**Discussion and Peer Review Report**

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**Submission date: 2022/11/29**

Note: This report contains two parts. In the first part you include your discussion thread. In the second part you put down your peer evaluation of four other reading reports.

**PART A: Discussion Thread**

[YANG, Yuxin](https://canvas.ust.hk/courses/45953/users/128241)

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FridayNov 18 at 7:05pm

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Very good report! In evaluation RQ5, you mentioned that additional historical information could improve the patch reduction of SeAPR. In fact, we can see from the graph that 33% of the APR tools did not improve performance and that there is a significant difference in the performance change among different tools (while for the effect of the partial matrix on performance, the two folds show a very high correlation). Can you give a speculative explanation for this phenomenon?

[ZHANG, Hexiao](https://canvas.ust.hk/courses/45953/users/128320)

[**ZHANG, Hexiao**](https://canvas.ust.hk/courses/45953/users/128320)

FridayNov 18 at 10:34pm

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Thanks, this is a very interesting question. The authors didn't explain it in the paper, but I can give an intuitive view.

Form RQ1, SeAPR works better with some APR tools, but less well with others.  
By introducing historical information from other tools, different tools will cancel each other out. Tools acquiring significant acceleration without historical data will have slightly lower performance, while others will have significantly higher performance. This is roughly what Figure 7 shows.

For me, it is amazing that SeAPR achieves consistent acceleration across different experimental setups, especially considering how simple high-quality tests and similarities are defined.

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FridayNov 18 at 7:43pm

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In evaluation part, it's shown that there're differences between the performance of SeAPR on full validation matrix and partial validation matrix. The full validation matrix turns out to have worse performance than partial validation matrix. However, as common knowledge, the test case that contains more information is supposed to have better performance. So what's the possible reason for partial validation matrix performs better?

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FridayNov 18 at 10:16pm

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Thanks for your question.

The key to the heuristic algorithm proposed in this paper is the definition of high-quality patches. That is a patch that enables the original failed test cases to pass. This definition is very subtle.

So the intuitive explanation for why SeAPR performs worse with full matrices is that a significant portion of low-quality patches with partial matrices are considered high-quality patches with full matrices since full matrices execute all tests against each patch and can potentially make more failing tests pass. The definition of a high-quality patch leads to this phenomenon.

Anyway, in both settings, SeAPR achieves some acceleration. Apparently, it is because of the better results using partial matrices that the authors used partial matrices as the default setting for the experiments. This is an empirical choice.

Edited by [ZHANG, Hexiao](https://canvas.ust.hk/courses/45953/users/128320) on Nov 18 at 10:17pm

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SaturdayNov 19 at 11:43am

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Thank you for your reply! It's clear and I completely understand why.

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FridayNov 18 at 10:16pm

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SePAR is really a simple and elegant method used in automated program repair. The writing is clear and well-organized. I can see how the simple method make a huge difference. The report points out that more information can be added to the similarity calculation in the *Reflection*. What information do you think can be taken into consideration other than those mentioned in the report?

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FridayNov 18 at 10:43pm

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Thanks.

SeAPR considers only modified methods when calculating the similarity between patches. So I think computing similarity at a finer granularity should be worth a try, such as code blocks, AST nodes, etc. There should be a trade-off between time cost and acceleration effect.

But I have to say that authors should have made similar attempts since they're straightforward. The results presented in the paper should be the optimal solution they achieved.

Edited by [ZHANG, Hexiao](https://canvas.ust.hk/courses/45953/users/128320) on Nov 19 at 9:48am

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SaturdayNov 19 at 1:12pm

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Thanks for your reply! This completely answers my doubts.

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[**HUANG, Qiuhua**](https://canvas.ust.hk/courses/45953/users/128221)

FridayNov 18 at 11:15pm

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As you mentioned in Patch Similarity and Prioritization in Summary, there are many other patch-prioritization formulae other than Ochiai, and experiments have shown that the different patch-prioritization have different results. Could you introduce some of them?

[ZHANG, Hexiao](https://canvas.ust.hk/courses/45953/users/128320)

[**ZHANG, Hexiao**](https://canvas.ust.hk/courses/45953/users/128320)

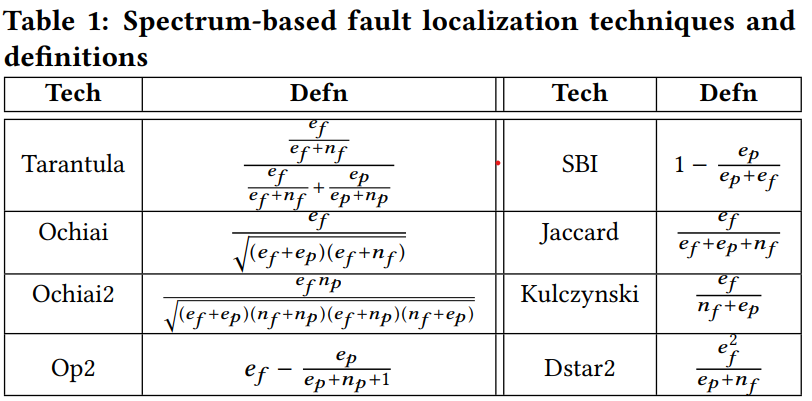
SaturdayNov 19 at 9:46am

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Thanks. These formulae come from fault localization techniques of APR.

