

Mark Harman's CV Summary

Independent data sources on Mark: Google Scholar; DBLP; Semantic Scholar; EPSRC.

Research Grants

Total funding as lead investigator (PI): **£14,687,806**

Career EPSRC funding proposal success rate: **74%** (17/23)

5 of my projects were ranked in first place by the prioritization panel

Grant highlightsI was principal investigator EPSRC **platform (2009-2014)** and EP-SRC **programme (2012-2017)** grants and currently hold an **ERC advanced fellowship (2017-2022)**.

PhD Supervision

Successfully completed PhDs: **27** (19 as first supervisor; 8 as second supervisor)

Peer reviewed papers

Total: 295

Journals: 103

Conferences: 192

Principal Peer Esteem Indicators

Editorial boards: TSE, TOSEM, JSS, EMSE, SEJ, STVR, SQJ, IST, JSEP.

Program chair: ICSE '18, FSE '15, ISSTA '13, ICST '11, ICSME '04 and others.

Program committee membership:	243
Program chair:	13
General chair:	8
Special issue editor:	17
Keynotes and invited conference talks:	35
Best paper awards:	11
H-index on Google Scholar:	70 (20,124 citations; 28th March 2018)

Member of the EPSRC college since 2003 & ICT Strategic Advisory Team (SAT) 2008–2013. I have 3 papers in the all-time top 100 highly cited papers on Software Engineering¹ and 5 of the top 10 on Search based Software Engineering².

Recent Management and Leadership Roles

I am currently engineering manager of the Sapienz Search Based Software Engineering team at Facebook, London. Previously, I was CREST centre director (2006-2017; 30 direct reports). Head of Software Systems Engineering (2012-2017; ~80 transitive reports). I co-founded the field of Search Based Software Engineering (SBSE), which has ~ 1700 active researchers in 42 different countries. Departmental Research Excellence Framework (REF2014) Submission Lead: I was the principal architect of UCL CS's first place ranking in the 2014 Research Excellence Framework.

Scientific Advisory Roles and Notable Awards/Prizes

I am a member of the scientific advisory board of the Swedish Wallenberg \$100M Autonomous Systems Program (WASP) and the University of Durham Department of Computer Science. GECCO human competitive results (HUMIES), Gold Medal and Bronze Medal 2016, silver medal in 2017 and 2014.

¹I&ST 2016

²SSBSE 2011

Mark Harman's CV Summary (Industry Page)

Vision for the Software Industry

I co-founded the field of Search Based Software Engineering (SBSE) in 2001. The key principle that underpins all my work is to shift software engineering effort from the construction of specific solutions to the construction of search spaces in which those solutions reside. As a result of this shift, many different computational search strategies can now be used to intelligently (and largely automatically) search the space. I believe that, in this way, SBSE offers us a near-optimal combination of the complementary abilities of humans and machines for the task of software development.

Current Industrial Work

Since 2017, at Facebook, the team I manage has been applying this foundational SBSE principle to the development of a system for practical and scalable search based software test design. This is the first system in the world to provide fully friction-free fault finding at this scale: no friction for software developers (who are freed from the tedious, time-consuming task of test case design). Also, no friction for software users (who are freed from finding faults in the software products they use).

Selected Previous Industrial Projects

My PhD students, postdocs and I worked on projects for many companies including Amazon, Daimler, Ericsson, Google, Huawei, IBM, Microsoft, and Motorola. Here is a sample of such industrial projects in reverse-chronological order:

Visa Inc; 2014–2016: I led a team of 4 working on metamorphic testing and test case prioritisation for fraud detection systems, and the application of game theory to ameliorate the fault-severity inflation problem.

Google; 2009-2011: I worked with my PhD student Shin Yoo (now associate prof. at KAIST) on optimised regression testing. The work demonstrated how SBSE techniques could reduce the time needed to find regressions faults. Its findings were published at FSE 2011 and Google's conference GTAC. Subsequent work on regression optimisation at Google is ongoing, but now led by others in the research community.

Microsoft; 2007-2008: I worked with my PhD student Kiran Lakhotia (now CTO at KyePot) on search based software testing, which was incorporated into the Pex tool, and subsequently released as part of Visual Studio in 2012. This work has been cited by Microsoft for its research impact (at ASE 2014) and was one of the research impact case studies included in the UK Research Excellence Framework 2014.

DaimlerChrysler; 2001-2009: I led a team 5 working on incorporating static analysis and search based software testing into DaimlerChrysler's automated testing framework. We had a series of projects, many of which led to highly-cited and influential research publications. I designed and implemented the variable dependence analysis system, VADA, which was successfully deployed to DaimlerChrysler's developers.

Start-ups and Spin-outs

I co-founded the automated test optimisation start-up MAJICKE (liquidated due to the three founders moving to Facebook) and the app analytics spin-out APPREDICT.



Figure 1: The Global Spread of SBSE Authorship 2001-2014

Research Overview and Principal Contributions

My principal research contributions lie in the areas of Source Code Analysis, Testing and Search Based Software Engineering (SBSE).

Of the three, SBSE will probably prove to have the greatest long term impact. In 2001 I published the paper on Search based Software Engineering (SBSE) that coined the term and, essentially, founded the discipline. Other researchers played critical roles in founding this field of study and there were also papers on the application of computational search to aspects of Software Engineering prior my 2001 paper. However, my 2001 paper was the first to argue that computational search (metaheuristic algorithms) could and should be applied right across the spectrum of software engineering activities. In this paper and my subsequent work, I demonstrated that there is a strong intellectual and technical fit between the problems in Software Engineering and their potential solution using computational search algorithms.

