

## Platooning for Improved Safety and Efficiency of Semi-Trucks (PISES – III)

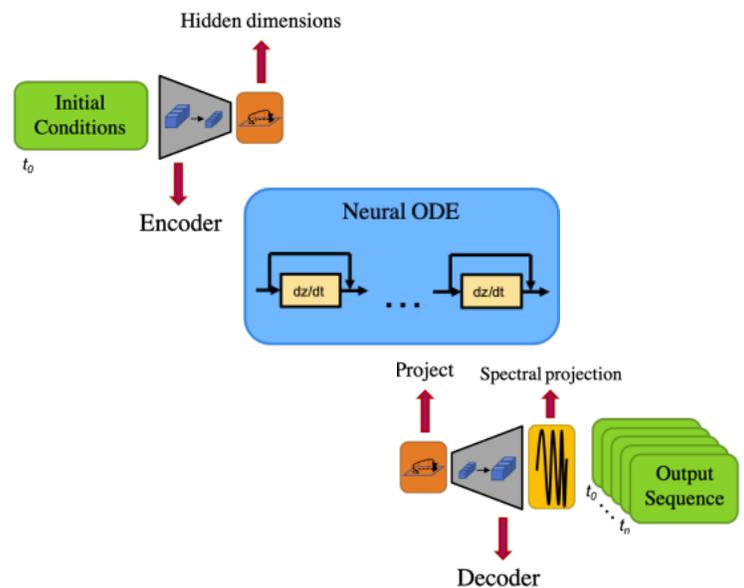
**Purpose:** Electrification and platooning are two major technology drivers that can lead to both lower costs and emissions for transportation. This project builds upon previous work to identify the synergy between these two mega-trends around platooning and electrification. In the first year of the project, the research team built models to estimate the effects of platooning on the aerodynamics and subsequently, the energy consumption. In the second year of the project, the team built machine-learning (ML) models to determine the aerodynamics of platoons. In this project, the team addresses several key questions around (i) the effect of platooning configurations and added sensor stack for platooning and (ii) trade-off between safety and energy savings related to velocity smoothing.

**Approach:** The research team evaluated different neural network architectures, model constraints, and then evaluated the data and trained the model.

### Key Finding:

- Building on previous research in scientific ML and turbulence modeling with ML, this work further demonstrates the effectiveness of data-driven models to be useful surrogates for approximating fluid dynamics and the benefits of platooning.

**Conclusion:** As the field of machine learning and fluid dynamics rapidly develops, others have been pushing the bounds of data-driven physics-informed models, even incorporating traditional solver machinery into their architectures. The research team sees the space of possible models as a spectrum, where there is a tradeoff in computational cost and accuracy as one incorporates increasingly more physics into the model. It will be vital moving forward for practitioners to strike the right balance for their specific application, and therefore in-depth studies of models along this spectrum will be crucial to the community.



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### Project Record:

<https://ppms.cit.cmu.edu/projects/detail/309>

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