KIDELTA LEARNING

Scalable AI for Automated Driving

Final Event | March 09, 2023

Automotive Suitability

TP4 overview

1

Automotive suitability

Transferring AI from the Lab to the Car

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embedded system

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Jernej Furman, CC BY 2.0

Transferring AI from the Lab to the Car

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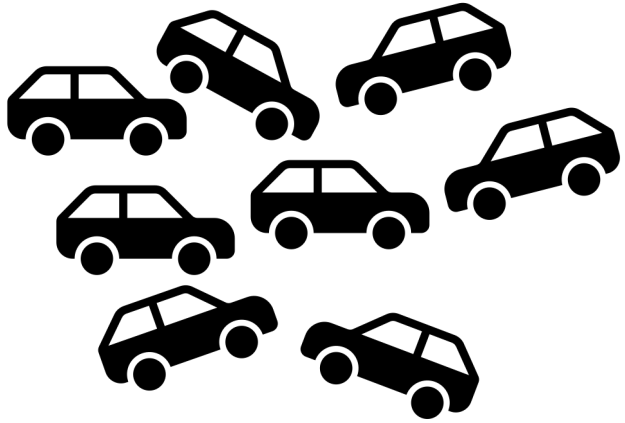
lab data (real/synthetic)

novel objects

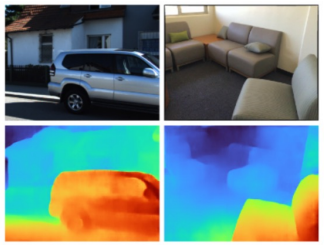
abnormal behaviour

unexpected szenarios

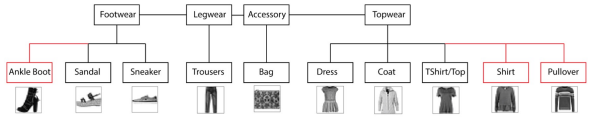


The Real World Delta

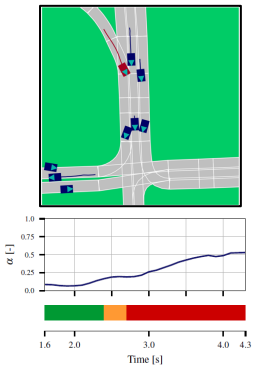
Uncertainty for Depth Estimation



Few-shot Learning for Robust Depth Estimation

