

How to Write Unit Tests with GoogleTest

Krzysztof Sakrejda edited this page on 4 Apr 2015 \cdot 2 revisions

What to Test

- 1. We're trying to make sure all the boundary conditions get called
 - o zero-size inputs for containers
 - o 0, NaN, inf, and -inf inputs for floating point
- We want to make sure all tests get tickled and the appropriate exception types are thrown and documented.
- 3. We want to test that autodiff works
 - o reverse-mode
 - o forward mode: double (1st order), var (2nd order), fvar (3rd order)

There should be a finite difference testing framework soon. An alternative is to define a second, simpler templated versio of a function and test against that.

Using GoogleTest

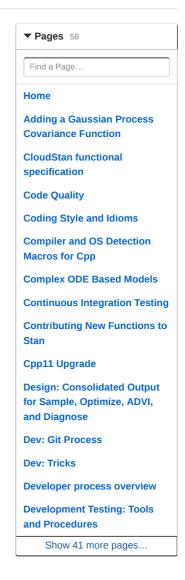
The place to start for doc for GoogleTest (other than looking at our existing examples) are:

- Primer: an overview
- · Advance Guide: good description of available tests and best API guide I know

Common test types

The documentation (above) is excellent so check there for details and the complete list of tests. The following is a small sample of commonly used test types in Stan and links to the relevant sections of the GoogleTest documentation.

- EXPECT/ASSERT EXPECT records the result but allows further tests in the same function, ASSERT exits the current function without cleanup. Stan unit tests use both forms.
- EXPECT_TRUE EXPECT_TRUE/FALSE test that the condition is TRUE/FALSE.
- EXPECT_EQ Tests that a calculated value equals (==) an expected result exactly, not appropriate for floating point comparison.
- EXPECT FLOAT EQ Tests that a floating point calculation results to known output values.
- $\bullet \ \ \mathsf{EXPECT_NEAR} \ \mathsf{Like} \ \mathsf{EXPECT_FLOAT_EQ} \ \mathsf{but} \ \mathsf{a} \ \mathsf{third} \ \mathsf{argument} \ \mathsf{sets} \ \mathsf{the} \ \mathsf{threshold} \ \mathsf{used}.$
- ASSERT_THROW Tests that a specific exception type is thrown.
- ASSERT_NO_THROW Tests that the statement does not throw. Some parts of the code are not supposed to throw... not sure which.



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