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_components** : Returns the number of connetcted components in the poset
- **cycles_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 Kőnig'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
- **ancestors_cycles_dimension**: Returns the the dimension of space of cycles in reduction 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
- **successors_cycles_dimension**: Returns the the dimension of space of cycles in reduction of subposet of nodes lower or equal than given

3 Experiments and Results

There are 27 experiments done. In the Figure 1 we can see how cases are distributed by size and dimension.

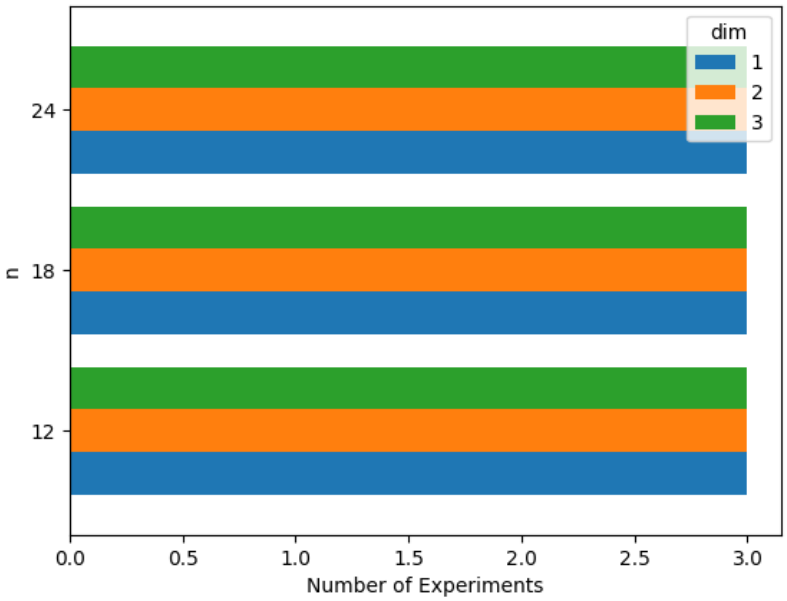

Figure 1: Size/dimension distribution of experiments

