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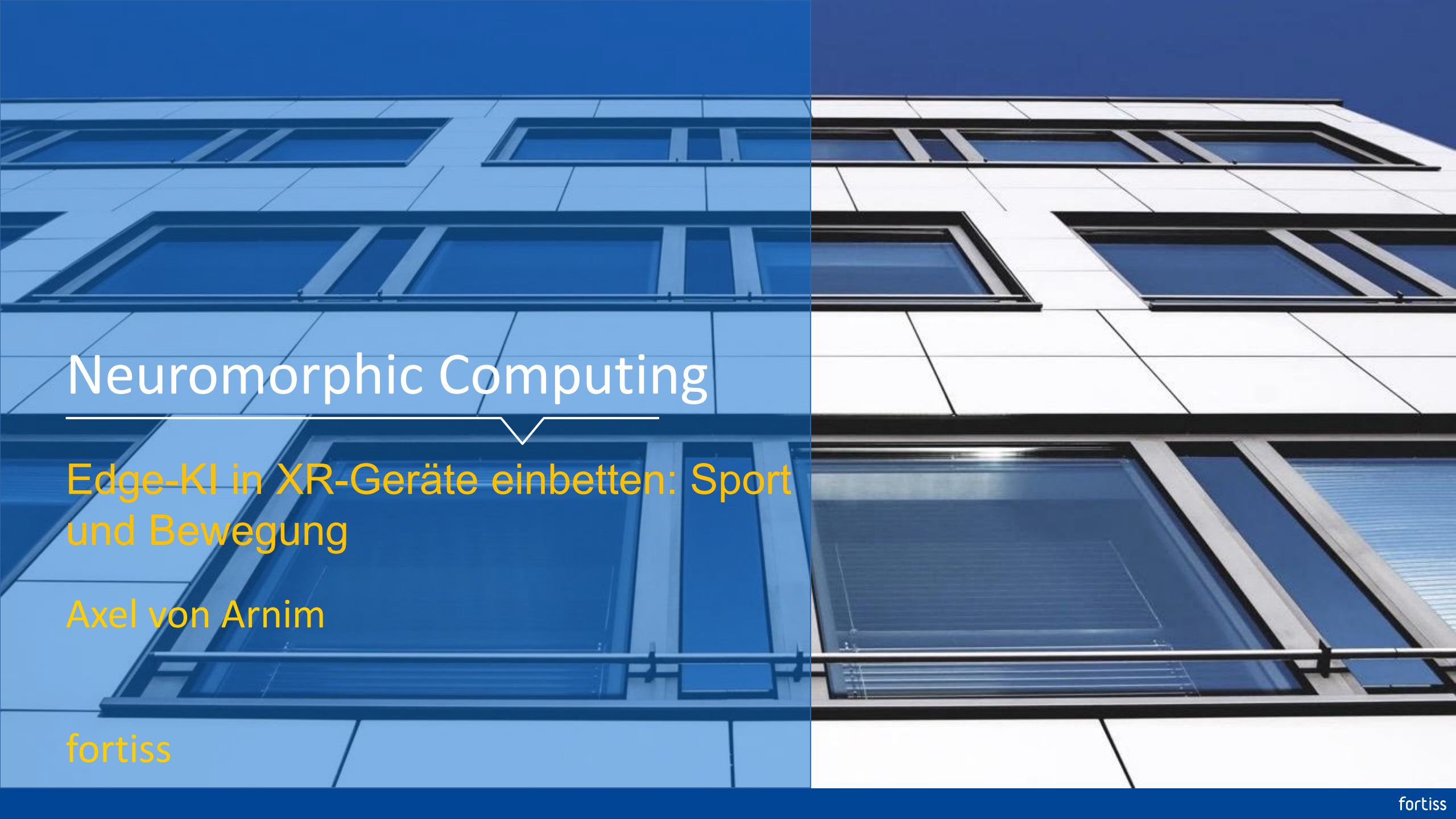


Neuromorphic Computing

Edge-KI in XR-Geräte einbetten: Sport und Bewegung

Axel von Arnim

fortiss

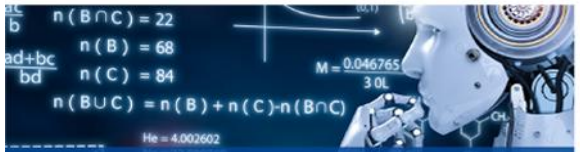
fortiss Kompetenzfelder

Architectures and Services for Critical Infrastructures
Simple design and clear modeling for software simulation and integration