From 1998 to 2002, I was the director of the SEMINAL network (Software Engineering using Metaheuristic INnovative ALgorithms). Since then, I have devoted a large part of my effort to developing the SBSE agenda, providing methods, tools and techniques for SBSE. Figures 1 and 2 show the growth and global spread of authorship of scientific papers on SBSE since my 2001 paper. As can be seen, there has been an explosion of SBSE activity. My own citation growth profile, according to Google Scholar, can be seen in Figure 3.

SBSE is now sufficiently large a topic to warrant more than 12 detailed surveys and analyses of aspects of the literature and regional workshops on SBSE in Brazil (founded in 2010), China (founded in 2012) and North America (founded in 2015), as well as an international conference (since 2009) and track at GECCO (since 2002). A recent retrospective³ on the growth of SBSE in Brazil published in the *Journal of Systems and Software* highlights the key role played by my work in founding and leading the development of the international SBSE research agenda.

There are also a number of SBSE tools that build on the scientific foundations of SBSE and which support SBSE applications right across the range of software engineering activities, from release planning, through design to testing refactoring and patching. My team and I contributed several of these, notably in the area of testing, where our tools have been used by Daimler, Google and Microsoft among others.

Recent surveys of the SBSE literature covering specific subareas such as estimation, non-functional properties, requirements, project management, software design, software product lines and testing as well as more general topics in software engineering. The prevalence of these surveys demonstrates that the general area of SBSE, is already developing flourishing and growing sub-areas and associated research communities.

³ *Search Based Software Engineering: Review and analysis of the field in Brazil* by Thelma Elita Colanzi, Silvia Regina Vergilio, Wesley Klewerton Guez Assuncao and Aurora Pozo. *Journal of Systems and Software*, 86(4):970-984; April 2013.

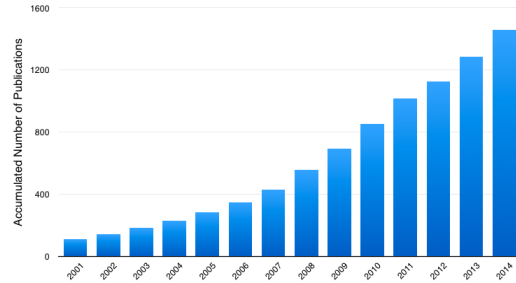


Figure 2: Growth in SBSE publications; 2001–2014 (source: SBSE repository; 2014 last year for which it was feasible, due to rapid growth, to collect data).

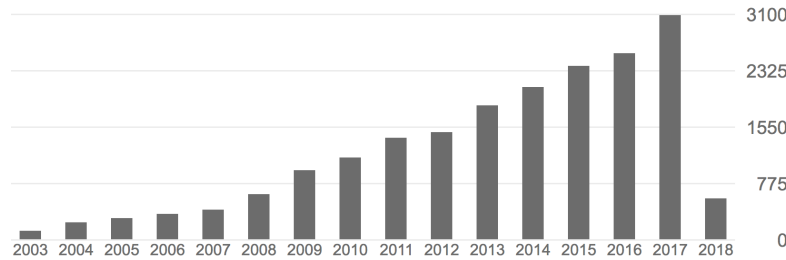


Figure 3: Annual Growth in citations to Mark Harman's work (since 2003). Total cites 20,124. H index: 70 (source: Google Scholar, as of March 28th 2018)

Quantitative Evidence for Research Quality

My **H index is 70** and I have **over 20,000 citations** to my work according to Google Scholar. Based on the ten years' research, 2002–2012, Microsoft Academic Search ranked me in **2nd place in the world for Software Engineering (out of 80,155 software engineers)** and its 5 year ranking placed me in **1st place (out of 27,262 software engineers)**. The Microsoft Academic Search system was decommissioned in 2012, but I believe these rankings have held up or improved since then as suggested by the Google scholar citation profile (see Figure 3).

A 2011 ten-year retrospective⁴ on SBSE work since I coined the term in 2001 ranked me first place among the (800 then, now more than 1,600) authors in the field of SBSE. The same survey reported that 5 of my papers occupied positions in the international top 10 papers over all authors by citation count.

A more recent survey of the 'top 100 papers' in Software Engineering⁵, listed three of my papers in the top 100 (only one scholar, Vic Basili, had more, with four, according to the survey).

I have been invited to give over **40 keynotes** at international scientific conferences and workshops (most recently including SSBSE 2018, SEFM 2018, ICSR 2017, CBSOFT 2016, ICST 2015, SPLC 2014, WCRE 2013, GECCO 2013, ASE 2012 and ESEM 2012), and many other invited talks. I have published widely on SBSE across a variety of software engineering applications from requirements engineering and software management through to software maintenance and testing. Many of my papers are in the top 1% of all cited papers in Computer Science, with several in the top 0.1% (according to Thomson Reuters Essential Science Indicators) and my co-authors and I have received 11 best paper awards, 2 SSBSE challenge track winners, an ACM distinguished paper award (2015) and four GECCO Humie medals (Gold and Bronze in 2016 and Silver in 2017 and 2014).

⁴F. G. Freitas and J. T. Souza: *Ten years of search based software engineering*, 3rd International Symposium on Search based Software Engineering (SSBSE 2011), pages 18?-32, Springer LNCS, 2011.

⁵V. Garousi and J. M. Fernandes: *Highly-cited papers in software engineering*, Information and Software Technology, Volume 71, Pages 108?128, 2016.