

Project list for CE/CS/SE 6367.002

Note that the proposal is due at 11:59pm March 1st.

Submission materials: a two-page proposal using the ACM format

(<http://www.acm.org/sigs/publications/proceedings-templates>, you can use either word or latex) specifying the following parts:

1. The problem you want to investigate
2. The basics of existing techniques and(or) the design of your technique
3. Your implementation plan
4. The experimental evaluation subjects and design

Mid-Term progress report is due at 11:59pm April 1st.

Submission materials: a four-page report specifying your progress and further plan

Final report is due at 11:59pm April 30th.

Submission materials: a 6-10 pages full report & code & data

Note: all the final project submissions will be graded based on the report quality, the difficulty level of your project, the easiness of using your tool, and the completeness of your experimental data. You are encouraged to use online project hosting websites (e.g., GitHub, Bitbucket) to store all your code and data related to the course project.

Implementation-Based Projects

1. Use ASM byte-code manipulation framework [3] to build an automated coverage collection tool that can capture method coverage, line coverage, and branch coverage for the program under test. Then, apply your tool to 10 real-world Java projects (>1000 lines of code) with JUnit tests (>50 tests) from GitHub [1]/SourceForge [2] (see a list in the appendix) to collect the method coverage, line coverage, as well as branch coverage results for all of them. Note that you should collect the coverage for each test method. You are highly recommended to use Java Agent [12] and integrate your tool with the Maven build system [18].
2. Use Eclipse JDT [4] source code manipulation framework to build an automated mutation testing framework. Then, apply your tool to 1 real-world Java project (>1000 lines of code) with JUnit tests (>50 tests) from GitHub/SourceForge to generate mutants and execute mutants for the project.
3. Use ASM byte-code manipulation framework [3] to build an automated mutation testing framework. Then, apply your tool to 1 real-world Java project (>1000 lines of code) with JUnit tests (>50 tests) from GitHub/SourceForge to generate mutants and execute mutants for the

project. You are highly recommended to use Java Agent [12] and integrate your tool with the Maven build system.

4. Implement the greedy and ILP-based test reduction techniques for real-world Java programs with unit tests. And evaluate them on 20 real-world Java programs (with >1000 lines of code and > 50 tests) from Github/SourceForge. Note that you can use Clover [6] or FaultTracer [17] to collect coverage information (e.g., statement coverage) for each test, and use the PIT [14] mutation testing tool to seed faults into the subjects under test.

Research-Based Projects

1. Implement the regression test selection technique based on control-flow graph analysis. More specifically, you should use WALA [9] or Soot [10] to implement the dangerous edge detection, and use Colver [6] or FaultTracer [17] to collect code coverage. Finally, perform an empirical study to compare your technique with state-of-the-art test selection tool Ekstazi [11] on 10 real-world projects from GitHub or SourceForge. **(We will have WALA and Soot tutorial soon in the class, and this project is highly recommended.)**
2. Perform an empirical study about the evolution of JUnit tests in 100 real-world software projects from GitHub or SourceForge. More specifically, you should study all the revisions (i.e., commits) of each project, and analyze the number of added, deleted, and changed tests for each revision. You are also encouraged to study the reasons for the test additions, deletions, or modifications.
3. Use Evosuite [7] and Randoop [8] to generate tests for Java programs; and use Colver [6] or FaultTracer [17] to measure two types of control-flow coverage: statement and decision (branch) coverage. Then study how different coverage types correlate with each other for different types of test suites, i.e., original manually-written JUnit test suites, Evosuite tests, and Randoop tests. Apply the study on 20 real-world Java projects (>1000 lines of code) with JUnit tests (>50 tests) from GitHub/SourceForge.
4. Perform an empirical study on the bug history on 10 real-world Java projects (>1000 lines of code) with JUnit tests (>50 tests) and issue tracking system from GitHub/SourceForge. Then study which types of bugs are more likely to be revealed by the JUnit tests in internal testing and which types are more likely to be reported by the users after release. Also investigate the reasons for that.
5. Use EvoSuite [7] as the test generation support to refine the invariants generated by Daikon [13]. For example, instrument the Daikon invariants

into the original program, and then use EvoSuite to generate additional tests to refute incorrect invariants and augment correct invariants. (**Hint:** *related to Automated Oracle Generation in our class.*)

6. Investigate advanced fault localization techniques, e.g., fault localization based on different coverage info (e.g., branch coverage, or even mutation testing), or likely program invariants/assertions. (**Hint:** *related to Automated Debugging in our class.*)
7. Testing the limit of mutation testing: download 50 Java projects with JUnit tests from GitHub (see a list in the appendix), apply two different mutation testing tools (i.e., MAJOR [15] and Judy [16]) on them. For the projects that can be applied with the tools, you should record the mutation testing results for each tool. Also, for the projects that cannot be applied with each tool, you should explain the reason for that.