Automated Software Testing
Software Engineering for data intensive applications

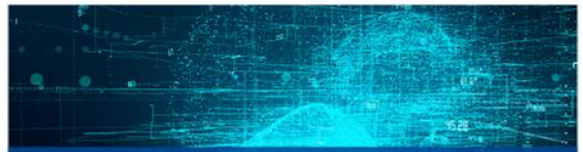
Human-centered Engineering
Understand and explain descisions of intelligent systems from the user's point of view

Industrial Internet of Things
Enabling the next generation of IIoT applications and services



Machine Learning
Development of solutions involving data and knowledge

Model-based Systems Engineering
Solutions for flexible engineering of cyber-physical systems



Neuromorphic Computing
Artificial intelligence: the third generation of neural networks

Platform Engineering
Pervasive, robust and trustworthy platforms

Requirements Engineering
Efficiently deal with volatile and heterogenous requirements

Safety and Security
Guaranteeing secure systems in software and system development

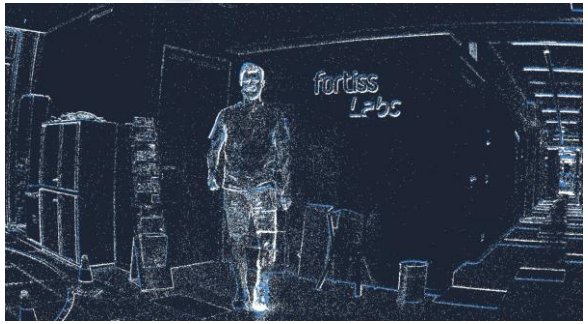
Software Dependability
Rigorous validation and verification for dependable and safe software systems

Was ist Neuromorphic Computing ?

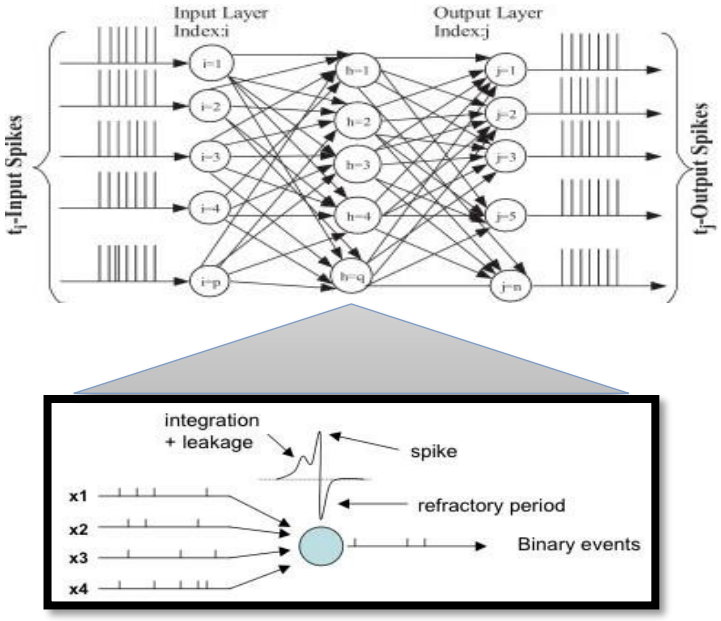
Hardware & Software für spiking neural networks

Neuromorphic Computing

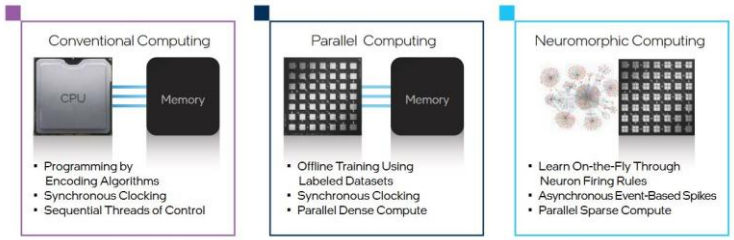
Event-based Sensors



Spiking Neural Networks



Neuromorphic Hardware



Vorteile

- Energieeffizienz
- Niedrige Latenz
  - Mit event basierten Sensoren
- Kompakte und skalierbare hardware
- Adaptives Lernen
  - Online, few shots learning

