

Safety Layer for Learning-based Controllers

Our layer for safety requirement satisfaction in dynamic systems

Helps industries with safety-critical processes

Who want to deploy learning-based controllers while respecting safety requirements

By adding a model able to identify and modify unsafe actions

And unlike usual methods, allows for constraint satisfaction with statistical guarantees

1. Problem / Challenges (inkl. Target Group)

Users want to deploy learning-based controllers in a safe manner, e.g. in the automotive, energy or Industry 4.0 domain.

Most controllers focus on how to accomplish a given task with the best performance. However, real systems are usually bounded by safety constraints that allow for safe operation. Learning policies that respect such constraints is challenging.

2. Solution / Results

Our system can be integrated to existing controllers and check if the chosen control actions will respect pre-determined safety constraints. Unsafe actions are modified to ensure a safe operation while maintaining the maximum performance.

3. Benefit / Offer

- Can be integrated into existing controllers
- Only modifies unsafe control actions (i.e., keeps performance in safe regions).
- Can adapt to changes in dynamics
- Uncertainty quantification allows for robust operation

4. USP

- Focus on safety without losing utility
- Developed by a team of control theory, safety engineering and AI experts
- Experience with the implementation backed by strong theoretical background

5. Publications

<https://s.fhg.de/publica2022>

<https://s.fhg.de/ICMLA>

<https://s.fhg.de/publica2023>

<https://s.fhg.de/ceur-publication>



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