References

- [1] GitHub: <https://github.com/>
- [2] SourceForge: <http://sourceforge.net/>
- [3] ASM: <http://asm.ow2.org/>
- [4] Eclipse JDT: <https://eclipse.org/jdt/>
- [5] DUA-Forensics: <http://www3.nd.edu/~rsanteli/duaf/>
- [6] Colver: <https://www.atlassian.com/software/clover/overview/>
- [7] EvoSuite: <http://www.evosuite.org/>
- [8] Randoop: <https://code.google.com/p/randoop/>
- [9] WALA: <http://wala.sourceforge.net/>
- [10] SOOT: <https://sable.github.io/soot/>
- [11] Ekstazi: <http://www.ekstazi.org/>
- [12] Java Agent:
<https://docs.oracle.com/javase/6/docs/api/java/lang/instrument/package-summary.html>
- [13] Daikon: <http://plse.cs.washington.edu/daikon/>
- [14] PIT: <http://pitest.org/>
- [15] MAJOR: <http://mutation-testing.org/>
- [16] Judy: <http://www.mutationtesting.org/>
- [17] FaultTracer: <http://www.utdallas.edu/~lxz144130/ftracer.html>
- [18] Maven: <https://maven.apache.org/>

Appendix (399 GitHub Java projects with JUnit tests, each line shows the project name+version+url, separated by “,”)

