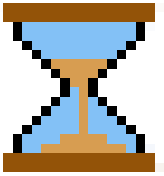

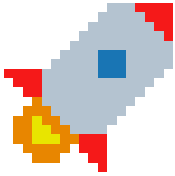

Applications & Problem Settings

Scalability State of the Art

Accelerate the Multitude of Queries

Introduction Product Lines

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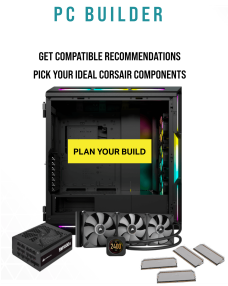

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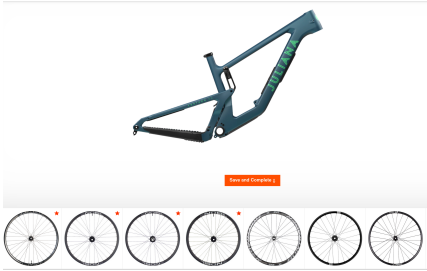

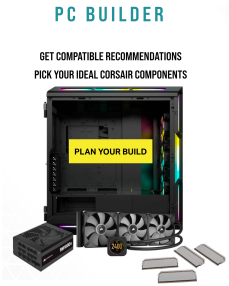

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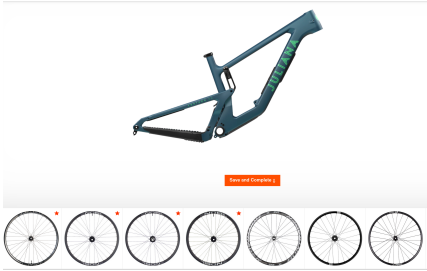

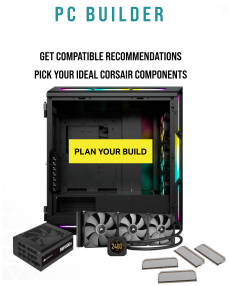

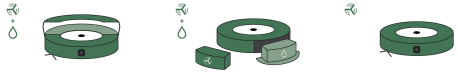

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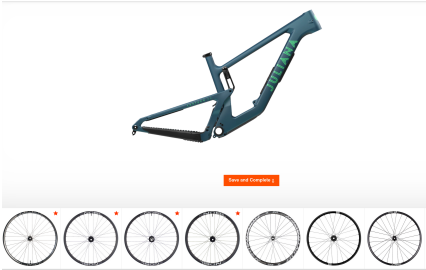

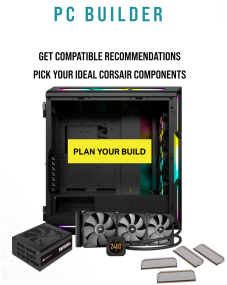

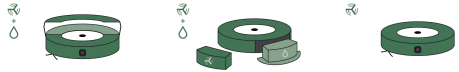

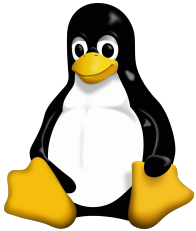

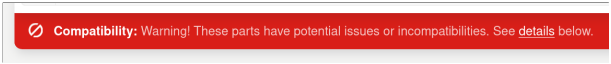
Compatibility: Warning! These parts have potential issues or incompatibilities. See details below.

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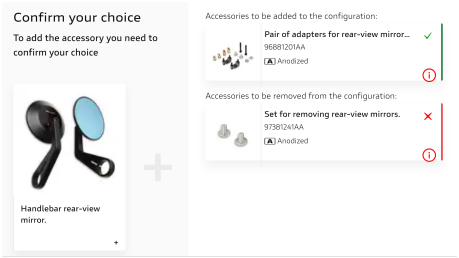
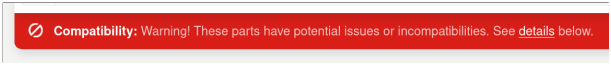
Introduction Feature Dependencies



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config SECURITY_INFINIBAND
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       depends on SECURITY && INFINIBAND
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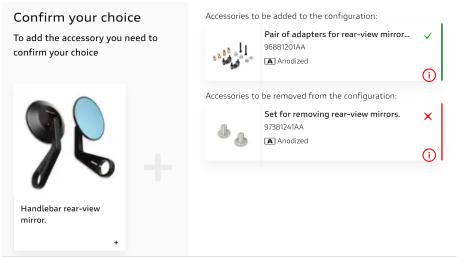
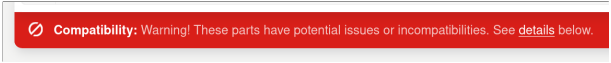
Introduction Feature Dependencies



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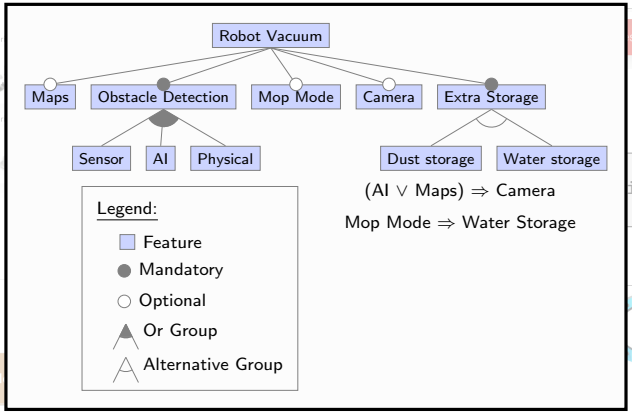
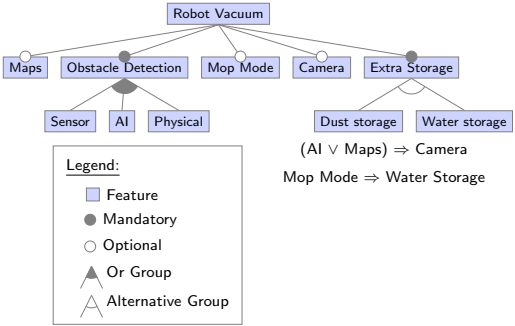
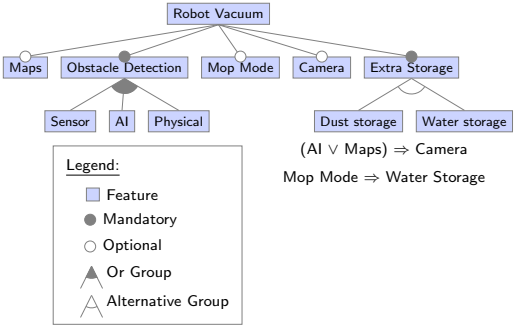




$(AI \vee Maps) \Rightarrow Camera$

$Mop\ Mode \Rightarrow Water\ Storage$



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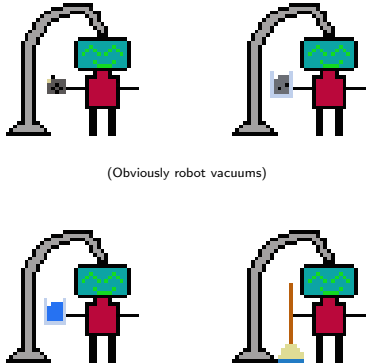
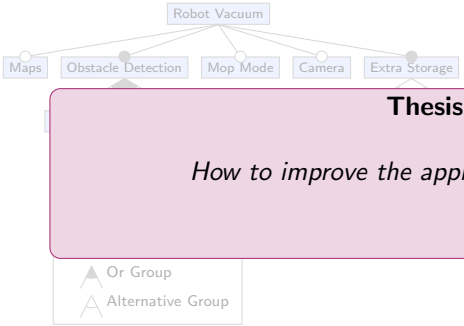
How many valid configurations?



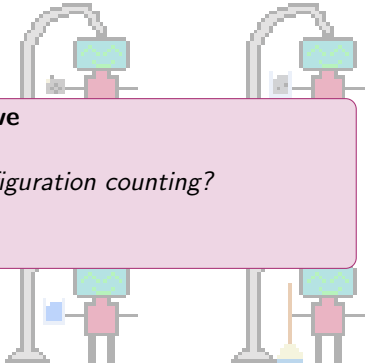
(Obviously robot vacuums)

How many valid configurations?



Thesis Main Objective

How to improve the applicability of configuration counting?



Applications & Problem Settings

What applications are facilitated by which counting operations?

Scalability State of the Art

How well does the state of the art scale for configuration counting?

Accelerate the Multitude of Queries

How can we scale to the numerous different computations required for configuration counting?

