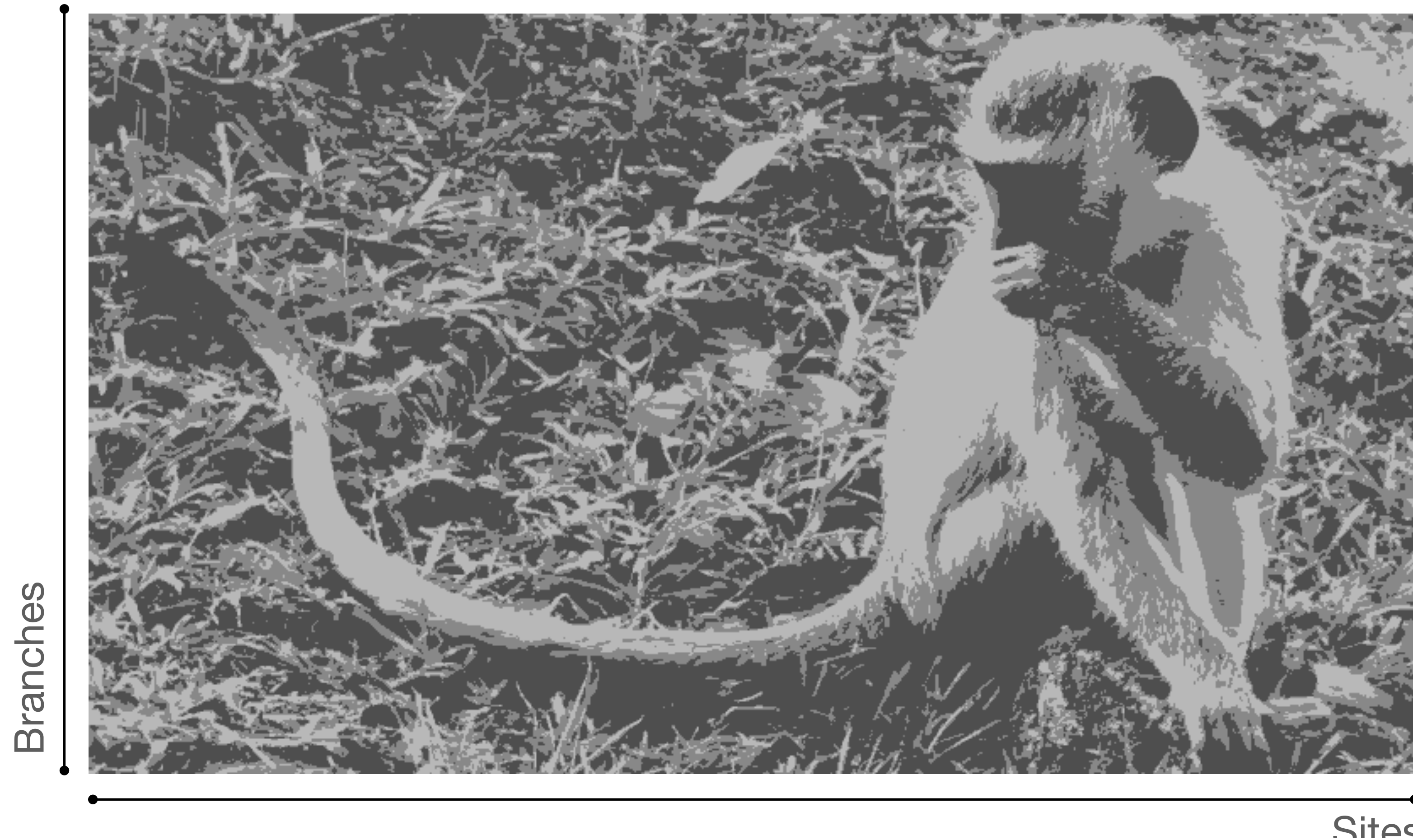
📷 Partition the image into horizontal bands (a priori); compare whether or not there is visual benefit to using separate 3-color palettes in two sets of bands instead of a single 3-color palette

🌲 [RELAX]: Compare whether or not the set of branches of interest (test set) has a significantly different dN/dS distribution than the rest of the tree (background), fitted jointly to the entire alignment. For relaxation testing, the two dN/dS distributions are related via a power transformation.