

# 1 Model

The probabilistic model is simple. The first we just generate the cloud of  $n$  points uniformly distributed in  $[0, 1]^d$ . After this we calculate the Alpha complex with these points, and then find its depth poset.

## 2 Scores

### 2.1 Poset Scores

- **number\_of\_nodes** : Returns the number of nodes in the poset.
- **number\_of\_relations** : Returns the number of relations in the transitive reduction.
- **number\_of\_compounds** : Returns the number of connected compounds in the poset
- **cycle\_dimension** : Returns the dimension of space of cycles in reduction.
- **number\_of\_minimal\_nodes** : Returns the number of minimal nodes.
- **number\_of\_maximal\_nodes** : Returns the number of maximal nodes.
- **height** : Returns the poset height - the length of the longest chain.
- **width** : Returns the poset width - the length of the longest antichain (subset, s.t. all elements are pairwise incomparable). The algorithm is based on Dilworth's theorem and it's proof via König's theorem: link
- **minimum\_maximal\_chain** : Returns the minimum size of maximal chains in the poset.
- **avarage\_maximal\_chain** : Returns the avarage size of maximal chains in the poset.

### 2.2 Node Scores

- **ancestors\_number**: Returns the number of nodes higher than given
- **ancestors\_height**: Returns the size of maximum chain of subposet of nodes higher or equal than given
- **ancestors\_width**: Returns the size of maximum chain of subposet of nodes higher or equal than given
- **successors\_number**: Returns the number of nodes higher than given
- **successors\_height**: Returns the size of maximum chain of subposet of nodes lower or equal than given
- **successors\_width**: Returns the size of maximum chain of subposet of nodes lower or equal than given

### 3 Experiments and Results

There are 1194 experiments done. In the Figure 1 we can see how cases are distributed by size and dimension.

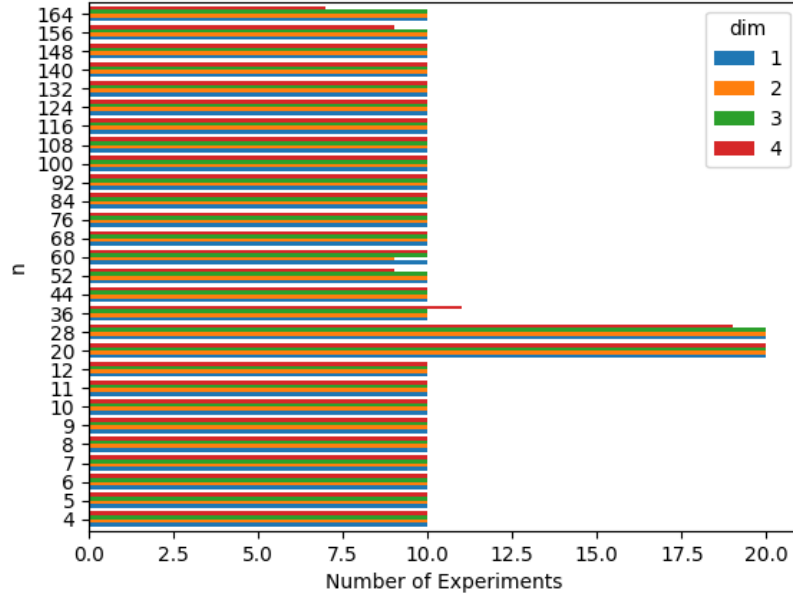


Figure 1: Size/dimension distribution of experiments

In the Figure 2 we can see the average poset scores values for each number of points  $n$ .

In the Figure 3 we can see the average mean node scores values in poset for each number of points  $n$ .

In the Figure 4 we can see the average maximum node scores values in poset for each number of points  $n$ .