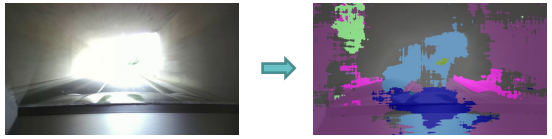


Hierarchical Novelty Detection

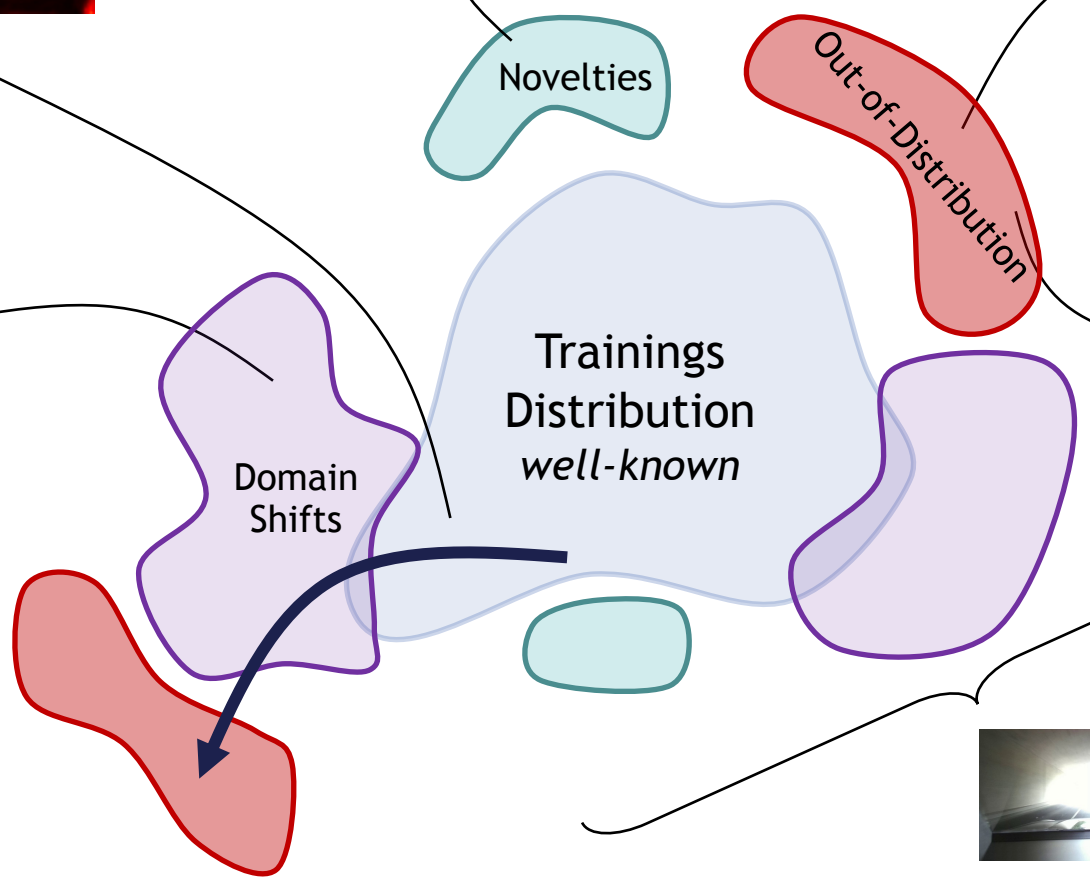


Detection of Abnormal Driving

Risk-minimizing Driving Policies



Robustness Analysis and Taxonomy of Corner Cases

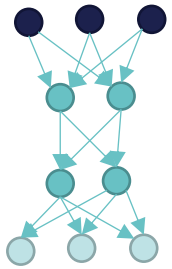


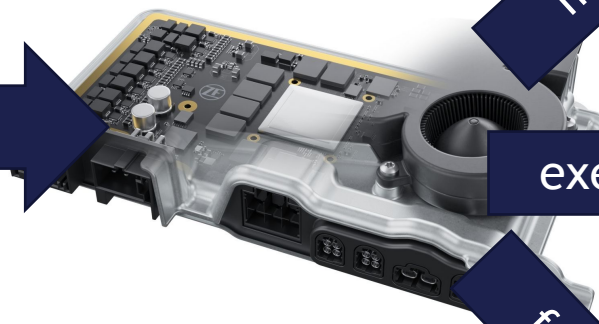
The Embedded Systems Delta

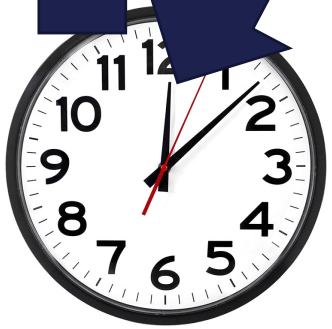
trained
neural network

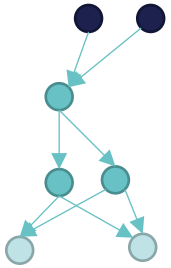
source code

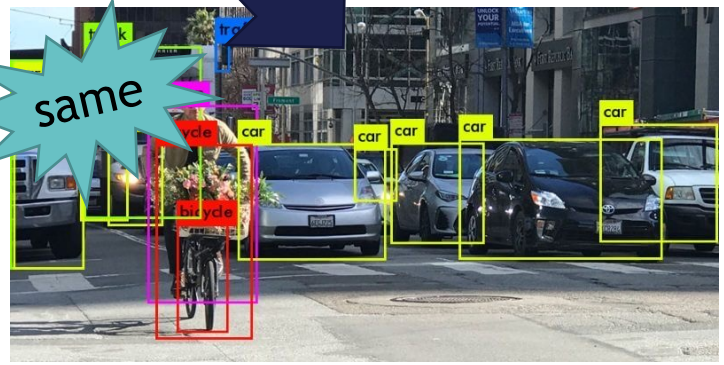
embedded system











modify

predict

transform

compiler

compiler

memory

exec. time

function

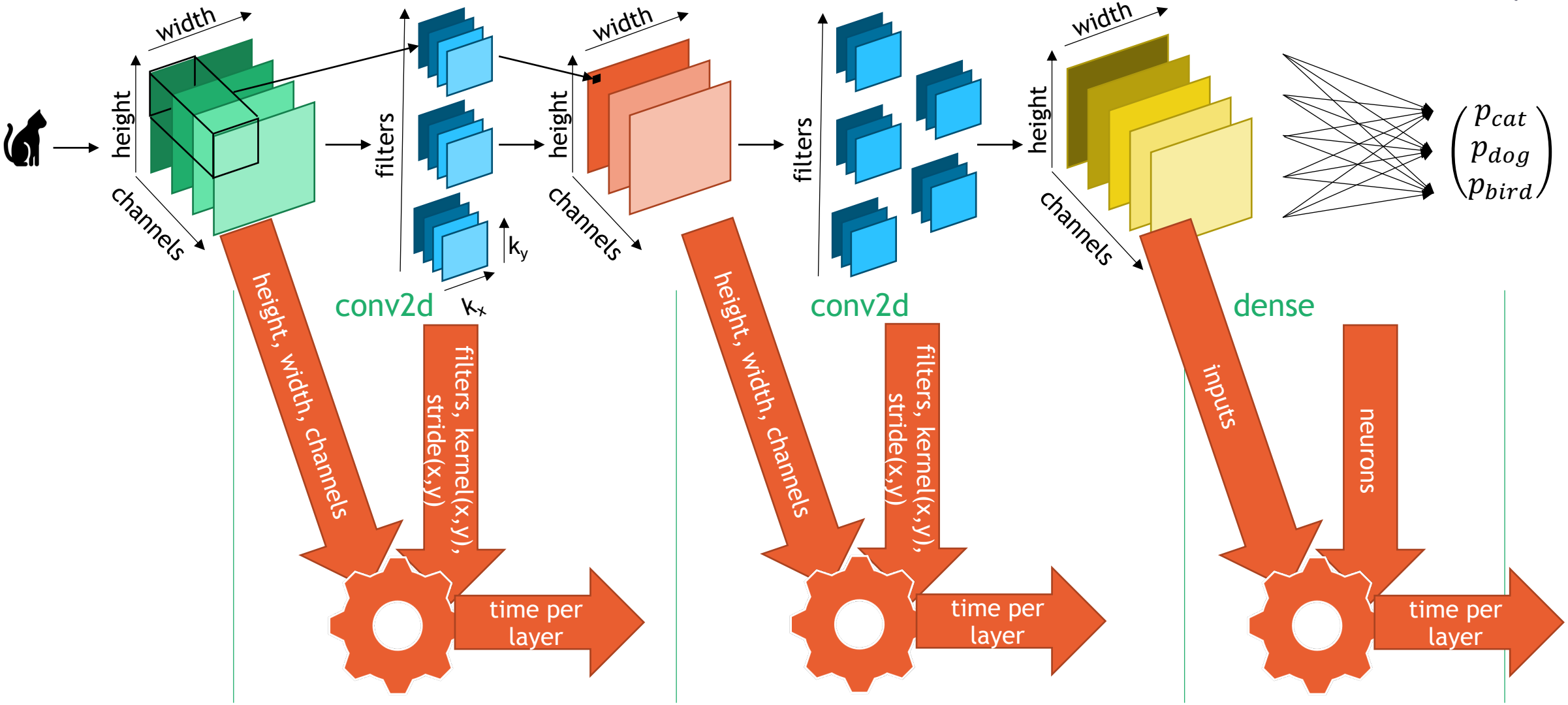
Highlight-Presentations

- Domenik Helms – AI Hardware Modeling
- Saqib Bukhari – Interpretable Pruning
- Philipp Schröppel – Robust Depth Estimation

