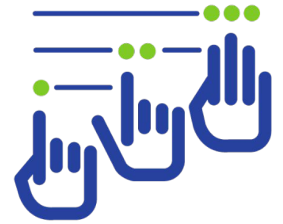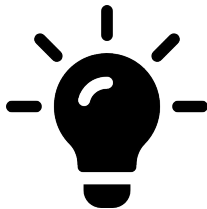Johannes K. Fichte (TU Dresden)
Markus Hecher (TU Wien)

SAT 2021, Virtual Event

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
- **2nd iteration**

- **Report of 2020 on ArXiv and in press with JEA**
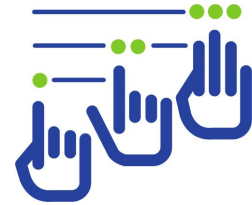
Sad news

Last year, Toni Pisjak rescued the evaluation by supporting us and providing us with resources on a cluster in Vienna.
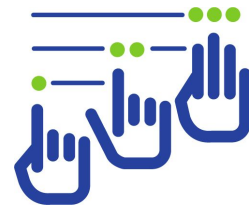
Sadly, Toni passed away in April.

He was one of the most friendly, eager, and reliable colleagues.
Always understating his valuable insights and incredible support.

Toni you will be missed.

Tracks

Tracks

1) Model Counting (high accuracy)
Input: Propositional formula F in CNF
Task: Output the number of satisfying assignments to F

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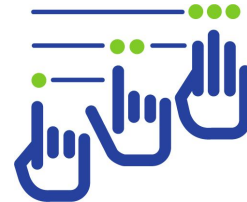Input: F + weight for each literal in F
Task: Output sum of weights of all models, where the weight of
                a model is the product of the weights of its literals.

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)
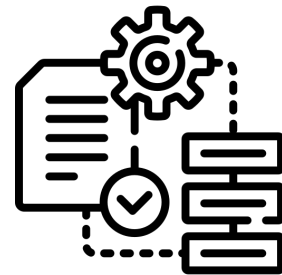
Tracks

4) Model Counting (lower accuracy)
Input: Propositional formula F in CNF
Task: Output the number of satisfying assignments to F

System

1. StarExec
2. 60min per instance
3. 8 GB main memory (RAM) per instance

Procedure
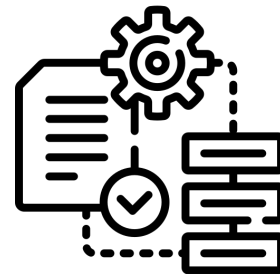
Evaluation Procedure

- 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 solver on StarExec

Submission Requirements

Bottom Line

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

Only: high accuracy Track 1-3 (relative error < 1%)
         low accuracy Track 4 (relative error < 80%)

Participants

Participants

Track	Groups
MC	10 (+2)
WMC	6 (+0)
PMC	5 (+2)

Knowledge Compilation (c2d, d4)	Component Caching (SharpSAT-TD, gpmc, bob)
Dynamic Programming (MC2021_swats, DPMC, SUMC2, pc2bdd)	Approximate Counting (MC2021_swats, nus-narasimha)

12 M

Benchmark Submissions 2021

- Guillaume Escamocher; Barry O'Sullivan

- Ivor Spence

- Daniel Pehoushek
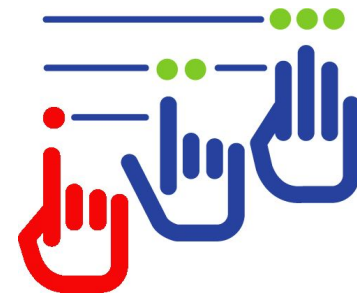
Thank you!

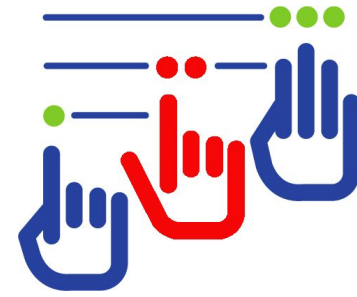*Instances -> Zenodo*

Descriptions -> Report

+ 2020 Instances

Results

Track 1: MC

#	Submission	Authors	From	solved	excl
1	**SharpSAT-TD**	Tuukka Korhonen Matti Järvisalo	Helsinki	**78**	0
2	**nus-narasimha (2021)**	Kuldeep Meel Mate Soos Shubham Sharma	Singapore	**61**	1
3	d4 (2021)	Jean-Marie Lagniez Pierre Marquis	Lens	51	0
4	gpmc (v1.0.1)	Kenji Hashimoto Takaaki Isogai	Nagoya	38	0
5	MC2021_swats	Sylwester Swat	Poznan	34	0
6	DPMC (2021)	Vu Phan Jeffrey Dudek Moshe Vardi	Huston	34	0
7	c2d (v3.0.0 MC 2021)	Adnan Darwiche	LA	29	0
8	bob	Daniel Pehoushek	Chincinati	11	0
9	SUMC2	Ivor Spence	Belfast	7	0

Total:
100
private
instances

Track 2: WMC

| #	Submission	Authors	From	solved	excl
1	**SharpSAT-TD**	Tuukka Korhonen Matti Järvisalo	Helsinki	**90**	1
2	**d4 (v2021)**	Jean-Marie Lagniez Pierre Marquis	Lens	**80**	0
3	**c2d (v3.0.0 MC2021)**	Adnan Darwiche	LA	79	0
4	DPMC (v2021)	Vu Phan Jeffrey Dudek Moshe Vardi	Huston	46	0
5	nus-narsimha (v2021)	Kuldeep Meel Mate Soos Shubham Sharma	Singapore	25	37