aalto-xml,0.9.12-SNAPSHOT,https://github.com/FasterXML/aalto-xml
agoncal-application-petstore-ee6,1.0,https://github.com/agoncal/agoncal-application-petstore-ee6
aho-corasick,0.2.4,https://github.com/robert-bor/aho-corasick
AhoCorasickDoubleArrayTrie,1.0.1,https://github.com/hankcs/AhoCorasickDoubleArrayTrie
akela,0.6-SNAPSHOT,https://github.com/mozilla-metrics/akela
Alternator,0.10.1-SNAPSHOT,https://github.com/mboudreau/Alternator
anomaly-detection,1.0-SNAPSHOT,https://github.com/tdunning/anomaly-detection
ansj_seg,2.0.8,https://github.com/NLPchina/ansj_seg
apgdif,2.4,https://github.com/fordfrog/apgdif
apk-parser,2.0.13,https://github.com/xiaxiaocao/apk-parser
appengine-guestbook-java,1.0-SNAPSHOT,https://github.com/GoogleCloudPlatform/appengine-guestbook-java
are-we-consistent-yet,1.0.0-SNAPSHOT,https://github.com/andrewgaul/are-we-consistent-yet
argparse4j,0.6.1-SNAPSHOT,https://github.com/tatsuhiro-t/argparse4j
asciidoctor-maven-plugin,1.5.3-SNAPSHOT,https://github.com/asciidoctor/asciidoctor-maven-plugin
ashot,1.4.12-SNAPSHOT,https://github.com/yandex-qatools/ashot
assertj-core,2.1.1-SNAPSHOT,https://github.com/joel-costigliola/assertj-core
asterisk-java,2.0.0.CI-SNAPSHOT,https://github.com/asterisk-java/asterisk-java
async-retry,0.0.8-SNAPSHOT,https://github.com/nurkiewicz/async-retry
avaje-ebeanorm,4.7.4-SNAPSHOT,https://github.com/ebean-orm/avaje-ebeanorm
batch-import,2.2.0,https://github.com/jexp/batch-import
BitHub,0.1,https://github.com/WhisperSystems/BitHub
BootsFaces-OSP,0.8.0-SNAPSHOT,https://github.com/TheCoder4eu/BootsFaces-OSP
brickhouse,0.7.1-SNAPSHOT,https://github.com/klout/brickhouse
budgetapp,1.1.0-SNAPSHOT,https://github.com/paukiatwee/budgetapp
Bukkit,1.7.10-R0.1-SNAPSHOT,https://github.com/Bukkit/Bukkit
byteunits,0.9.1-SNAPSHOT,https://github.com/JakeWharton/byteunits
caesar,1.4.0,https://github.com/vbauer/caesar
calculus,1.0-SNAPSHOT,https://github.com/mttkay/calculus
cascading_ext,1.6-SNAPSHOT,https://github.com/LiveRamp/cascading_ext
cassandra-reaper,0.2.2-SNAPSHOT,https://github.com/spotify/cassandra-reaper
cassandra-webconsole,1.0.8-SNAPSHOT,https://github.com/suguru/cassandra-webconsole
charts4j,1.4-SNAPSHOT,https://github.com/julienchastang/charts4j
checkstyle,6.8-SNAPSHOT,https://github.com/checkstyle/checkstyle
chromecast-java-api-v2,0.0.7-SNAPSHOT,https://github.com/vitalidze/chromecast-java-api-v2
cli-parser,1.1.3-SNAPSHOT,https://github.com/spullara/cli-parser
clj-ds,0.0.5-SNAPSHOT,https://github.com/krukow/clj-ds
clojure-maven-plugin,1.7.2-SNAPSHOT,https://github.com/talios/clojure-maven-plugin
cloudhopper-smpp,5.0.9-SNAPSHOT,https://github.com/twitter/cloudhopper-smpp
clue,0.0.6,https://github.com/javasoz/clue
CodeGlance,1.4.2,https://github.com/Vektah/CodeGlance
CommandHelper,3.3.1-SNAPSHOT,https://github.com/sk89q/CommandHelper
commons-codec,1.11-SNAPSHOT,https://github.com/apache/commons-codec
commons-imaging,1.0-SNAPSHOT,https://github.com/apache/commons-imaging
commons-io,2.5-SNAPSHOT,https://github.com/apache/commons-io
commons-lang,3.5-SNAPSHOT,https://github.com/apache/commons-lang
compile-testing,1.0-SNAPSHOT,https://github.com/google/compile-testing
compress,1.0.4-SNAPSHOT,https://github.com/ning/compress
computoser,0.0.1-SNAPSHOT,https://github.com/Glamdring/computoser
Confucius,1.3-SNAPSHOT,https://github.com/IvanTrendafilov/Confucius
cors-filter,1.0.2-SNAPSHOT,https://github.com/eBay/cors-filter
couchdb-lucene,1.1.0-SNAPSHOT,https://github.com/rnewson/couchdb-lucene
coveralls-maven-plugin,3.2.0-SNAPSHOT,https://github.com/trautonen/coveralls-maven-plugin
crawler4j,4.2-SNAPSHOT,https://github.com/yasserg/crawler4j
css-selectors,2.0,https://github.com/chrsan/css-selectors
csv-serde,1.1.2-0.11.0,https://github.com/ogrodnek/csv-serde
cucumber-java-skeleton,0.0.1,https://github.com/cucumber/cucumber-java-skeleton
cucumber-reporting,0.1.1-SNAPSHOT,https://github.com/masterthought/cucumber-reporting
dashboard-demo,1.0.3-SNAPSHOT,https://github.com/vaadin/dashboard-demo
ddd-cqrs-sample,0.1-SNAPSHOT,https://github.com/BottegalT/ddd-cqrs-sample
deft,0.4.0-SNAPSHOT,https://github.com/rschildmeijer/deft
dictomaton,1.2.1-SNAPSHOT,https://github.com/danieldk/dictomaton
DiskLruCache,2.0.3-SNAPSHOT,https://github.com/JakeWharton/DiskLruCache
disruptor_thrift_server,0.3.9-SNAPSHOT,https://github.com/xedin/disruptor_thrift_server
docker-java,0.8.2-SNAPSHOT,https://github.com/kpelykh/docker-java
docker-maven-plugin,3.0.1-SNAPSHOT,https://github.com/wouterd/docker-maven-pluggin
DotCi,2.8.10-SNAPSHOT,https://github.com/groupon/DotCi
dropwizard-configurable-assets-bundle,0.2.3-SNAPSHOT,https://github.com/bazaarvoice/dropwizard-configurable-assets-bundle