2

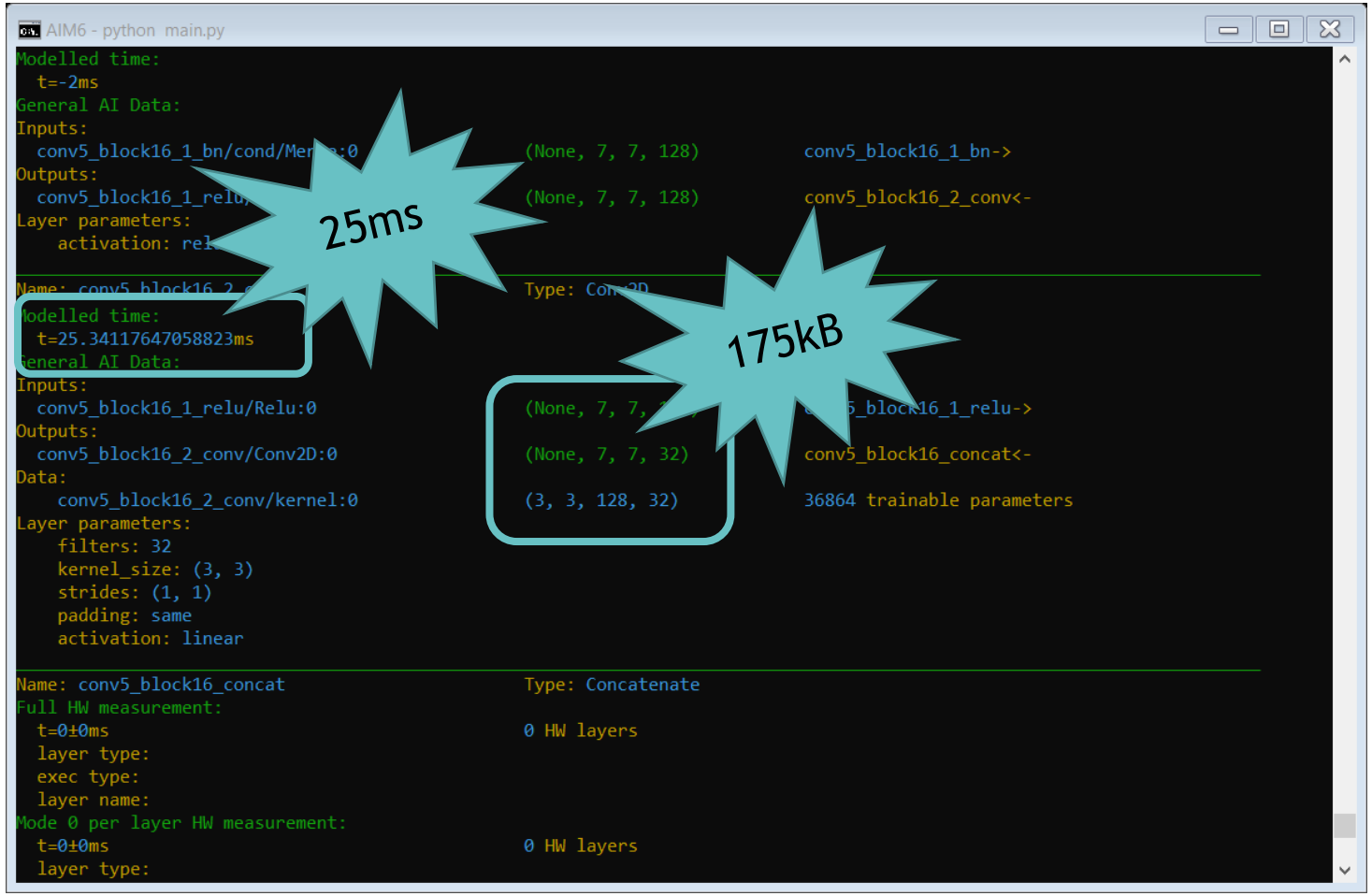
Prediction

Modeling idea

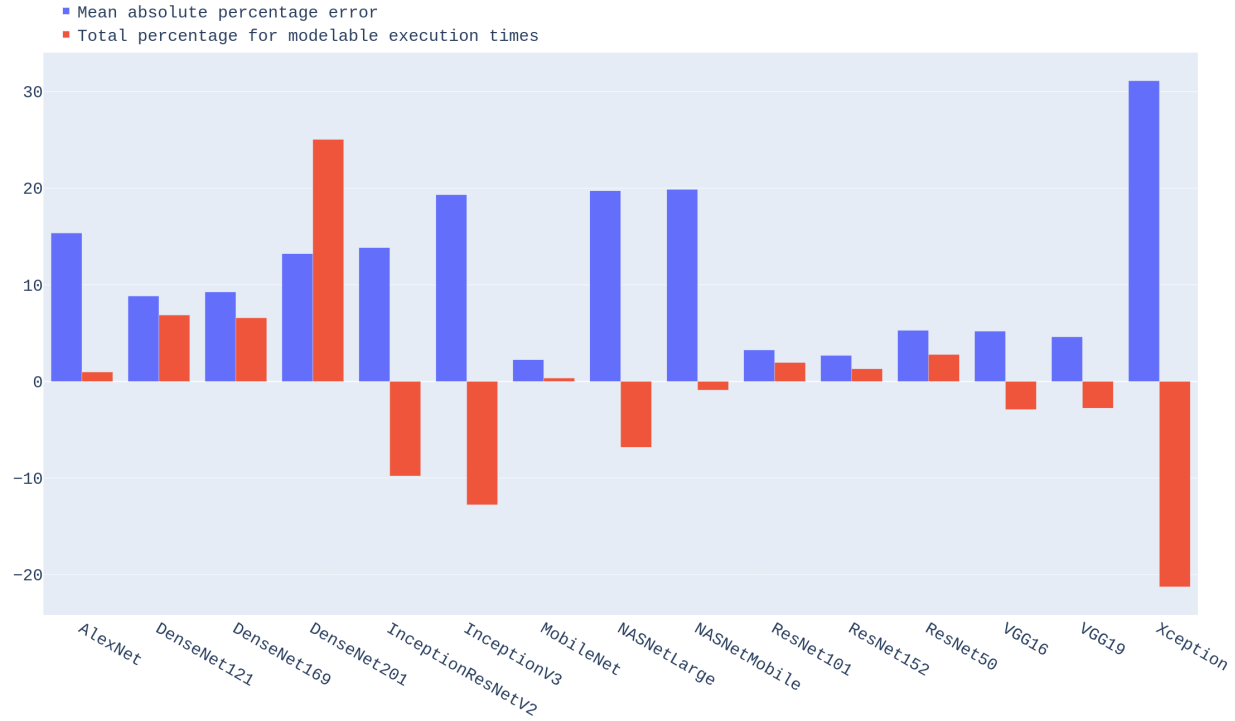


Prediction of AI Properties

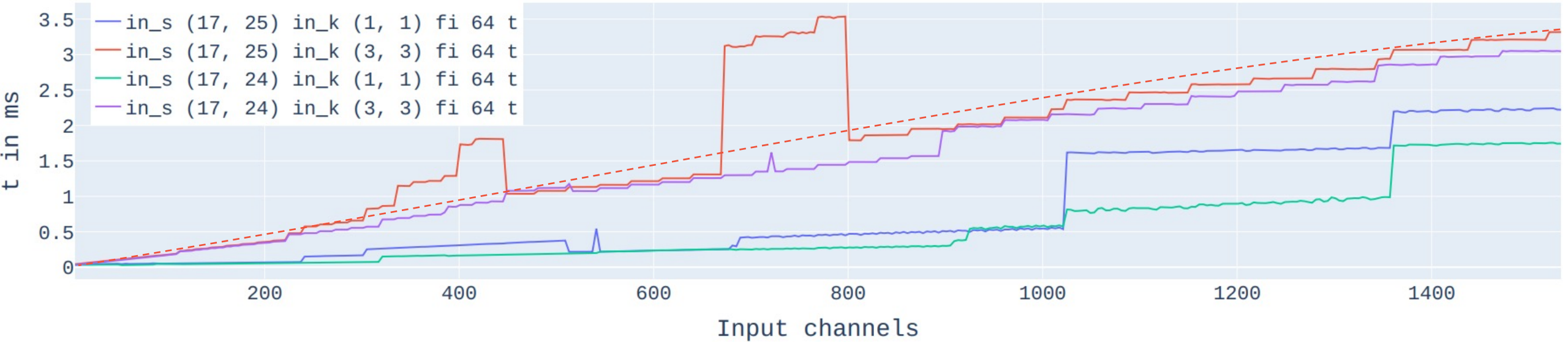
```
290
291
