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I am **very** pleased to write in support of Dennis Farmer as a candidate for the Big Data Summer Institute undergrad research program this year. I am sure he would be an outstanding participant, contributing a great deal but also learning a lot in the process.

Dennis has been a major force in a research group I am conducting under the auspices of the Center for Complex Systems here at the University of Michigan. In weekly brainstorming sessions and in extensive programming development on his own, I've been impressed not only with his formal skills but with his diligence and dedication and his creativity in finding new solutions to new problems, often along lines quite different than those I anticipated. He is extremely smart, always focused and on topic, with a great sense of intellectual curiosity and exploration. He is soft-spoken with a wonderful sense of humor, and is wonderful at interacting with others, both in discussion and in assisting less experienced programmers in the group. I should perhaps add that he is doing all of this on a volunteer basis, without credit or recompense, motivated simply by the interest and promise of the project itself. The continuing work of the group wouldn't be possible without him.

The topic of our research together is an abstract study of the structure of scientific theories and their adaptability in the face of a barrage of incoming evidence. Recent work has attempted to model scientific theories as Bayesian nets in which nodes represent the different claims of a theory, general or specific, with links between them indicating implication or support in terms of conditional probabilities. With that picture of scientific theories as Bayesian networks, we can study the updating of theories with incoming evidence at different nodes (Henderson et al. 2010, Climenhaga 2019 and forthcoming, Grim et al. 2022a, b). To date, however, this work assumes that the skeletal structure of the network remains

the same: updating involves change of credence at different nodes and change of conditional probabilities between them, but does not involve structural changes in the network itself. Our attempt is to extend this line of thought to structural change in the network itself. Our goal is both a descriptive and a normative one. What patterns of exploration can we expect from different network-change heuristics? What heuristics for network change can most effectively deal with conflicting evidence and most effectively model a 'world' that generates that evidence? Dennis has not only been our primary programmer, but has played a primary role in how we phrase our questions and how we might work toward answers with simple models.

I don't think you could find a better candidate. Big data has not been a part of our project, and that is where I think the undergraduate research program could be a major addition to Dennis' repertoire of skills. I know from experience that he would dive into it with enthusiasm and dedication, both applying and expanding his already considerable skills. I am happy to recommend him in the highest terms and without reservation.