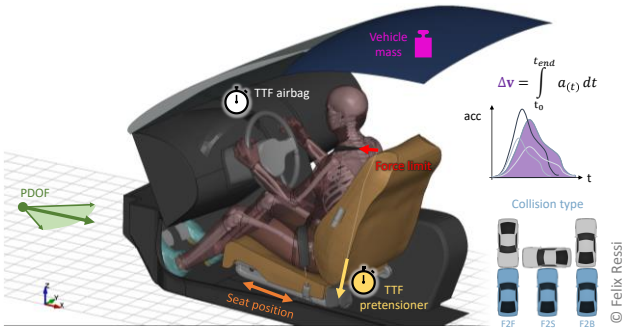
Vehicle Safety Institute

Frontiers of Occupant Safety:
A Comprehensive Analysis Using Stochastic Human Body Model Simulations

Background

The performance of occupant safety systems like airbags and seat belts is commonly determined using a few well-defined load cases. However, a growing body of research attempts to improve on this approach by varying relevant input parameters stochastically. While it facilitates statistical analyses and offers a broader perspective, the approach also adds complexity. A concrete application is the stochastic replication of individually reconstructed real-world car crashes, in order to understand the most essential influence factors on similar collisions.

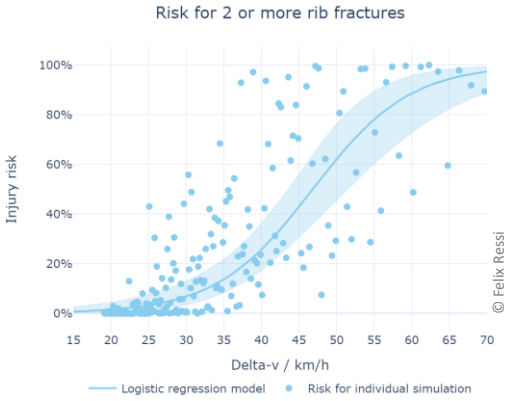


Overview on some exemplary variables available for variation

This thesis proposal offers an exciting chance to contribute to this dynamic area of research, offering insights into the intersection of engineering, accident reconstruction, trauma biomechanics and data science.

Goals

- Identification of a relevant occupant safety load case based on a real-world crash and the essential influence factor for the stochastic variation.
- Analysis of the effects of all factors on occupant injury risk in several body regions, using detailed human body models.



Exemplary rib fracture risk results for 200 stochastic HBM simulations.

Tasks

- **Familiarization** with HBM-based occupant safety and stochastic simulation.
- **Conceptualization** of an appropriate simulation matrix.
- **Creation of simulation setup** based on existing modules provided by VSI.
- **Simulation and analysis** of all variants of the simulation matrix.
- **Deduction** of the effects of all influence factors considered for variation.

Suitable for students of

- MSc Mechanical Engineering/Mechanical Engineering and Business Economics

Organisational overview

- Start: anytime
- Performance bonus: € 2.500,- (up to 4000,- for excellent work)
- Contact: Felix Ressi, felix.ressi@tugraz.at