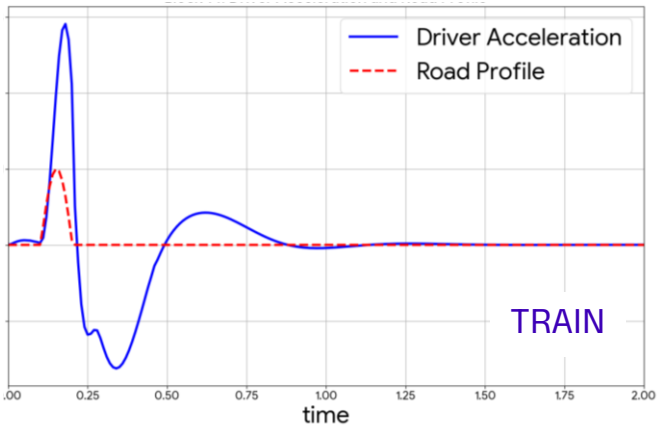
JuliaHub

Governed by PHYSICS, driven by DATA:

Orchestrating the SMART Prototype Lifecycle with AI AGENTS

2026 SMART PROTOTYPES SUMMIT – Udine, MAY 19th-22nd, 2026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1.25
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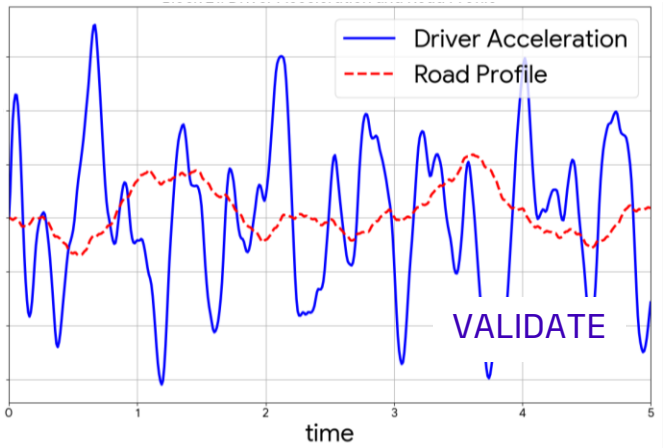
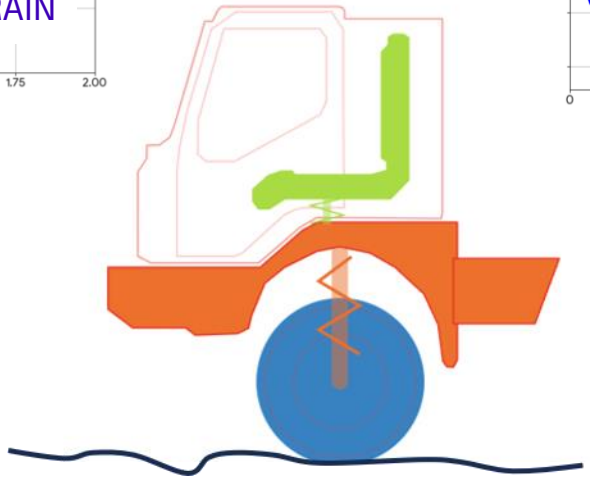
1.75
2.00
time

