

UNIVERSIDAD  
DE CÁDIZ, TU

DEPARTAMENTO DE

i+d+i



**UCASE**  
Software Engineering Research Group  
Department of Computer Science and Engineering

# UCA<sup>SE</sup>

## Software Engineering Research Group (TIC-025)

(8 PhD, 1 PhD Univ. Aston UK, 6 MSc)

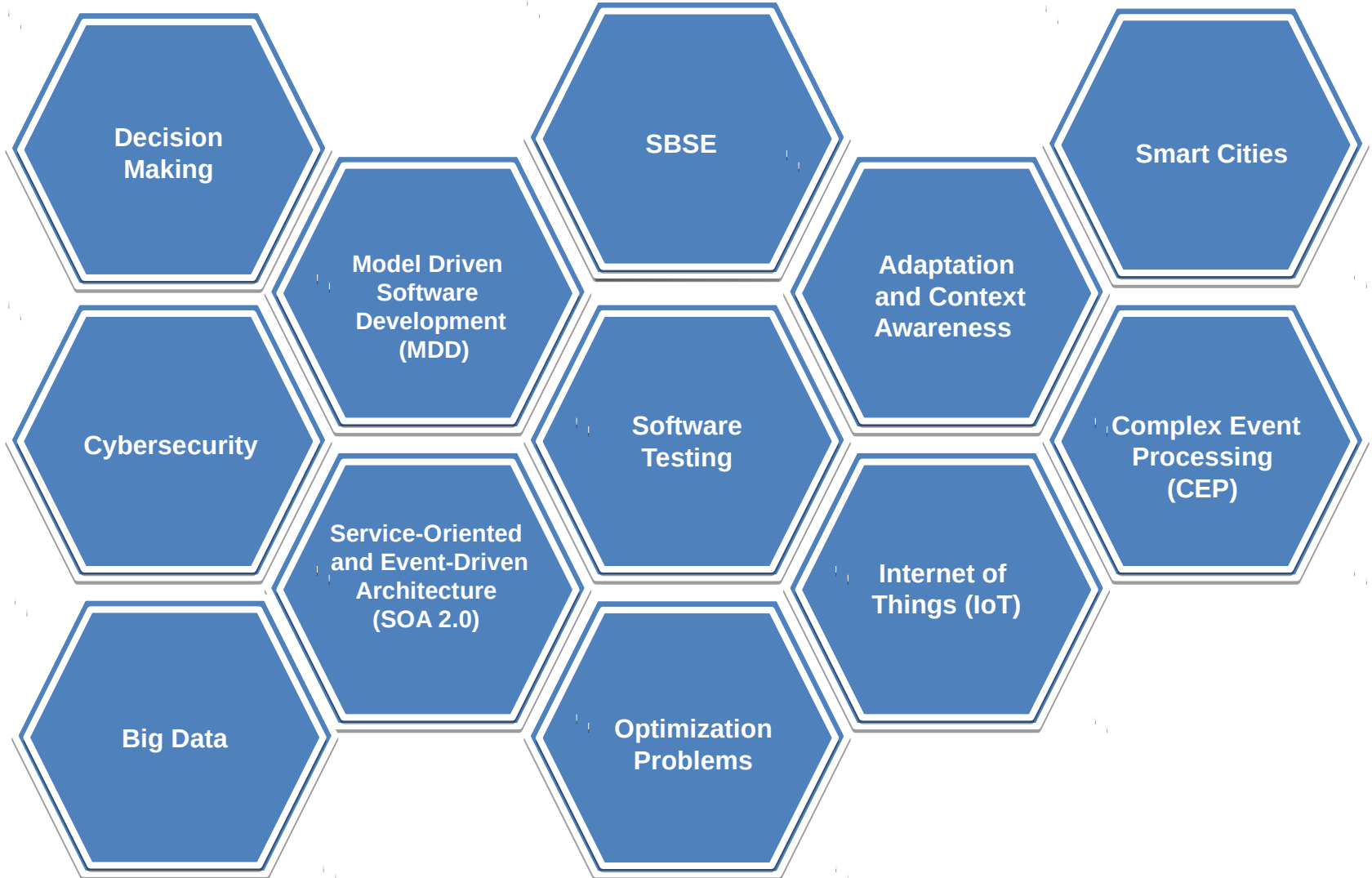
SBSE

5 PhD, 1 PhD Univ. Aston UK, 3 MSc

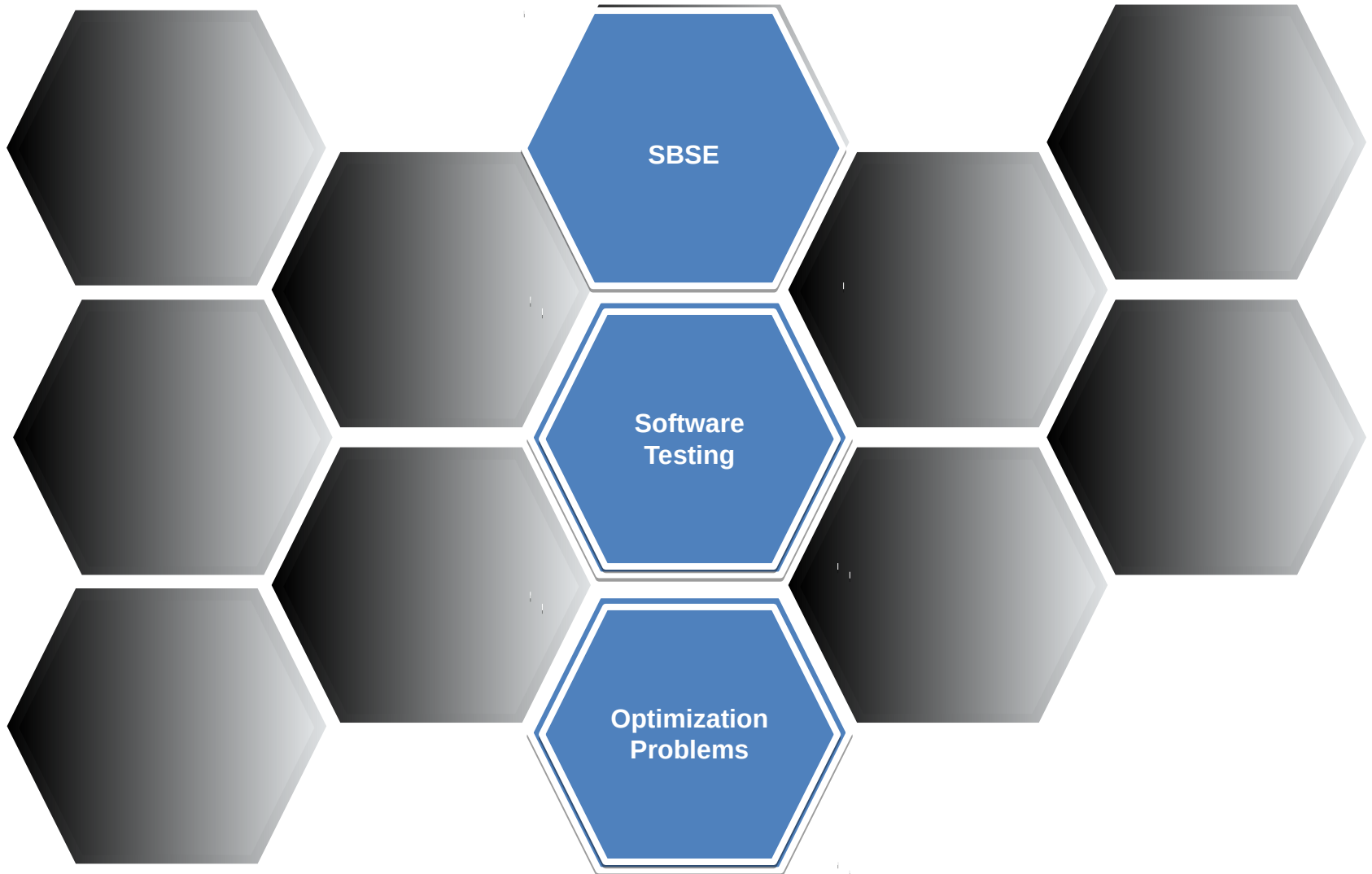
1 PhD TIC-259



### Research Fields



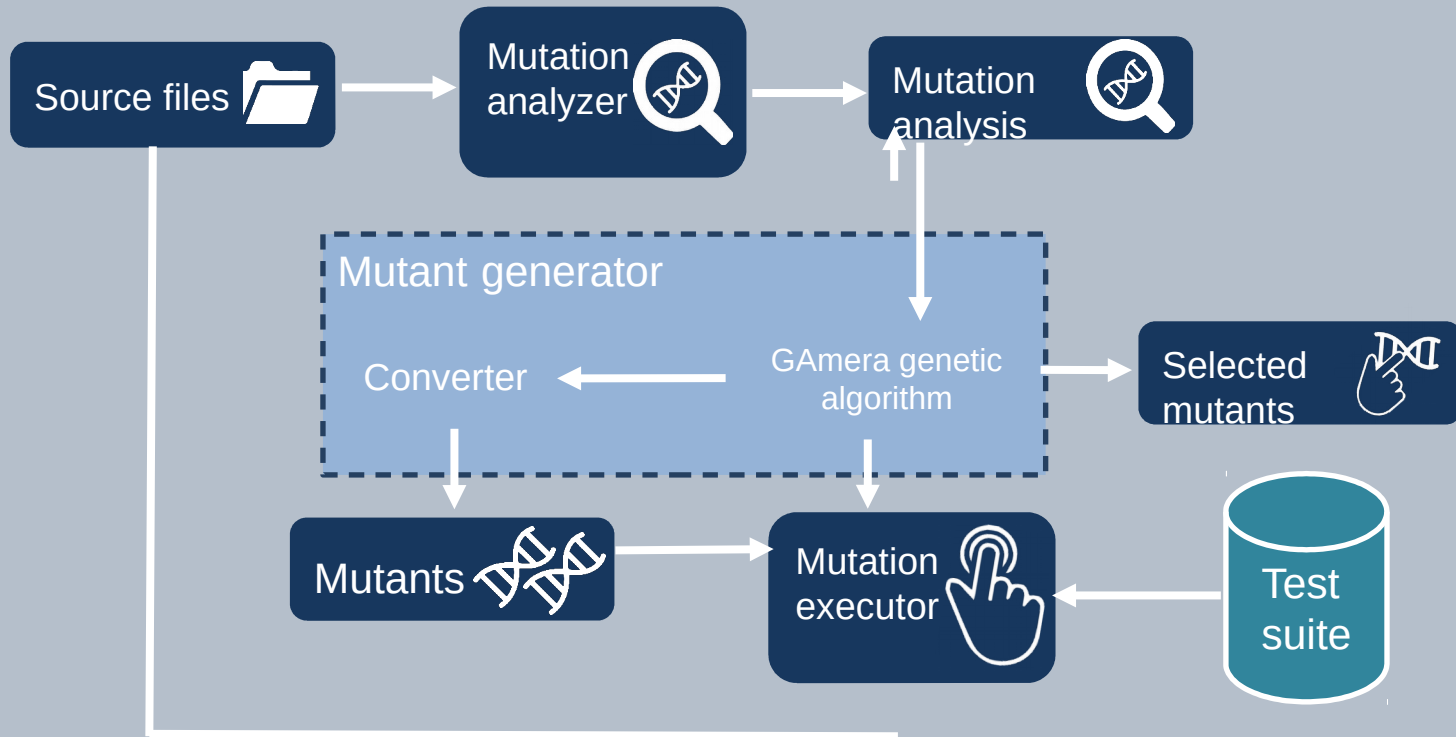
### Research Fields in SBSE



### SBST: Search-Based Software Testing



### Search techniques