I. Contributions to research and development

a. **Articles published or accepted in peer-reviewed journals**

Boyuan Chen, Jian Song, Peng Xu, Xing Hu, and Zhen Ming (Jack) Jiang. (2018) An Automated Approach To Estimating Code Coverage Measures via Execution Logs. In Proceedings of the 33rd IEEE/ACM International Conference on Automated Software Engineering (ASE). 305 - 316.
Boyuan Chen and Zhen Ming (Jack) Jiang. (2017) Characterizing and Detecting Anti-patterns in the Logging Code. In Proceedings of the 39th International Conference on Software Engineering (ICSE). 71 - 81 (Master's work).
Boyuan Chen and Zhen Ming (Jack) Jiang. (2017) Characterizing logging practices in Java-based open source software projects - a replication study in Apache software foundation. Empirical Software Engineering. 22: 330 - 374 (Master's work).

II. Most significant contributions to research and development

The paper "An Automated Approach To Estimating Code Coverage Measures Using Execution Logs" is a collaboration work with the software engineers at Baidu, which is one of the largest AI and internet companies in the world. In this work, we have developed a research prototype, **LogCoCo**, to tackle an engineering challenge: using logs to calculate code coverage. I am the first author of the paper and have designed, implemented, and evaluated **LogCoCo** with the assistance of my supervisor. State-of-art code coverage tools all depend on additional code instrumentation. Therefore, these tools bring in extra overhead in systems, which makes it difficult to apply in a production environment. **LogCoCo**, which requires no additional instrumentation, can estimate code coverage with high precision and recall. Since no instrumentation is required, we can use it to estimate code coverage in production, which will greatly help software engineers in understanding system runtime behavior from a code coverage perspective. This is the first work to estimate code coverage via execution logs.

The paper "Characterizing and detecting anti-patterns in the logging code" was published in ICSE, which is the top software engineering conference. In this work, we have found six types of anti-patterns existing in logging code and developed a tool called **LCAnalyzer** to automatically detect these anti-patterns. I am the first author of this paper and have designed, implemented and evaluated **LCAnalyzer** with the assistance of my supervisor. This is the first work to deal with **how-to-log** problems. We submitted issue reports to ten large scale open-source software including Hadoop (one of the most popular distributed systems), HBase (one of the most popular NoSql database systems) ,etc. . 64 issue reports have been submitted and 46 (72%) have been accepted by the developers. This clearly demonstrates that our research contributes greatly to the open source community relating to software maintenance and software quality. This was a part of my master's thesis work.

III. Applicant's statement

Research experience

I worked as a research visitor at IBM Canada during my master's studies (2016.01 - 2016.08). During this time, I helped the development team accelerate the log analysis process. I learned how to transform industry requirements to research directions. I needed to continuously communicate with software testers for analyzing the data generated in the testing process. I was also responsible for organizing meetings with the software developers, testers, the development manager and the project manager to discuss the research design and evaluation. Finally, I developed a framework for log analysis to detect certain types of issues that existed in some IBM products. I have also conducted a technology transfer to the development team. This experience helped me to learn how to transform a research prototype to a industry product.

I also worked as a research intern at Baidu from 2017.08 to 2017.12. During this time, I worked with many senior software developers and testers. We discussed the challenges they were facing in software testing processes in real world large scale software systems. We went through several brainstorming meetings and came up with a research plan. Then I designed a research prototype and implemented it as a research tool all by myself. We have applied these tools on some of Baidu's products and received positive feedback from engineers.

Relevant activities

When I was a master's student, I worked as a teaching assistant for four courses. I was responsible for grading, giving lectures, and monitoring exams. I have also assisted other master's students in reviewing and revising their research paper drafts. I took part in the Lassonde 50:50 challenge as a mentor in the summer of 2018, coaching two grade 11 female students for six weeks.

When I was working as a research associate in the SCALE lab at York University, I was responsible for several types of system administration tasks. These activities included, helping Ph.D and master's students to set up programming environments; writing scripts to collect and clean data, etc.

I have done quite a few paper co-reviews for some software engineering conferences and journals, including Empirical Software Engineering, ICSME (The International Conference on Software Maintenance and Evolution) 2018, TSE (IEEE Transactions on Software Engineering), etc..

I have received the ACM SIGSOFT CAPS Grant for ASE in 2018.