292  # get AI benchmark from the repository
293  ai = tf.keras.applications.DenseNet121()
294
295  # initialize the aimodel withj the benchmark
296  graph = aimodel.Aimodel(ai)
297
298  # print and write out report
299  graph.write_report()
```



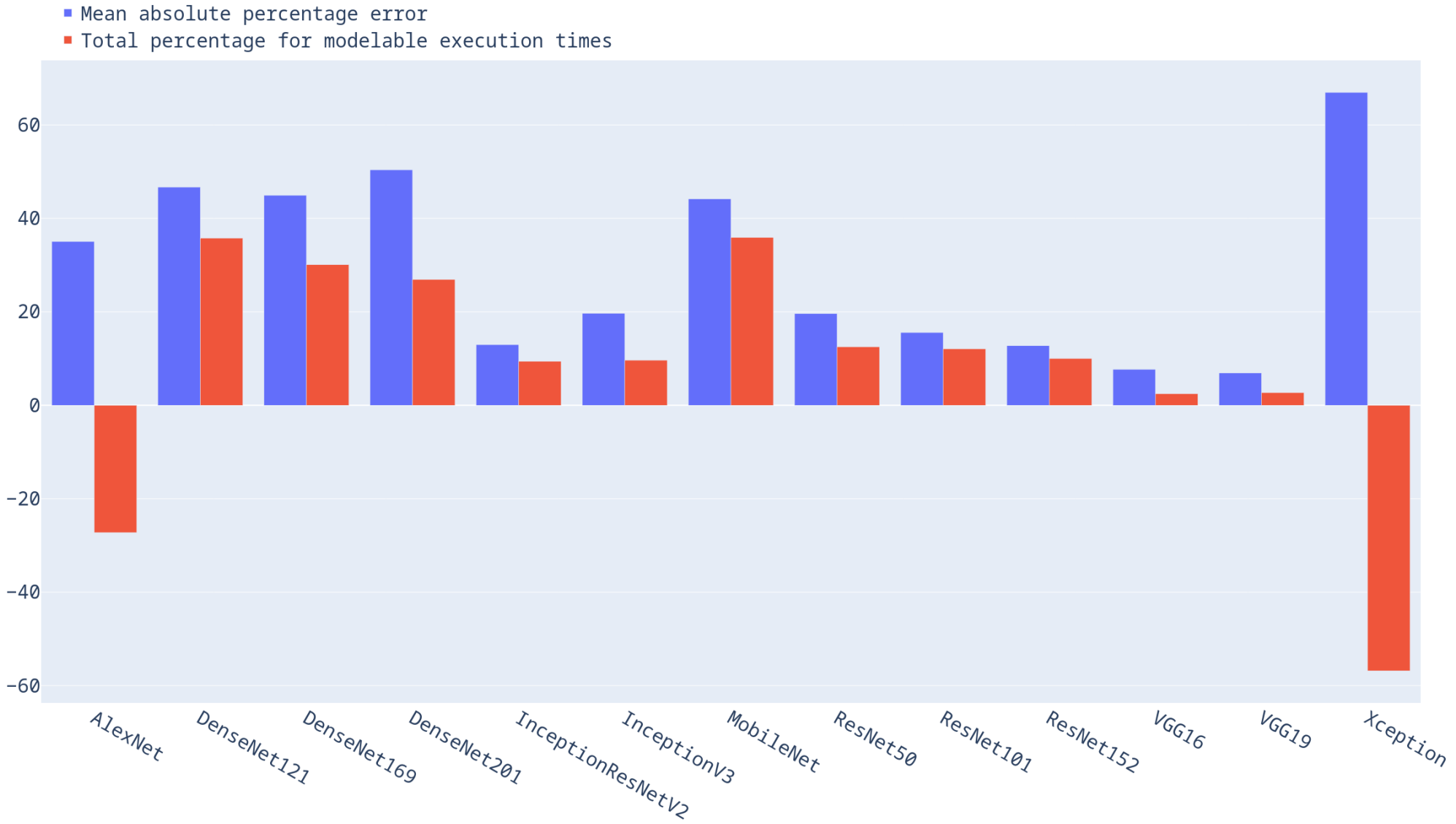
Benchmark results neural compute stick



in_s ([17, 17], [24, 25]), in_c [5, 1533], k [(1, 1), (3, 3)], fi [64, 64], st (1, 1)