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druid,1.0.15-SNAPSHOT,https://github.com/alibaba/druid
dynalink,0.8-SNAPSHOT,https://github.com/szegedi/dynalink
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elasticsearch-analysis-smartcn,3.0.0-SNAPSHOT,https://github.com/elastic/elasticsearch-analysis-smartcn
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elasticsearch-jdbc,1.6.0.0,https://github.com/jprante/elasticsearch-jdbc
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elasticsearch-readonlyrest-plugin,1.3,https://github.com/sscarduzio/elasticsearch-readonlyrest-plugin
elasticsearch-redis-river,0.0.5,https://github.com/leeadkins/elasticsearch-redis-river
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elasticsearch-transport-websocket,1.4.0.0,https://github.com/jprante/elasticsearch-transport-websocket
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encog-java-core,3.4.0-SNAPSHOT,https://github.com/encog/encog-java-core
evernote-sdk-java,1.25.1,https://github.com/evernote/evernote-sdk-java
evo-inffector,1.0-SNAPSHOT,https://github.com/atteo/evo-inffector
ews-java-api,2.0-SNAPSHOT,https://github.com/OfficeDev/ews-java-api
exp4j,0.4.6-SNAPSHOT,https://github.com/fasseg/exp4j
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fast-cast,3.09,https://github.com/RuedigerMoeller/fast-cast
fastweixin,1.3.3-SNAPSHOT,https://github.com/sd4324530/fastweixin
faunus,0.4.5-SNAPSHOT,https://github.com/thinkaurelius/faunus
first-stories-twitter,1.0-SNAPSHOT,https://github.com/mvogiatzis/first-stories-twitter
fjord,0.1.0-master-SNAPSHOT,https://github.com/penberg/fjord
flip-tables,1.0.3-SNAPSHOT,https://github.com/JakeWharton/flip-tables
floodlight,1.2-SNAPSHOT,https://github.com/floodlight/floodlight
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GCViewer,1.35-SNAPSHOT,https://github.com/chewiebug/GCViewer
gdx-artemis,0.6-SNAPSHOT,https://github.com/apotapov/gdx-artemis
gelf,1.1.13-SNAPSHOT,https://github.com/t0xa/gelf
GenericTree,1.0,https://github.com/vivin/GenericTree
geo,0.7.2-SNAPSHOT,https://github.com/davidmoten/geo
geocluster-facet,0.0.13-SNAPSHOT,https://github.com/zenobase/geocluster-facet
geohash-java,1.1.1-SNAPSHOT,https://github.com/kungfoo/geohash-java
GeoIP2-java,2.2.1-SNAPSHOT,https://github.com/maxmind/GeoIP2-java
geoip-api-java,1.2.15-SNAPSHOT,https://github.com/maxmind/geoip-api-java
geojson-jackson,1.6-SNAPSHOT,https://github.com/opendatalab-de/geojson-jackson
getdown,1.5-SNAPSHOT,https://github.com/threerings/getdown
github-plugin,1.11.4-SNAPSHOT,https://github.com/jenkinsci/github-plugin
glacieruploader,0.0.8-SNAPSHOT,https://github.com/MoriTanosuke/glacieruploader
glg2d,0.3-SNAPSHOT,https://github.com/brandonborkholder/glg2d
GoogleAuth,0.5.0,https://github.com/wstrange/GoogleAuth
greplin-bloom-filter,1.0-SNAPSHOT,https://github.com/Cue/greplin-bloom-filter
greplin-lucene-utils,1.0,https://github.com/Cue/greplin-lucene-utils
greplin-zookeeper-utils,1.1-SNAPSHOT,https://github.com/Cue/greplin-zookeeper-utils
gson-fire,1.1.0,https://github.com/julman99/gson-fire
guava-examples,1.0-SNAPSHOT,https://github.com/tfnico/guava-examples
gwt-bootstrap,2.3.2.1-SNAPSHOT,https://github.com/gwtbootstrap/gwt-bootstrap
h2o-2,2.9-SNAPSHOT,https://github.com/h2oai/h2o-2
hadoop-book,1.0-SNAPSHOT,https://github.com/elephantscale/hadoop-book
hashids-java,1.0.2-SNAPSHOT,https://github.com/jiecao-fm/hashids-java
HdrHistogram,2.1.5-SNAPSHOT,https://github.com/HdrHistogram/HdrHistogram
hepaudit,1.1.5,https://github.com/foursquare/hepaudit
hivemall,0.3.2-1,https://github.com/myui/hivemall
HtmlSpanner,0.5-SNAPSHOT,https://github.com/NightWhistler/HtmlSpanner
HTTP-Proxy-Servlet,1.7-SNAPSHOT,https://github.com/mitre/HTTP-Proxy-Servlet