Applications & Problem Settings

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Applications Related Work

Related Work

Limitations

Contributions

Applications & Problem Settings

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Related Work

- Occasional occurrences in related work
- Small collections (with specific scope)

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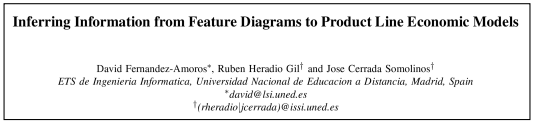
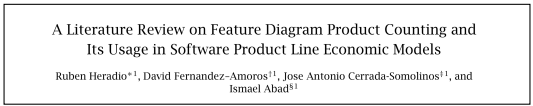
Contributions



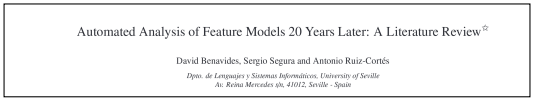
Inferring Information from Feature Diagrams to Product Line Economic Models

David Fernandez-Amoros*, Ruben Heradio Gil† and Jose Cerrada Somolinos†
ETS de Ingenieria Informatica, Universidad Nacional de Educacion a Distancia, Madrid, Spain
**david@lsi.uned.es*
†*(rheradio|jcerrada)@issi.uned.es*



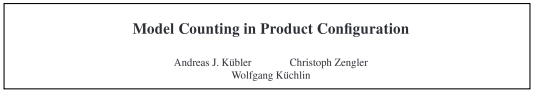
A Literature Review on Feature Diagram Product Counting and Its Usage in Software Product Line Economic Models

Ruben Heradio*[1], David Fernandez-Amoros[†1], Jose Antonio Cerrada-Somolinos[†1], and Ismael Abad[§†]



Automated Analysis of Feature Models 20 Years Later: A Literature Review☆

David Benavides, Sergio Segura and Antonio Ruiz-Cortés
Dpto. de Lenguajes y Sistemas Informáticos, University of Seville
Av. Reina Mercedes s/n, 41012, Seville - Spain



Model Counting in Product Configuration

Andreas J. Kübler Christoph Zengler
Wolfgang Küchlin

Applications Related Work

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- Occasional occurrences in related work
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Limitations

- Scattered
- Applications from practice missing
- Unclear how to compute

Contributions

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Contributions

1. Collection (**VaMoS'21**)
2. Industry applications (**VaMoS'21**)
3. Computation (**VaMoS'21**, **AMAI'24**)

VaMos'21

Applications of #SAT Solvers on Feature Models

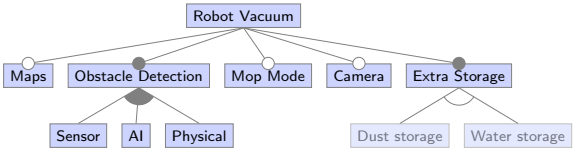
Chico Sundermann, University of Ulm, Germany
Michael Nieke, TU Braunschweig, Germany
Paul Maximilian Bittner, University of Ulm, Germany
Tobias Heß, University of Ulm, Germany
Thomas Thüm, University of Ulm, Germany
Ina Schaefer, TU Braunschweig, Germany

AMAI'24

On the benefits of knowledge compilation for feature-model analyses

Chico Sundermann[1] · Elias Kuiter[2] · Tobias Heß[1] · Heiko Raab[1] · Sebastian Krieter[1] · Thomas Thüm[1]

Feature Prioritization



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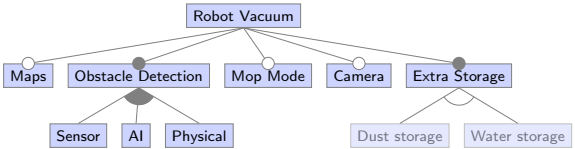

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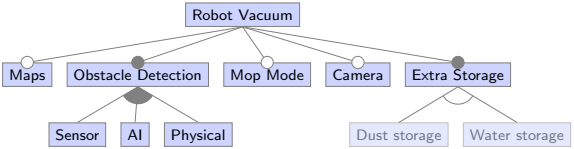

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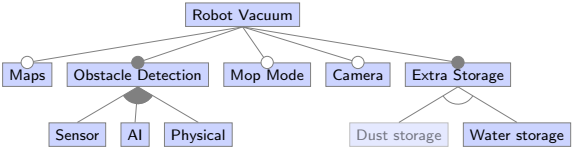
$\#Dust < \#Water$

More robots with water!

Feature Prioritization



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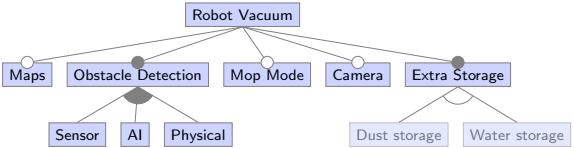

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$$\frac{\#Water}{\mathrm{Cost}(Water)} \overset{?}{\leqslant} \frac{\#Dust}{\mathrm{Cost}(Dust)}$$

Configuration Counting — Why Care?

Feature Prioritization

Configuration Counting — Why Care?

- Variability Factor
- Degree of Orthogonality
- Cost Savings
- Void Feature Model
- Maintainability Prediction
- Variability Reduction (NEW)
- Configuration Relevance (NEW)

- Degree of Reuse
- Homogeneity
- Feature Anomalies
- Feature Payoff
- Optimize Configuring
- Atomic Set Candidates (NEW)
- Feature Prioritization (NEW)
- CTC Restrictiveness (NEW)

- Uniform Random Sampling
- Atomic Sets (NEW)
- Rate Interactions (NEW)
- Selection Impact (NEW)

- Rating Errors
- Subset Variability (NEW)

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Key Result

Plenty applications rely on counting.

Configuration Counting — Why Care?

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Configuration Counting

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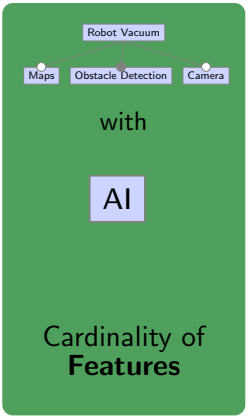
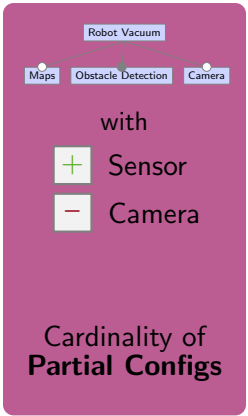
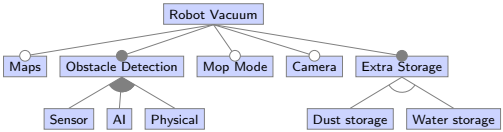




How to?



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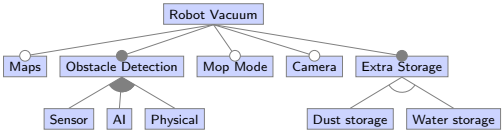
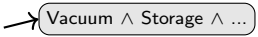
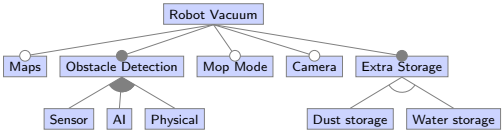
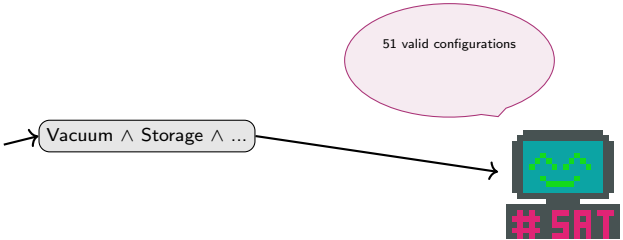

Robot Vacuum
Maps
Obstacle Detection
Mop Mode
Camera
Extra Storage
Sensor
AI
Physical
Dust storage
Water storage
(AI ∨ Maps) ⇒ Camera
Mop Mode ⇒ Water Storage


Vacuum ∧ Storage ∧ ...

