

A systematic literature review of the SBSE research
community in Spain
— *Primary studies* —

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1 Spanish Institutions working on SBSE

1.1 University of Alcalá de Henares

- Researchers: Teresa Diez, Juan José Cuadrado-Gallego, Luis Fernández-Sanz, Javier Moreno, Carmen Pagés-Arévalo, Pasqualina Potena, Daniel Rodríguez.
- Primary studies: [188, 189, 192, 191, 190, 193, 160, 84, 135, 159, 202]

1.2 University of Almería

- Researchers: Alfonso Bosch, Isabel María del Águila, José del Sagrado, Francisco J. Orellana, Samuel Túnez
- Primary studies: [67, 72, 68, 69, 65, 70, 62, 64, 71, 50, 66, 63, 147, 73]

1.3 University of the Basque Country

- Researchers: José Javier Dolado, Iñaki Inza, Jose A. Lozano, Alexander Mendiburu, Ramón Sagarna
- Primary studies: [83, 204, 54, 205, 206, 207, 59, 208, 209, 84]

1.4 University of Cádiz

- Researchers: Emma Blanco, Álvaro Cortijo-García, Pedro Delgado-Pérez, Juan José Domínguez-Jiménez, Bernabé Dorronsoro, Antonia Estero-Botaro, Antonio García-Domínguez, Lorena Gutiérrez-Madroñal, Inmaculada Medina-Bulo, Francisco Palomo-Lozano, Mercedes Ruiz
- Primary studies: [87, 88, 89, 191, 190, 34, 95, 96, 119, 94, 80, 147, 148, 78, 77, 79, 74, 75, 76, 118, 149, 202, 211, 210]

1.5 University Carlos III of Madrid

- Researchers: Pablo Basanta-Val, R. Castro-Fernández, Alejandro Cervantes, Iria Estévez-Ayres, Marisol García-Valls, Gustavo Recio, Iago Rodríguez-López
- Primary studies: [49, 116]

1.6 Complutense University of Madrid

- Researchers: Luis M. Alonso, César Andrés, David Atienza, S. Belmar, J. Manuel Colmenar, Alberto de la Encina, Óscar Garnica, César M. González Íñiguez, Rubén Gonzalo, J. Igancio Hidalgo, Mercedes Hidalgo-Herrero, Juan Lanchares, Mercedes G. Merayo, Carlos Molinero, Alberto Núñez, Manuel Núñez, Pablo Rabanal, Jose L. Risco-Martín, Ismael Rodríguez, Fernando Rubio, Pablo Virseda
- Primary studies: [120, 20, 121, 182, 185, 181, 187, 161, 81, 26, 186, 180, 162, 60, 136, 179, 183, 11, 138, 137, 55, 82, 163, 145, 184, 78, 77]

1.7 University of Córdoba

- Researchers: José Antonio Molina, Aurora Ramírez, José Raúl Romero, Sebastián Ventura
- Primary studies: [167, 168, 170, 169, 171, 172, 173, 164, 151, 175, 165, 174, 177, 166, 176, 178]

1.8 University of Extremadura

- Researchers: Javier Berrocal, José M. Chaves-González, Josefa Díaz, Francisco Fernández de Vega, José García-Alonso, Juan A. Gómez-Pulido, David L. González-Álvarez, Francisco Luna, Juan Manuel Murillo, Amparo Navasa, Miguel A. Pérez-Toledano, Miguel A. Vega-Rodríguez
- Primary studies: [120, 35, 100, 3, 36, 37, 38, 39, 41, 40, 129, 144, 130, 157, 184, 42, 115, 44, 43]

1.9 University of Huelva

- Researchers: Pedro J. Abad, José Luis Álvarez, José Luis Arjona, Iñaki Fernández de Viana
- Primary studies: [98, 99]

1.10 University of Málaga

- Researchers: Enrique Alba, Franco Arito, Francisco Chicano, Miguel Ángel Domínguez, Juan J. Durillo, Javier Ferrer, Lidia Fuentes, Francisco Luna, Gabriel Luque, Lawrence Mandow, Antonio J. Nebro, Gustavo G. Pascual, Mónica Pinto
- Primary studies: [4, 5, 7, 8, 6, 9, 47, 45, 46, 100, 10, 3, 48, 103, 91, 102, 231, 53, 90, 104, 51, 52, 129, 105, 12, 49, 108, 106, 124, 156, 125, 130, 157, 64, 110, 109, 155, 50, 107, 126, 158, 232, 141, 139, 101, 142, 85, 86, 131, 140, 146]

1.11 University of Mondragón

- Researchers: Aitor Arrieta, Ainhoa Arruabarrena, Leire Etxeberria, Urtzi Markiegi, Goiuria Sagardui, Justyna Zander
- Primary studies: [17, 18, 15, 13, 133, 134, 14, 16, 19]

