Intellectual Merit Criterion

Overall Assessment of Intellectual Merit

Excellent

Explanation to Applicant

In terms of the review criteria: 1. What is the potential for the proposed activity to a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and - The proposed research has the potential to significantly advance knowledge of deep learning from a theoretical perspective, which is seriously lacking at this point in time. These advances could have impacts for most of machine learning that is happening today. b. Benefit society or advance desired societal outcomes (Broader Impacts)? - The applicant discusses the BI of the proposed research in terms of bias and fairness, which is an excellent point to bring up. If we can relate these models back to theoretical bounds, then we can better understand how to address issues of bias and fairness. 2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts? - The proposed activities are creative and novel. 3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success? -The plan is well reasoned and organized. The applicant broke the proposed research up into manageable pieces that build to the final research goal. In terms of measuring success, the applicant poses the research in terms of their hypothesis which can be tested. So success could be measured in terms of proving or disproving their hypothesis. 4. How well qualified is the individual, team, or institution to conduct the proposed activities? - The applicant is well positioned to perform the proposed activities, with significant background in ML research from industry to academia. 5. Are there adequate resources available to the PI (either at the home institution or through collaborations) to carry out the proposed activities? - The applicant specifies resources available to them. They should have everything they need to complete the proposed activities.

Broader Impacts Criterion

Overall Assessment of Broader Impacts

Excellent

Explanation to Applicant

In terms of the review criteria: 1. What is the potential for the proposed activity to a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and b. Benefit society or advance desired societal outcomes (Broader Impacts)? - The applicant's proposed research, prior research and current outreach and teaching activities have significant broader impacts. The applicant has demonstrated their commitment to outreach and teaching through their various activities. I have no doubt they will continue with these efforts in graduate school and when they continue on to academia. 2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts? - The applicant introduced a robotics program to middle schools throughout the LA area, mentoring a team to win a competition in 2019. Additionally, they introduced the BOTS program 3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success? - Yes. The only thing that is really missing in terms of Broader Impacts is a plan for the future. But the demonstrated record by the applicant makes it clear that they will continue with their outreach activities. 4. How well qualified is the individual, team, or institution to conduct the proposed activities? - With a ton of background with the robotics program and BOTS program as well as contributing lectures to the opensource materials, the applicant has shown that they are qualified. 5. Are there adequate resources available to the PI (either at the home institution or through collaborations) to carry out the proposed activities? - Yes.

Summary Comments

The applicant gives a high-level overview of their accomplishments, both in terms of Intellectual merit and Broader impacts for research and outreach. And then they proceed to detail their experiences in both areas. They have an incredible amount of

outreach and teaching experience, and their research is very interesting and has real impact. They have had several research internships. They introduce their long-term plans to join academia and eventually go into university leadership in order to foster relationships. They are well-positioned to perform the proposed research. They have a demonstrated record of outreach and teaching. They detail their long-term plans. I have no doubt they will have significant impact on the field as a future researcher.

Intellectual Merit Criterion

Overall Assessment of Intellectual Merit
Excellent

Explanation to Applicant
Strengths: The applicant developed a novel Bayesian Neural Networks model for uncertainty quantification that is highly scalable and outperformed state-of-the-art methods by a large margin. The applicant has been awarded several merit-based scholarships and has won 1st place in several AI competitions. I applaud the applicant's passion for pursuing graduate research in theoretical machine learning, particularly in optimization and generalization in deep learning. Theoretical advances in this area can have significant impact on the science of deep learning, increasing algorithm efficiency, accuracy, and robustness. The applicant is well prepared for graduate study by taking PhD level computer science courses during his undergraduate study. Weaknesses: None

Broader Impacts Criterion

Overall Assessment of Broader Impacts
Excellent

Explanation to Applicant
Strengths: The applicant has been volunteering in mentoring K-12 students in robotics programs and led team participations in different competitions. The applicant has also been actively participating in the USC Center for AI in Society that focused on applications of machine learning for social good. His passion in analyzing and rectifying biases in deep learning models would have a great impact on the society. Previously developed machine learning model developed by the applicant has already been utilized in a series of interdisciplinary applications including segmentations of graphite electrodes, laser-welded metal joints, and medical CT imaging. Weaknesses: None

Summary Comments
The applicant aims to understand the theoretical basis of deep learning algorithms on why it fits the training data exactly but achieving a low test risk by characterizing training and generalization behaviors. The applicant has an excellent academic and research experience. The applicant is well prepared for graduate study and knows how to work collaboratively and as a leader.

Intellectual Merit Criterion

Overall Assessment of Intellectual Merit
Excellent

Explanation to Applicant
The applicant proposes projects in theoretical machine learning field. He has research and internship experience which led to some publications that are under review. Based on the letters of reference, the description of the project, and academic background, I believe applicant can be a very competitive PhD candidate in computer science and machine learning.

Broader Impacts Criterion

Overall Assessment of Broader Impacts

Excellent

Explanation to Applicant

Applicant understands the importance of fairness and bias in the concept of machine learning models. They have mentorship experience and other relevant experiences which makes him an appropriate mentor for his peers or undergraduate students. The project itself also has broader impacts affecting the society overall.

Summary Comments

Based on the points mentioned in the intellectual merits and broader impacts sections, I believe this application is very competitive.