

Finding Adam in the online nearest-neighbor tree.

Etienne Lasalle

In this talk, I will present the problem of finding the root in the online nearest-neighbor tree (NNT) model. Consider a probability distribution P on some metric space (\mathcal{X}, d) . Here we will restrict ourselves to the uniform distribution on the unit circle with the Euclidean distance. The random tree is constructed recursively as follows. Each time a new node is drawn from P , it gets linked to its nearest neighbor (according to d).

Assume that we only observe the structure of such a large tree. That is, we only have access to the connectivity and neither the vertex positions in \mathcal{X} nor the vertex labels are available. Can we find a set S of vertices with a reasonable size (i.e., independent of the tree size) that contain the root with high probability.

I will explain how we can obtain such set S by using a notion of centrality, and present the similarities and differences with the uniform random recursive tree (uRRT) model where vertices gets linked uniformly at random to a previous node. Namely, using the same centrality-based approach for both models, for $\varepsilon > 0$ and a set S of size $1/\varepsilon$ (up to constant and logarithmic factors), we find the root with probability at least $1 - \varepsilon$ in the uRRT model and with probability at least $1 - \varepsilon^3$ for the NNT model.