Rapid Adjudication of Static Analysis Meta-Alerts During Continuous Integration (CI)

To overcome barriers to using automated classifiers during CI, we designed a system that enables classification to be used in CI builds, including cascading adjudications.

**Problem**
Manual adjudication of static analysis meta-alerts requires too much effort in short CI build and PR-approval time frames to address many (if any) of them. This problem is technically challenging. Developing a new static analysis tool to precisely match flaws in different version of Java or C++ code requires language-specific algorithms, and the matching must be fast to work in a CI/CD system.

Also, when cascading is imprecise, mis-labeled data worsens classifier performance, and no effective systems exist that use automated classifiers for multiple static analysis tools in a CI system.

**Solution**
The solution involves (1) a system that supports classification integrated with CI, and builds on the SCAIFE API and implementation we developed for an extensible architecture that supports classification, and (2) precise cascading implementations.

We (1) designed a model for integrated SCAIFE-CI systems, including SCAIFE changes, performance measures, and new classifier features; (2) implemented parts of the design (collaborators tested and reviewed subsequent versions); (3) performed an experiment using diff-based (imprecise) cascading and generated data for comparison to precise cascading. Future plans are to develop a precise cascading and generated data for comparison to precise cascading. Future plans are to develop a precise cascading algorithm, improve classifiers, and fully integrate them.

**FY20 Code and API Artifacts**
- (Sep 2020) SCAIFE System v 1.2.2 is released with significant CI-SCAIFE integration progress; it includes five APIs, an HTML manual, SCALe, and the rest of the software system. (collaborators)
- (Sep 2020) SCALe is released for SCALe v r.6.2.2.2.A. (public)
- (Sep 2020) Five SCAIFE APIs are released. (collaborators, public)
- (Jul 2020) SCAIFE System v 1.1.1 is released with API modules and SCALe automation for CI-SCAIFE integration; the system includes separable SCALe v. r.6.1.1.1.A, five APIs, and an HTML manual. (collaborators)
- (Mar 2020) SCAIFE System v 1.0.0 is released with containers for CI-SCAIFE integration; the system includes a SCALe separable module, new APIs, and an HTML manual. (collaborators)
- (Feb 2020) SCAIFE API v 0.0.9-beta is published. (collaborators, Github)
- (Oct 2019) SCAIFE System Beta VM v 2.1 is released with a bill of materials. (collaborators)

**FY20 Additional Artifacts**
- (Sep 2020) Diff-based cascading experiment artifacts are produced.
- (Sep 2020) SCAIFE/SCALe HTML manual is released for SCALe v r.7.0.0.0.A. (public, collaborators)
- (Jul 2020) “How to Instantiate SCAIFE API Calls” manual is released. (public)
- (Apr 2020) “Open Dataset RC_Data for Classifier Research” is published. (public)
- (Mar 2020) “How to Test and Review the SCAIFE System v 1.0.0 Release” manual is published. (collaborators)
- (Feb 2020) “SCAIFE API Version 0.0.9-Beta: Reviewer Roadmap” manual is published. (collaborators)

The team developed progressive versions of (1) a design for CI-classifier (CI-SCAIFE) integration and (2) an API definition. The team also implemented a system for modular classification with features to enable CI-integration and to measure performance.