for cost reduction in mutation testing

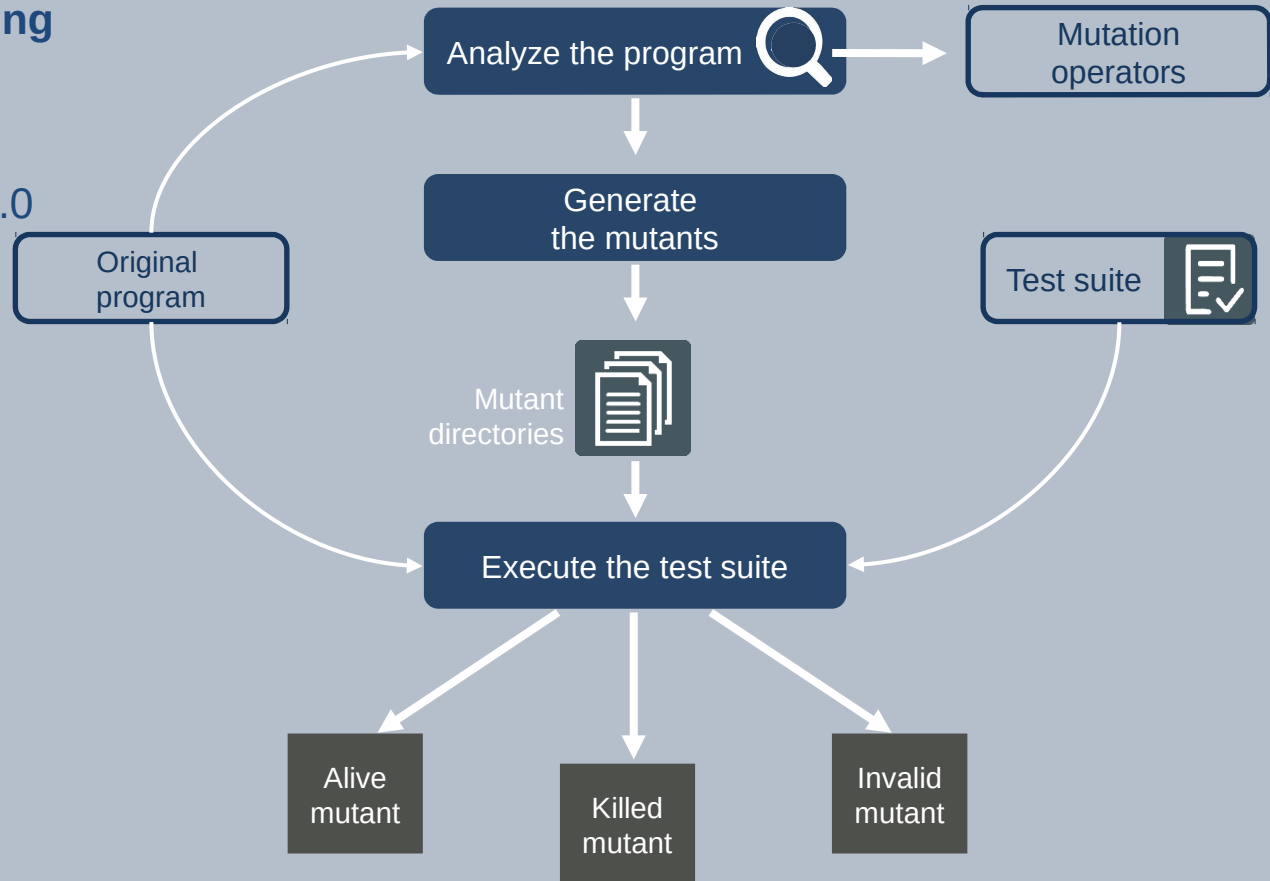


### SBST: Search-Based Software Testing



#### Tools for mutation testing

- MuCPP – C++
- MuEPL – EPL
- MuBPEL – WS-BPEL 2.0







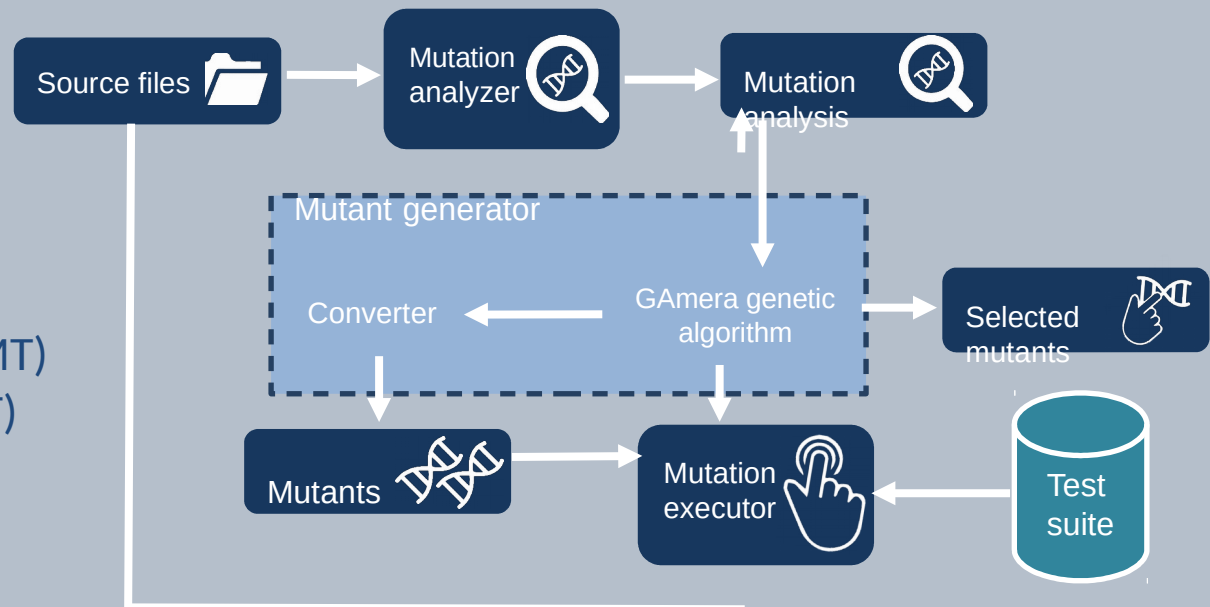
### SBST: Search-Based Software Testing

## Design of Evolutionary Mutation Testing (EMT) and Equivalence-Aware EMT (EA-EMT)

- Improve the test suite at a lower cost using genetic algorithms

### Tools

- **GiGAn** (MuCPP with EMT)
- **Gamera** (MuBPEL with EMT)
- **Tempus** (MuEPL with EMT)





