

# Portfolio optimization of risk management actions in safety critical systems

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# Portfolio optimization for risk-informed decisions

## ■ Objectives

- Develop methods for identifying portfolios of risk management actions to minimize ***residual risks*** at different levels of risk management cost
- Applications especially to nuclear and other ***safety critical systems***

## ■ Why portfolio optimization?

- Prioritization based on ***risk-importance measures*** fails to account for costs and feasibility constraints (budget, technical, legal)
- Component-based optimization may lead to ***sub-optimal risk management plans***

## Publications

### ■ Journal papers

- A. Mancuso, M. Compare, A. Salo, E. Zio, T. Laakso. “*Risk based optimization of pipe inspections in large underground networks with imprecise information*”, Reliability Engineering and System Safety 152, pp. 228-238 (2016).
- A. Mancuso, M. Compare, A. Salo, E. Zio. “*Portfolio optimization of safety measures for reducing risks in nuclear systems*”, Reliability Engineering and System Safety 167, pp. 20-29 (2017).

### ■ Under review

- A. Mancuso, M. Compare, A. Salo, E. Zio. “*Portfolio optimization of structural safety measures for dynamic systems*”, Submitted to Reliability Engineering and System Safety.

## Plans

- Optimization model for the selection of management policies which dynamically depend on the state of the system components (information provided by sensors and inspections).
- Project on “*Portfolio optimization of security measures against cyber threats*” in collaboration with International Institute for Applied Systems Analysis.