

# Collaborative Research: Making Software Engineering Work for Computational Science & Engineering: An Integrated Approach

Jeffrey Carver and George K. Thiruvathukal

[carver@cs.ua.edu](mailto:carver@cs.ua.edu), [gkt@cs.luc.edu](mailto:gkt@cs.luc.edu)

## SE-CSE Workshops <http://SE4Science.org>



Software Engineers and Scientists

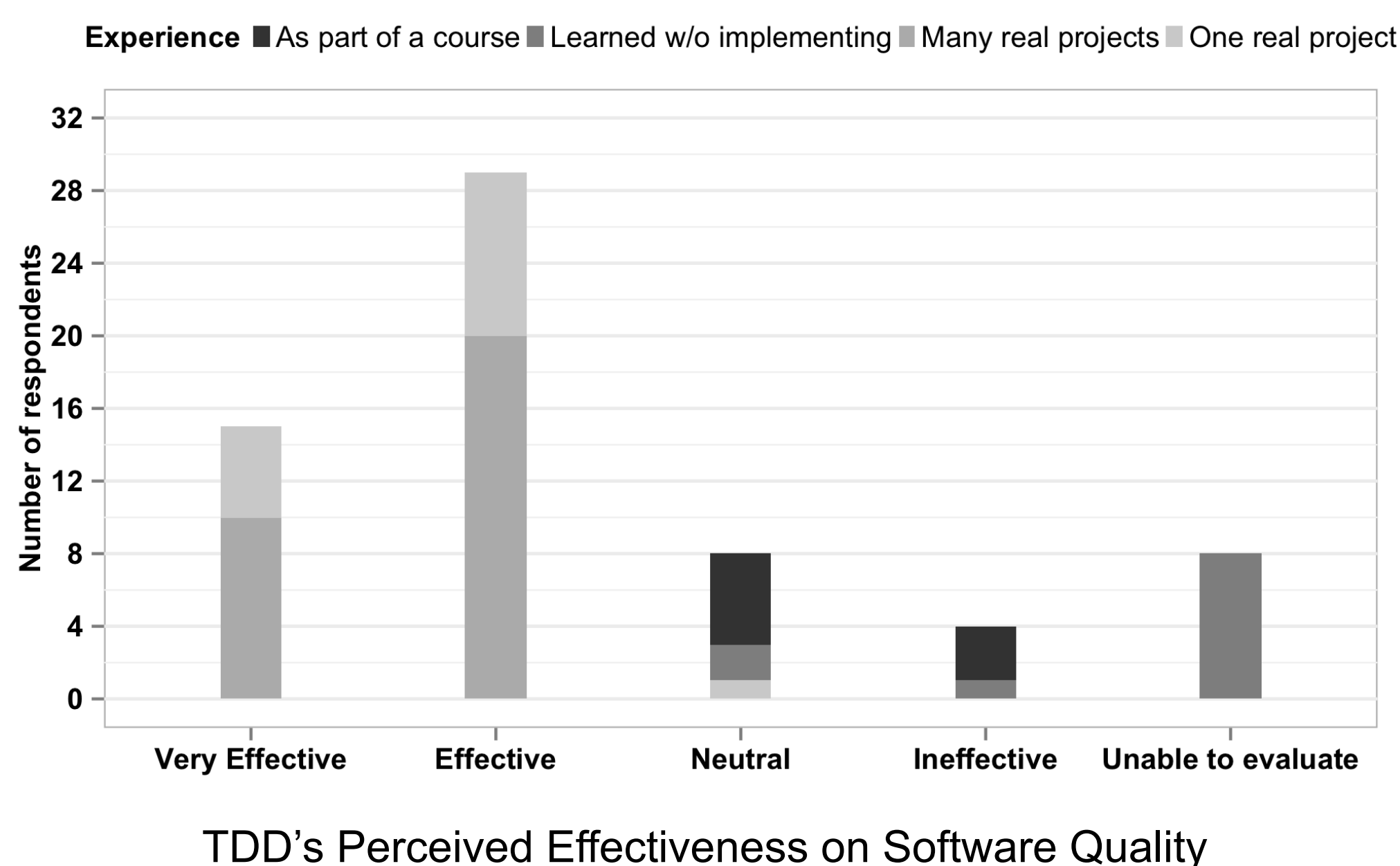
Held at ICSE, SC, ICCS

Facilitate Discussion and Collaboration

Recent/future workshops partially supported by this grant

Upcoming: *ICSE (Buenos Aires)*  
*SC'17 [To be proposed]*

## Use of Test-Driven Development (TDD) in Scientific Software



Testing Problems and Solutions  
√ = suggested by survey participants  
! = solution based on our experience

