Seminar – Tuesday, February 17 in 100-A Riggs Hall **3:30 p.m. – 4:30 p.m.**

Seminar Series

An Algorithm for Searching an Alternative Hypothesis Space Using a Variation of MAX-SAT

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Abstract

We develop techniques for automated hypothesis generation over contradictory data set by using the equivalence of first order predicate logic with prefix modal quantifiers under the finite model hypothesis and Mixed Integer Linear Programming (MILP) problems. The equivalence between integer programming and logical satisfiability has been known since Karp's seminal work in NP-completeness. Other authors have made use of this equivalence to explore efficient methods of solving the satisfiability problem in the propositional calculus for specific problem types. The work presented here differentiates itself from previous work in that we do not assume that all logical assertions are true without doubt. Instead we look for alternative hypotheses about the validity of the claims by identifying alternative optimal solutions to a corresponding MILP. We use a collection of slack variables in the derived linear constraints to indicate the presence of contradictory data or assumptions. The objective is to minimize contradictions between data and assertions represented by the presence of non-zero slack in the set of linear constraints.

The major results provided in this talk are: (i) a correspondence between first order predicate logic with modal quantifier prefixes under the finite model hypothesis and mixed integer linear programming problems and (ii) an implicit enumeration algorithm for exploring the contradiction hypothesis space.

Biography of Speaker

Dr. Griffin is currently a Wigner fellow at Oak Ridge National Laboratory. His PhD is in Industrial Engineering from Pennsylvania State University. He has worked on research projects ranging from network security, sensor networks, and military command and control.