

# Dr. Álvaro Torralba

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Born : September 10, 1985 — Madrid, Spain

## Current position

*Post-Doc*, Saarland University

## Areas of specialization

Artificial Intelligence, Automated Planning, Heuristic Search

## Selected Publications

- Á. Torralba, C. Linares López, D. Borrajo *Symbolic Perimeter Abstraction Heuristics for Cost-Optimal Planning*, Artificial Intelligence Journal, 2018.
- Á. Torralba, V. Alcázar, P. Kissmann, S. Edelkamp, *Efficient Symbolic Search for Cost-Optimal Planning*, Artificial Intelligence Journal, 2017.
- J. Daum, Á. Torralba, J. Hoffmann, P. Haslum, and I. Weber, *Practical Undoability Checking via Contingent Planning*, Proc. of the 26th International Conference on Automated Planning and Scheduling (ICAPS'16). Outstanding Student Paper Award.
- Á. Torralba and P. Kissmann, *Focusing on What Really Matters: Irrelevance Pruning in Merge-and-Shrink*, Proc. of the 8th Symposium on Combinatorial Search (SOCS'15). Best Paper Award
- Á. Torralba and J. Hoffmann, *Simulation-Based Admissible Dominance Pruning*, Proc. of the 24th International Joint Conference on Artificial Intelligence (IJCAI'15).
- Á. Torralba, V. Alcázar *Constrained Symbolic Search: On Mutexes, BDD Minimization and More*, Proc. of the 6th Symposium on Combinatorial Search (SOCS'13). Best Paper Award

## Qualifications

- 2015 Promotion to Dr. at Universidad Carlos III de Madrid, Spain.  
“Symbolic Search and Abstraction Heuristics for Cost-Optimal Planning”.  
Supervisors: Prof. Daniel Borrajo and Prof. Carlos Linares López.  
Final grade: “cum laude”.
- 2010 Master in Computer Science and Technology.  
Universidad Carlos III de Madrid
- 2009 Diploma in Computer Science Engineering.  
Universidad Carlos III de Madrid

## Awards

- 2016 **Honorable Mention in ICAPS Best Dissertation Award 2016.**
- 2016 **ICAPS 2016 Outstanding Student Paper Award.** For the paper *Practical Undoability Checking via Contingent Planning*, co-authored with Jeanette Daum, Jörg Hoffmann, Patrik Haslum, and Ingo Weber.
- 2016 Developer of the *SymPA* planner, **runner-up of the 1st unsolvability international planning competition (IPC’16).**
- 2015 **Best Paper Award at the 8th Symposium on Combinatorial Search (SoCS’15).** For the paper *Focusing on What Really Matters: Irrelevance Pruning in Merge-and-Shrink*, co-authored with Peter Kissmann.
- 2014 Developer of the *SymBA*<sup>\*</sup>-2 planner, **winner of the sequential-optimal track of the 8th international planning competition (IPC’14).** (joint work with Vidal Alcázar, Peter Kissmann, Stefan Edelkamp, and Daniel Borrajo)
- 2014 Developer of the *cGamer* planner, **runner-up of the sequential-optimal track of the 8th international planning competition (IPC’14).** (joint work with Vidal Alcázar, Peter Kissmann, and Stefan Edelkamp)
- 2013 **Best Paper Award at the 6th Symposium on Combinatorial Search (SoCS’13).** For the paper *Constrained Symbolic Search: On Mutexes, BDD Minimization and More*, co-authored with Vidal Alcázar.

## Positions

- 2014 – now Researcher at Saarland University, Saarbrücken, Germany.
- 2010 – 2014 P.h.D. student, funded member of graduate school at Universidad Carlos III de Madrid.

2009 – 2010 Technical support for research at Universidad Carlos III de Madrid.

## Visits

2014, 2015, 2017, 2018 3 months visit (divided between 4 visits) to Carlos Areces in Universidad Nacional de Córdoba, Argentina.