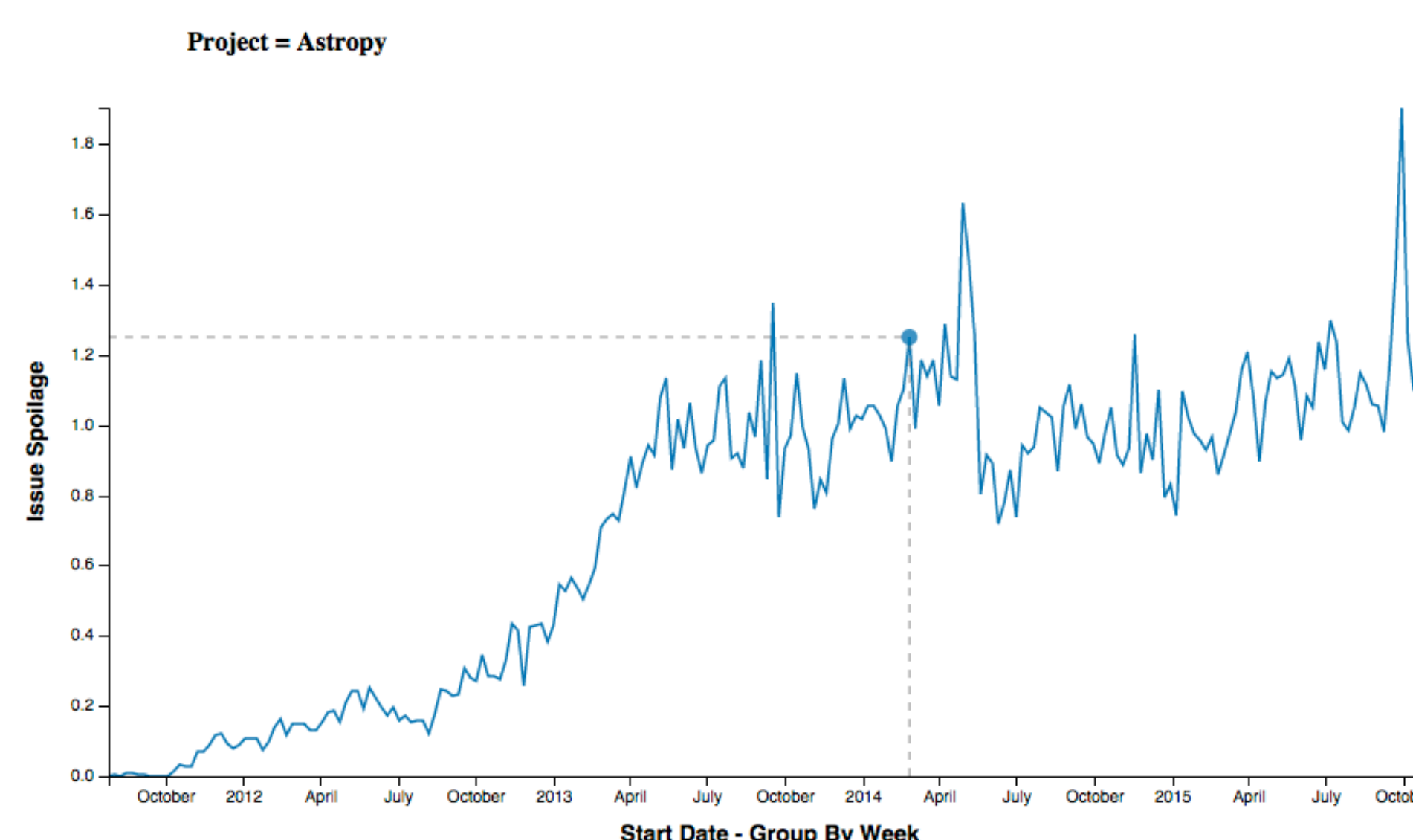
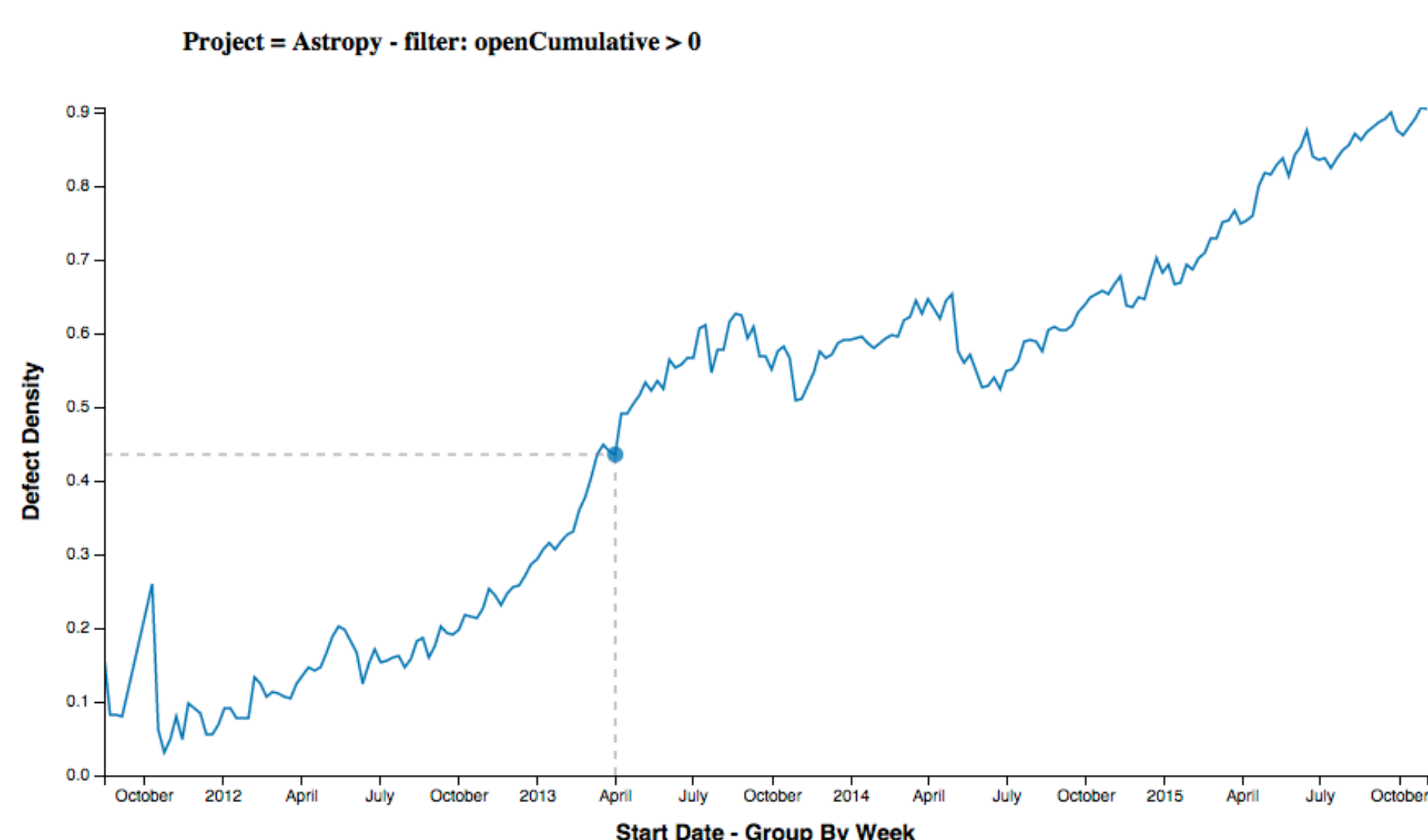
	Use a suitable tool	Experience	Redesign the test	Understand requirements	Gain confidence
Writing a test	√	√	--	!	!
Complex application	--	√	--	√	√
Code coverage	!	!	√	√	--
Lack of SE practices, tools, and standard	√	--	--	--	--
Time consuming	√	!	--	√	--
Changing requirements	--	--	--	--	--

