



# ANDANTE

AI FOR NEW DEVICES AND TECHNOLOGIES AT THE EDGE

## Commercially-relevant benchmarks for Neuromorphic computing

Dylan Muir — SynSense Zürich | Chengdu | Shanghai

# **Dylan Muir**

## Senior director, Algorithms and Applications

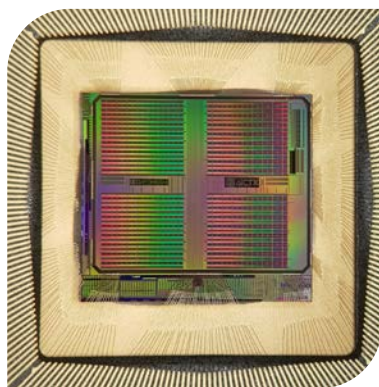
Electronic Engineering, Computer Science,  
Computational Neuroscience





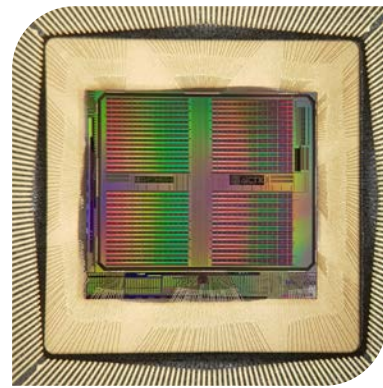
# SynSense

- Low-power ML and signal processing ASICs
- Asynchronous event-driven architectures
- Convolutional and general-purpose SNN processors
- Spin-off from UZH and ETH Zürich, Switzerland



# COMMERCIAL BENCHMARKING

- To compare our HW with other competing HW

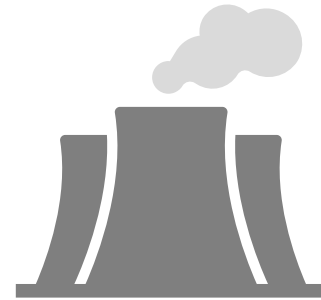
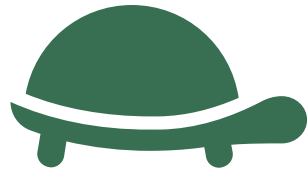


≠



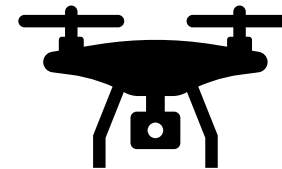
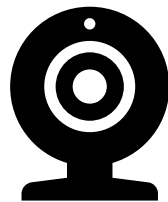
# COMMERCIAL BENCHMARKING

- To compare our HW with other competing HW
- To characterise specifications of our HW for marketing purposes
  - E.g. latency, power consumption



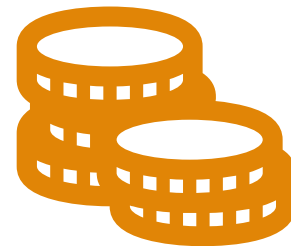
# COMMERCIAL BENCHMARKING

- To compare our HW with other competing HW
- To characterise specifications of our HW for marketing purposes
  - E.g. latency, power consumption
- To demonstrate what we can deliver under a specific use case



# COMMERCIAL BENCHMARKING

- To compare our HW with other competing HW
- To characterise specifications of our HW for marketing purposes
  - E.g. latency, power consumption
- To demonstrate what we can deliver under a specific use case
- For OEM to make a purchasing decision