2012 3 months visit to Stefan Edelkamp in Universität Bremen, Germany.

## Publications

### Journal Articles

1. Á. Torralba, C. Linares López, D. Borrajo *Symbolic Perimeter Abstraction Heuristics for Cost-Optimal Planning*, Artificial Intelligence Journal, 2018.
2. Á. Torralba, V. Alcázar, P. Kissmann, S. Edelkamp, *Efficient Symbolic Search for Cost-Optimal Planning*, Artificial Intelligence Journal, 2017.
3. V. Demberg, J. Hoffmann, D. Howcroft, D. Klakow, and Á. Torralba, *Search Challenges in Natural Language Generation with Complex Optimization Objectives*, Kuenstliche Intelligenz, 2015.
4. J. García, J. E. Flórez, Á. Torralba, D. Borrajo C. Linares López, A. García Olaya and J. Sáenz, *Combining linear programming and automated planning to solve inter-modal transportation problems*, European Journal of Operational Research, 2013

### Conference Papers

5. Á. Torralba, *From Qualitative to Quantitative Dominance Pruning*, Proceedings of the 26th International Joint Conference on Artificial Intelligence (IJCAI'17).
6. S. Franco, Á. Torralba, L. H. S. Lelis, and M. Barley, *On Creating Complementary Pattern Databases*, Proceedings of the 26th International Joint Conference on Artificial Intelligence (IJCAI'17).
7. D. Gnad, Á. Torralba, and J. Hoffmann, *Symbolic Leaf Representation in Decoupled Search*, Proceedings of the 10th Annual Symposium on Combinatorial Search (SOCS'17).
8. D. Gnad, Á. Torralba, A. Shleyfman, and J. Hoffmann, *Symmetry Breaking in Star-Topology Decoupled Search*, Proceedings of the 27th International Conference on Automated Planning and Scheduling (ICAPS'17).

9. M. Schwenger, Á. Torralba, J. Hoffmann, D. Howcroft, V. Demberg, *From OpenCCG to AI Planning: Detecting Infeasible Edges in Sentence Generation*, Proceedings of the 26th International Conference on Computational Linguistics (Coling'16).
10. Á. Torralba, D. Gnad, P. Dubbert, J. Hoffmann, *On State-Dominance Criteria in Fork-Decoupled Search*, Proceedings of the 25th International Joint Conference on Artificial Intelligence (IJCAI'16).
11. Á. Torralba, C. Linares López, D. Borrajo, *Abstraction Heuristics for Symbolic Bidirectional Search*, Proceedings of the 25th International Joint Conference on Artificial Intelligence (IJCAI'16).
12. J. Daum, Á. Torralba, J. Hoffmann, P. Haslum, and I. Weber, *Practical Undoability Checking via Contingent Planning*, Proceedings of the 26th International Conference on Automated Planning and Scheduling (ICAPS'16).
13. Á. Torralba and P. Kissmann, *Focusing on What Really Matters: Irrelevance Pruning in Merge-and-Shrink*, Proceedings of the 8th Symposium on Combinatorial Search (SOCS'15).
14. Á. Torralba and J. Hoffmann, *Simulation-Based Admissible Dominance Pruning*, Proceedings of the 24th International Joint Conference on Artificial Intelligence (IJCAI'15).
15. V. Alcázar and Á. Torralba, *A Reminder about the Importance of Computing and Exploiting Invariants in Planning*, Proceedings of the 25th International Conference on Automated Planning and Scheduling (ICAPS'15).
16. S. Edelkamp, P. Kissmann and Á. Torralba, *BDDs Strike Back (in AI Planning)*, Proceedings of the Twenty-Ninth AAAI Conference on Artificial Intelligence (AAAI'15).
17. J. Hoffmann, P. Kissmann, and Á. Torralba, *"Distance"? Who Cares? Tailoring Merge-and-Shrink Heuristics to Detect Unsolvability*, Proceedings of the 21st European Conference on Artificial Intelligence (ECAI'14).
18. Á. Torralba, V. Alcázar *Constrained Symbolic Search: On Mutexes, BDD Minimization and More*, Proceedings of the 6th Symposium on Combinatorial Search (SOCS'13).
19. Á. Torralba, C. Linares López, D. Borrajo, *Symbolic Merge-and-Shrink for Cost-Optimal Planning*, Proceedings of the 23rd International Joint Conference on Artificial Intelligence (IJCAI'13).
20. Á. Torralba, S. Edelkamp, P. Kissmann *Transition Trees for Cost-Optimal Symbolic Planning*, Proceedings of the 23rd International Conference on Automated Planning and Scheduling (ICAPS'13).

