

Safety Layer for Learning-based Controllers

Our layer for safety requirement satisfaction in dynamic systems helps industries with safety-critical processes that want to use learning-based controllers while respecting safety requirements. Unlike conventional methods, the Fraunhofer IKS model is able to identify and modify unsafe actions. It enables constraint satisfaction with statistical guarantees.

Challenge: Learning policies must respect safety constraints

Users want to deploy learning-based controllers in a safe manner, for example 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.

Solution: Modify unsafe control actions

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

Your benefits:

- Our layer can be integrated into existing controllers.
- It only modifies unsafe control actions (i.e., keeps performance in safe regions).
- It can adapt to changes in dynamics.
- Our uncertainty quantification allows for robust operation.

Why work with Fraunhofer IKS:

- 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.

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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