AUTONOMOUS SYSTEMS INITIATIVE

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AI-based Advance Control Methods for next generation combustion engines

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Emission Reduction

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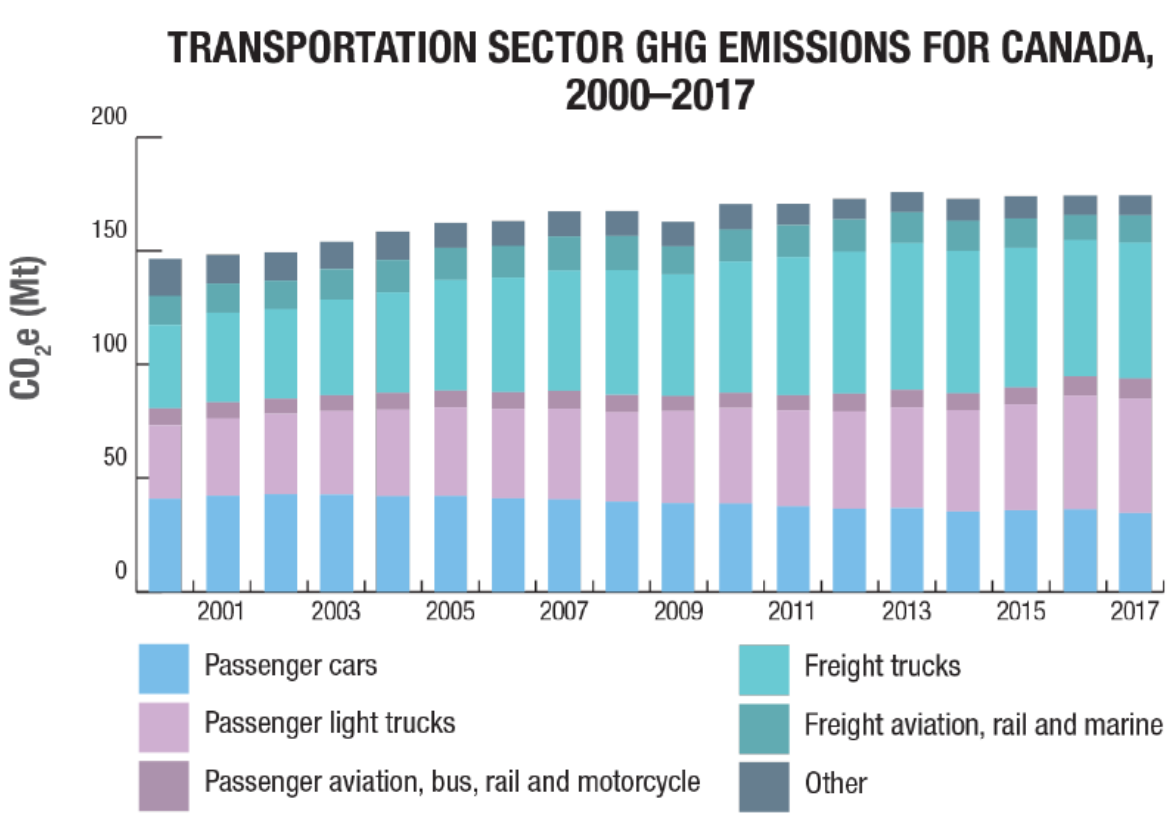
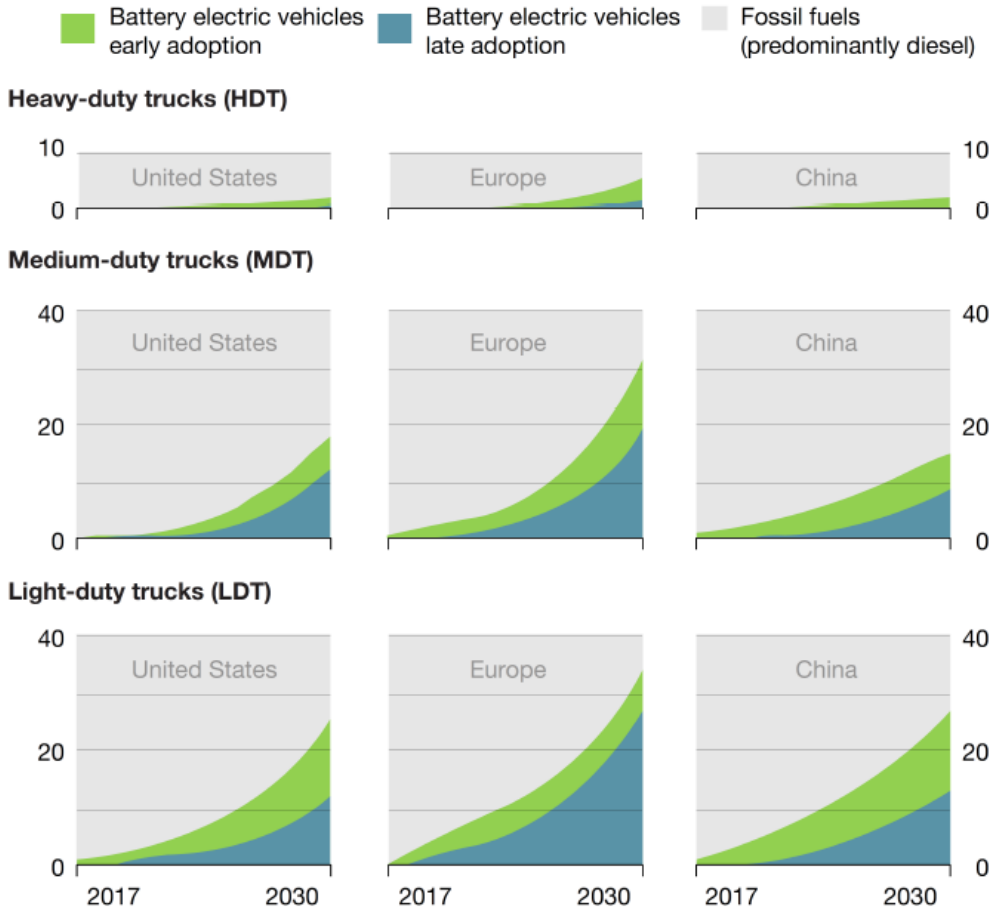
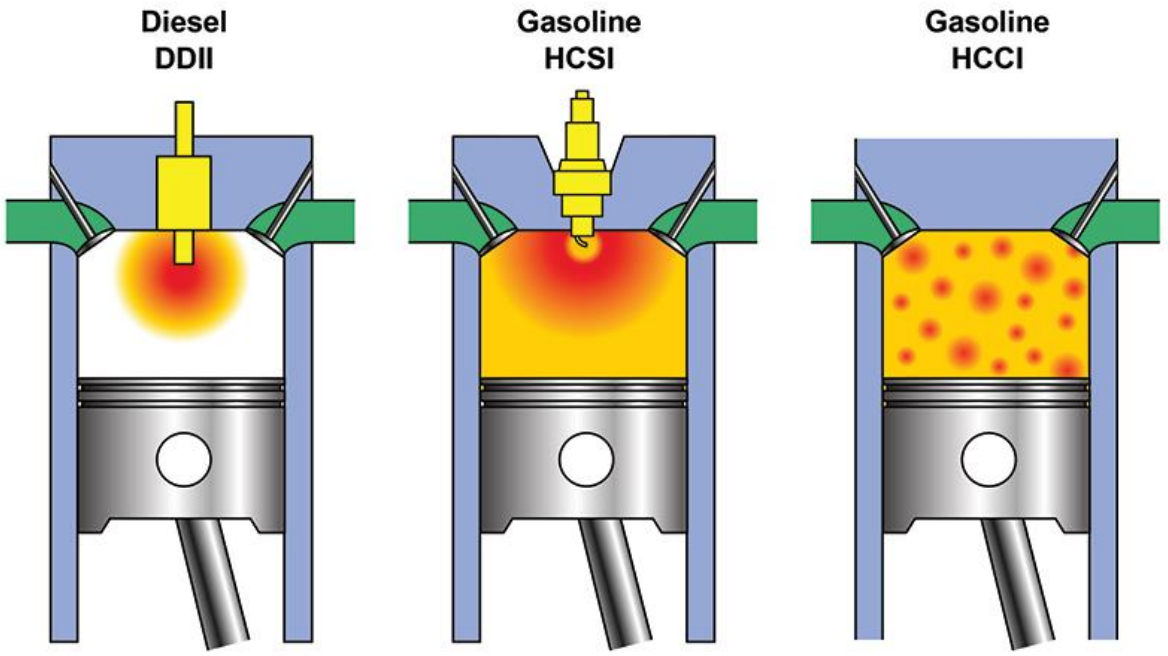