21. S. Edelkamp, P. Kissmann, Á. Torralba *Symbolic A\* Search with Pattern Databases and the Merge-and-Shrink Abstraction* Proceedings of the 20th European Conference on Artificial Intelligence (ECAI'12).
22. Á. Parra, Á. Torralba, C. Linares López, *Precomputed-Direction Heuristics for Sub-optimal Grid-Based Path-finding*, Proceedings of the 5th Symposium on Combinatorial Search (SOCS'12).
23. J. E. Flórez, Á. Torralba, J. García, C. Linares López, A. García Olaya, D. Borrajo, *Planning Multi-Modal Transportation Problems*, Proceedings of the 21st International Conference on Automated Planning and Scheduling (ICAPS'11).
24. Á. Torralba, C. Linares López, *Size-Independent Additive Pattern Databases for the Pancake Problem*, Proceedings of the 4th Symposium on Combinatorial Search (SOCS'11).

### Workshop Papers

25. A. Torralba and J. Hoffmann, *Simulation-Based Admissible Dominance Pruning*, Proceedings of the 7th Workshop on Heuristic Search for Domain-Independent Planning (HSDIP'15).
26. J. Hoffmann, P. Kissmann, and A. Torralba, *"Distance"? Who Cares? Tailoring Merge-and-Shrink Heuristics to Detect Unsolvability*, Proceedings of the 6th Workshop on Heuristic Search for Domain-Independent Planning (HSDIP'14).
27. S. Edelkamp, P. Kissmann, Á. Torralba, *Lex-Partitioning: A New Option for BDD Search*, First Workshop on GRAPH Inspection and Traversal Engineering, GRAPHITE 2012.

### Other Publications

28. A. Torralba, *SymPA: Symbolic Perimeter Abstractions for Proving Unsolvability*, in Proceedings of the 1st Unsolvability International Planning Competition (IPC 2016), at ICAPS'16.
29. A. Torralba J. Hoffmann, and P. Kissmann, *MS-Unsat and SimulationDominance: Merge-and-Shrink and Dominance Pruning for Proving Unsolvability*, in Proceedings of the 1st Unsolvability International Planning Competition (IPC 2016), at ICAPS'16.
30. D. Gnad, A. Torralba, J. Hoffmann, and M. Wehrle, *Decoupled Search for Proving Unsolvability*, in Proceedings of the 1st Unsolvability International Planning Competition (IPC 2016), at ICAPS'16.

