MODEL COUNTING COMPETITION 2022

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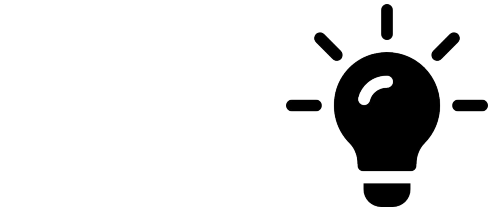
Markus Hecher (TU Wien)

FLoC Olympic Games 2022,
Technion, Haifa

Idea of the Competition

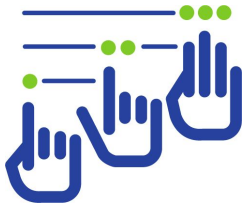


*Deepen **relationship** between latest theoretical and practical development on the various **model counting problems** and their **practical applications***

- Gain visibility of model counting
- Foster progress and new solving approaches and ideas
- **3rd iteration**

- **Report of 2020 JEA / Report 2021 (on our list)**

Tracks



Tracks

1) **Model Counting**

Input: Propositional formula F in CNF
Task: Output the number of satisfying assignments to F

2) **Weighted Model Counting**

Input: F + weight for each literal in F
Task: Output sum of weights of all models, where the weight of a model is the product of the weights of its literals.

3) **Projected Model Counting**

Input: F + set P of projection variables
Task: Output the projected model count of F (number of satisfying assignment wrt. to variables in P)

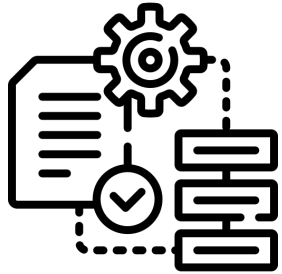
4) **Projected Weighted Model Counting**

Ranking

A) Arbitrary Precision (0% relative error; DQF >0 wrong)
B) Small Precision Loss (0.1% relative error; DQF >20 wrong)
C) Approximate Solving (0.8 approx factor; DQF >20 wrong)
~~**D) Heuristic (20% relative error ok)**~~

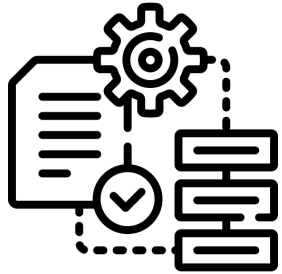
System

1. StarExec
2. 60min per instance
3. 32 GB main memory (RAM) per instance



Procedure

Evaluation Procedure



- Open call for benchmarks
- Evaluated submitted benchmark instances + known sets

We selected 200 instances and split them in public / private.

1) Public instances and public challenge
   Submission open for a few weeks.
2) **Private instances (100)**
   After a final deadline, we evaluate solvers on StarExec
   If we see errors, we give authors a few days to comment or fix.
   We included results of a fixed version if provided.

Submission Requirements

Bottom Line

Almost no limits regarding requirements on the software,
but we strongly encourage open source

Participants

Participants

Track	Groups
MC	11 (+1)
WMC	5 (-1)
PMC	4 (-1)
PWMC	2 (+2)

Knowledge Compilation (c2d, d4)	Component Caching (SharpSAT-TD, gpmc, bob, SharpSAT-td-Arjun)
Dynamic Programming (DPMC)	Approximate Counting (SharpSAT-td-Arjun+ApproxMC)

Benchmark Submissions 2022

- Guillaume Escamocher; Barry O'Sullivan
- Ivor Spence
- Daniel Pehoushek
- Samuel Teuber; Alexander Weigl
- Piotr Jerzy Gorczyca
- Yong Lai
- Elisa Böhl; Sarah Alice Gaggl; Dominik Rusovac

Instances -> Zenodo Descriptions -> Report

\+ 2020+2021 Instances

Thank you!