How to? Reduce to #SAT





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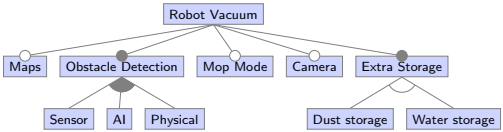
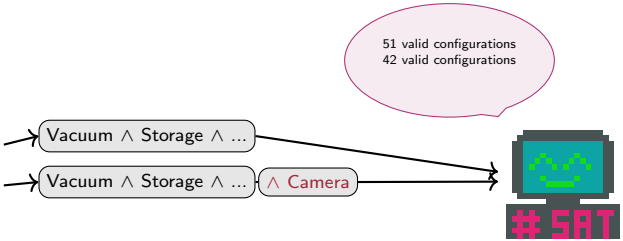


(AI ∨ Maps) ⇒ Camera

Mop Mode ⇒ Water Storage



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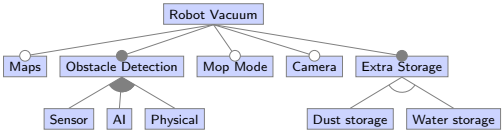

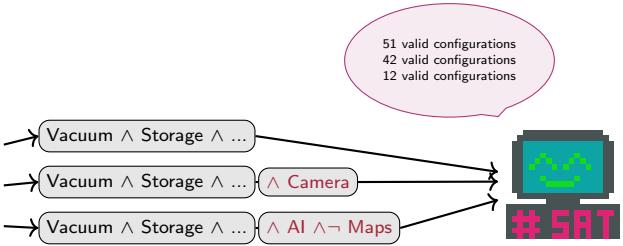

Applications Complexity of Applications

Type	Analysis	Number of Queries	Repeatability
Cardinality of Feature Models	Variability Factor [Benavides et al.(2005)]	1	Static
	Variability Reduction [Sundermann et al.(2021)]	1	Static
	Degree of Orthogonality [Czarnecki and Kim(2005)]	1	Static
	Maintainability Prediction [Bagheri et al.(2012)]	1	Static
	Configuration Relevance [Sundermann et al.(2021)]	1	Static
	Cost Savings of Product Line [Clements et al.(2005)]	1	Static
Cardinality of Features	Homogeneity [Fernández-Amorós et al.(2014)]	$O(\|F\|)$	Static
	Atomic Set Candidates [Sundermann et al.(2021)]	$O(\|F\|)$	Static
	Feature Prioritization [Sundermann et al.(2021)]	$O(\|F\|)$	Static
	CTC Restrictiveness [Sundermann et al.(2021)]	$O(\|F\|)$	Static
	Degree of Reuse [Cohen(2003)]	$O(\|F\|)$	Static
	Optimize Configuring [Chen and Erwig(2011), Mazo et al.(2014)]	$O(\|F\|)$	Static
	Payoff Threshold [Heradio et al.(2013)]	$O(\|F\|)$	Static
Cardinality of Partial Configuration	Interactive Configuration [Sundermann et al.(2021)]	$O(\|F\|^2)$	Dynamic
	Uniform Random Sampling [Oh et al.(2019)]	$O(\|F\|)$	Dynamic
	Rating Feature Interactions [Sundermann et al.(2021)]	$O(\|F\|^2)$	Dynamic
Cardinality of Formula	Rating Errors [Kübler et al.(2010)]	1	Dynamic
	Variability of Feature Subsets [Sundermann et al.(2021)]	1	Dynamic

Applications Complexity of Applications

Type	Analysis	Number of Queries	Repeatability
Cardinality of Feature Models	Variability Factor [Benavides et al.(2005)]	1	Static
	Variability Reduction [Sundermann et al.(2021)]	1	Static
	Degree of Orthogonality [Czarnecki and Kim(2005)]	1	Static
	Maintainability Prediction [Bagheri et al.(2012)]	1	Static
	Configuration Relevance [Sundermann et al.(2021)]	1	Static
	Cost Savings of Product Line [Clements et al.(2005)]	1	Static
Cardinality of Features	Homogeneity [Fernández-Amorós et al.(2014)]	$O(\|F\|)$	Static
	Atomic Set Candidates [Sundermann et al.(2021)]	$O(\|F\|)$	Static
	Feature Prioritization [Sundermann et al.(2021)]	$O(\|F\|)$	Static
	CTC Restrictiveness [Sundermann et al.(2021)]	$O(\|F\|)$	Static
	Degree of Reuse [Cohen(2003)]		Static
	Optimize Configuring [Chen and		
	Payoff Threshold [Heradio et al.(		
Cardinality of Partial Configuration	Interactive Configuration [Sunder		
	Uniform Random Sampling [Oh et al.(2019)]	$O(\|F\|)$	Dynamic
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Key Result

Multitude of complex operations required

Applications & Problem Settings

What applications are facilitated by which counting operations?

Scalability State of the Art

How well does the state of the art scale for configuration counting?

Accelerate the Multitude of Queries

How can we scale to the numerous different computations required for configuration counting?

Applications & Problem Settings

Key Contributions

Collect applications
Add industrial applications
Computation instructions

VaMoS'21

AMAI'24

Key Results

Plenty applications
Multitude of queries

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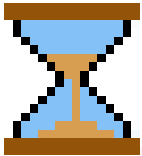
State of the Art Related Work

Related Work

Limitations

Contributions



Scalability State of the Art

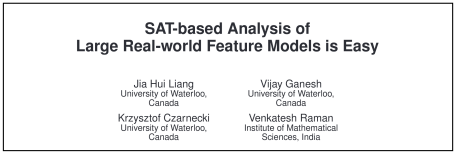
State of the Art Related Work

Related Work

- Evaluations of several strategies
- Small-scale evaluations on #SAT solving

Limitations

Contributions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Model Counting in Product Configuration

Andreas J. Kübler Christoph Zengler
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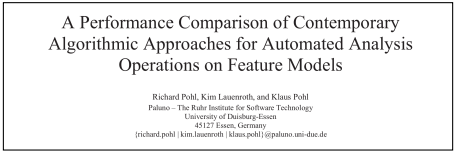
A Performance Comparison of Contemporary
Algorithmic Approaches for Automated Analysis
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Richard Pohl, Kim Lauenroth, and Klaus Pohl
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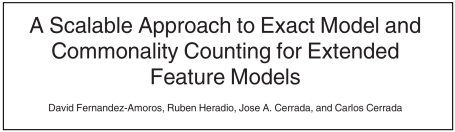
University of Duisburg-Essen
45127 Essen, Germany
{richard.pohl | kim.lauenroth | klaus.pohl}@paluno.uni-due.de


A Scalable Approach to Exact Model and
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David Fernandez-Amoros, Ruben Heradio, Jose A. Cerrada, and Carlos Cerrada

State of the Art Related Work

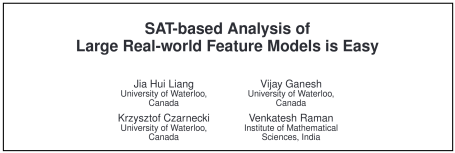
Related Work

- Evaluations of several strategies
- Small-scale evaluations on #SAT solving

Limitations

- Very few solvers
- Restricted systems

Contributions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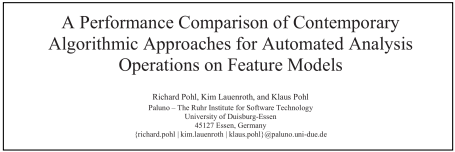
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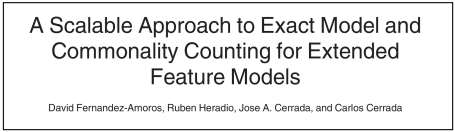
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Related Work

- Evaluations of several strategies
- Small-scale evaluations on #SAT solving

Limitations

- Very few solvers
- Restricted systems

Contributions

1. Gathering solvers (**VaMoS'20, EMSE'23**)
2. Evaluate on industrial feature models (**VaMoS'20, EMSE'23**)
3. Evaluate on evolution (**VaMoS'20**)
4. Gather industrial feature models (**SPLC'24**)

VaMos'20

Evaluating #SAT Solvers on Industrial Feature Models

Chico Sundermann, Technische Universität Braunschweig
Thomas Thüm, University of Ulm
Ina Schaefer, Technische Universität Braunschweig

EMSE'23

Empirical Software Engineering (2023) 28:29
https://doi.org/10.1007/s10664-022-10265-9

Evaluating state-of-the-art #SAT solvers on industrial configuration spaces

Chico Sundermann[1] · Tobias Heß[1] · Michael Nieke[2] · Paul Maximilian Bittner[1] · Jeffrey M. Young[3] · Thomas Thüm[1] · Ina Schaefer[2]

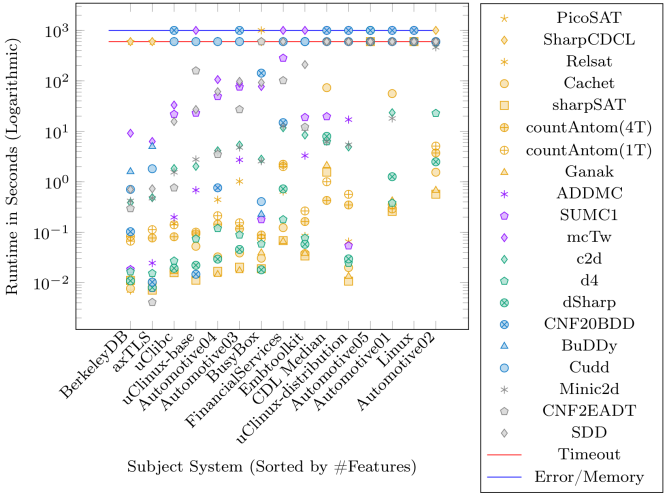
SPLC'24

Collecting Feature Models from the Literature: A Comprehensive Dataset for Benchmarking