Refactoring Problems and Solutions  
√ = suggested by survey participants  
! = solution based on our experience

	Coaching developers	Use refactoring tools	Redesign the software	Redesign the unit test
Dependence on unit tests	--	--	--	√
Dependence on the architecture design	--	--	√	--
Dependence on the environment	--	√	--	--
Lack of knowledge	√	--	!	--
Legacy code	!	!	--	!

Nanthaamornphong, A. and Carver, J. "Test-Driven Development in scientific software: a survey." *Software Quality Journal*. DOI: 10.1007/s11219-015-9292-4

## Metrics Dashboard & Survey



### Metrics Dashboard Status

- Web service deployed on AWS to compute and report defect density / issue spoilage from live *git* repository data
- Currently tracking ~20+ scientific software projects (most from GitHub)
- Web site to visualize results of web service at [metricsdashboard.cs.luc.edu](http://metricsdashboard.cs.luc.edu)
- M.S. thesis on the Metrics Dashboard prototype completed in August 2016.

### Metrics Survey Status

- Computed survey with a total of 73 responses
- Data analysis currently ongoing
- Draft paper in progress with planned submission in March/April 2017

The core Metrics Dashboard development team at Loyola University Chicago is George K. Thiruvathukal, Nicholas J. Hayward, Shilpika, Saulo Aguiar, and Konstantin Läufer.