

# EmergenTheta

Variations on Symbolic Transition Systems  
(Competition Contribution)

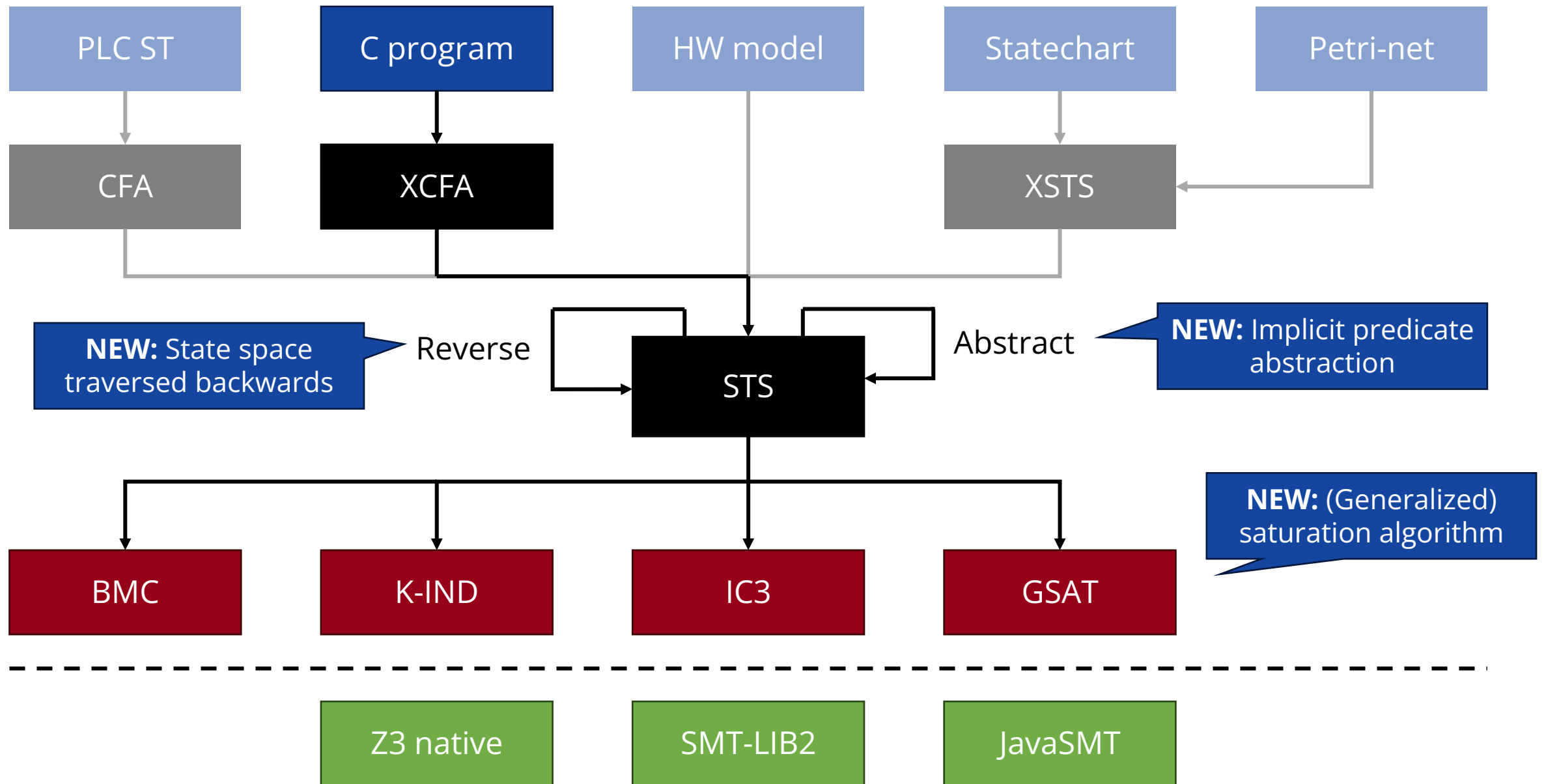
Milán Mondok, **Levente Bajczi**, Dániel Szekeres, Vince Molnár



**Critical Systems  
Research Group**

# EmergenTheta

- Theta: our main entry, **ARG-based CEGAR** analysis
- EmergenTheta: **sandbox** entry for **experimental analyses**
  - **STS**-based architecture with **diverse algorithm** backends and **model transformations**
  - Combined in a **sequential portfolio**
  - Debut: SVCOMP'24
- Novelties in 2025:
  - (Generalized) **saturation** algorithm
  - Implicit **predicate abstraction, reversed** exploration



# EmergenTheta

Saturation (180s)

**Z3, GSAT, maxenum: 1000**

BMC (30s)

Z3

MathSAT

CVC5

K-Induction (300s)

Z3

CVC5

MathSAT

IMC (rest)

Z3, **abstract**

Z3, **reversed**

CVC5, **reversed**

MathSAT, **reversed**



# Results

Config	284 tasks solved in preprocessing!		unreach-call		termination		no-overflow	
	safe	unsafe	safe	unsafe	safe	unsafe	safe	unsafe
Preprocessing	1	0	Saturation: 185 correct verdicts				0	0
GSAT	152	33	0	0	0	0	0	0
BMC	209	134	11	38	34	143		
K-Induction	380	34	4	1	6	4		
Abstract K-Induction	37	0	112	0	63	1		
Reversed K-Induction	2	0	0	0	0	0		
Sum	781	201	Abstraction and reversal: we solved tasks that we couldn't solve without them					
Wrong	2	0	20	0	15	0		

# Strengths and Weaknesses

- *NoOverflow* and *Termination* categories using TransVer
  - **284 tasks** correctly solved by sanity checks in preprocessing
  - Some bugs, but some have already been fixed
- Oversight in the portfolio:
  - K-induction was run instead of IMC  
→ more robust portfolio engine needed?
- **Reversal** and **predicate abstraction**: both enabled us to solve more tasks
- Generalized **saturation**: 152 + 33 correct verdicts  
→ promising results, but only correctness witnesses this year
- 37 incorrect results: mishandling of floating point NaN values and preprocessing bugs (fixed since competition)