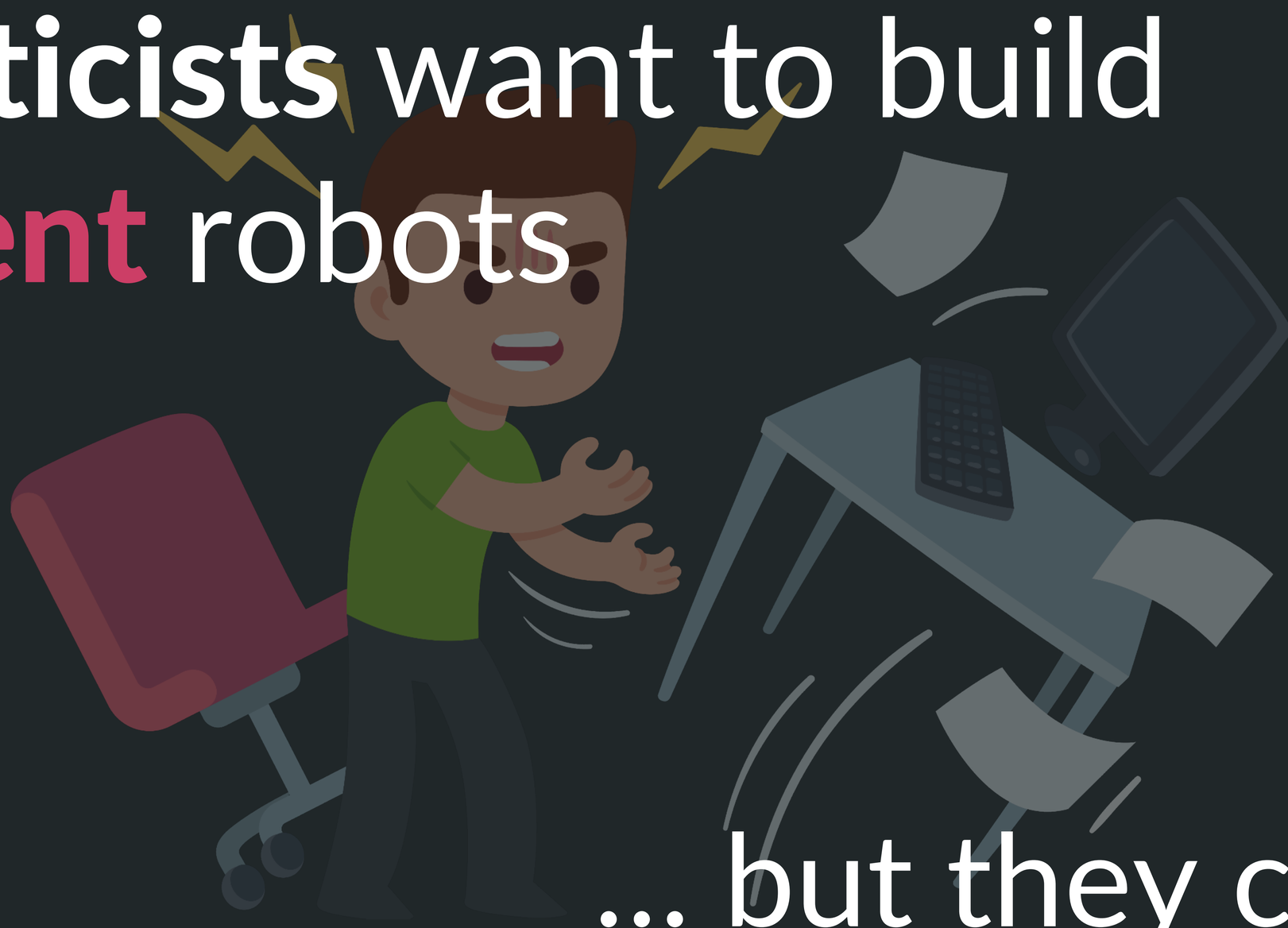
download for clickable version!

Roboticists want to build **resilient** robots



... but they can't!

WHY CAN'T THEY?

- Low Technology Readiness for safety assessment in robotics
- Lack of formal verification targeting ROS-based systems
- Diverse engineering culture: control theory, mechanics, electrical, software engineers.
- ROS offers modularity, but reconfiguration is not practiced;
- When interacting with the real-world, robots face uncertainty.

HOW TO CHANGE THIS SITUATION?! (clickable!)

ARCHITECT

DESIGNING FOR **OBSERVABILITY**, **MODIFIABILITY** AND **SEAMLESS INTEGRATION** OF INDEPENDENTLY DEVELOPED COMPONENTS [1]

ADAPT

TAMING UNCERTAINTY:
A **GOAL-ORIENTED** APPROACH [2]

COMBINING
CONTROL THEORY AND
ARTIFICIAL INTELLIGENCE [3]

VERIFY

MAPPING PROPERTIES FROM
CONTROL THEORY AND
SOFTWARE ENGINEERING [4]

COMBINING
OFFLINE **MODEL CHECKING**
AND ONLINE **DATA MINING** [5]

VALIDATE

MODELLING ADVERSARIAL ROBOTS WITH **BEHAVIOR TREES** FOR **SCENARIO-BASED TESTING** [6]

INVESTIGATORS


R. CALDAS


P.PELLICCIONE


T. BERGER

REFERENCES (clickable!)

[1]. Rodrigues, G., et al. "An architecture for mission coordination of heterogeneous robots." JSS, 2022.

[2]. Solano, G., et al. "Taming uncertainty in the assurance process of self-adaptive systems: a goal-oriented approach." IEEE/ACM SEAMS, 2019.

[3]. Caldas, R., et al. "A hybrid approach combining control theory and AI for engineering self-adaptive systems." IEEE/ACM SEAMS, 2020.

[4]. Caldas, R., et al. "Towards Mapping Control Theory and Software Engineering Properties using Specification Patterns." IEEE ACSOS-C, 2021.

[5]. Rodrigues, A., et al. "A learning approach to enhance assurances for real-time self-adaptive systems." IEEE/ACM SEAMS, 2018.

[6]. Queiroz, R., et al. "A Driver-Vehicle Model for ADS Scenario-based Testing." *(under review)* IEEE Transactions on Intelligent Vehicles, 2022.

RICARDO.CALDAS@CHALMERS.SE

TAKE A PICTURE FOR
DIGITAL POSTER
FULL PAPERS!

CHALMERS
UNIVERSITY OF TECHNOLOGY

WASP | WALLENBERG AI, AUTONOMOUS SYSTEMS AND SOFTWARE PROGRAM