

Cluster of Excellence „Internet of Production“

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Goal

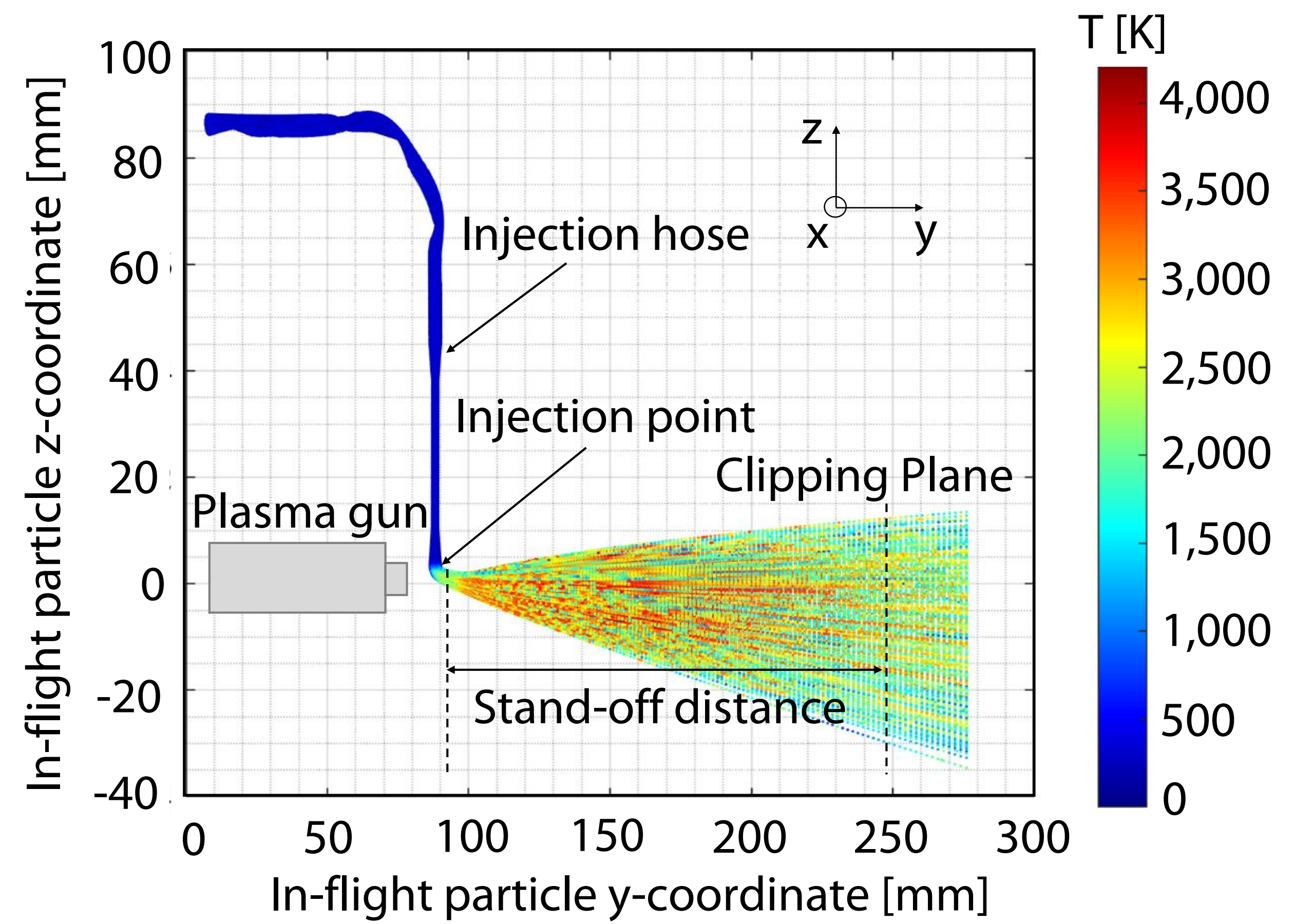
Methods

Results

Outlook

Acknowledgment

- Design and integrate production specific AI and machine learning methods for automatic provision of Digital Shadows
 - Data-based model reduction and composition
 - Design virtual agents for real-time process control
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- Replacing the computationally intensive simulations of plasma jet with Support Vector Machine (SVM)
 - Defining a set of representative process parameters using different Design of Experiments (DOE):
 - Latin Hypercube Sampling (LHS)
 - Central Composite Design (CCD)
 - Performing simulations & preparing training data by creating an automated data preparation pipeline
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- Demonstrating the suitability of SVM metamodels for prediction of particle properties in plasma spraying
 - Fast and precise Digital Twin of plasma spraying
 - Accurate prediction of the mean particle properties
 - Clear replication of the trend of single particle properties
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- Journey to digital shadow of plasma spraying: Combining further reduced models and experimental data analytics of the process chain
 - Composition of real-time data acquisition from production machines for process control



