## A APPENDIX



Figure 3: Classifier free guidance for cell type conditional enhancer design. Sequences are generated specifically for a cell type with DFM and D3 using different CFG levels. FBD and target class probabilities of the generated sequences for three different cell types i.e. 2, 68 and 16 are plotted here following (Stark et al., 2024).



Figure 4: Sampling trajectories for three scenarios, varying in initial and target activity levels. The activity predictions of both developmental (Dev) and housekeeping (HK) enhancer tasks for intermediate sequences are plotted across different experimental conditions. We provide the initial sequence activities and the target activities with order [Dev, Hk] as follows: (left) [5.51, 7.60] to [7.04, 7.04], (middle) [5.51, 7.60] to [5.5, 0.17], (right) [7.04, 0.92] to [5.5, 7.6].



Figure 5: Mutation map of a single target over the course of sampling process for a high activity target [Dev=7.04, HK=7.04] and sampling initiation with a highly active [Dev=7.04, HK=0.92] sequence.



Figure 6: Attribution map of some intermediate sequences over the course of sampling process for a high activity target [Dev=7.04, HK=7.04] and sampling initiation with a highly active [Dev=7.04, HK=0.92] sequence. We accompany each attribution map with the activity predictions of both developmental (Dev) and housekeeping (HK) enhancer tasks for better understanding.



Figure 7: Mutation fractions over the course of sampling process. We consider sampling trajectories for three scenarios, varying in initial and target activity levels, and calculate the mutation fraction for each step. These process is repeated 40k times and the average mutation fractions are plotted with error bars. We provide the initial sequence activities and the target activities with order [Dev, Hk] as follows: (left) [5.51, 7.60] to [7.04, 7.04], (middle) [5.51, 7.60] to [5.5, 0.17], (right) [7.04, 0.92] to [5.5, 7.6].