## Teaching

### Main Lectures and Seminars

- Summer 2018 *Artificial Intelligence*, Core Lecture, Saarland University. (co-lectured with Wolfgang Wahlster)
- Summer 2017 *Artificial Intelligence*, Core Lecture, Saarland University. (co-lectured with Jörg Hoffmann and Wolfgang Wahlster)
- Winter 2016 – 2017 *Automatic Planning*, Specialized Lecture in Artificial Intelligence, Saarland University. (co-lectured with Jörg Hoffmann)
- Summer 2017 *Search Problems in Natural Language Processing*, Seminar, Saarland University. (co-lectured with Jörg Hoffmann)
- Winter 2016 – 2017 *Search Problems in Natural Language Processing*, Seminar, Saarland University. (co-lectured with Jörg Hoffmann)
- Summer 2016 *Admissible Search Enhancements*, Seminar, Saarland University. (co-lectured with Jörg Hoffmann, Daniel Gnad, and Marcel Steinmetz)
- Winter 2015 – 2016 *Automatic Planning*, Specialized Lecture in Artificial Intelligence, Saarland University. (co-lectured with Jörg Hoffmann)
- Winter 2015 – 2016 *Admissible Search Enhancements*, Seminar, Saarland University. (co-lectured with Jörg Hoffmann, Daniel Gnad, and Marcel Steinmetz)
- Summer 2015 *Heuristic Search for MDPs*, Seminar, Saarland University. (co-lectured with Jörg Hoffmann and Peter Kissmann)
- Winter 2014 – 2015 *Heuristic Search for MDPs*, Seminar, Saarland University. (co-lectured with Jörg Hoffmann and Peter Kissmann)
- Summer 2014 *Planning and Learning*, Seminar, Saarland University. (co-lectured with Jörg Hoffmann and Peter Kissmann)

### Teaching Assisant

- 2017 – 2018 *Automatic Planning*, Specialized Lecture in Artificial Intelligence, Saarland University. (co-assistant with Cosmina Croitoru)
- 2016 *Artificial Intelligence*, Core Lecture, Saarland University. (co-assistant with Daniel Gnad, Marcel Steinmetz and student tutors)
- 2015 *Artificial Intelligence*, Core Lecture, Saarland University. (co-assistant with Daniel Gnad, Marcel Steinmetz and student tutors)

- 2014 – 2015 *Automatic Planning*, Specialized Lecture in Artificial Intelligence, Saarland University. (co-assistant with Peter Kissmann and Daniel Gnad)
- 2014 *Artificial Intelligence*, Core Lecture, Saarland University. (co-assistant with Peter Kissmann and student tutors)
- 2013 – 2014 *Heuristic Search and Optimization*, Core Lecture, Universidad Carlos III de Madrid. (co-assistant with Jesús Virseda)
- 2012 – 2013 *Heuristic Search and Optimization*, Core Lecture, Universidad Carlos III de Madrid. (co-assistant with Vidal Alcázar)
- 2011 – 2012 *Heuristic Search and Optimization*, Core Lecture, Universidad Carlos III de Madrid. (co-assistant with Vidal Alcázar)
- 2010 – 2011 *Programming*, Core Lecture, Universidad Carlos III de Madrid.

### **Supervision of Master Thesis**

- 2017 *Dynamic Merging Strategies for Merge and Shrink Unsolvability Heuristics*. by Muhammad Lathif Pambudi (co-supervised with Jörg Hoffmann), Saarland University.
- 2017 *Planning intelligent agents in Minecraft using ActorSim*. by Soumya Chakraborty (co-supervised with Jörg Hoffmann), Saarland University.
- 2017 *Planning Methods in Linguistic Distance*. by Jeanette Aline Daum (co-supervised with Jörg Hoffmann), Saarland University.
- 2015 *Fork-Decoupled FOND Planning* by Robin Wagner (co-supervised with Jörg Hoffmann and Daniel Gnad), Saarland University.

### **Supervision of Bachelor Thesis**

- 2016 *An Analysis of OpenCCGs Search Space*. by Julia Wichlacz (co-supervised with Jörg Hoffmann), Saarland University.
- 2016 *Building a Partial Sentence Completion Quality Predictor for OpenCCG*. by Polina Stadnikova (co-supervised with Jörg Hoffmann and Vera Demberg), Saarland University.
- 2015 *When a Sentence falls apart. . . Using heuristically guided dead end detection in sentence realization* by Maximilian Schwenger (co-supervised with Jörg Hoffmann, David Howcraft and Vera Demberg), Saarland University.
- 2015 *Dominance Pruning Methods for Fork-Decoupled Search* by Patrick Dubbert (co-supervised with Jörg Hoffmann and Daniel Gnad), Saarland University.