Exemplary simulated particle trajectories and their temperatures in plasma jet

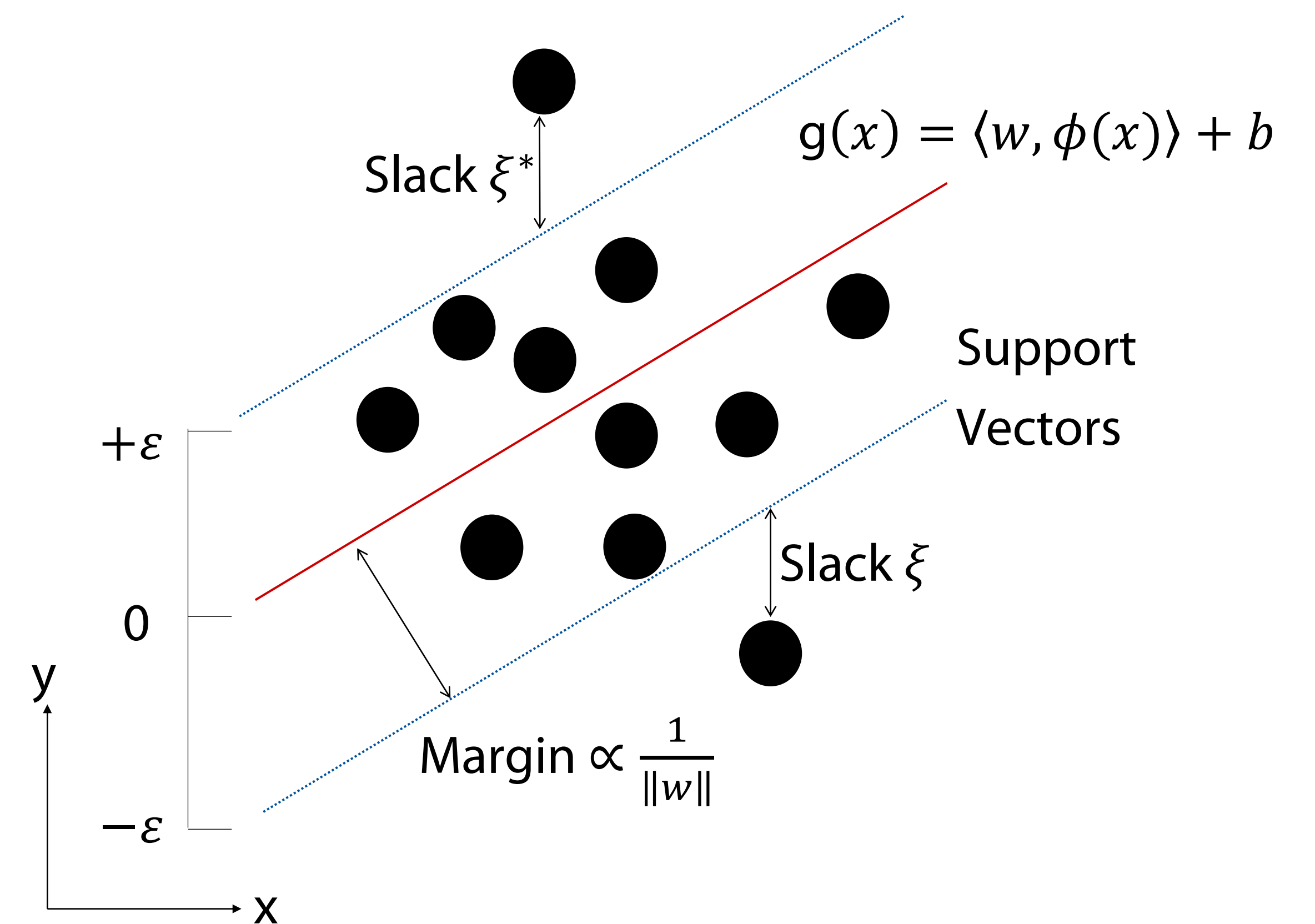
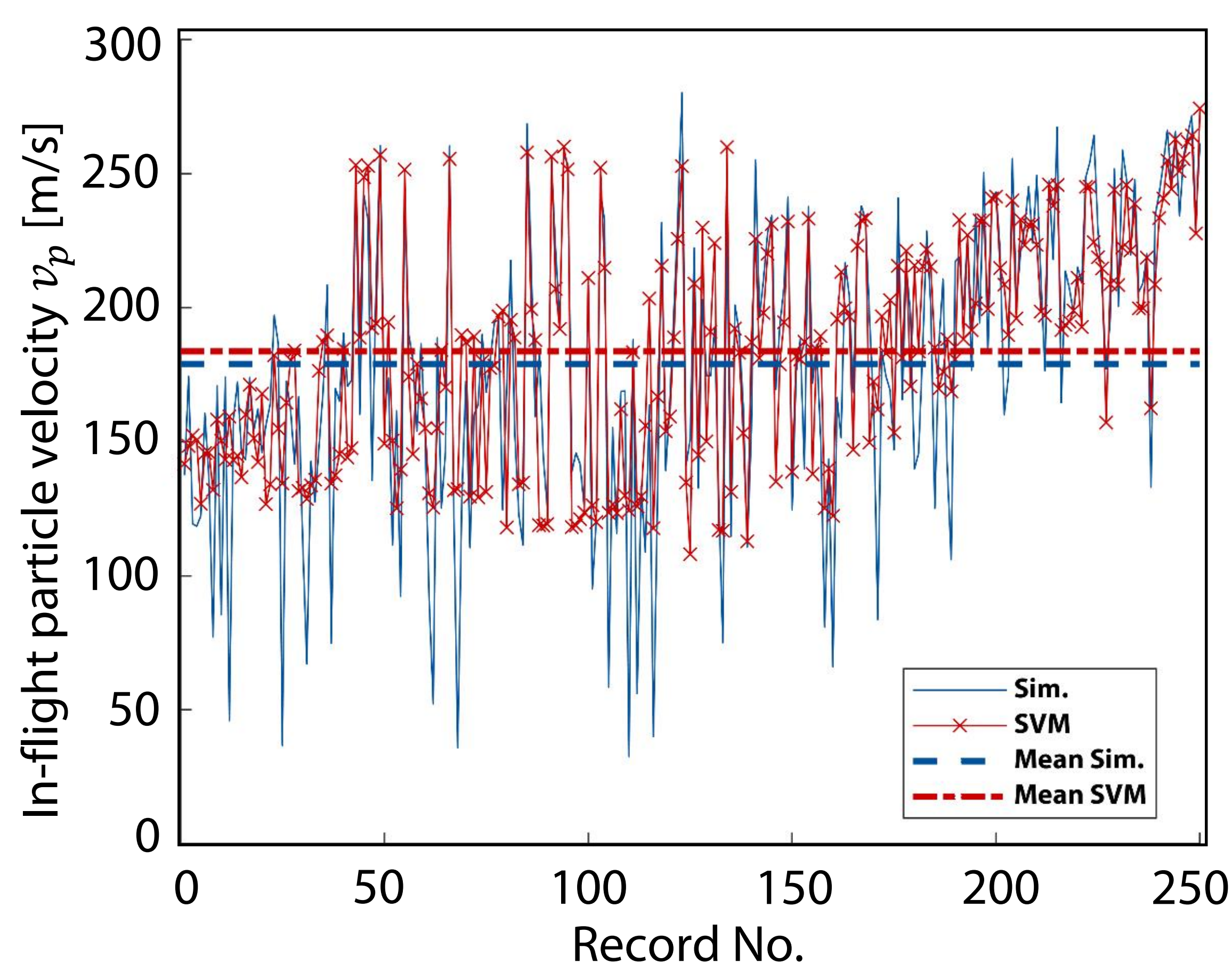