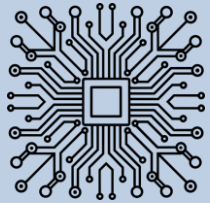
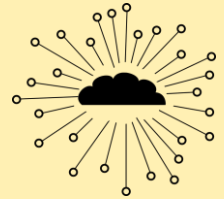


Image credits: Pixabay (royalty-free)

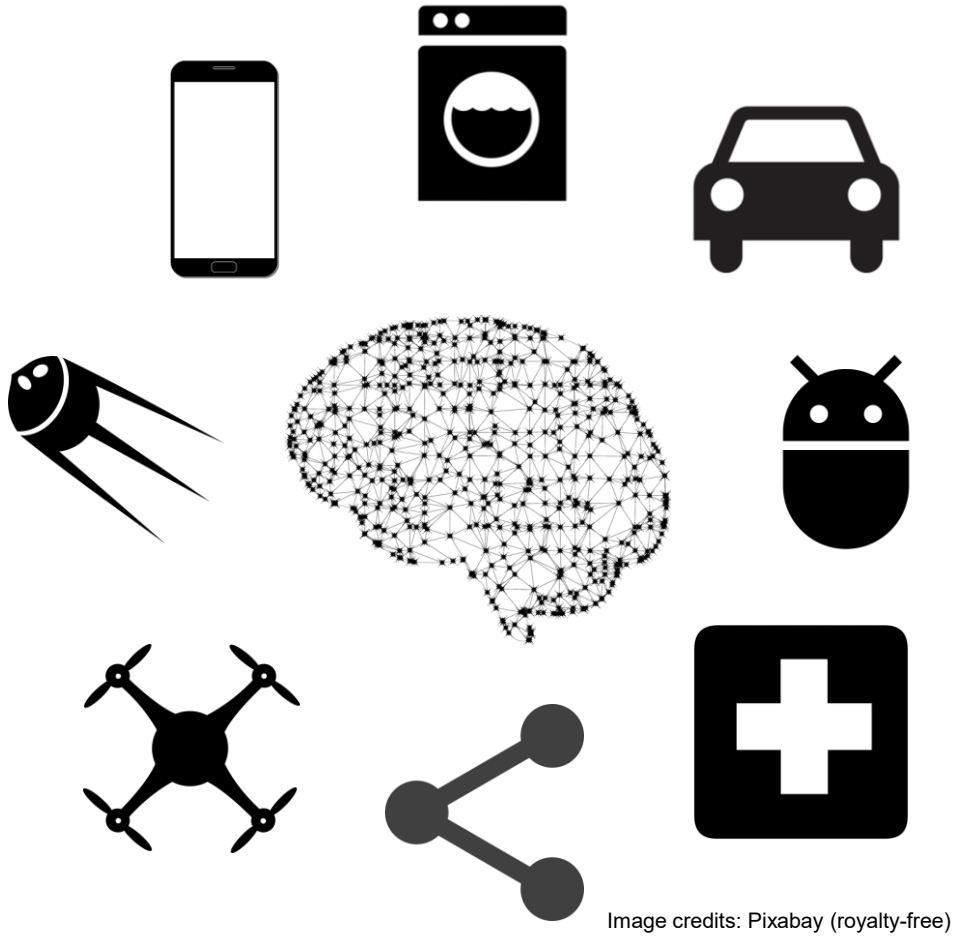
Ideal für Edge-KI

- Mehr eingebettete KI, weniger Kommunikation
- Längere Akkuzeit für mobile Geräte



Anwendungsdomäne

- Wo Edge-KI und Energieeffizienz von Vorteil sind:
  - Automotive
  - Wearables
  - IoT
  - Defense
  - Mobile robots
  - Space
  - Smartphone, AR/VR
  - Medtech