## SBST: Search-Based Software Testing

### Mutation Testing

#### Detection of equivalent mutants

- With LLVM optimization
- With Trivial Compiler Equivalence and EA-EMT



#### Improvement performance testing

- Use mutation testing and an evolutionary algorithm for look for mutants that simulate performance errors







## SBST: Search-Based Software Testing

### Reduction of test suite size

- Minimization of test-suite size through linear programming techniques



### Generation of test cases

- Test case generation for WS-BPEL with genetic algorithm  
**Rodan** - WS-BPEL 2.0
- Test case generation with interactive search



### SBSE: Requirements Engineering

#### Requirements Engineering

- NRP: Next Release Problem
- Multiple variants



## SBSE: Code refactoring

### Code refactoring

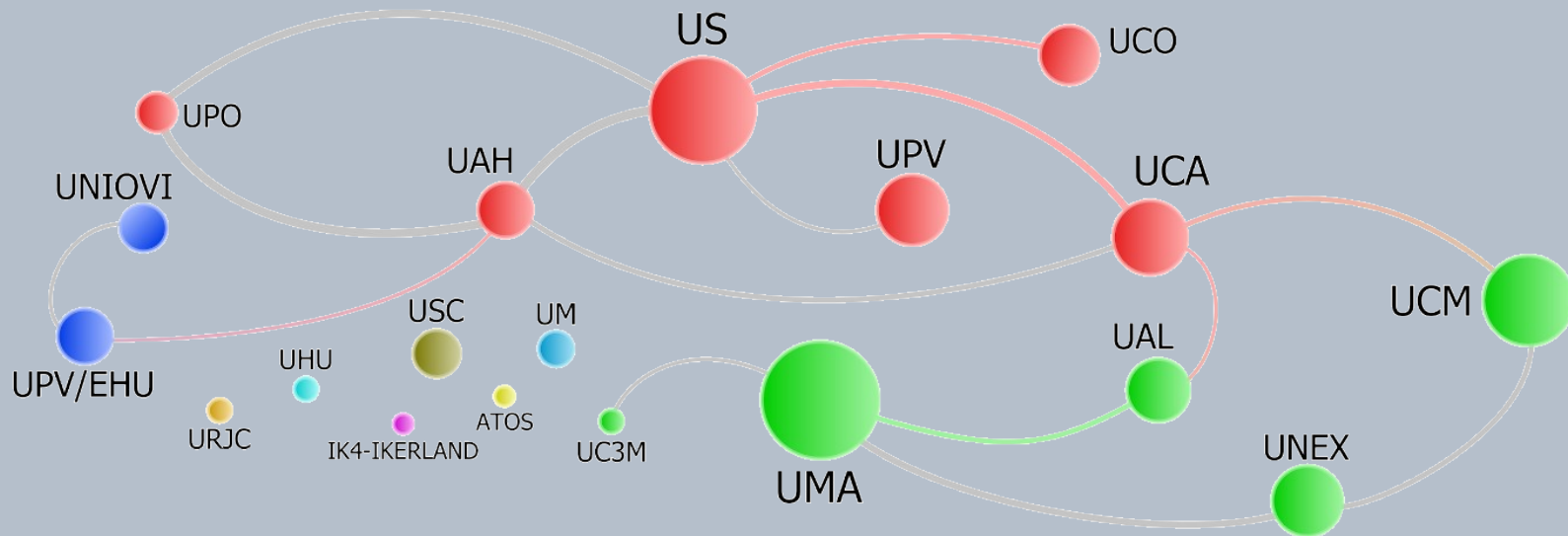
- With other goal
- Take into account the performance the program will have when executed





### SBSE: literature review

### The SBSE research community in Spain



## Future perspectives



### SBSE tools (GiGAN, Tempus and GAmEra)

- Application to real programs.



### SBSE EMT

- **Improvements:** introduction of new information to guide the search.
- **New applications:** evaluation of performance tests.



### SBSE test case generation

- Test case generation with interactive search.



### SBSE test suite size reduction

- Application to real test suites.
- Comparison with other techniques.

### Collaboration with other universities



UNIVERSIDAD DE ALMERÍA



UNIVERSITY OF LEICESTER



Western Norway University of Applied Sciences



UNIVERSIDAD DE LA REPÚBLICA URUGUAY



UNIVERSIDAD COMPLUTENSE MADRID



Aston University Birmingham



Navantia



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THANK YOU





















































