1163-60-1507 **Linden Yuan*** (lyuan12@umd.edu) and **Wai-Tong Louis Fan**. *Spectral gaps of Markov chains on strings.* Preliminary report.

Let $\mathcal{A}$ ($\mathcal{A}$ for "alphabet") be a finite set of cardinality at least two, and let $\mathcal{S} = \bigcup_{M=0}^{\infty} \mathcal{A}^M$ be the finite-length sequences over $\mathcal{A}$. Motivated by preexisting models of DNA evolution, we study a certain family of continuous-time Markov chains with state space $\mathcal{S}$. Each of these Markov chains is ergodic, meaning there is a unique invariant distribution, call it Π, and the transition probabilities $P_t(x, \cdot) \to \Pi$ (converge to Π) as $t \to \infty$. Using tools from optimal transport, we derive an explicit formula for the "convergence rate" ε_1 of $P_t(x, \cdot) \to \Pi$. In addition, existing results imply that $\varepsilon_1 = \lambda_1$, where λ_1 is the spectral gap. This equality yields an information-theoretic interpretation of our result, since λ_1 is (essentially) known to govern a phase transition in a couple of inference problems. Finally, after introducing two real-world models of DNA evolution and discussing implications of our results for these models, we outline alternative models and alternative inference problems for future research. This work was done at the Mathematics REU at Indiana University Bloomington. (Received September 15, 2020)