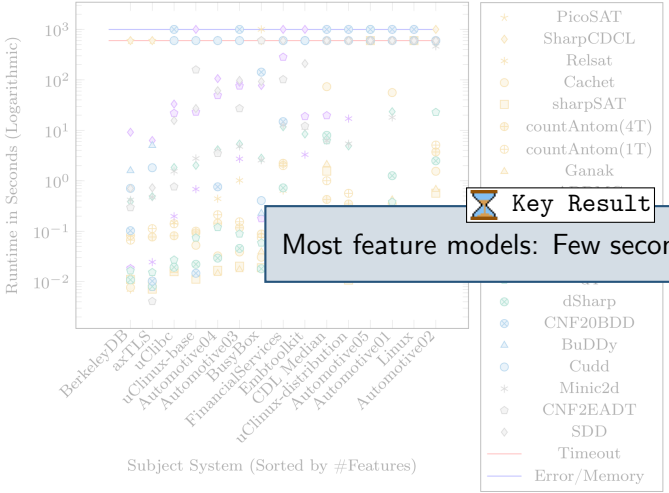
Chico Sundermann, University of Ulm, Germany
Vincenzo Francesco Brancaccio, University of Ulm, Germany
Elias Kuiter, University of Magdeburg, Germany
Sebastian Krieter, Paderborn University, Germany
Tobias Heß, University of Ulm, Germany
Thomas Thüm, Paderborn University, Germany

State of the Art

Runtimes #SAT on Feature Models



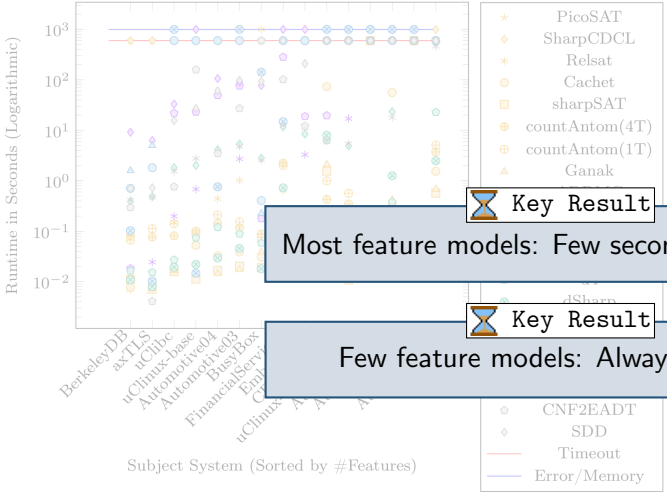
State of the Art Runtimes #SAT on Feature Models



Key Result

Most feature models: Few seconds of runtime

State of the Art Runtimes #SAT on Feature Models



Key Result

Most feature models: Few seconds of runtime

Key Result

Few feature models: Always timeout

Applications & Problem Settings

Key Contributions

Collect applications
Add industrial applications
Computation instructions

VaMoS'21
AMAI'24

Key Results

Plenty applications
Multitude of queries

Scalability State of the Art

How well does the state of the art scale for configuration counting?

Accelerate the Multitude of Queries

How can we scale to the numerous different computations required for configuration counting?

Applications & Problem Settings

Key Contributions

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Add industrial applications
Computation instructions

VaMoS'21
AMAI'24

Key Results

Plenty applications
Multitude of queries

Scalability State of the Art

Key Contributions

Gather #SAT solvers
Gather industrial models
Performance study

VaMoS'20
EMSE'23
SPLC'24

Key Results

Most systems in few seconds
Few systems do not scale at all

Accelerate the Multitude of Queries

How can we scale to the numerous different computations required for configuration counting?

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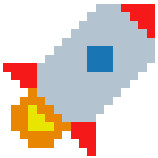
Acceleration Related Work

Related Work

Limitations

Contributions



Accelerate the Multitude of Queries

Acceleration Related Work

Related Work

- State of the art: Black-box #SAT solving

Limitations

Contributions

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Model Counting in Product Configuration

Andreas J. Kübler, Christoph Zengler, Wolfgang Küchlin

A Literature Review on Feature Diagram Product Counting and Its Usage in Software Product Line Economic Models

Ruben Heradio[*1], David Fernandez-Amoros[†1], Jose Antonio Cerrada-Somolinos[†1], and Ismael Abad[§1]

Acceleration Related Work

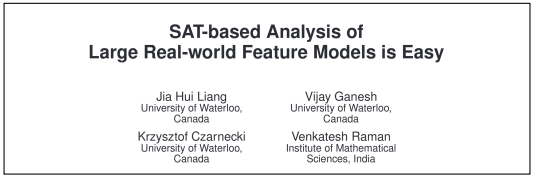
Related Work

- State of the art: Black-box #SAT solving

Limitations

- Scalability for multi-query requirements
- Reuse between different queries

Contributions



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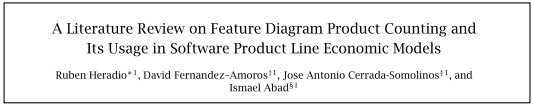

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Acceleration Related Work

Related Work

- State of the art: Black-box #SAT solving

Limitations

- Scalability for multi-query requirements
- Reuse between different queries

Contributions

1. Address multitude of queries with knowledge compilation (**AMAI'24**)
2. Reusing d-DNNFs (**TOSEM'24**)
3. Projected d-DNNF Compilation (**ASE'24**)
4. Pseudo-Boolean d-DNNF Compilation (**TSE'25 Sub.**)

AMAI'24

On the benefits of knowledge compilation for feature-model analyses

Chico Sundermann[1] · Elias Kuiter[2] · Tobias Heß[1] · Heiko Raab[1] · Sebastian Krieter[1] · Thomas Thüm[1]

TOSEM'24

Reusing d-DNNFs for Efficient Feature-Model Counting

CHICO SUNDERMANN, University of Ulm, Germany
HEIKO RAAB, University of Ulm, Germany
TOBIAS HESS, University of Ulm, Germany
THOMAS THÜM, Paderborn University, Germany
INA SCHAEFER, Karlsruhe Institute of Technology, Germany

ASE'24

Efficient Slicing of Feature Models via Projected d-DNNF Compilation

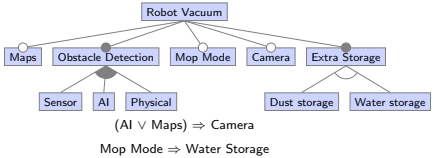
Chico Sundermann, University of Ulm, Ulm, Germany
Jacob Loth, University of Ulm, Ulm, Germany
Thomas Thüm, Paderborn University, Paderborn, Germany

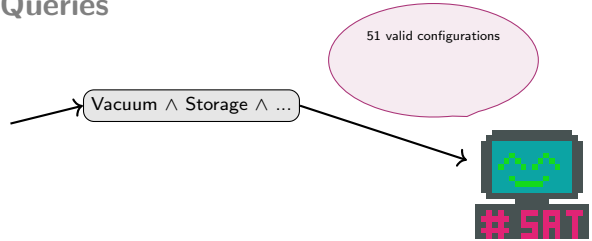
TSE Sub.