Track 3: PMC
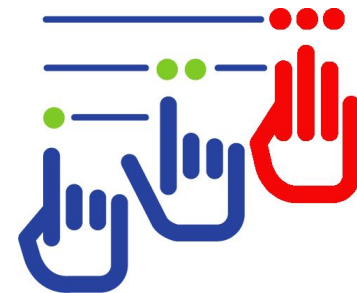
#	Submission	Authors	From	solved	excl
1	**gpmc (v1.0.1)**	Kenji Hashimoto Takaaki Isogai	Nagoya	**70**	0
2	**d4 (2021)**	Jean-Marie Lagniez Pierre Marquis	Lens	**57**	0
3	**nus-narasimha (2021)**	Kuldeep Meel Mate Soos Shubham Sharma	Singapore	**52**	22
4	pc2bdd	Kenji Hashimoto Takaaki Isogai	Nagoya	41	0
5	ProCount (2021)	Vu Phan Jeffrey Dudek Moshe Vardi	Huston	21	0
6	c2d (v3.0.0 MC 2021)	Adnan Darwiche	LA	4	0

Track 4: MC (harder, lower accuracy)

| #	Submission	From	solved	excl
1	**SharpSAT-TD**	Helsinki	**68**	0
2	**Nus-narasimha (2021)**	Singapore	**65**	0
3	**d4 (2021)**	Lens	**53**	0
4	c2d (v3.0.0)	LA	**50**	0
5	DPMC (2021)	Huston	48	0
6	MC2021_swats	Poznan	40	0
7	SUMC2	Belfast	26	0

Conclusion
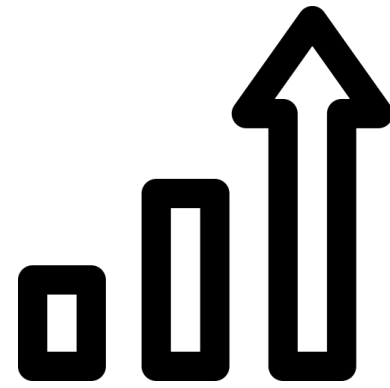
Improvements

1) New Participants (sharpSAT-TW solved +20% over 2nd on Track 1)

2) More open source solvers: D4 (2021) + hopefully c2d (3.0.0)

3) Solvers mostly improved housekeeping

Summary Organization 2021
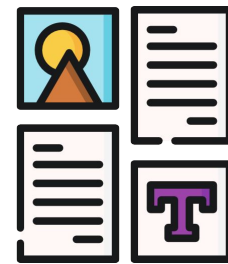
- Updated Format (compatibilities)
  Poll soon, which for 2020 or 2021 format for the community
  We will update previously published instances (Zenodo)
- Zenodo
  - Instances (Sept) / public+private instances already on website
  - Solvers (binaries) / encourage developers to place sources on Zenodo

- Full Report on ArXiv (Oct)
- Idea: full evaluation of all existing instances on 2020 and 2021 solvers
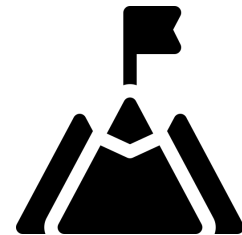
Challenges

- **Hard meaningful instances for Weighted Model Counting**
  (we had crafted instances -> meaningless low/high weights)
  Probabilistic reasoning instances?

- Accuracy/Confidence on Tracks

- **Cluster resources essential**
  - Dresden
    - worked really well, esp. amount of available resources
  - StarExec
    - limited resources -> time to scheduling takes quite long

Thanks go to

- All the **participants of the 2021 competition**!
  - For their submissions and active participation and
  - Their incredible patience
- All **contributors of instances**!
- Judge: **Martin Gebser** (AAU Klagenfurt) and Technical Advisor: **Daniel Le Berre** (CRIL Lens)
- **Peter Schüller** (TUW) **and Aaron Stump** (StarExec)
  - Help and Resources with StarExec
  - Customizing our judges for optil.io
  - ...
- **ZIH** (**TU Dresden)** for providing cluster resources

Send us photos for a virtual group picture ;-)

Organizers

Johannes K. Fichte
TU Dresden
Markus Hecher
TU Wien, U. Potsdam

Judge
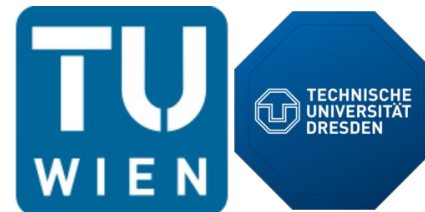Martin Gebser
(AAU Klagenfurt)

Technical Advisor
Daniel Le Berre
(CRIL Lens)

Sponsors…

Outlook

Benchmarks!!!

We need more instances or generators.

- Interesting instances
  - Please submit!
  - Especially for instances from probabilistic reasoning

- **We need you!**

- Is it interesting to solve hard circuits?

Edition 2022

Track 1: Model Counting

- 1A: approximate/heuristic
- 1B: nearly exact (high precision)
- 1C: exact (arbitrary precision)

Track 2: Projected Weighted Counting

- 1A: approximate/heuristic
- 1B: nearly exact (high precision)

Track 3: Projected Counting?
Track 4: Weighted Model Counting?
Currently Lack of useful Benchmarks

Call for benchmarks in September.

Hope we see you in 2022.
mccompetition.org