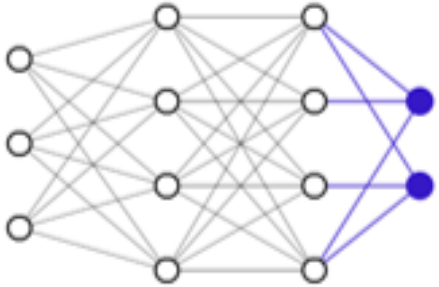

Driver Acceleration
Road Profile
VALIDATE
0
1
2
3
4
5
time

DATA



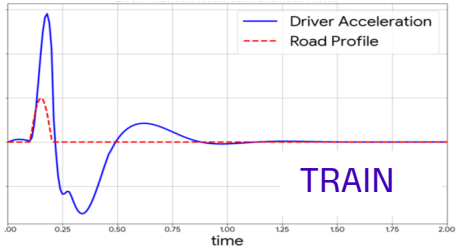
SMART

DATA



Not so

SMART



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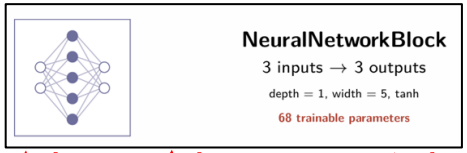
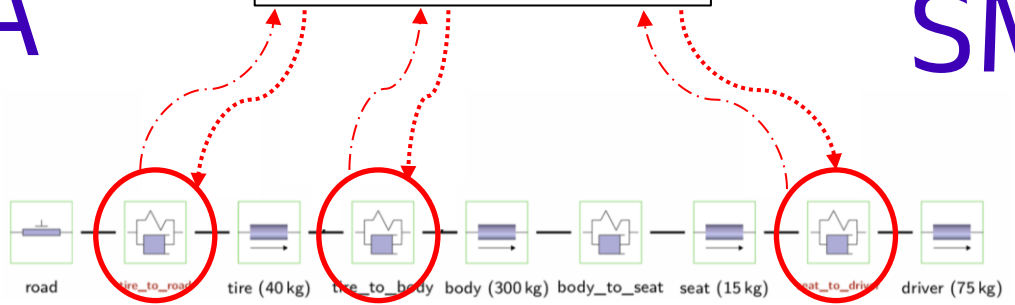
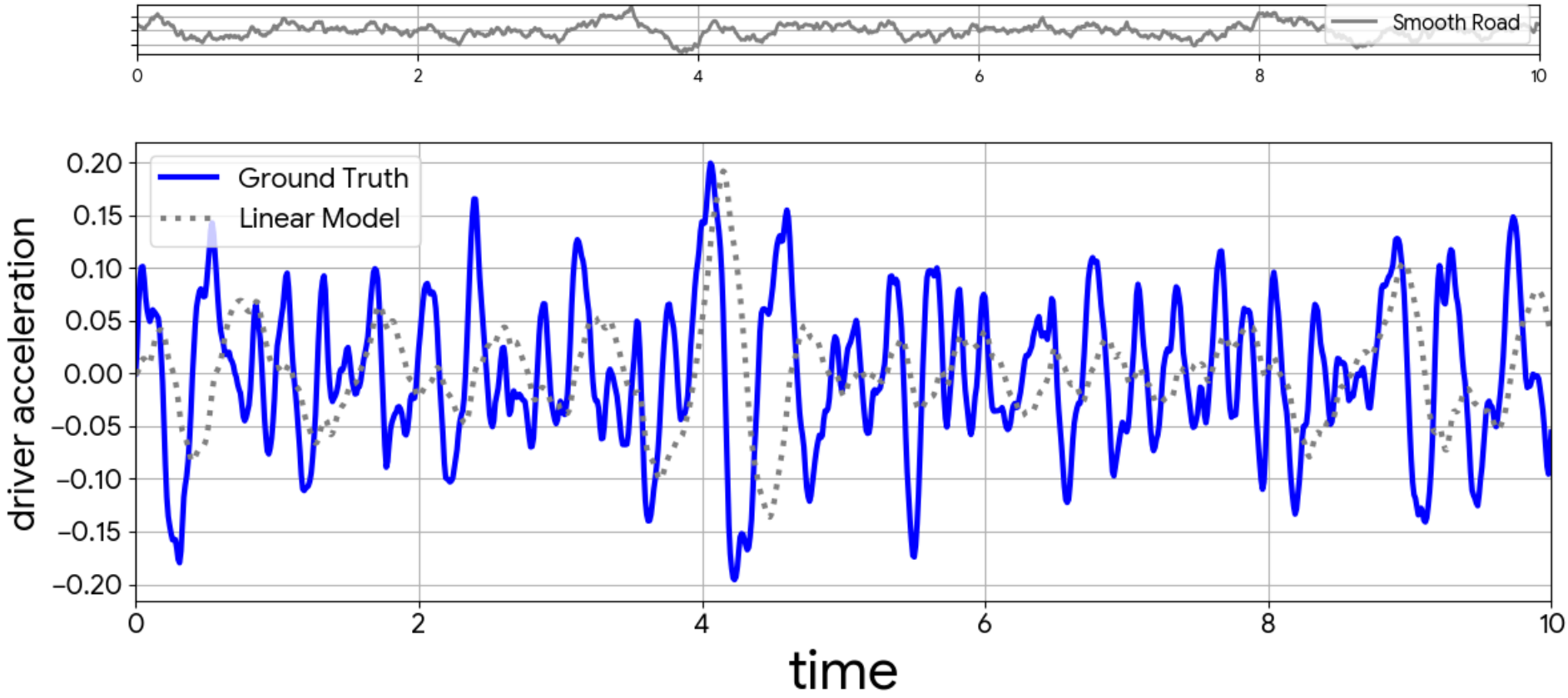