Tackling Expressive Feature-Modeling Constructs with Pseudo-Boolean d-DNNF Compilation

Chico Sundermann*†, Stefan Vill*, Elias Kuiter‡, Sebastian Krieter‡, Thomas Thüm†, and Matthias Tichy*
* Ulm University, Germany † TU Braunschweig, Germany ‡ University of Magdeburg, Germany

Scalability Issues Multitude of Queries





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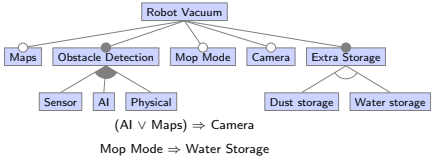
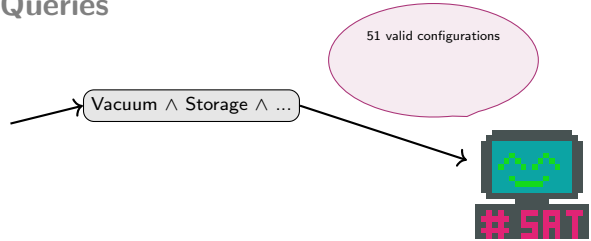
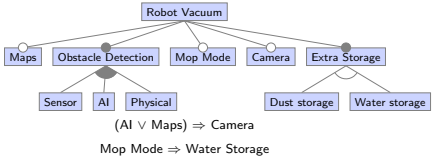


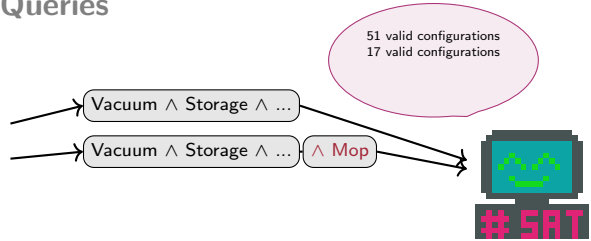


Most systems: Few seconds of runtime

Scalability Issues

Multitude of Queries





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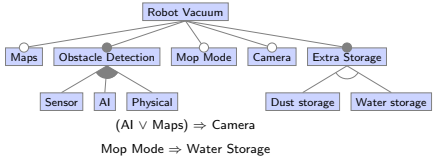

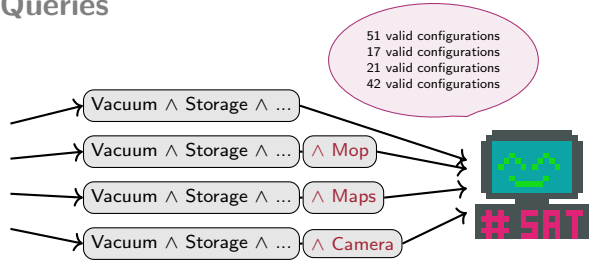

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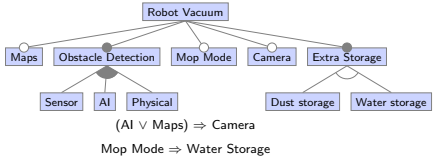
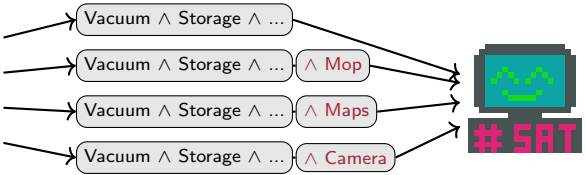
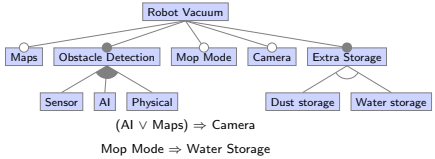


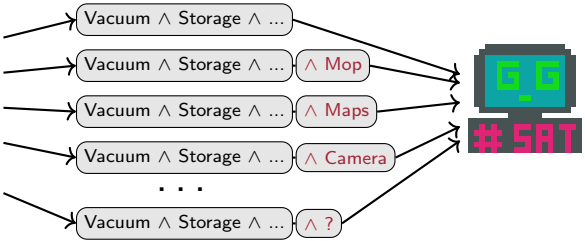


Most systems: Few seconds of runtime

Type	Number of Queries	Repeatability
Features	$\mathcal{O}(\lvert F\rvert)$	Static
	$\mathcal{O}(\lvert F\rvert)$	Static
	$\mathcal{O}(\lvert F\rvert)$	Static
	$\mathcal{O}(\lvert F\rvert)$	Static
	$\mathcal{O}(\lvert F\rvert)$	Static
	$\mathcal{O}(\lvert F\rvert)$	Static
	$\mathcal{O}(\lvert F\rvert)$	Static
	$\mathcal{O}(\lvert F\rvert)$	Static
Partial Configurations	$\mathcal{O}(\lvert F\rvert^2)$	Dynamic
	$\mathcal{O}(\lvert F^2\rvert)$	Dynamic
	$\mathcal{O}(\lvert F\rvert)$	Dynamic
	$\mathcal{O}(\lvert F^2\rvert)$	Dynamic
Formula	1	Dynamic
	1	Dynamic

Scalability Issues — Multitude of Queries





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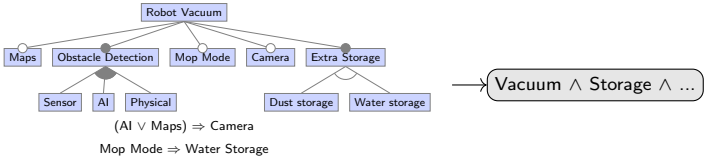
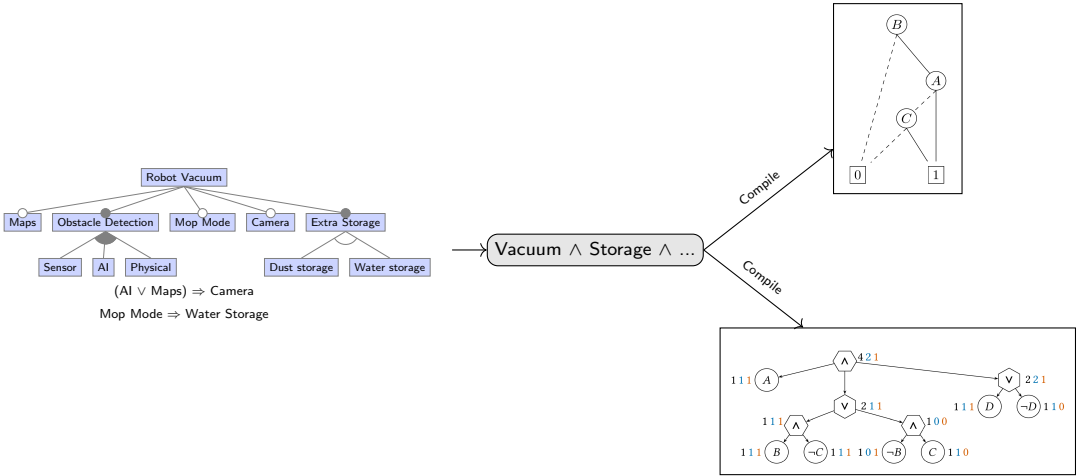
Acceleration Knowledge Compilation



Darwiche and Marquis, A Knowledge Compilation Map, JAIR'02

Acceleration Knowledge Compilation



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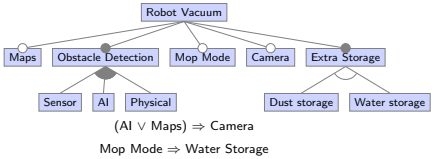

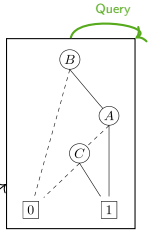

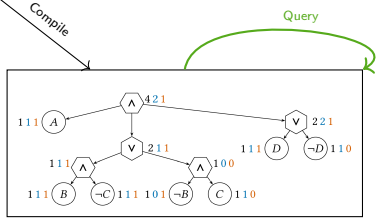

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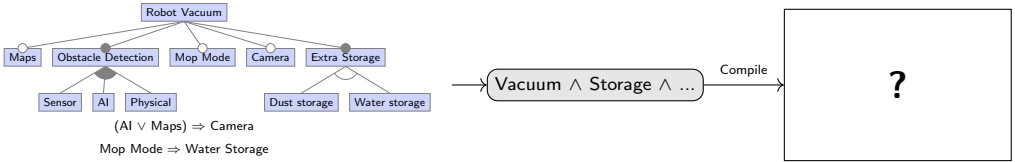
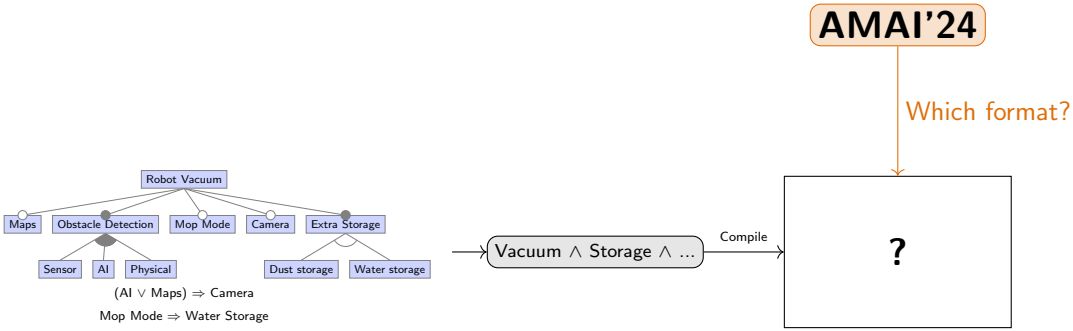


Darwiche and Marquis, A Knowledge Compilation Map, JAIR'02

Acceleration Knowledge Compilation



Darwiche and Marquis, A Knowledge Compilation Map, JAIR'02

Acceleration Overview Contributions

1. Which problems need to be solved?
   - Survey over existing analyses surveys
   - Classify analyses by underlying problem
2. Which knowledge compilation formats exist?
   - SLR on knowledge compilation
3. What are the capabilities of the formats?
   - Mapping languages to tractable analyses
4. How do available compilers scale?
   - SLR & Github search for compilers
   - Empirical evaluation on feature models

Acceleration Overview Contributions

1. Which problems need to be solved?

Survey over existing analyses surveys

Classify analyses by underlying problem

Which knowledge compilation format to use in **what** scenario?