hutool,2.9.1,https://github.com/looly/hutool
IClosure,1.3.0-SNAPSHOT,https://github.com/cosmin/IClosure
invokebinder,1.7-SNAPSHOT,https://github.com/headius/invokebinder
jackson-core,2.6.0-rc4-SNAPSHOT,https://github.com/FasterXML/jackson-core
jackson-databind,2.6.0-rc4-SNAPSHOT,https://github.com/FasterXML/jackson-databind
jackson-dataformat-csv,2.6.0-rc4-SNAPSHOT,https://github.com/FasterXML/jackson-dataformat-csv
jackson-dataformat-xml,2.6.0-rc4-SNAPSHOT,https://github.com/FasterXML/jackson-dataformat-xml
jackson-datatype-guava,2.6.0-rc3-SNAPSHOT,https://github.com/FasterXML/jackson-datatype-guava
jackson-datatype-joda,2.6.0-rc4-SNAPSHOT,https://github.com/FasterXML/jackson-datatype-joda
jackson-module-afterburner,2.6.0-rc4-SNAPSHOT,https://github.com/FasterXML/jackson-module-afterburner
jacop,4.2.0,https://github.com/radsz/jacop
JActor,5.0.0-SNAPSHOT,https://github.com/laforge49/JActor
jade4j,0.4.4-SNAPSHOT,https://github.com/neuland/jade4j
JAdventure,0.1-SNAPSHOT,https://github.com/Progether/JAdventure
jarchivelib,1.0.0-SNAPSHOT,https://github.com/thrau/jarchivelib
jasmine-maven-plugin,2.0-SNAPSHOT,https://github.com/searls/jasmine-maven-plugin
java-apns,1.0.0.Beta7-SNAPSHOT,https://github.com/notnoop/java-apns
javacpp,1.0-SNAPSHOT,https://github.com/bytedeco/javacpp
java-dirty,1.7-SNAPSHOT,https://github.com/mrwilson/java-dirty
javaewah,1.0.3-SNAPSHOT,https://github.com/lemire/javaewah
java-faker,0.6-SNAPSHOT,https://github.com/DiUS/java-faker
JavaFastPFOR,0.1.4-SNAPSHOT,https://github.com/lemire/JavaFastPFOR
java-gitlab-api,1.1.8-SNAPSHOT,https://github.com/timols/java-gitlab-api
java-grok,0.1.2-SNAPSHOT,https://github.com/thekrakken/java-grok
java-jwt,2.1.1-SNAPSHOT,https://github.com/auth0/java-jwt
java-libpst,0.8.1,https://github.com/rjohnsondev/java-libpst
java-merge-sort,1.0.1-SNAPSHOT,https://github.com/cowtowncoder/java-merge-sort
javapoet,1.2.0-SNAPSHOT,https://github.com/square/javapoet
java-service,0.7.0-SNAPSHOT,https://github.com/gearman/java-service
java-sizeof,0.0.6-SNAPSHOT,https://github.com/dweiss/java-sizeof
javasrc,1.0-SNAPSHOT,https://github.com/lanDarwin/javasrc
javatuples,1.3-SNAPSHOT,https://github.com/javatuples/javatuples
java-uuid-generator,3.1.5-SNAPSHOT,https://github.com/cowtowncoder/java-uuid-generator
JavaVerbalExpressions,1.3-SNAPSHOT,https://github.com/VerbalExpressions/JavaVerbalExpressions
Java-WebSocket,1.3.1-SNAPSHOT,https://github.com/TooTallNate/Java-WebSocket
jaxrs-analyzer,0.6-SNAPSHOT,https://github.com/sdaschner/jaxrs-analyzer
jbake,2.5.0-SNAPSHOT,https://github.com/jbake-org/jbake
jBCrypt,0.4,https://github.com/jeremyh/jBCrypt
jboss-modules,1.5.0.Beta1-SNAPSHOT,https://github.com/jboss-modules/jboss-modules
jcabi-aspects,1.0-SNAPSHOT,https://github.com/jcabi/jcabi-aspects
jcabi-github,1.0-SNAPSHOT,https://github.com/jcabi/jcabi-github
jcabi-http,2.0-SNAPSHOT,https://github.com/jcabi/jcabi-http
JDBM3,3.0-SNAPSHOT,https://github.com/jankotek/JDBM3
jdeb,1.4,https://github.com/tcurdt/jdeb
jenkins-ansicolor-plugin,0.4.1-SNAPSHOT,https://github.com/dblock/jenkins-ansicolor-plugin
jenkins-sonar-plugin,2.3-SNAPSHOT,https://github.com/SonarSource/jenkins-sonar-plugin
jetty-session-redis,2.4.ga-SNAPSHOT,https://github.com/Ovea/jetty-session-redis
jfreechart-fse,2.0-pre1,https://github.com/jfree/jfreechart-fse
jhipster-sample-app,0.0.1-SNAPSHOT,https://github.com/jhipster/jhipster-sample-app
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