## Mean Poset Scores

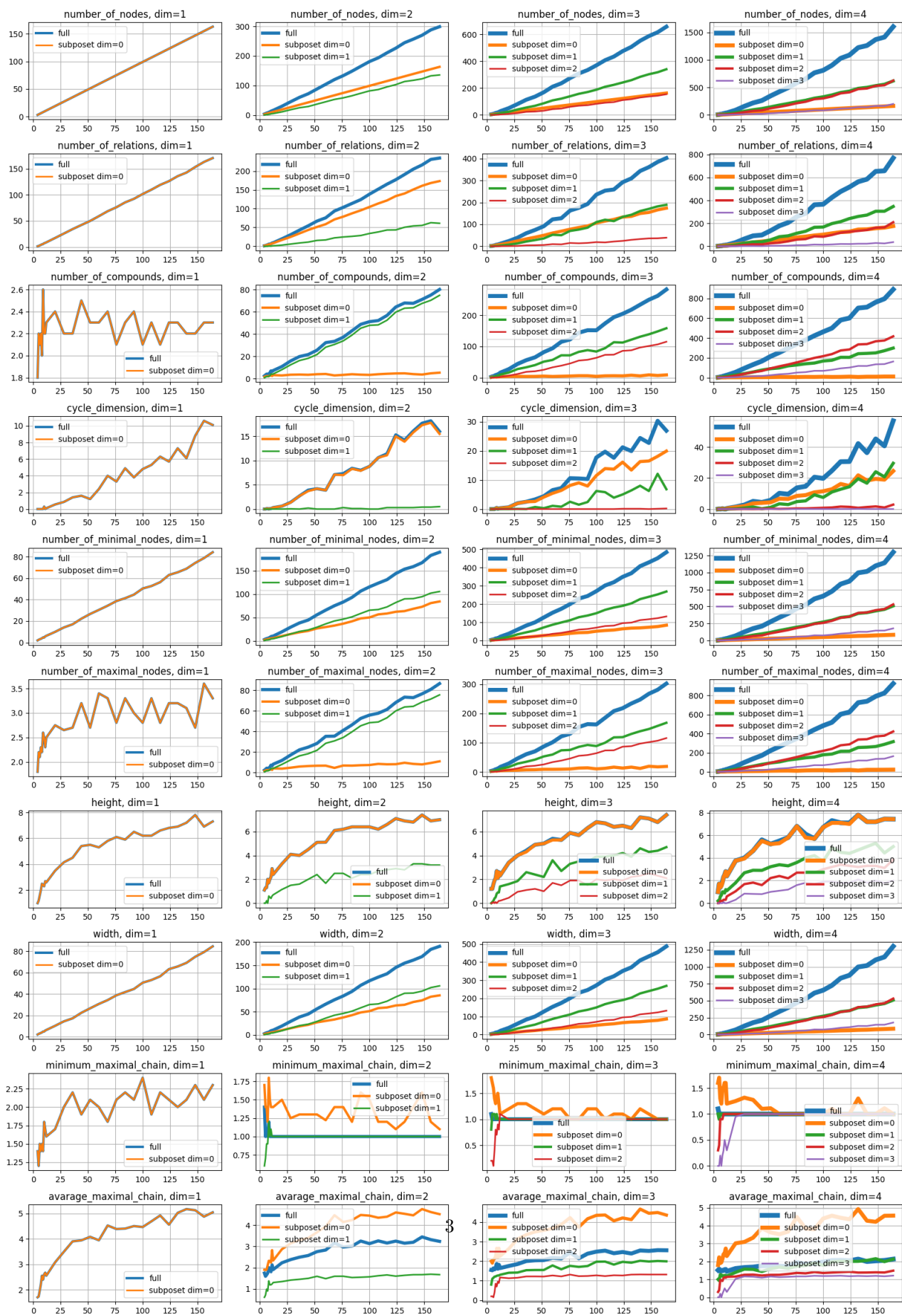


Figure 2: Mean poset scores