Instance Selection 2022

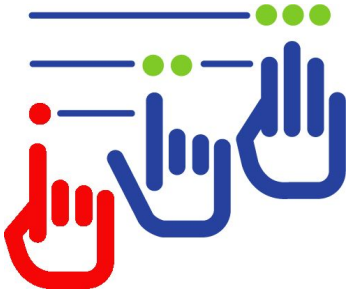
- Solved <1s by sharpSAT => Remove
- Max 10 Instances per Benchmark Set
- Choose randomly
- Max 40 instances that cannot be solved within 14.000s by existing solvers
- Weighted Model Counting
    - Select instances randomly (weighted and unweighted)
    - Generate weights randomly

        On counting graph, if it can be generated

        Random weights (at most 10 rounds), otherwise
- Cleanup (minor format issues from submissions)

Results

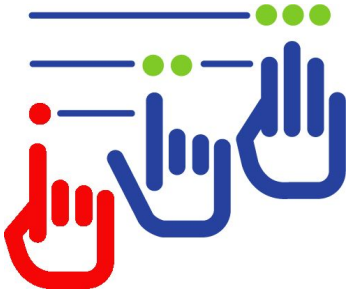
Track 1: MC / Ranking A



#	Submission	Authors	solved
1	**SharpSAT-td+Arjun**	Mate Soos Kuldeep S. Meel	**79**
2	**ExactMC**	Yong Lai, Kuldeep S. Meel. Roland H.C. Yap, Zhenghang Xu	**77**
	SharpSAT-TD	Tuukka Korhonen Matti Järvisalo	**77**
4	d4	Pierre Marquis Jean-Marie Lagniez	76
5	gpmc	Kenji Hashimoto Shota Yap	69
6	MTMC	Ivor Spence	66
7	DPMC	Vu Phan Jeffrey Dudek Moshe Vardi	61
8	c2d	Adnan Darwiche	50

Total:
100
private
instances

Track 1: MC / Ranking B



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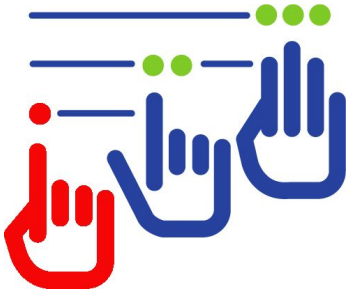
4	d4	Pierre Marquis Jean-Marie Lagniez	76
5	gpmc	Kenji Hashimoto Shota Yap	69
6	MTMC	Ivor Spence	66
7	DPMC	Vu Phan Jeffrey Dudek Moshe Vardi	61
8	TwG	Sylvester Swats	53
9	c2d	Adnan Darwiche	50

Total:
100
private
instances

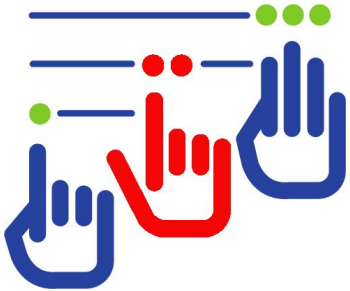
Track 1: MC / Ranking C



#	Submission	Authors	solved
1	**SharpSAT-td-Arjun+ApproxMC**	Mate Soos Kuldeep S. Meel	**74**

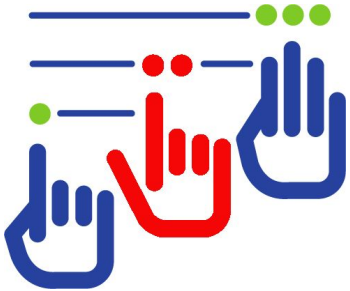
Total:
100
private
instances

Track 2: WMC / Ranking A



#	Submission	Authors	solved
1	**SharpSAT-TD**	Tuukka Korhonen Matti Järvisalo	**75**
2	**c2d**	Adnan Darwiche	**60**
3	**DPMC**	Vu Phan Jeffrey Dudek Moshe Vardi	**35**

Track 2: WMC / Ranking B



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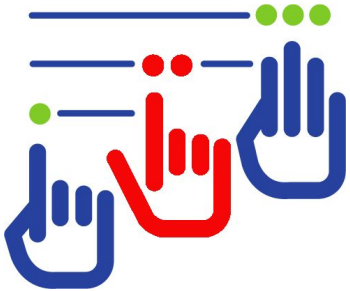
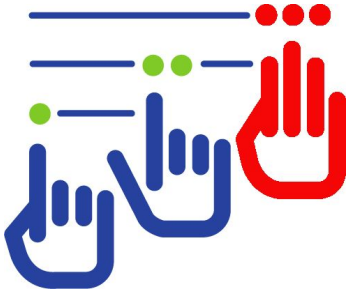
1	**SharpSAT-TD**	Tuukka Korhonen Matti Järvisalo	**75**
2	**gpmc**	Kenji Hashimoto Shota Yap	**68**
3	**d4**	Pierre Marquis Jean-Marie Lagniez	**66**
4	c2d	Adnan Darwiche	60
5	DPMC	Vu Phan Jeffrey Dudek Moshe Vardi	43