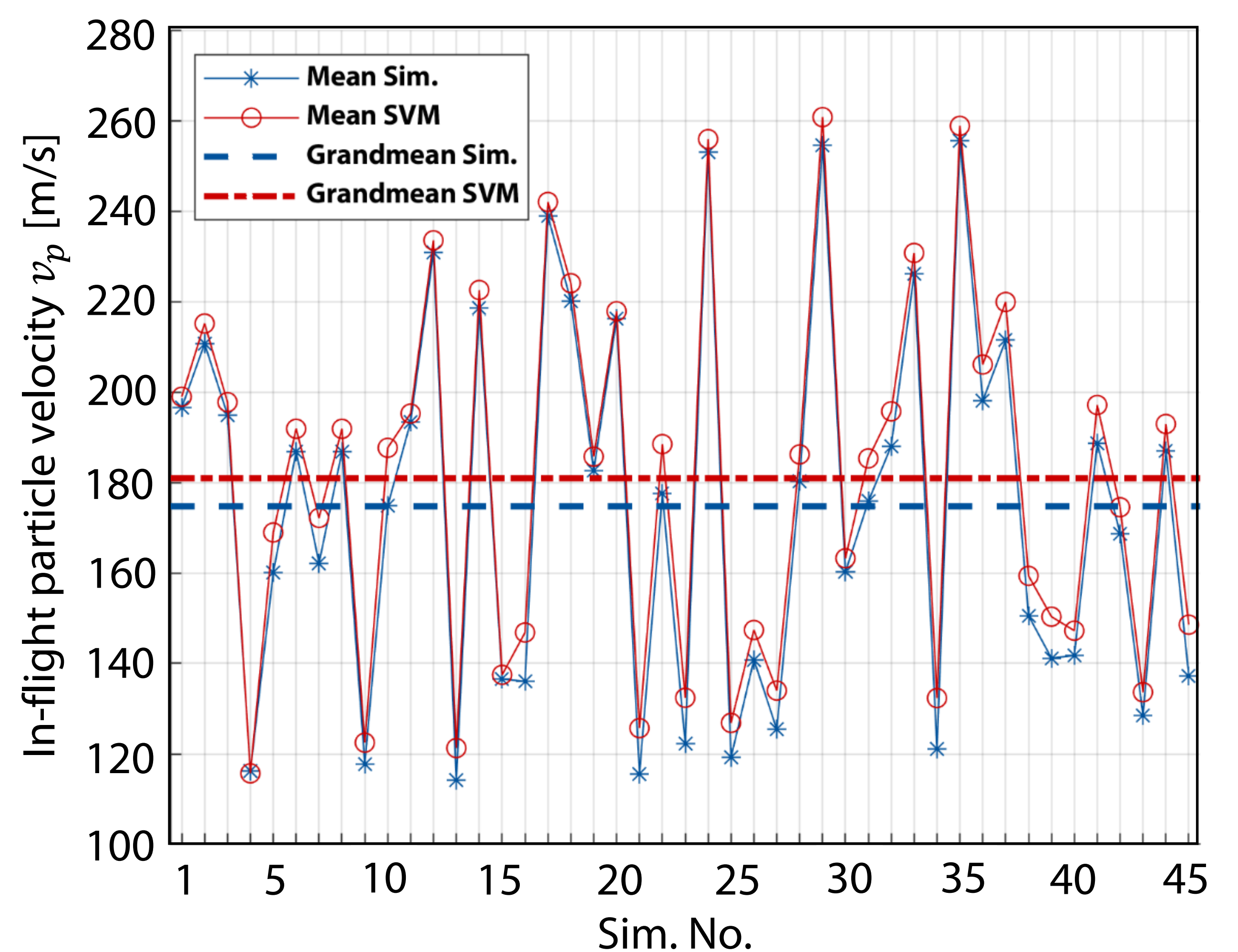


Illustration of the support vectors, margins and slack variables in SVM regression



Exemplary trend of the predicted particle velocities of SVM model from LHS data sets



Results of the mean particle velocities per simulation for SVM model from LHS data sets

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