Their definitions are as below. In SeAPR's case, ef/nf is the similarity/dissimilarity between the current patch and high-quality patches, and ep /np is the similarity/dissimilarity between the current patch and low-quality patches.

I think they are just different ways of fitting. The choice is entirely determined by experiments.



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FridayNov 18 at 11:40pm

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This report clearly summarizes the process and multiple variants of the SeAPR algorithm. In the Evaluation section, the experimental results are comprehensively presented through multiple research questions that are easy to understand.  
However, my question is, from the RQ3 in Evaluation, it can be seen that the partial validation matrix is generally better than the full validation matrix. Could you please briefly explain why or perform some analysis?

[ZHANG, Hexiao](https://canvas.ust.hk/courses/45953/users/128320)

[**ZHANG, Hexiao**](https://canvas.ust.hk/courses/45953/users/128320)

SaturdayNov 19 at 9:36am

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Thanks. I have answered the same question to Jinglan. Please check out our discussion.

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SundayNov 20 at 5:06pm

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Thanks a lot for your reply!

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SaturdayNov 19 at 1:20pm

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This report describes the method and experimental results of SePAR well. It would be better if some methods for comparison can be introduced by the way when describing the experimental results, like top methods in Evaluation part. Anyway, I had learned a lot from it. Thank you very much!

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SaturdayNov 19 at 1:39pm

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I noticed the full matrices and partial matrices mentioned ini others comments and I am little confused with the partial matrices in the Definitions of Input part in the Summary. You mentioned that most modern APR tools terminate the test execution of a patch as soon as they observe a test failure for that patch. Is that the same for the SePAR?

[PAN, Han](https://canvas.ust.hk/courses/45953/users/128251)

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SaturdayNov 19 at 8:55pm

[Manage Discussion Entry](https://canvas.ust.hk/courses/45953/discussion_topics/382341)

Sorry for not expressing my question clearly.  
What I mean is that after obtaining the priority value of the unverified patch, when a tool is executing a patch and observes a patch test failure, will the test execution of the patch be terminated immediately? If so, how do you ensure that the number of patch executions is not affected by this factor?

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SaturdayNov 19 at 9:09pm

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I probably understand your question, and it's very meaningful to deepen our understanding. Thanks.

According to the SeAPR algorithm, the process is:  
The APR tool verifies a patch -> SeAPR updates priorities -> the APR tool verifies the next top-priority patch.

However, it is impractical to directly embed SeAPR into existing tools, so they take a roundabout approach in experiments. The pipeline is:  
1. Perform an automatic repair with the APR tool, and extract the verification order of patches.  
2. Start from the first patch: verifies a patch -> updates priorities -> verifies the next top priority patch.

In RQ3, the paper tested the effect of terminating early.

Edited by [ZHANG, Hexiao](https://canvas.ust.hk/courses/45953/users/128320) on Nov 20 at 10:43am

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SundayNov 20 at 5:15pm

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Thanks a lot for your reply!

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SaturdayNov 19 at 2:46pm

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Thank you for your work! It's very practical and valuable. The report is also very clear and make it easy for any reader to easily get the idea of the paper.

I'm curious about the usage of the technique. What's it's potential future scenario? In which field can it be used to help improve efficiency and accuracy?

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SaturdayNov 19 at 6:07pm

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SeAPR is an optimization of the existing APR tools in the patch validation phase. It reduces APR time consumption and increases efficiency by calculating the priority of patch execution.

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SaturdayNov 19 at 3:36pm

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I have one more question. As you mentioned in the evaluation section, this method was validated on the Defects4J dataset, WHICH is a very popular benchmark dataset for the Java Automated Program Repair, Defect Location domain. It seems that there is no mention of validation in other languages. But the idea of this method appears generic. Will the method be extensible to the APR tools of other programming languages?

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SaturdayNov 19 at 6:02pm

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Yes. It's obvious for SeAPR's technology and ideas are not dependent on any specific features of the programming language.

This paper chose to use Java because most state-of-the-art APR tools are implemented in JAVA and tested on Defects4J. SeAPR is an optimization of the existing APR tools in the patch validation phase. Its input is generated by APR tools.

Edited by [ZHANG, Hexiao](https://canvas.ust.hk/courses/45953/users/128320) on Nov 19 at 6:03pm

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[**LI, Yizhang**](https://canvas.ust.hk/courses/45953/users/129083)

SundayNov 20 at 7:18pm

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SeAPR is very useful, can you briefly describe its drawbacks or future directions for improvement?

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[**ZHANG, Hexiao**](https://canvas.ust.hk/courses/45953/users/128320)

MondayNov 21 at 10:50am

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Thanks.

Experiments show that the acceleration effect of SeAPR is obvious when the number of candidate patches is large. However, with few candidate patches, it is difficult to achieve the desired optimization.

For future directions, please check my discussion with PAN, Han.

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SundayNov 20 at 7:19pm

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The work mentioned in this paper is practical because every software application faces the problem of program repair. And SeAPR can greatly reduce the number of patch executions with a small overhead, thus saving the effort of manual checking. The elaboration is also very clear. Thank you for your work!