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# Math 269 - Combinatorics

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## Periodic words, common subsequences and frogs

**Abstract:**

Let  $W^{(n)}$  be the  $n$ -letter word obtained by repeating a fixed word  $W$ , and let  $R_n$  be a random  $n$ -letter word over the same alphabet. We show several results about the length of the longest common subsequence (LCS) between  $W^{(n)}$  and  $R_n$ ; in particular, we show that its expectation is  $\gamma_W n - O(\sqrt{n})$  for an efficiently-computable constant  $\gamma_W$ .

This is done by relating the problem to a new interacting particle system, which we dub “frog dynamics”. In this system, the particles (‘frogs’) hop over one another in the order given by their labels. Stripped of the labeling, the frog dynamics reduces to a variant of the PushASEP.

In the special case when all symbols of  $W$  are distinct, we obtain an explicit formula for the constant  $\gamma_W$  and a closed-form expression for the stationary distribution of the associated frog dynamics.

Froggies on a pond  
They get scared and hop along  
Scaring others too.

Their erratic gait  
Gives us tools to calculate  
LCS of words.

(Joint work with Boris Bukh)

Host: Jacques Verstraete

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2:00 PM  
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