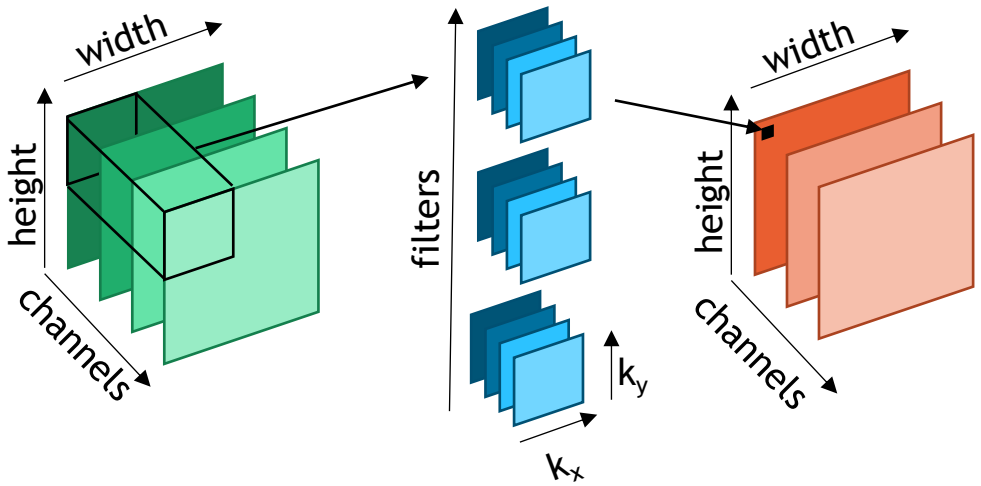
Benchmark results GPU



3

Optimization

Tucker decomposition



$$y_f = \sum_{k_x,k_y,c} a_{k_x,k_y,c} \cdot w_{k_x,k_y,c,f} = A \times_4 W$$

$$W \in \mathbb{R}^{k_x \times k_y \times c \times f}$$

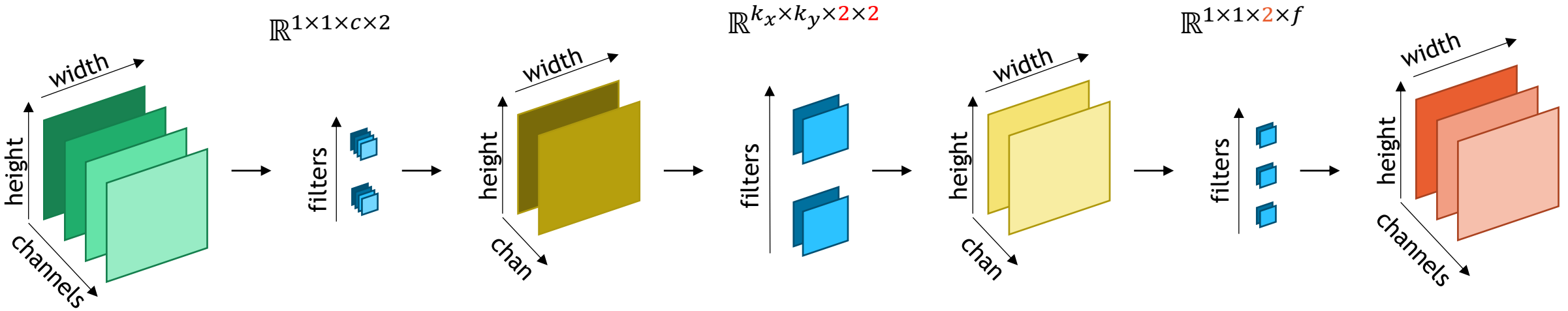
$$\text{Tucker(p,q)} \rightarrow W \approx C \times_3 G \times_4 F$$

