Proposal Review 1 : 2321227

Back to Proposal

Agency Name:	National Science Foundation
Agency Tracking Number:	**2321227**
Organization:	
NSF Program:	CISE Core: Large Projects
PI/PD:	Pierce, Benjamin
Application Title:	CISE: Large: Property-Based Testing for the People
Rating:	Multiple Rating: (Very Good/Good)

Review

Summary

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

***INTELLECTUAL MERIT

--Strengths
- It appears that the proposed work will generate new algorithms and automation to make PBT testing more effective and efficient for software testing as well as easier to use.
- The PIs aim to apply previous results (sometimes in related areas) and the extend the current capabilities of PBT to make new, more useful tools, algorithms, and approaches.
- The PIs intend to use surveys and observational studies to determine what is needed and evaluate the approaches they obtain for ease of use.
- The PIs appear to have a reasonable plan for carrying out the proposed work.

- The PIs appear to have specific approaches that they aim to investigate to address each of the needs they identify
- The PIs are well-qualified to lead the proposed work.
- There seem to be adequate resources available to the PIs to carry out the proposed work.

--Weaknesses
- A lot of the final results may depend on the people who agree to participate in their surveys and studies. It is possible that these people will not be representative of the population that would ideally be using the proposed tools.
- More preliminary data could have been included in the proposal.
- It is sometimes hard to gauge from the proposal how straightforward the PIs feel that some of the proposed modifications will be, and if they are not straightforward, how the approach will maximize the chances of success.

Results of prior NSF support (if applicable): Only one PI has previous NSF support. Those results look fine.

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

***BROADER IMPACTS, including enhancing diversity and integrating research and education:

--Strengths:
- Software bugs are a significant problem that can lead to catastrophic failures and thus should be detected as early as possible.
- Tools created in the projected will be distributed as open-source.
- The PIs intend to work with a large number of undergraduates on research with a focus on students from underrepresented groups.
- The PIs have a good record of mentoring students from underrepresented groups--especially female students.
- The interaction with industry-based software engineers increase the chances that the project will lead to tangible changes in industry.

--Weaknesses:
- No significant weaknesses

Please evaluate the strengths and
weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if
applicable

--Adequacy of Data Management Plan:
The database management plan is short, but it appears to be adequate.

--Adequacy of Post-doctoral Mentoring Plan (if applicable): N/A

***SOLICITATION-SPECIFIC REVIEW CRITERIA

-- Does the proposal identify a computer and information science and engineering grand challenge and an agenda to tackle such a challenge?

The grand challenge identified in the proposal is "accelerating the adoption of PBT ...to make a significant dent in the global cost of software bugs." Significantly reducing software bugs is an important and difficult problem to solve.

-- Does the proposal explicitly identify the participating CISE core programs it covers and make the case for why the challenge is within the scope of one or more of these participating core programs?

The proposal definitely fits within the scope of the participating core programs.

-- Does the proposal define the roles of all members of the team and the synergies among them in a Management and Coordination plan?

The management and coordination plan is detailed and generally well-thought-out. All participants will meet weekly. One issue with this is that the meetings might run very long and/or some of the participants may not get to talk very much. However, if this should become a problem, it is solvable. I could not find budgeted line items in the description, but these may not be necessary as the PIs are at the same institution.

BROADENING PARTICIPATION IN COMPUTING:

1. Goal and Context: Does the plan describe a goal and the data from your institution(s) or local community that justifies that goal? Yes. They want the diversity of the participants in the REU program and the Task for the introductory CS course to at least match the characteristics of the population of Pennsylvania.

2. Intended population(s): Does the plan identify the characteristics of participants from an underrepresented group, including school level? Yes. Some are undergraduates. Otherwise are TAs and thus are likely either graduate students or senior undergraduates.

3. Strategy: Does the plan describe activities that address the stated goal(s) and intended population(s)? Yes. The PIs have plans for actively recruiting students from underrepresented groups.

4. Measurement: Is there a plan to measure the outcome(s) of the activities? Yes. This is based upon statistics of the TA cohort as well as group statistics and surveys for the undergraduate REU students.

5. PI Engagement: Is there a clear role for each PI and co-PI? Does the plan describe how the PI is prepared (or will prepare or collaborate) to do the proposed work? Both PIs are at the same institution and it appears that they both will participate in this part of the proposal.

Summary Statement

This project involves the exploration of property-based testing (PBT) for software, where PBT consists of identifying properties and then verifying those properties when the code is run with a large number of automatically-generated inputs. The PIs aim to make PBT more useful to software test practitioners by finding ways to automate more of the PBT process and provide a better user interface. The PIs started their investigation with a survey of practitioners at Jane Street Capital to find their opinions of and pain points with current versions of PBT.

Overall, it appears that this is a good proposal. One of the strengths lies in the fact that it is motivated (and will be further motivated) by surveys and studies of how people use (or don't use) PBT. The PIs have a detailed description of how different parts of the PBT process can be better automated to make them more useful and effective. Some additional preliminary data may have been helpful to motivate some of these more technical research questions, however.

The broader impact is good in that if successful it will help to produce software that has fewer bugs by the time it reaches the end user.