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

stefan.pranger@iaik.tugraz.at