$$G \in \mathbb{R}^{k_x \times k_y \times p \times q}$$

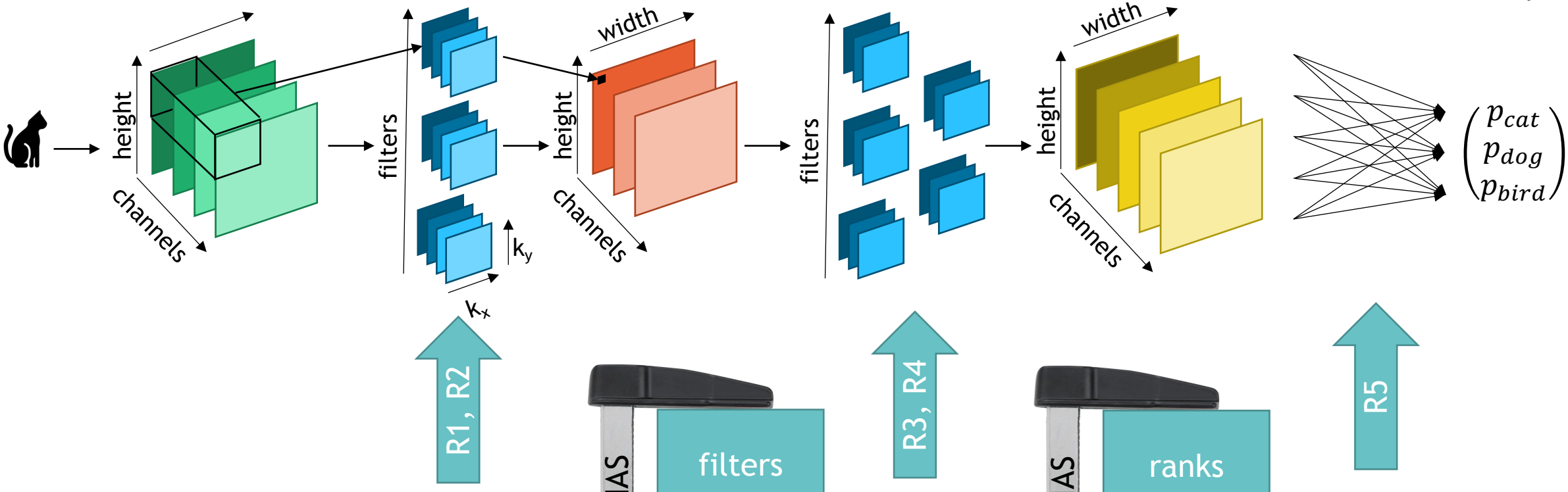
$$C \in \mathbb{R}^{1 \times 1 \times c \times p}$$

$$F \in \mathbb{R}^{1 \times 1 \times q \times f}$$

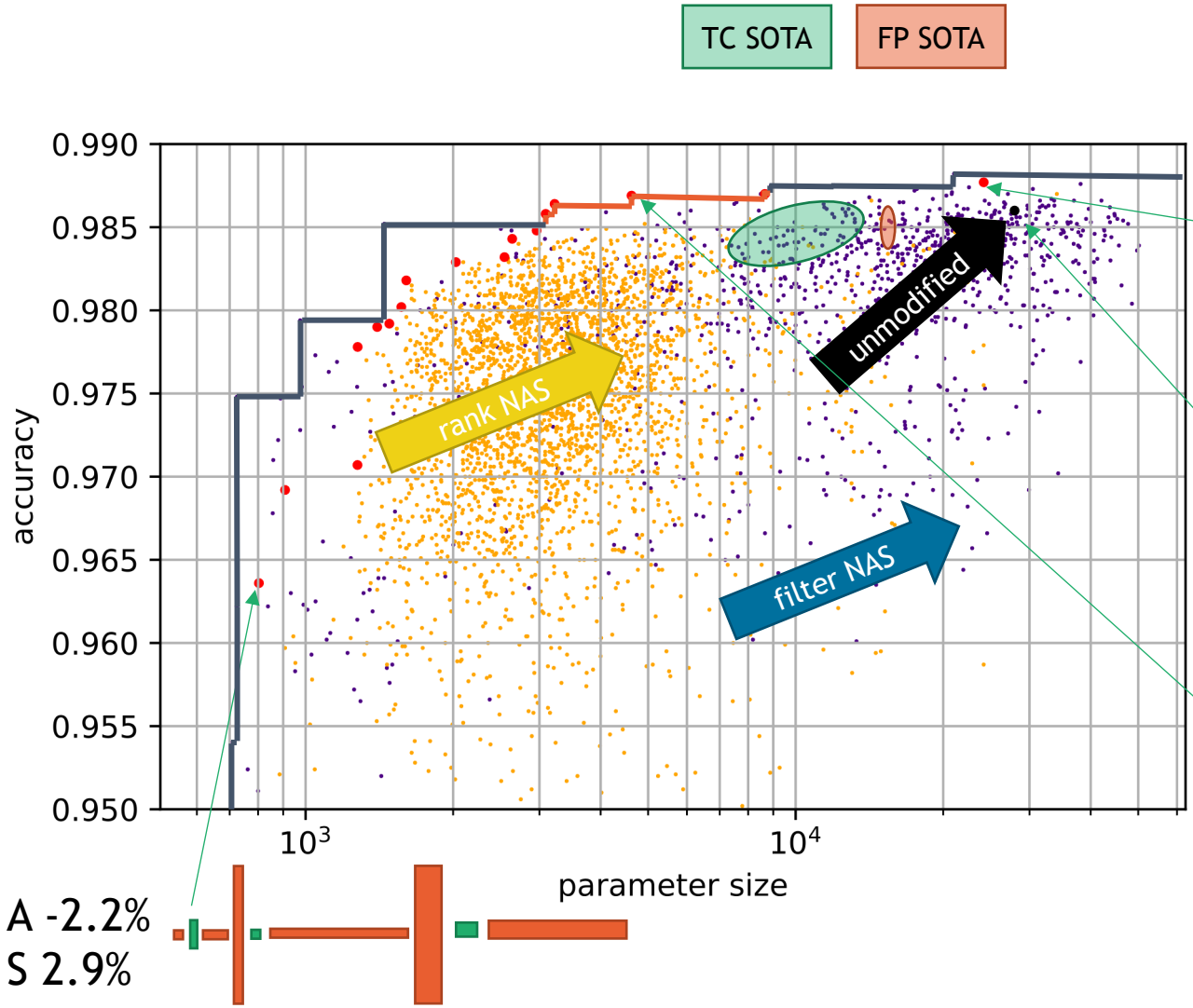
Tucker(2,2)