# BENCHMARK KPIs



- Accuracy — Generally lower per neuron for SNNs



- TOPS/W — Biased in favour of vector processors

Difficult to make a direct comparison with SNN processors



- Latency / inference rate — Can be a benefit of SNNs

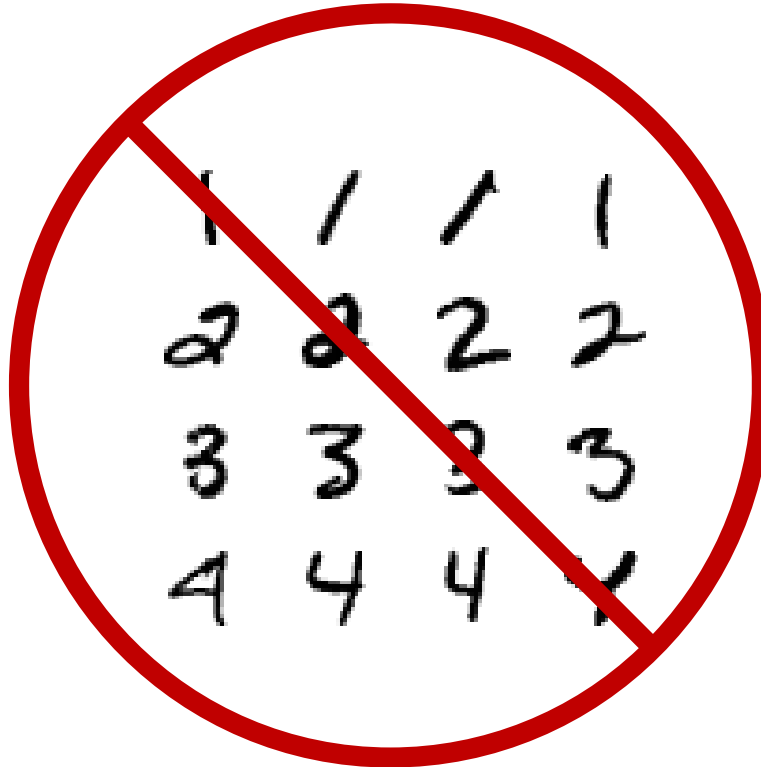


- Robustness to device mismatch — Not included in most benchmarks



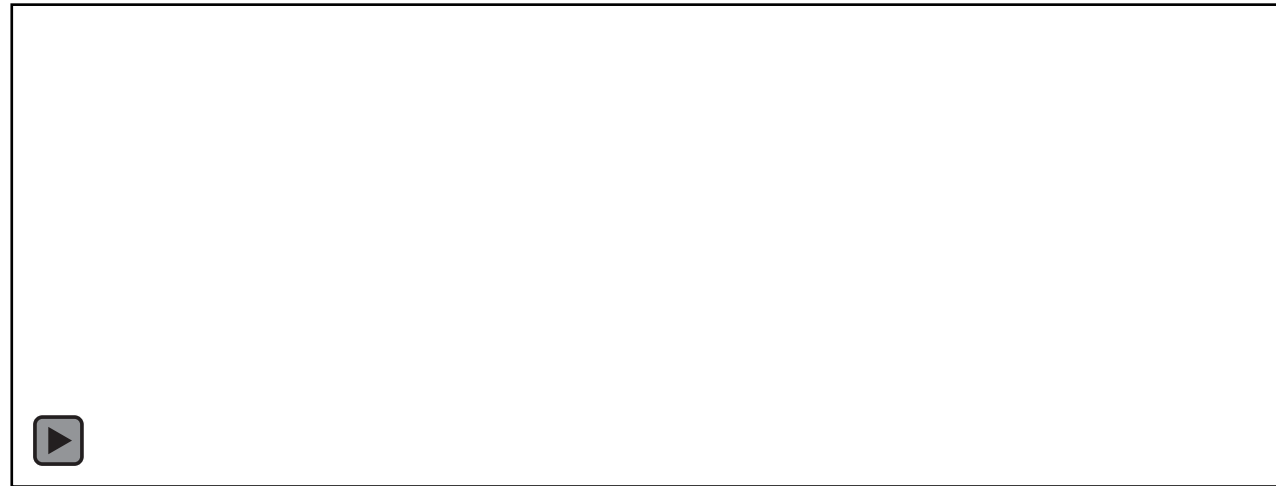
# USEFUL BENCHMARK TASKS

- Need to be difficult enough to be meaningful for commercial use cases
  - i.e. not MNIST



# USEFUL BENCHMARK TASKS

- Need to be difficult enough to be meaningful for commercial use cases
  - i.e. not MNIST
- Need to be similar in flavour to commercial use cases
  - e.g. continuous vision versus static images





# USEFUL BENCHMARK TASKS

- Need to show off the benefits of NM hardware
  - Low power
  - Low latency
  - Continuous processing

# USEFUL BENCHMARK TASKS

- Need to show off the benefits of NM hardware
  - Low power
  - Low latency
  - Continuous processing
- Good training coverage for real-world data
  - Out of domain data — mismatch between benchmark data sets and real-world performance