- 2015      *Search Algorithms and Determinization Heuristics in Simulated Pentesting* by Luise Odenthal (co-supervised with Jörg Hoffmann), Saarland University.
- 2014      *Learning Pattern Collections* by Maike Maas (co-supervised with Jörg Hoffmann), Saarland University.
- 2014      *Exploiting Portfolios in the Usage of Learned Pruning Rules for Heuristic Search Planning* by Valerie Poser (co-supervised with Jörg Hoffmann and Olivier Buffet), Saarland University.
- 2014      *Understanding the Learning and Usage of Pruning Rules for Heuristic Search Planning* by Inken Hagestedt (co-supervised with Jörg Hoffmann, Alan Fern, and Olivier Buffet), Saarland University.
- 2014      *Analizador de posiciones del tablero del Go* by Javier Huertas Tato (co-supervised with Daniel Borrajo), Universidad Carlos III de Madrid.
- 2013      *Jaminion: Plataforma de Dominion* by Sergio Durán Vegas, Universidad Carlos III de Madrid.

## Scientific Activities

### Event Organization

- Organizer of the 2018th edition of the International Planning Competition (IPC'18).
- Organizer of the 9th edition of the Heuristics and Search for Domain-independent Planning Workshop (HSDIP'17).
- Organizer of the 8th edition of the Heuristics and Search for Domain-independent Planning Workshop (HSDIP'16).

### Journal Reviewer

- Artificial Intelligence Journal
- Journal of Artificial Intelligence Research
- AI Communications

### Conference Reviewer

- Program Committee of the *11th Symposium on Combinatorial Search (SOCS'18)*.
- Program Committee of the *26th International Joint Conference on Artificial Intelligence (IJCAI'18)*.



- Program Committee of the *Demo-Track of the 26th International Joint Conference on Artificial Intelligence (IJCAI'18)*.
- Program Committee of the *28th International Conference on Automated Planning and Scheduling (ICAPS'18)*.
- Program Committee of the *32th AAAI Conference on Artificial Intelligence (AAAI'18)*.
- Program Committee of the *10th Symposium on Combinatorial Search (SOCS'17)*.
- Program Committee of the *25th International Joint Conference on Artificial Intelligence (IJCAI'17)*.
- Program Committee of the *Demo-Track of the 25th International Joint Conference on Artificial Intelligence (IJCAI'17)*.
- Program Committee of the *27th International Conference on Automated Planning and Scheduling (ICAPS'17)*.
- Program Committee of the *31th AAAI Conference on Artificial Intelligence (AAAI'17)*.
- Program Committee of the *24th International Joint Conference on Artificial Intelligence (IJCAI'16)*.
- Program Committee of the *Demo-Track of the 24th International Joint Conference on Artificial Intelligence (IJCAI'16)*.
- Program Committee of the *26th International Conference on Automated Planning and Scheduling (ICAPS'16)*.
- Program Committee of the *8th Symposium on Combinatorial Search (SOCS'15)*.
- Program Committee of the *24th International Joint Conference on Artificial Intelligence (IJCAI'15)*.
- Program Committee of the *29th AAAI Conference on Artificial Intelligence (AAAI'15)*.
- Program Committee of the *7th Symposium on Combinatorial Search (SOCS'14)*.
- Additional Reviewer of the *25th International Conference on Automated Planning and Scheduling (ICAPS'15)*.
- Additional Reviewer of the *24th International Conference on Automated Planning and Scheduling (ICAPS'14)*.
- Additional Reviewer of the *6th Symposium on Combinatorial Search (SOCS'13)*.
- Additional Reviewer of the *5th Symposium on Combinatorial Search (SOCS'12)*.

## **Membership in Ph.D. Committees**

- August 2017, Mittul Singh, Saarland University
- March 2017, Isabel Cenamor, Universidad Carlos III de Madrid
- May 2016, Stefan Richter, Saarland University
- December 2015, Stefan Schuh, Saarland University