SMART



PHYSICS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0
2
4
6
8
10
Ground Truth
Linear Model
driver acceleration
0.20
0.15
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−0.05
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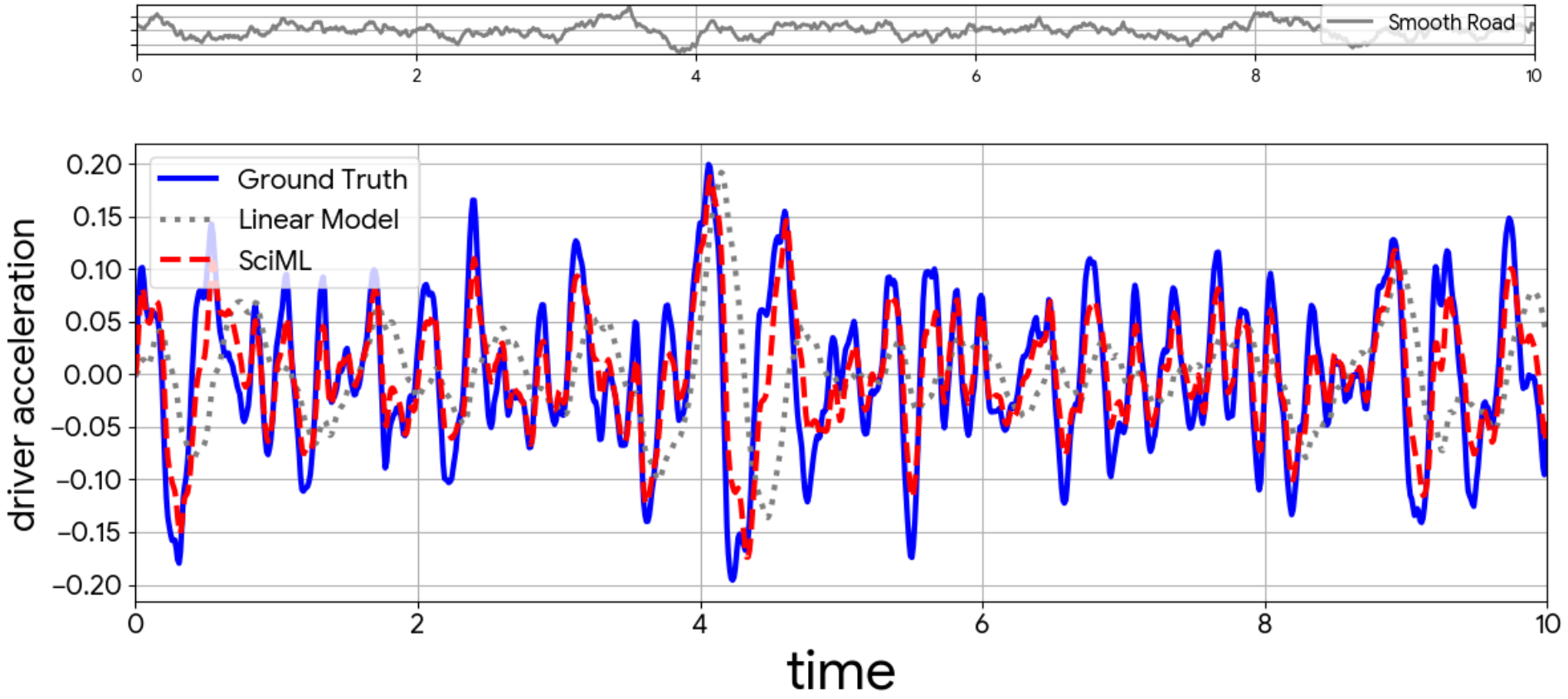
−0.20
0
2
4
6
8
10
time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4
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8
10
Ground Truth
Linear Model
SciML
driver acceleration
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−0.10
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−0.20
time


