tion at both the atomic and structural levels. The Graph of Graphs Generator, computer system GOGG, is a newly implemented meta-level problem-solving tool that enables HGAs to be applied to problems represented graph theoretically. This system is in its early stages of development, and in this poster, we describe the original architecture, algorithms, and initial applications of system GOGG along with the underlying framework of HGAs in which GOGG is currently being used. We also delineate a future plan in which GOGG is to be used as a deductive knowledge representation tool where hierarchical facts and rules are the fundamental units of reasoning. This poster presents a system that serves as a generative as well as an evaluative tool to represent nested chromosomes as well as measure them using dual fitness functions: one of the atomic and one of the structural, to enable the work of HGAs modeling complex adaptive emergent systems. To date, we have an operational system that can generate hierarchical graphs composed of atomic level graphs that serve as the vertices for structural level graphs. We present the design, algorithms, and some early insights from using system GOGG including the notions of enmeshment, encasement, and extraction. Currently, our most pressing goal is to identify and apply the system to real-world problems that are both complex enough to warrant hierarchical genetic evolution of nested graphs, and manageable enough to execute in an undergraduate research program.

Manipulation of Second-Order Copeland Elections Using Branch-and-Bound Heuristic

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The Copeland voting scheme is a protocol in which all candidates in an election engage in the same number of pairwise contests. A winner is a candidate that maximizes the difference between her number of victories and defeats in all pairwise contests. In case of a tie, the eventual winner is the candidate whose defeated competitors have the largest sum of Copeland score. This tie-breaking rule is the second-order Copeland voting. While the Copeland voting scheme can be efficiently manipulated in polynomial time, the second-order Copeland voting is NP-complete to manipulate. Although this complexity is daunting to deter a voter, NP-completeness is a worst case measure, and only shows that at least one instance of the problem requires such complexity. Thus, real-life instances of an election that we care about may be easy to manipulate. We propose a branch-and-bound heuristic for manipulation of the second-order Copeland elections, and investigate the performance of the heuristic using randomly generated data. We provide empirical evaluation of the effects of manipulation of an election by a strategic voter for a constant number, $4 \leq c \leq 7$, of candidates, and an unbounded number, $v \in \{2000, . . . , 10000\}$, of voters. Experiments suggest that there are instances of the elections that may be efficiently manipulated using the proposed heuristic when a voter has perfect information about the preferences of other voters. However, the second-order Copeland scheme becomes significantly resistant to manipulation for fairly large number of candidates. This research is partially supported by the Virginia Military Institute's Professional Travel Funds.

Applying Different Machine Learning Strategies to Avalanche Forecasting in the Canton of Glarus in Eastern Switzerland: A Case Study

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Snow avalanches pose a serious threat in alpine regions. They may cause significant damage and fatal accidents. Assessing the local avalanche hazard is therefore of vital importance. This assessment is based, amongst others, on daily collected meteorological data as well as expert knowledge about avalanche activity. However, meteorological data collected on consecutive days may be very similar and distinguishing an avalanche day from a non-avalanche day typically comes with a high level of uncertainty. Additionally, the interaction of the different aspects of weather conditions in causing an avalanche event is unknown. Avalanches in the available data set represent rare events, making their exact characterization even more difficult and uncertain. In a former work, we developed decision support systems for predicting avalanche events based on Balanced Random Forest and Weighted Random Forest. In the work reported here we discuss the effect of applying different machine learning strategies on our previously trained models. Variable selection and oversampling of the positive class, i.e. avalanche days, showed to have little influence on the model's performance. We furthermore trained a Naive Bayes classifier and assessed its performance. The independence assumption is clearly violated, nevertheless the Naive Bayes classifier showed a notably improved sensitivity and a slightly higher specificity compared to our previous models and was judged feasible as a decision support in avalanche warning by an avalanche expert. We compare our former models to the ones obtained applying variable selection and oversampling of the minority class and to a Naive Bayes classifier.

Computing Locally Symmetric Models

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Global symmetry describes similarities between objects as a whole. But there are similarities between objects that are