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Sc. B. Computer Science - Capstone Summary

CSCI-29510, Prescriptive Analytics, places an emphasis on using programming and algorithms to solve business problems and to provide optimal (or near optimal) solutions. Throughout the semester we experimented with SAT solvers, linear programming, integer programming, and constraint programming. Many of these projects required outside software packages to solve the instances and we were tasked with just formulating the problem. However, we built our SAT solvers from scratch; at the end of the project, we had several quality SAT solvers that were all built using the same structure with a pre-defined input and output. In the entrepreneurial spirit of the class, we decided to create a web app that would allow others to submit CNF files, a common SAT file format, to a specified SAT solver or to run it on all of them. The solver would then output an answer of either UNSAT or SAT with a list of variable assignments that demonstrate the satisfiability.

Sean Segal, Valentin Perez, and I built the web app using Firebase. We constructed a flask server that was built on top of each of the SAT solvers and could take input specifying which solver to use. Given the consistent directory structure and run commands, it was not too difficult to achieve this functionality. We attempted to make the structure of the server quite modular so that it would be easy to add functionality for the other projects. We set up our Firebase app as a simple website with an intuitive UI. One difficulty that we had to work through was the ability to submit requests and then be able to revisit the results later. We had to make it such that you could check if the solver had finished or was still running. We ended up solving this problem by creating unique ids associated with each input file. We used a deterministic hash function so that it was also possible to see if this file had been run before. We found this to be a nice design choice as it would also reduce our server load if we were to

deploy this. Ultimately, we were quite satisfied with the final project and believe that it can and will be used in the future of this class.