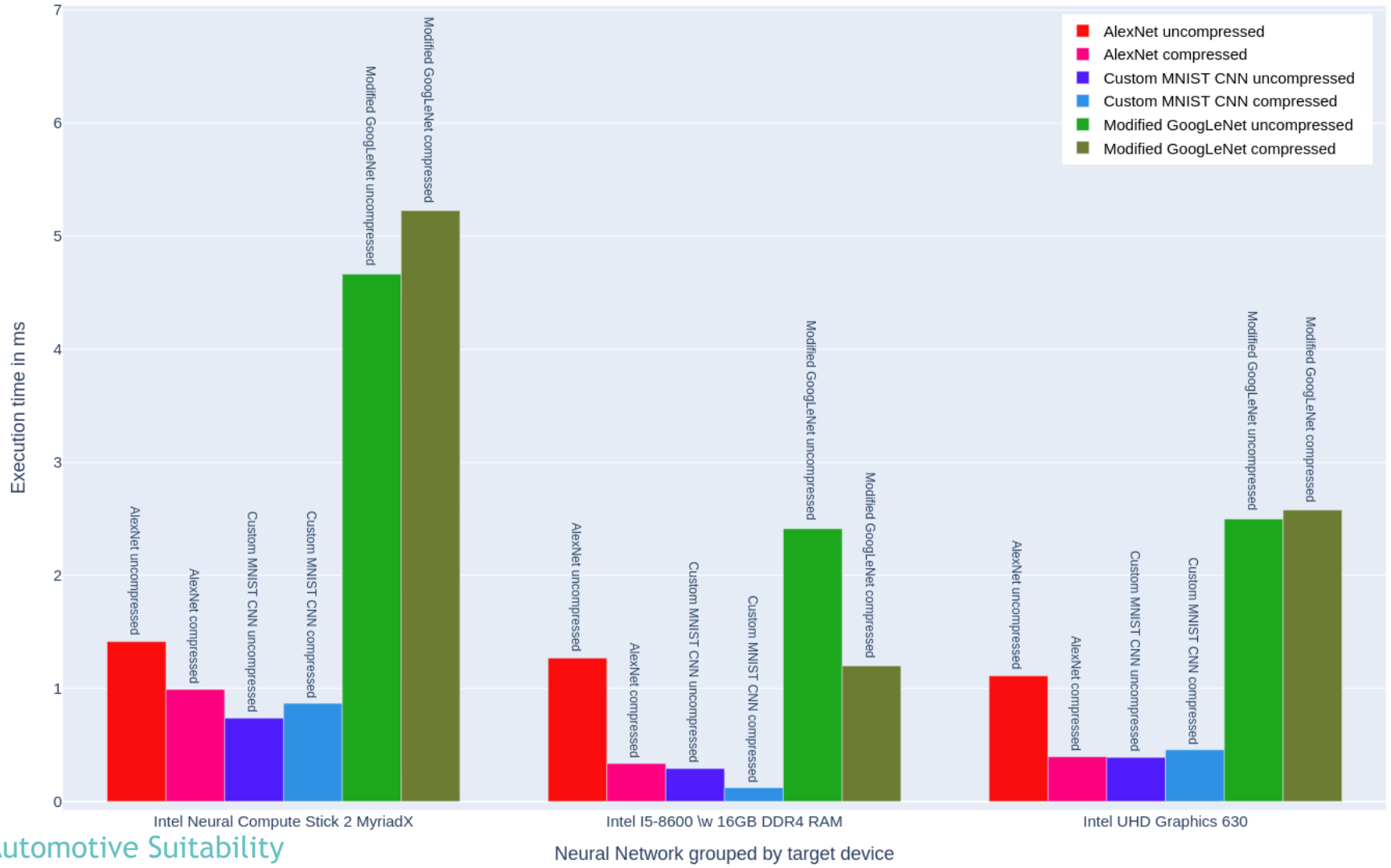
Introducing NAS



Combining TC and NAS



Execution time on various HW platforms



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Thank you for your attention

KI Delta Learning is a project of the KI Familie. It was initiated and developed by the VDA Leitinitiative autonomous and connected driving and is funded by the Federal Ministry for Economic Affairs and Climate Action.

KI FAMILIE

Supported by:

Federal Ministry for Economic Affairs and Climate Action

on the basis of a decision by the German Bundestag

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