Track 2: WMC / Ranking C



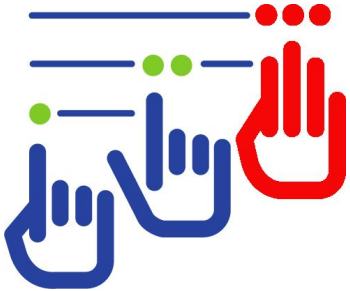
No submission

Track 3: PMC / Ranking A



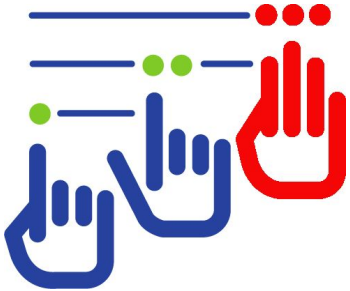
#	Submission	Authors	solved
1	**gpmc**	Kenji Hashimoto Shota Yap	**72**
2	**d4**	Pierre Marquis Jean-Marie Lagniez	**71**
3	**Ganak**	Mate Soos Kuldeep Meel	**56**
4	DPMC	Vu Phan Jeffrey Dudek Moshe Vardi	26

Track 3: PMC / Ranking B



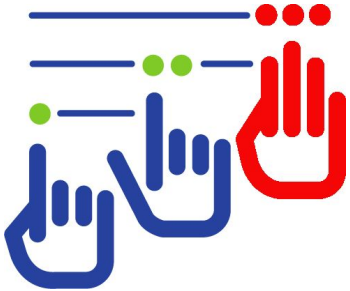
No submission

Track 3: PMC / Ranking C



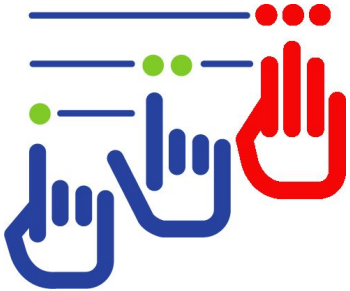
#	Submission	Authors	solved
1	**Ganak**	Mate Soos Kuldeep Meel	**83**

Track 4: PWMC / Ranking A



#	Submission	Authors	solved
1	**DPMC**	Vu Phan Jeffrey Dudek Moshe Vardi	**35**

Track 4: PWMC / Ranking B



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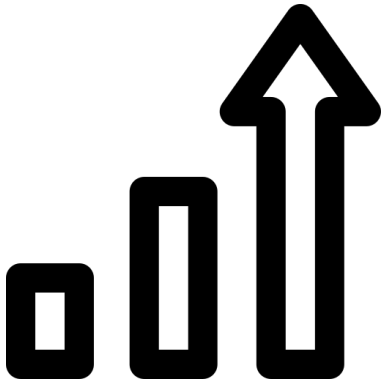
Conclusion



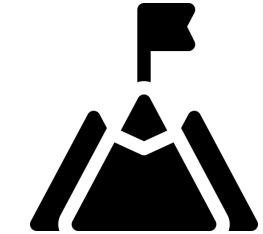
Small Improvements

1) New Participants

2) More open source solvers / Solver quality improved

3) New Track / Better Ranking

Challenges



- Hard meaningful instances for Weighted Model Counting
  Pls submit probabilistic reasoning instances?

- Multiple Rankings

- Cluster resources

Thanks go to

- All the **participants of the 2022 competition**!
  - For their submissions and active participation and
  - Their incredible patience
- All **contributors of instances**!
- Judge: **Mario Alviano** (University of Calabria) and Technical Advisor: **Daniel Le Berre** (CRIL Lens)
- **Aaron Stump** (StarExec)
- **ZIH** (**TU Dresden)** for providing cluster resources

Organizers

Johannes K. Fichte
TU Wien
Markus Hecher
TU Wien

Judges

Mario Alviano
(Univ. of Calabria)

Martin Gebser
(Univ. Klagenfurt)

Technical Advisor

Daniel Le Berre
(CRIL Lens)

Sponsors...

StarExec

TU WIEN

TECHNISCHE UNIVERSITÄT DRESDEN

ZIH
Zentrum für Informationsdienste und Hochleistungsrechnen

data experts
Systemberatung
Softwareentwicklung
Informationsverarbeitung

Outlook

Edition 2023

- Same Tracks?
- Same Ranking?
- Virtual meeting to prepare the next iteration

Hope we see you in 2023.

mccompetition.org