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

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

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

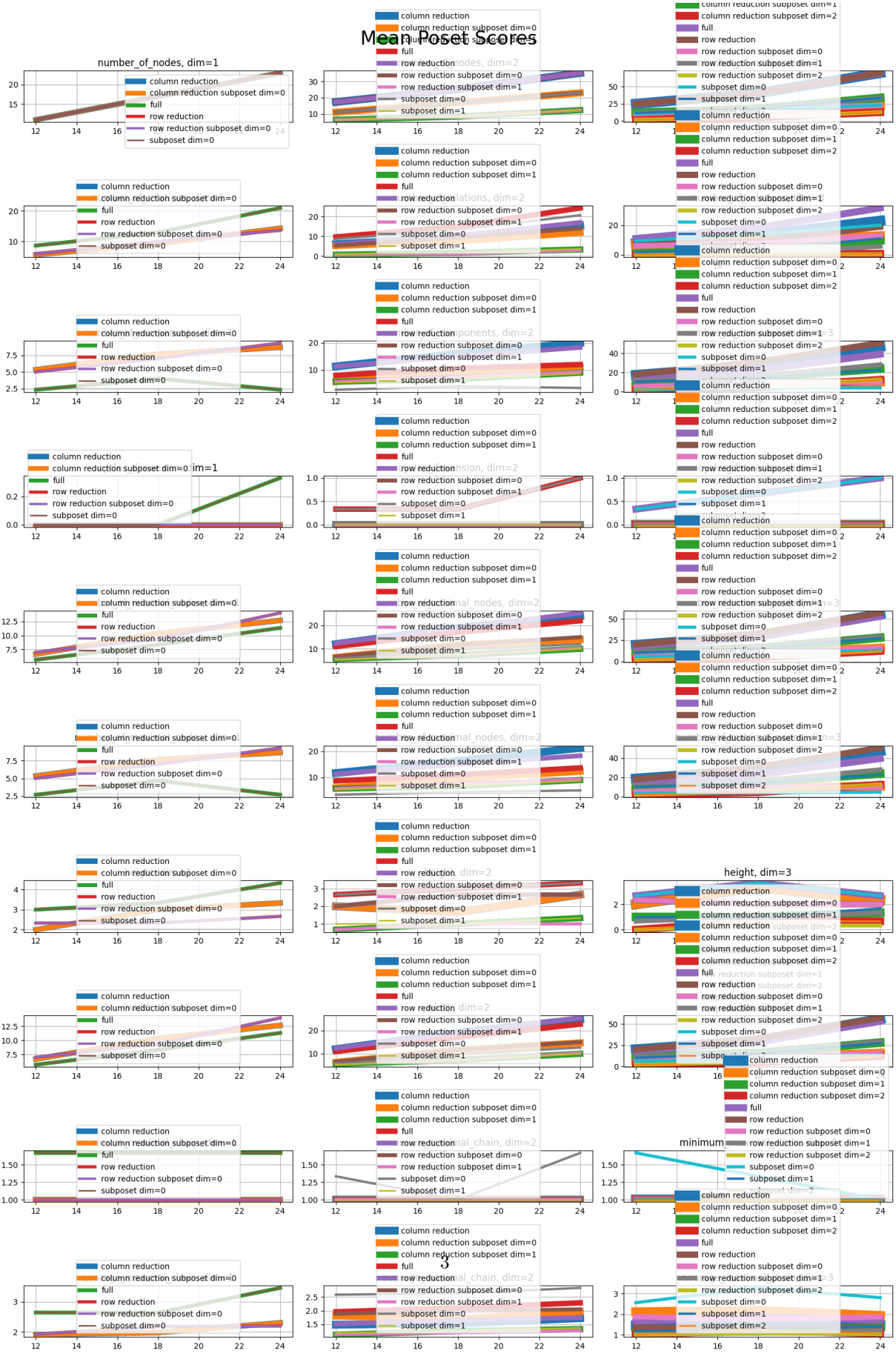

Figure 2: Mean poset scores

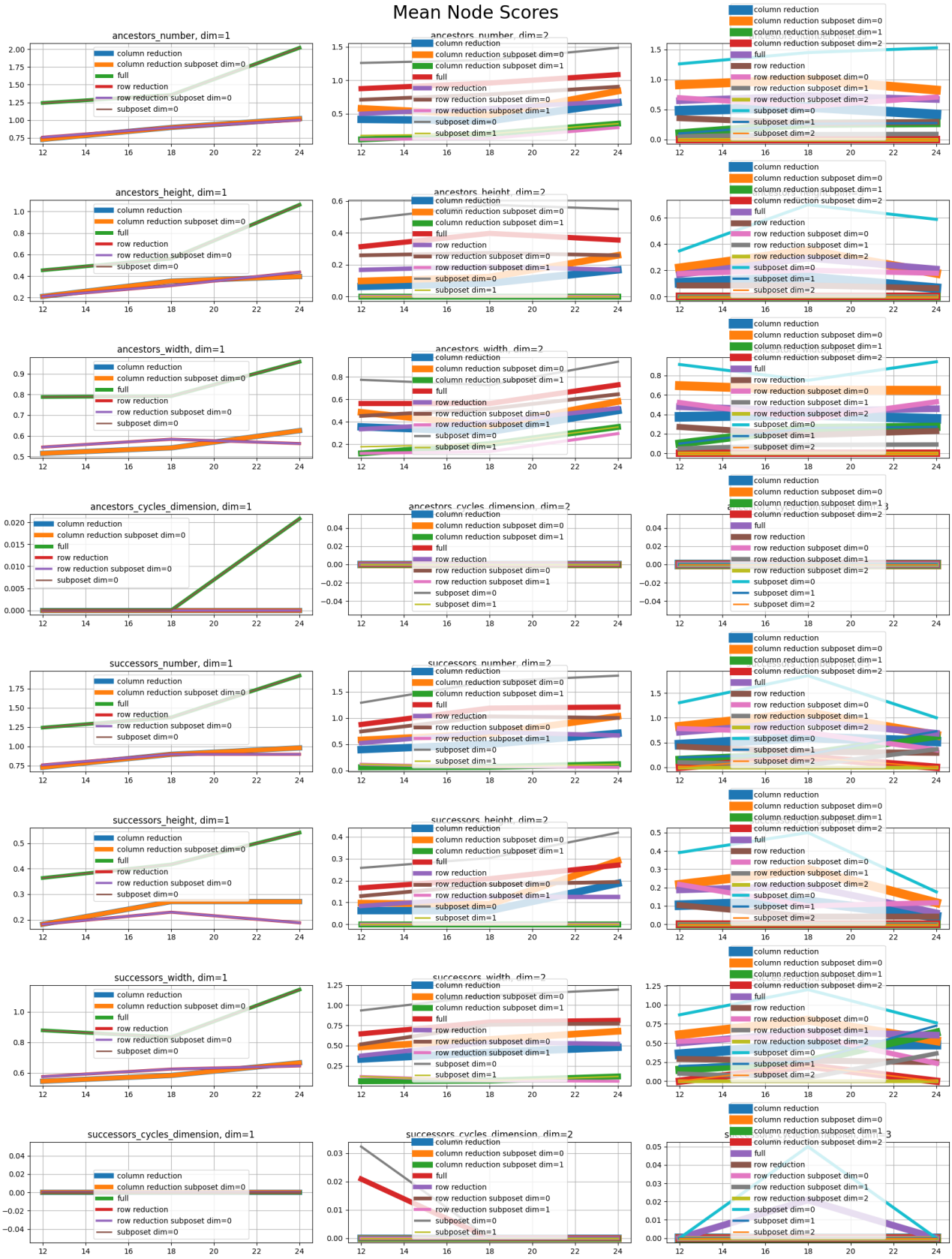

Figure 3: Mean node scores

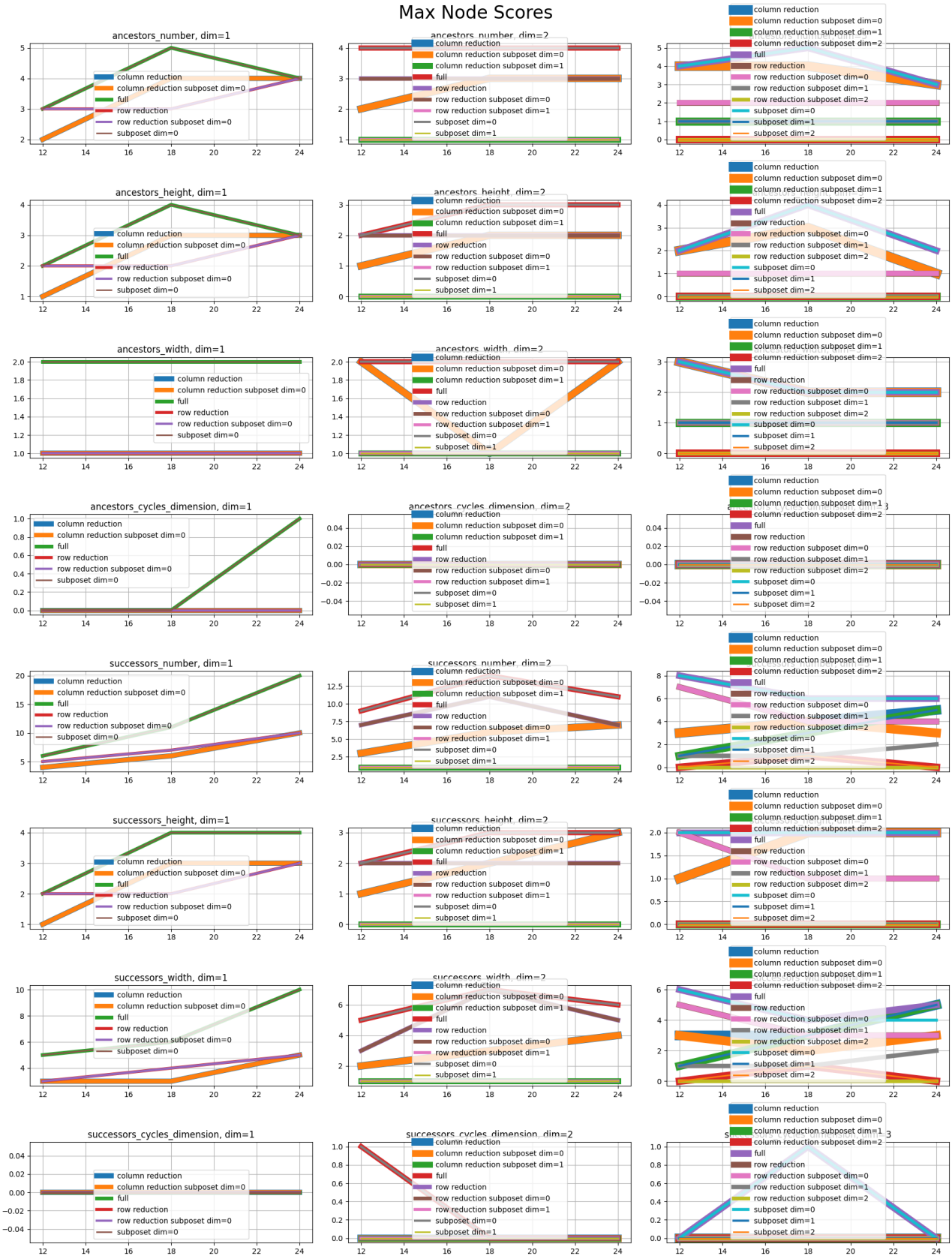

Figure 4: Max node scores