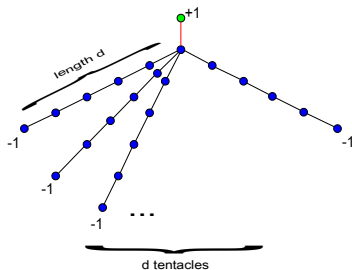


Online Prediction on Large Diameter Graphs

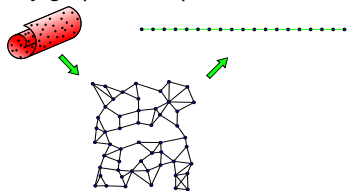
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- Learn labelling of a graph online
- Mistake bounds:
 $M \leq f(\text{complexity}(\mathbf{u}), \text{geometry}(\mathcal{G}))$
- Limitation of Laplacian methods
- e.g. Min norm interpolation:



- Mistake bound = $\Theta(\sqrt{|V|})$

- *Spine*: approximate structure-preserving embedding of any graph into a path



- 1-NN \equiv **Halving Algorithm** on S
- $M = \mathcal{O}\left(\phi_{\mathcal{G}}(\mathbf{u}) \log\left(\frac{|V|}{\phi_{\mathcal{G}}(\mathbf{u})}\right)\right)$
- Cumulative time to predict m labels
 $\mathcal{O}(m \log m + |E|)$
- Second solution:
 - Exploits cluster structure
 - Exploits connectivity
 - Logarithmic guarantee