1.12 University of Oviedo

- Researchers: Belarmino Adenso-Díaz, Raquel Blanco, Claudio de la Riva, Eugenia Díaz, José García-Fanjul, María José Suárez-Cabal, Javier Tuya
- Primary studies: [56, 58, 57, 59, 33, 31, 32, 219]

1.13 University Pablo de Olavide

- Researchers: Jesús S. Aguilar-Ruiz, Roberto Ruiz
- Primary studies: [188, 189, 192, 193, 135]

1.14 Polytechnic University of Valencia

- Researchers: Sofía Carlos Alberola, Francisco Almenar, Himer Avila-George, Arthur Baars, Anna Esparcia-Alcázar, Giovanni Giachetti, Vicente Hernández, Beatriz Marín, Mireilla Martínez, Sebastián Martorell, Urko Rueda, A. Sánchez, José F. Villanueva, Tanja Vos
- Primary studies: [220, 117, 25, 221, 226, 23, 24, 132, 224, 222, 22, 223, 21, 225, 201, 92, 93]

1.15 University Rey Juan Carlos

- Researchers: Rafael Capilla
- Primary studies: [212, 213]

1.16 University of Santiago de Compostela

- Researchers: Miguel I. Couto, Manuel Lama, Manuel Mucientes, Pablo Rodríguez-Mier, Juan C. Vidal
- Primary studies: [143, 198, 194, 195, 199, 196, 197, 200]

1.17 University of Sevilla

- Researchers: David Benavides, Amador Durán, María José Escalona, Pablo Fernández, José A. Galindo, Octavio Martín-Díaz, María Martínez-Ballesteros, José Antonio Parejo, Isabel Ramos, José C. Riquelme, Antonio Ruiz-Cortés, Ana B. Sánchez, Sergio Segura, Miguel Toro, Pablo Trinidad, Javier Troya
- Primary studies: [2, 1, 29, 30, 203, 218, 28, 27, 230, 217, 150, 189, 228, 192, 191, 227, 190, 193, 224, 214, 127, 154, 229, 215, 128, 80, 151, 122, 114, 153, 111, 113, 112, 79, 165, 135, 97, 152, 211, 210, 216]

1.18 ATOS Research

- Researchers: Rafael González, Yosú Gorronogoitia, Mateusz Radzimski
- Primary studies: [123]

1.19 IK4-IKERLAN Research Center

- Researchers: Xabier De Carlos, Xabier Mendiáldua, Salvador Trujillo
- Primary studies: [61]

2 Topics and techniques studied by each institution

Considering the primary studies under review, Table 1 shows the universities heading at least one paper in the field, as well as the SE problems (column 2) that they have addressed using search techniques (column 3). Numbers in parenthesis refer to the amount of primary studies associated to a given category. To avoid duplication, a paper is assigned to the first appearing Spanish author.

Table 1: Topics and techniques studied by each institution

Institution	SE activities	Search techniques
UALH	Project scheduling(2), software improvement(2), software planning(2), effort estimation(1), software quality measures(1)	GA(5), ES(2), EC(1)
UAL	Requirements selection(10), requirements prioritisation (1), general(1)	ACO(6), GRASP(6), GA(5), EX(3)
UC3M	Web service composition(1)	EX(1)
UCA	Testing and validation(11), test case generation(4), test case selection(2), requirements selection(2) , software planning (1)	GA(16), EX(3)
UCO	Architectural design(12), general (3), web service composition(1)	EC(7), EP(3), GA(2)
UCM	Migration and integration(14), model checking(3), test case generation(3), test data generation(3), testing and validation(1), test case selection(1)	GA(17), GE(6), EX(3), HC(1)
UHU	Testing and validation(2)	ACO(2)
UM	Test case generation(2), test case selection(1), test case prioritisation(1), testing and validation(5)	GA(6), Greedy(3), AVM(3), MET(1), EC(1)
UMA	Model checking(9), test case generation(6), project scheduling(5), test data generation(5), requirements selection(5), test case prioritisation(4), test case selection(3), refactoring(3), software product lines(1), model-based design(1), testing and validation(1), integration and deployment(1), modularisation(1), software improvement (1)	GA(25), EX(14), ES(12), ACO(11), Greedy(3), PSO(2), SA(2), VNS(2), DE(1), HC(1)
UNEX	Test case generation(6), requirements selection(3), test data generation(2), project scheduling(1), test case selection(1), general(1)	GP(8), GA(3), ABC(2), DE(1), EC(1), EP(1), ES(1), FA(1), TLBO(1)
UNIOVI	Test case generation(5), test data generation(2), testing and validation(1)	SS(4), TS(3), EX(1), GA(1)
UPV	Testing and validation(4), test data generation(2), test case generation(1)	GA(2), GP(2), ACO(1), AVM(1), EC(1), SA(1)
UPV/EHU	Test data generation(4), test case generation(2), cost estimation(1), effort estimation(1), general(1)	EDAs(4), GP(2), ES(1)
URJC	Integration and deployment(1)	EX(1)
US	Software product lines(14), testing and validation (4), model-based design(3), web service composition(2), reverse engineering(2), effort estimation(1), project scheduling(1), software quality measures(1), architectural design(1), test case prioritisation(1), service selection(1)	EX(12), EC(7), GA(5), EP(1), ES(1), GRASP(1), HC(1), TS(1)
USC	Web service composition(8)	EX(5), GP(2), HC(1)