Homogenous charge compression ignition



Advantages:

- Reduced NOx emissions by up to 99%
- Efficiency benefits up to 30%
- Can operate on bio-fuels and e-fuels

Challenges:

- Difficult to control ignition timing
- Complex physical combustion modeling is required

Model Predictive Control challenges

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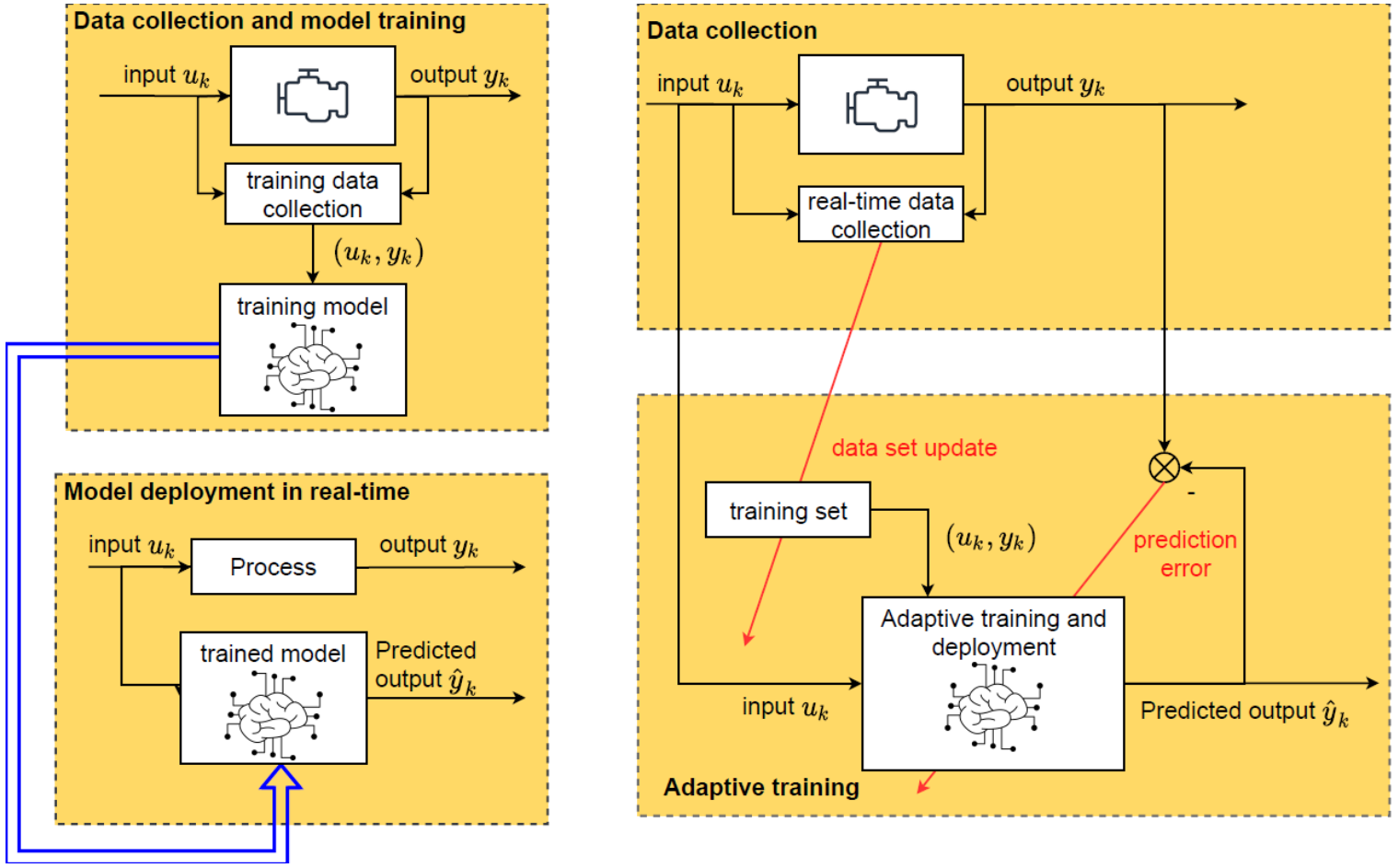
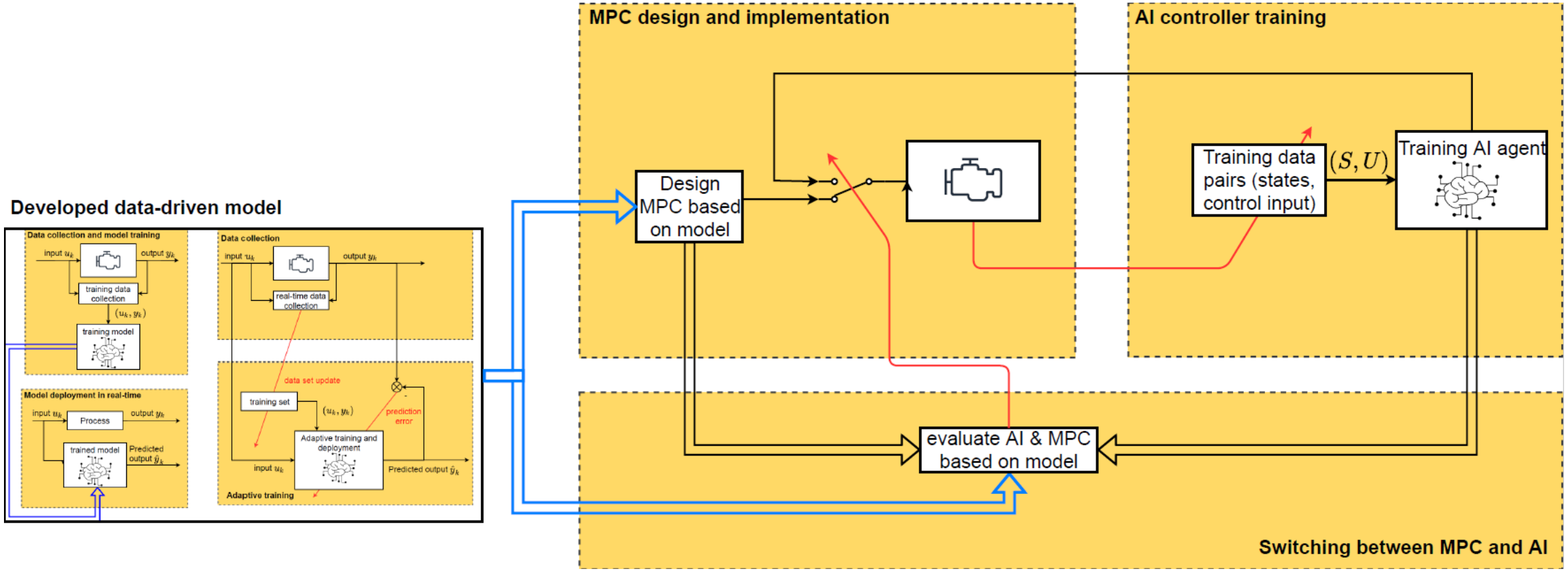
Strengths	Challenges	Our solution
Simple multivariable design	Model quality significantly affects controller performance	Offline AI based modeling along with online adaption
Constraint enforcement	High computational load	AI based MPC imitation
Performance optimization		

Di Cairano, Stefano, and Ilya V. Kolmanovsky. "Automotive applications of model predictive control." *Handbook of Model Predictive Control*. Birkhäuser, Cham, 2019. 493-527.

AI-based modeling



AI-based MPC imitation



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Thank you

Questions?