Mean Node Scores

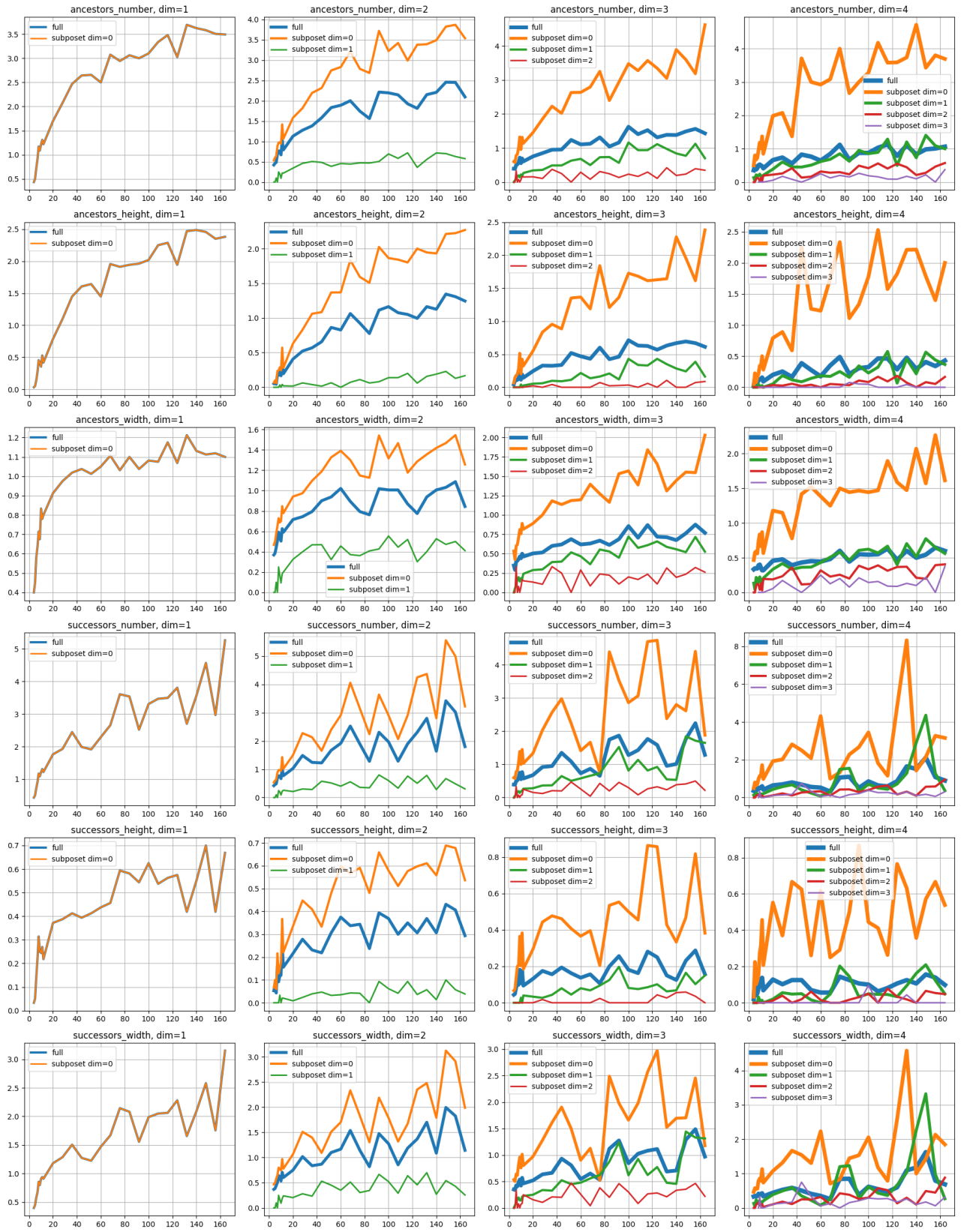


Figure 3: Mean node scores

