



# TEMPEST - Shielding Against the Storm

Advisor: **Stefan Pranger**

## Motivation



**Are you interested in logic and reinforcement learning?  
Do you like working with high-performant code?  
Let's combine all three!**

In settings in which a reinforcement agent operates in environments with inherent randomization, **probabilistic model checking** allows us to make precise, real-time capable analysis of the safety of all available actions at runtime. This information can be used to mask unsafe actions from the agent in order to guarantee safety.

**TEMPEST** [1] is the new tool for synthesis of both strategies and shields for different types of models. It is built on top of the powerful model checker **STORM** [2]. Our aim is that our tool becomes a leading synthesis tool, especially designed to be easily usable in reinforcement learning settings. We are extending our tool with a wider range of model checking algorithms and additional features. If you're interested to become a part of this project, please contact us! For a more detailed overview visit: [tempest-synthesis.org](http://tempest-synthesis.org).

## Goals and Tasks

- > Chat with us and pick the topic that is the most interesting for you.
- > We will discuss the principles of probabilistic model checking.
- > Implement an algorithm to construct strategies.
- > Test your implementation.

## Literature

- > S. Pranger et al.  
TEMPEST–Synthesis Tool for Reactive Systems and Shields in Probabilistic Environments  
[arXiv preprint arXiv:2105.12588 2021](https://arxiv.org/abs/2105.12588)
- > C. Dehnert et al.  
A storm is coming: A modern probabilistic model checker  
[International Conference on Computer Aided Verification](#)

## Courses & Deliverables

- Master Project**  
Project code  
Report  
Presentation
- OR –
- Master's Thesis + Diplomandinenseminar (CS)**  
Initial presentation  
Project code  
Thesis (60+ pages)  
Final presentation

## Recommended if you're studying

- CS    ICE    SEM

## Prerequisites

- > Interest in Logics and Mathematics
- > Interest in C++-Programming

## Advisor Contact

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