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.

Goals and Tasks

> Chat with us and pick the topic that is the most interesing 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

> C. Dehnert et al.
> A storm is coming: A modern probabilistic model checker
> International Conference on Computer Aided Verification

Courses & Deliverables

☑ **Introduction to Scientific Working**
Short report on background
Short presentation

☑ **Bachelor Project**
Project code and documentation

☑ **Bachelor's Thesis**
Project code
Thesis
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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