3. What are the capabilities of the formats?

Mapping languages to tractable analyses

4. How do available compilers scale?

SLR & Github search for compilers

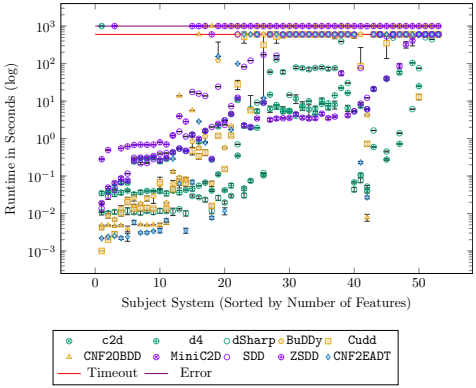
Empirical evaluation on feature models

Acceleration Format Capabilities

	SAT-Based			#SAT-Based			AllSAT	Algebraic		
	CO	CO_f	CO_C	$\#FM$	$\#FM_f$	$\#FM_c$	Enum.	Comp	Diff.	Slice
CNF										
Horn	✓	✓	✓							
EPCCL	✓	✓	✓							
DNF	✓	✓	✓				✓			✓
DNNF	✓	✓	✓				✓			✓
d-DNNF	✓	✓	✓	✓	✓	✓	✓			
EADT	✓	✓	✓	✓	✓	✓	✓			
SDD	✓	✓	✓	✓	✓	✓	✓			
PI	✓	✓	✓	✓	✓	✓	✓			✓
IP	✓	✓	✓	✓	✓	✓	✓			
ROBDD	✓	✓	✓	✓	✓	✓	✓	✓	✓	
MODS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Acceleration Scalability Compilers

	#SAT-Based		
	$\#FM$	$\#FM_f$	$\#FM_c$
CNF			
Horn			
EPCCL			
DNF			
DNNF			
d-DNNF	✓	✓	✓
EADT	✓	✓	✓
SDD	✓	✓	✓
PI	✓	✓	✓
IP	✓	✓	✓
ROBDD	✓	✓	✓
MODS	✓	✓	✓



Acceleration Scalability Compilers

	#SAT-Based		
	$\#FM$	$\#FM_f$	$\#FM_c$
CNF			
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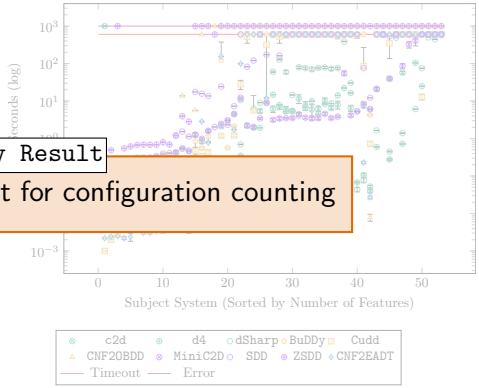
DNNF			
d-DNNF	✓		
EADT	✓	✓	✓
SDD	✓	✓	✓
PI	✓	✓	✓
IP	✓	✓	✓
ROBDD	✓	✓	✓
MODS	✓	✓	✓

Key Result

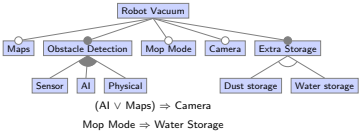
d-DNNFs are a sweet-spot for configuration counting



Configuration Counting with Knowledge Compilation

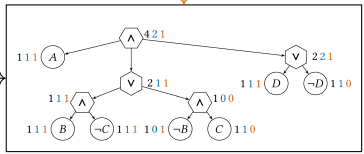
AMAI'24

Which format?
d-DNNF

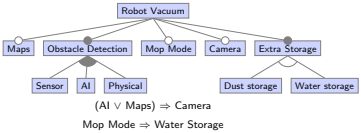


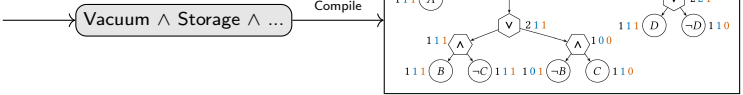
Vacuum ∧ Storage ∧ ...

Compile

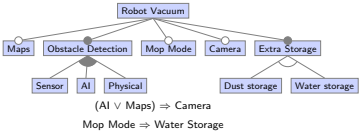


Configuration Counting with Knowledge Compilation





Configuration Counting with Knowledge Compilation



Vacuum ∧ Storage ∧ ...

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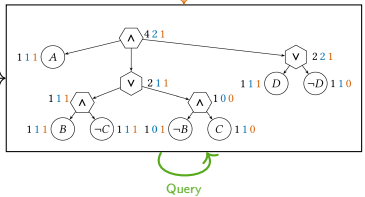


Query

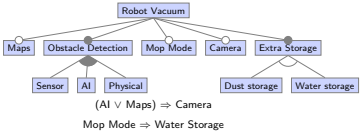
AMAI'24

Which format?
d-DNNF

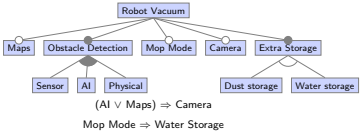
How to reuse?

TOSEM'24

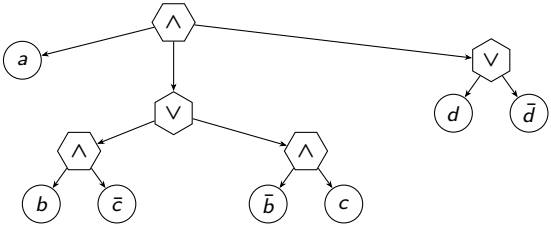
Reusing d-DNNFs Approach



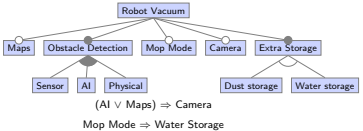
Reusing d-DNNFs Approach



Compile



Reusing d-DNNFs Approach



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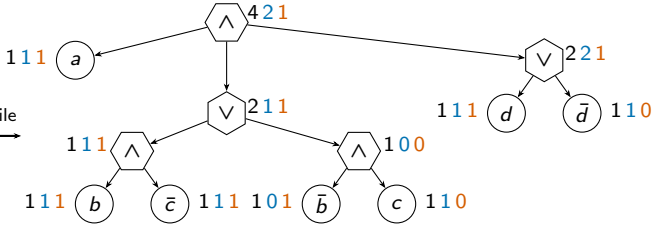
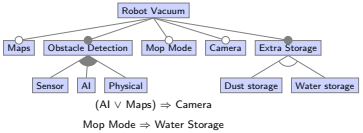


ddnnife

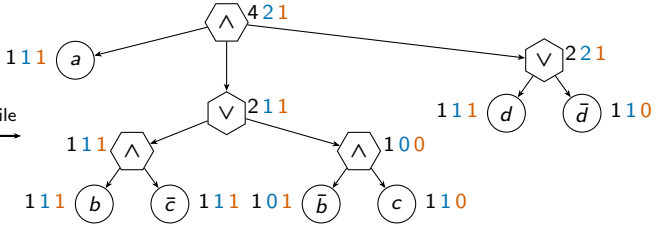
#*FM* (Feature Model):	·	$\wedge : \prod$
#*f* (Feature):	b	$\vee : \sum$
#C_p (Partial Config.):	$\{\bar{c}, d\}$	[a]

[a] Basic algorithm adapted from: Darwiche, On the Tractable Counting of Theory Models and its Application to Belief Revision and Truth Maintenance, JANCL'01