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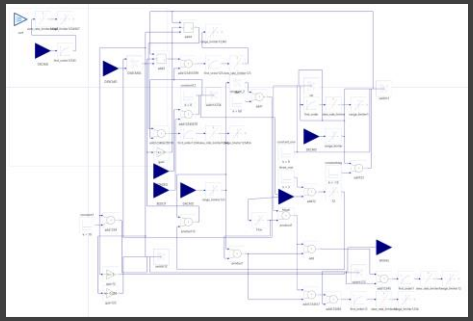


Symbols

All forces and moments are referred to the body axis system. See figures 2 and 3 for body and axis sign conventions and control-surface nomenclature, respectively.

b	reference span, ft
$\bar{c}$	reference length, ft
C_A	axial-force coefficient (+ indicates force in aft direction)
C_l	rolling-moment coefficient
C_m	pitching-moment coefficient
C_N	normal-force coefficient (+ indicates force in up direction)
C_n	yawing-moment coefficient
C_X	axial-force coefficient (+ indicates force in forward direction)
C_Y	side-force coefficient
C_Z	normal-force coefficient (+ indicates force in down direction)
F_X, F_Y, F_Z	aerodynamic force in X, Y, and Z direction, respectively
h	height of center of gravity above ground, ft
M	Mach number
M_X, M_Y, M_Z	moment about X, Y, and Z axis, respectively
$\mathbf{P}_j$	curve-fit polynomial coefficient vector
p, q, r	roll, pitch, and yaw rate, respectively
S	reference area, ft^2
α	angle of attack, deg (+ indicates aircraft nose up)
β	angle of sideslip, deg (+ indicates aircraft nose left)
	(+ indicates trailing edge down)
$\delta_{bf_{lr}}$	lower right body-flap deflection, deg (+ indicates trailing edge down)
$\delta_{bf_{ul}}$	upper left body-flap deflection, deg (+ indicates trailing edge down)
$\delta_{bf_{ur}}$	upper right body-flap deflection, deg (+ indicates trailing edge down)
δ_{lg}	landing-gear position, deg (0 = up, 98 = down)
δ_r	rudder deflection, deg (+ indicates trailing edge left)
δ_{wf_l}	left wing-flap deflection, deg (+ indicates trailing edge down)
δ_{wf_r}	right wing-flap deflection, deg (+ indicates trailing edge down)
$\delta_{\Delta f}$	differential body-flap deflection, deg (+ indicates right wing down)

Subscripts:

o	basic configuration
GE	ground effect

Abbreviations:

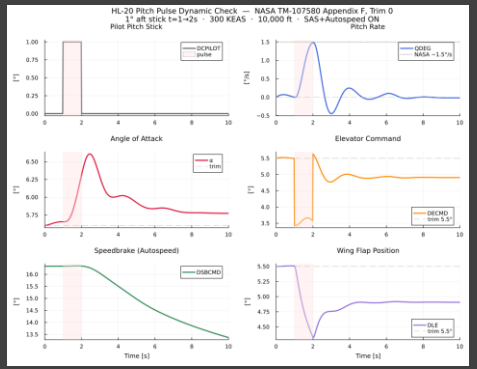
ANL	aircraft nose left
ANR	aircraft nose right
ANU	aircraft nose up
RWD	right wing down
TED	trailing edge down
TEL	trailing edge left
TEU	trailing edge up

Model Description

Origin of Data

Most data for this model originated from wind tunnel tests. Low-speed ($M = 0.08$) data were obtained in the Langley 30- by 60-Foot Tunnel; higher

500 pages



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