ABC: Artificial bee colony, ACO: Ant colony optimisation, AVM: Greedy and alternating variable method, DE: Differential evolution, EDAs: Estimation of distribution algorithms, EC: Evolutionary computation, EP: Evolutionary programming, ES: Evolution strategy, EX: Exact search, FA: Firefly algorithm, HC: Hill climbing, GA: Genetic algorithm, GE: Grammatical evolution, GP: Genetic programming, GRASP: Greedy randomised adaptive search procedure, MET: Metaheuristics, PSO: Particle swarm optimisation, TLBO: Teaching learning based optimisation, SA: Simulated annealing, SS: Scatter search, TS: Tabu search, VNS: Variable neighbourhood search

3 SBSE Tools

3.1 Software requirements

- InSCo Req.
 - Associated institution: University of Almería
 - Reference: [72]
 - URL: <http://www.dkse.ual.es/es/insco/insco.do>
 - Licence: N/A
 - Last update: 2012
- OATSAC
 - Associated institution: University of Cádiz
 - Reference: [119]
 - URL: <http://ucase.uca.es/nrp/>
 - Licence: GPL3
 - Last update: N/A

3.2 Analysis and design

- FAMA
 - Associated institution: University of Sevilla
 - Reference: [27]
 - URL: <http://www.isa.us.es/fama/>
 - Licence: LGPL3
 - Last update: 2012 (release 1.1.1)
- BeTTy
 - Associated institution: University of Sevilla
 - Reference: [214]
 - URL: <http://www.isa.us.es/betty/>
 - Licence: LGPL3
 - Last update: 2011 (release 1.1.1)
- MOMoT
 - Associated institution: University of Sevilla
 - Reference: [112]
 - URL: <http://martin-fleck.github.io/momot/>
 - Licence: N/A

- Last update: 2017 (current release 2.0.0 - 2016)

- MDE Optimiser

- Associated institution: University of Málaga
- Reference: [232]
- URL: http://github.com/mde-optimiser/mde_optimiser
- Licence: N/A
- Last update: 2016

3.3 Testing and validation

- eCrash

- Associated institution: University of Extremadura
- Reference: [39]
- URL: <http://sourceforge.net/projects/ecrashtesting/>
- Licence: N/A
- Last update: 2013

- EvoTest

- Associated institution: Polytechnic University of Valencia
- Reference: [117]
- URL: <http://evotest.iti.upv.es/>
- Licence: GNU GPL
- Last update: 2017

- GAmEra

- Associated institution: University of Cádiz
- Reference: [88]
- URL: <http://neptuno.uca.es/~gamera>
- Licence: GPL3
- Last update: 2010

- TESALIA

- Associated institution: Polytechnic University of Valencia
- Reference: [21]
- URL: <http://tesalia.github.io/>
- Licence: LGPL
- Last update: 2014

- Rodan
 - Associated institution: University of Cádiz
 - Reference: [95]
 - URL: <http://neptuno.uca.es/redmine/projects/sources-fm/wiki/Rodan>
 - Licence: N/A
 - Last update: N/A

- FITTEST Tool suite
 - Associated institution: Polytechnic University of Valencia
 - Reference: [225]
 - URL: <http://code.google.com/p/fittest>
 - Licence: BSD
 - Last update: 2014

- QAShrink
 - Associated institution: University of Oviedo
 - Reference: [219]
 - URL: <http://in2test.lsi.uniovi.es/sqltools/qashrink/>
 - Licence: University of Oviedo
 - Last update: 2017 (release 2.0.64.109)

- Testar
 - Associated institution: Polytechnic University of Valencia
 - Reference: [93]
 - URL: <https://testar.org>
 - Licence: N/A
 - Last update: N/A

3.4 Maintenance

- Subgroup discovery toolkit
 - Associated institution: University of Alcalá
 - Reference: [193]
 - URL: http://kt.ijs.si/petra_kralj/SubgroupDiscovery/
 - Licence: MIT
 - Last update: 2011 (release 1.1.3)

- RePOR
 - Associated institution: University of Málaga
 - Reference: [140]
 - URL: <http://www.swat.polymtl.ca/rmorales/jssrepor/>
 - Licence: Polytechnique Montréal
 - Last update: 2018

3.5 General

- API for interactive SBSE
 - Associated institution: University of Córdoba
 - Reference: [176]
 - URL: <http://www.uco.es/grupos/kdis/sbse/isbse/api>
 - Licence: N/A
 - Last update: 2018

4 Full list of primary studies - references

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