Reusing d-DNNFs Approach



Compile

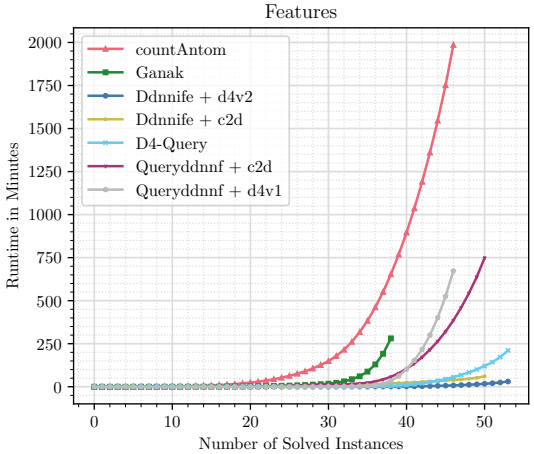


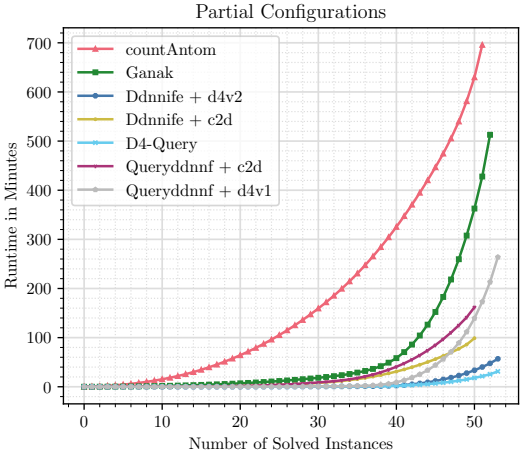
ddnnife

#*FM* (Feature Model):	·	$\wedge : \prod$
#*f* (Feature):	b	$\vee : \sum$
#C_p (Partial Config.):	$\{\bar{c}, d\}$	

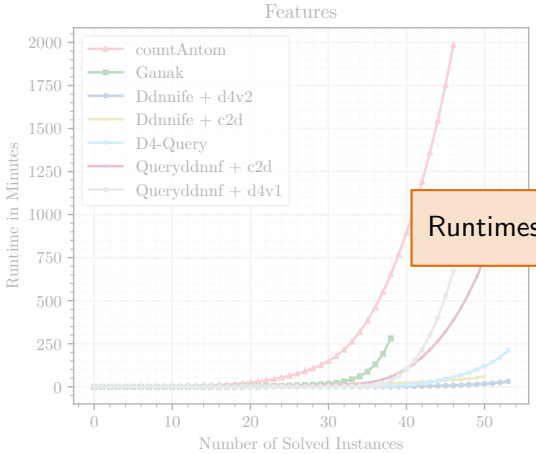
Partial Traversals	Partial Derivatives
Reusing Subtrees	Core/Dead features
...	...

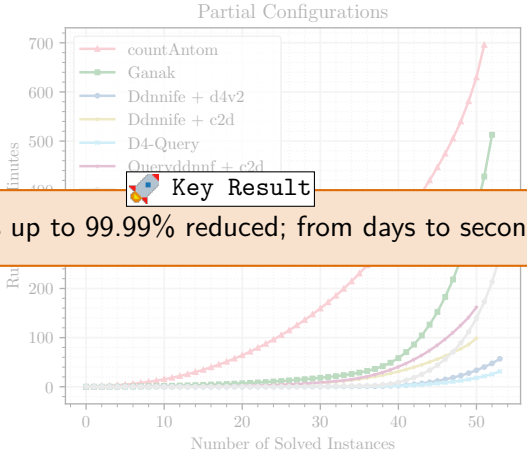
Reusing d-DNNFs Performance





Reusing d-DNNFs Performance

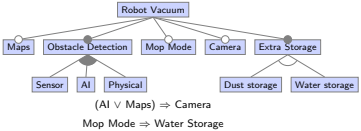


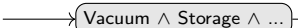


Key Result

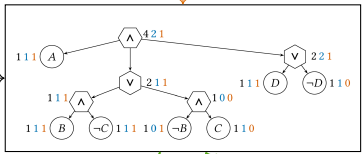
Runtimes up to 99.99% reduced; from days to seconds

Acceleration with Knowledge Compilation





Compile



Query

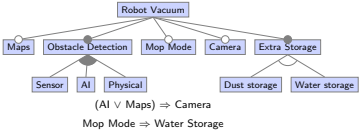
AMAI'24

Which format?
d-DNNF

How to reuse?

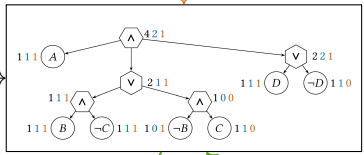
TOSEM'24

Acceleration with Knowledge Compilation



Vacuum ∧ Storage ∧ ...

Compile



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ASE'24

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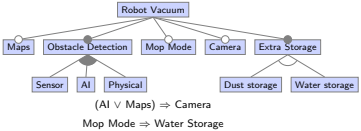
Acceleration with Knowledge Compilation



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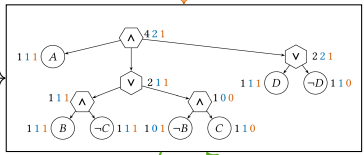


AMAI'24

Which format?
d-DNNF

How to compile subsets?

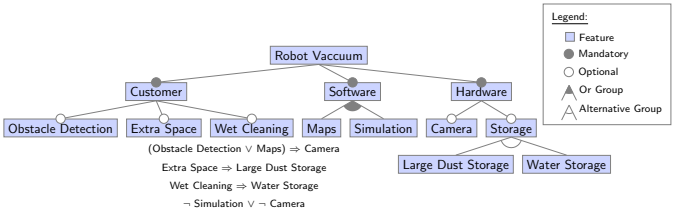
Query

How to reuse?

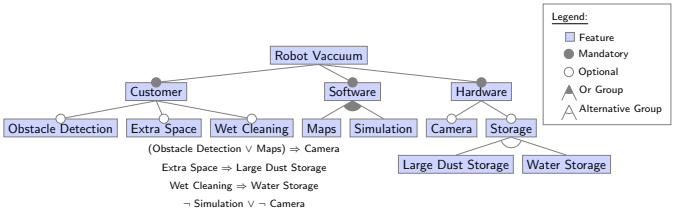
ASE'24

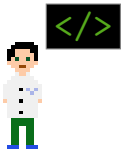
TOSEM'24

Acceleration Queries on Feature Subsets



Acceleration Queries on Feature Subsets





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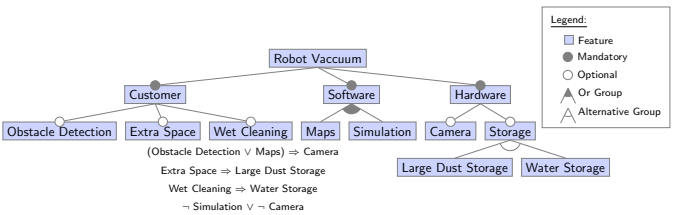
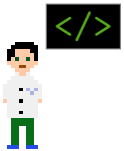
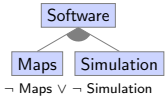
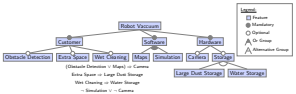




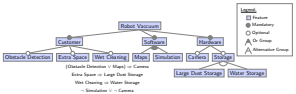


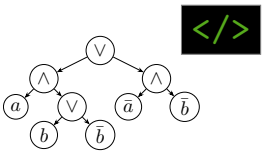
Projected d-DNNF Compilation Approach



Projected d-DNNF Compilation

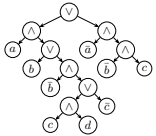
Approach



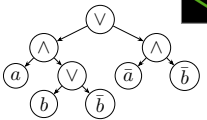


Projected d-DNNF Compilation Approach

d-DNNF Compilation



Forgetting



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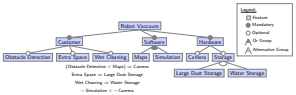
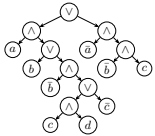
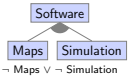


d-DNNF Compilation

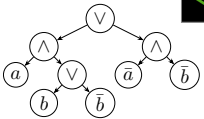


Feature-Model Slicing (Acher et al., Krieter et al.)

Forgetting



d-DNNF Compilation (Darwiche)



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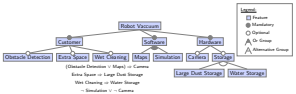
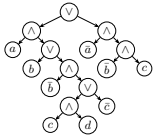


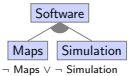
d-DNNF Compilation



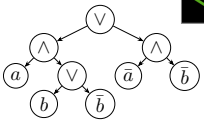
Feature-Model Slicing (Acher et al., Krieter et al.)

