In order to be able to accurately assess the performance of TCR clustering based on specificity, we used Pure Cluster Fraction (PCF), Pure Cluster Retention (PCR), and Normalised Mutual Information (NMI) [Zhang, Hongyi, Xiaowei Zhan, and Bo Li. "GIANA allows computationally-efficient TCR clustering and multi-disease repertoire classification by isometric transformation." Nature communications 12, no. 1 (2021): 4699.] as metrics for the assessment of clustering results. First, purity was defined as the percentage of TCRs in a cluster that were specific for the most common epitope, and pure clusters as clusters with a purity of 100%. Pure Cluster Fraction is defined as the percentage of pure clusters over all clusters, and Pure Cluster Retention is defined as the percentage of TCRs classified as pure clusters over all TCRs. These two metrics measure the ability of the clustering algorithm to cluster TCRs of the same specificity into one class. Pure Cluster Fraction and Pure Cluster Retention focus on clusters with 100% purity, and 100% purity tends to be more common in smaller clusters, which also implies that these metrics prefer smaller clusters. Therefore, we also use NMI to evaluate the clustering results. Define NMI as twice the mutual information divided by the sum of the entropy of the two labels (i.e., cluster label and specificity). Mutual information can reflect the amount of information added to our knowledge of the category when we are told what the clusters are, while entropy increases with the number of clusters, and normalisation of mutual information can impose a penalty for too many clusters.