

# Art Gallery problem

Antonio Jovanović

Fakultet primijenjene matematike i informatike  
Sveučilište J. J. Strossmayera u Osijeku

The Art Gallery problem is a visibility problem in computational geometry where the task is to minimize the number of guards in a simple polygon. In other words, the goal is to identify a minimal set of points within the polygon, known as guards, so that every point inside the polygon is visible to at least one guard. This visibility is determined by a line segment connecting each point to a guard, entirely contained within the polygon. Between the different variants of the problem, we focus on the case where guards are chosen from the set of polygon vertices. There are several elegant proofs that the optimal number of guards in an  $n$ -sided polygon is at most  $\lfloor \frac{n}{3} \rfloor$ . Because finding the optimal set of guards is NP-hard, approximation algorithms are commonly used to generate a solution.

We propose a novel approach that uses deep learning. More precisely, we use *pointer networks*, a specialized type of neural network designed to select a subset of some set based on certain criteria. We implemented a recurrent neural network, that trains slowly, but is fast in generating guards, and a Transformer network, that trains rapidly, has more parameters, but is somewhat slower in generating guards. In this talk we will present deep learning techniques that allow us to solve this problem, and the corresponding results.