## Max Node Scores

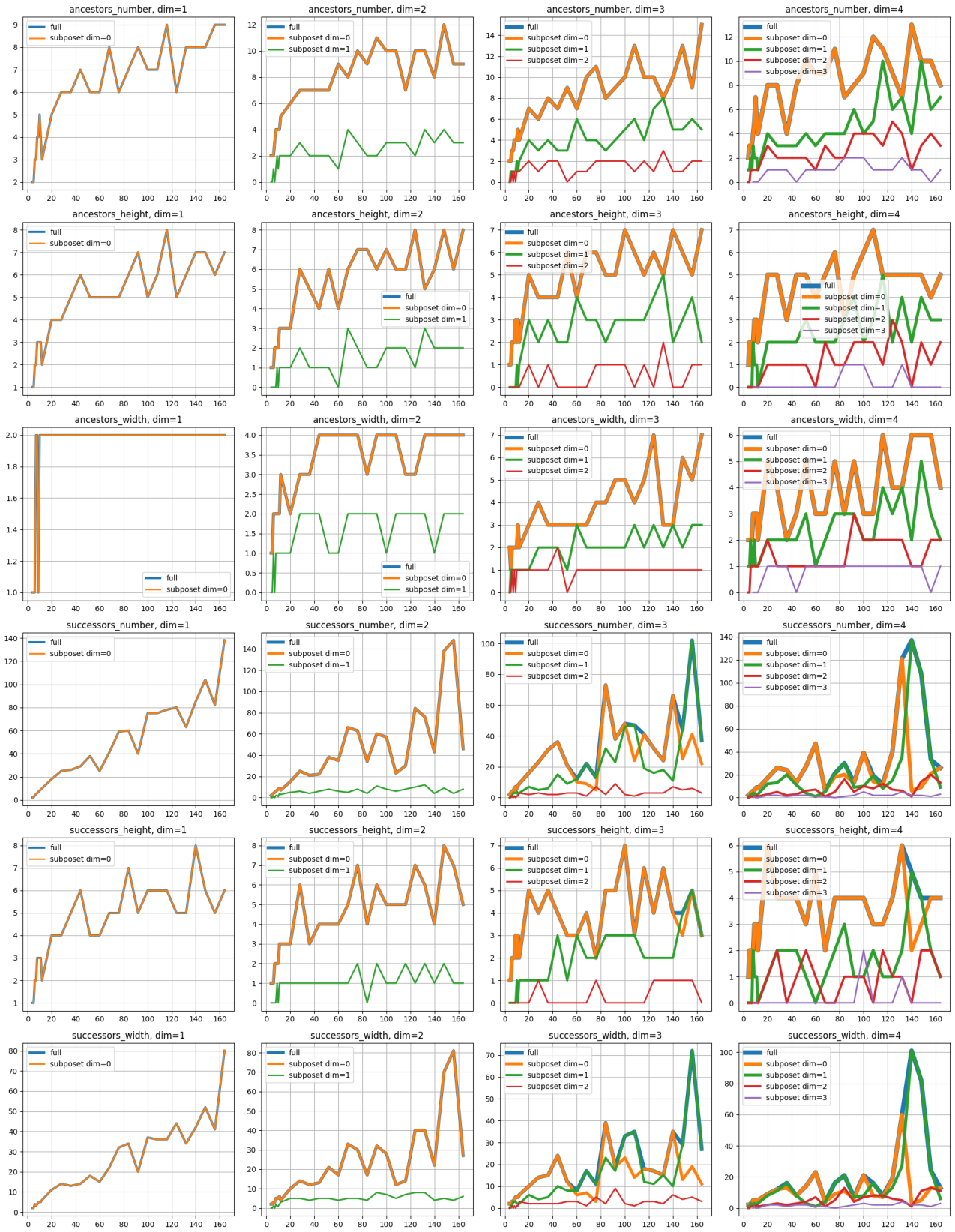


Figure 4: Max node scores