Projected d-DNNF Compilation (pd4)

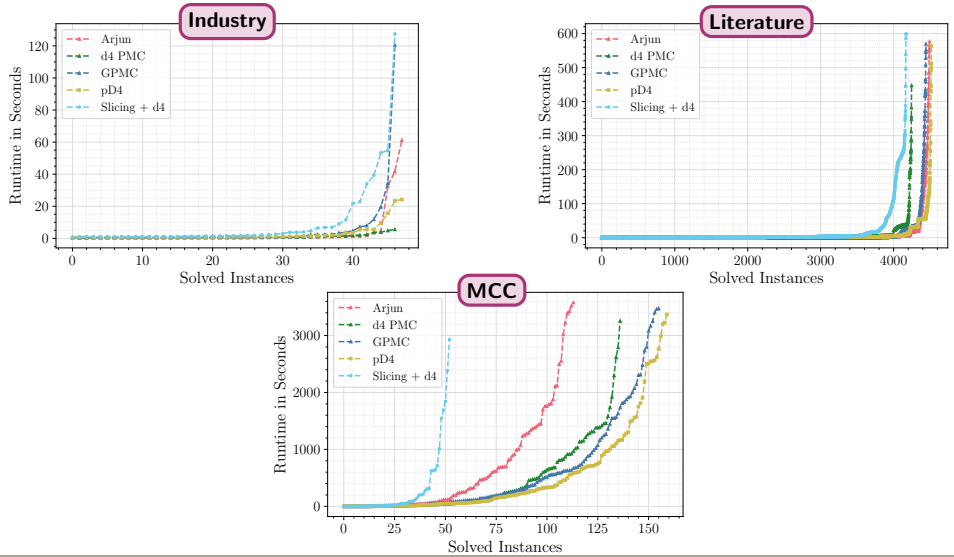
Forgetting



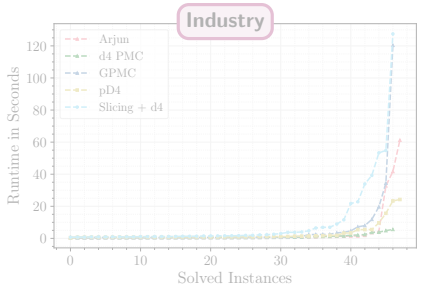
d-DNNF Compilation (Darwiche)

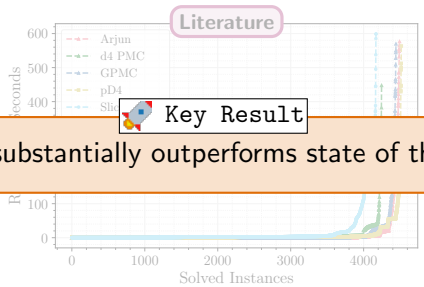


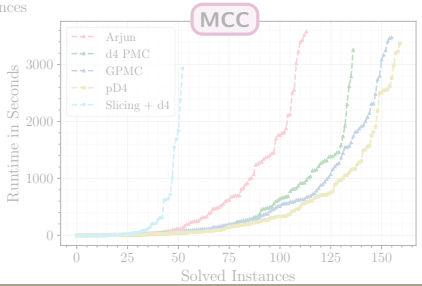
Projected d-DNNF Compilation Performance



Projected d-DNNF Compilation Performance



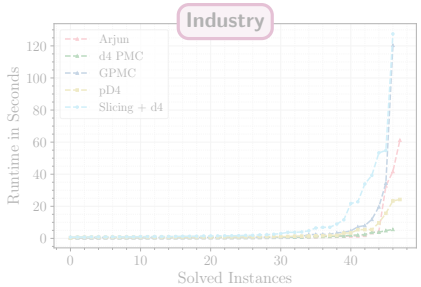


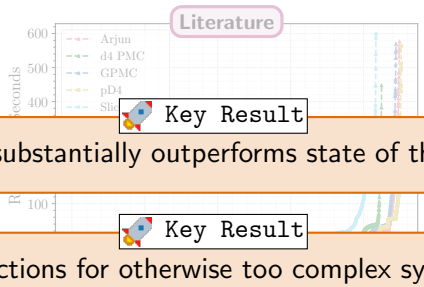


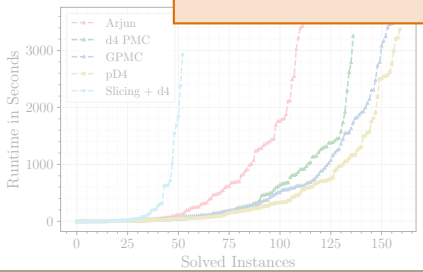
Key Result

pd4 substantially outperforms state of the art

Projected d-DNNF Compilation Performance







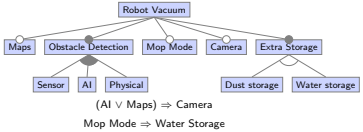
Key Result

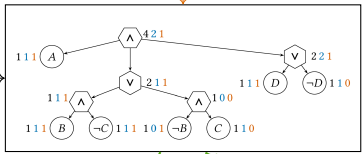
pd4 substantially outperforms state of the art

Key Result

Projections for otherwise too complex systems

Acceleration with Knowledge Compilation





AMAI'24

Which format?
d-DNNF

Query

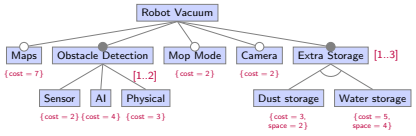
How to compile subsets?

How to reuse?

ASE'24

TOSEM'24

Acceleration with Knowledge Compilation



TSE Sub.

How to cope with expressive constructs?

Vacuum ∧ Storage ∧ ...

Compile

AMAI'24

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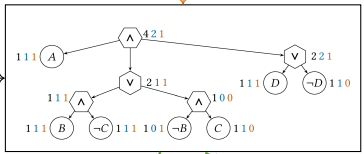

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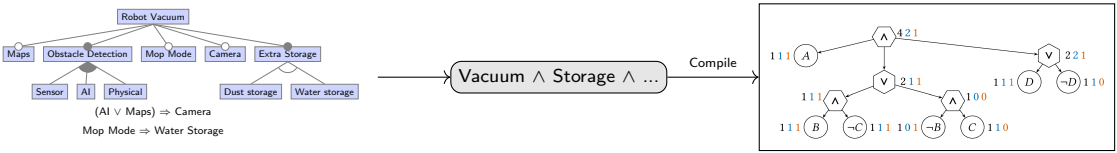

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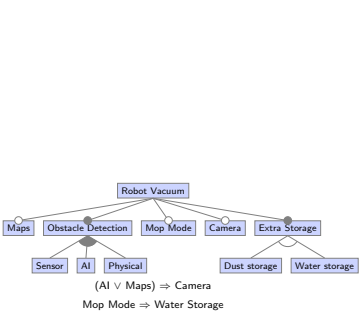

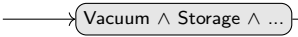

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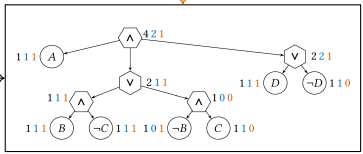

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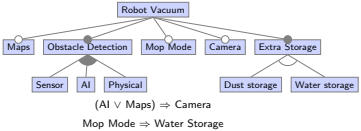

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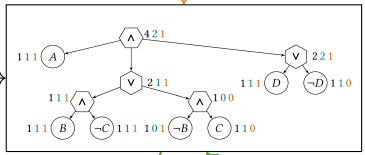

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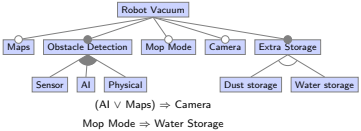

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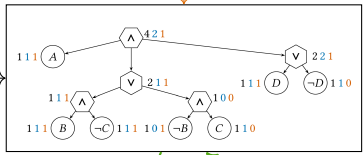

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Applications & Problem Settings

Key Contributions

Collect applications
Add industrial applications
Computation instructions

VaMoS'21
AMAI'24

Key Results

Plenty applications
Multitude of queries

Scalability State of the Art

Key Contributions

Gather #SAT solvers
Gather industrial models
Performance study

VaMoS'20
EMSE'23
SPLC'24

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Most systems in few seconds
Few systems do not scale at all

Accelerate the Multitude of Queries

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Knowledge-compilation ecosystem
Efficient reuse of d-DNNFs
Projection compilation
Pseudo-Boolean compilation

AMAI'24
TOSEM'24
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TSE Sub.

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Runtimes reduced from days to seconds
Compilation enabled for new scenarios
Successfully applied in industry

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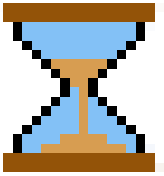

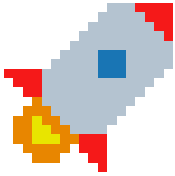

Applications & Problem Settings

Scalability State of the Art

Accelerate the Multitude of Queries


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Unleashing the Potential of Configuration Counting for Product Lines