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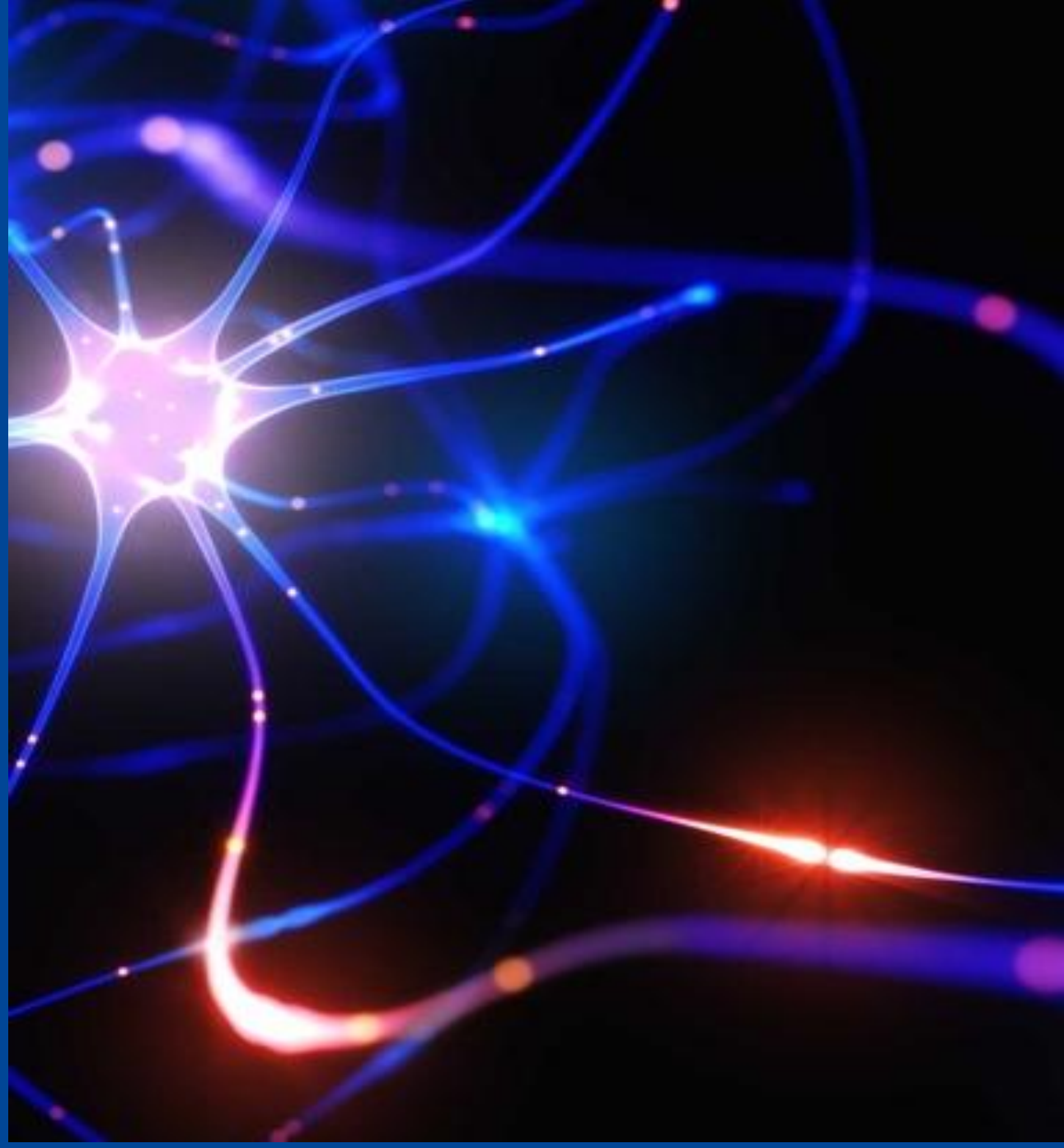
Neuromorphic Computing für Sport und Bewegung

Beispielprojekte

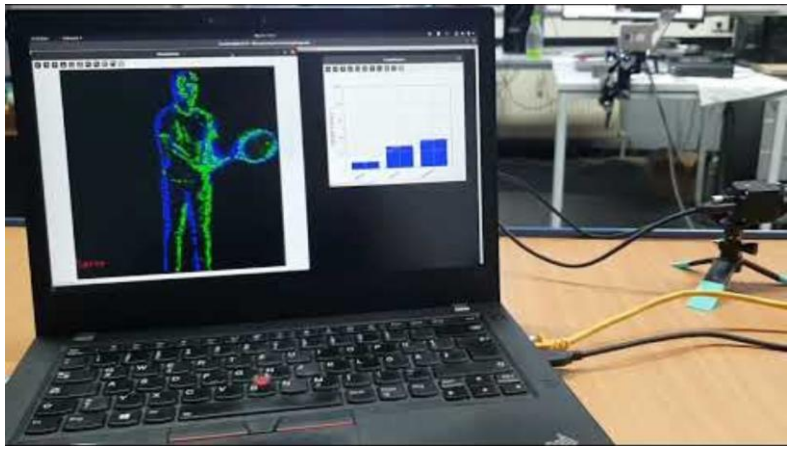


Partner

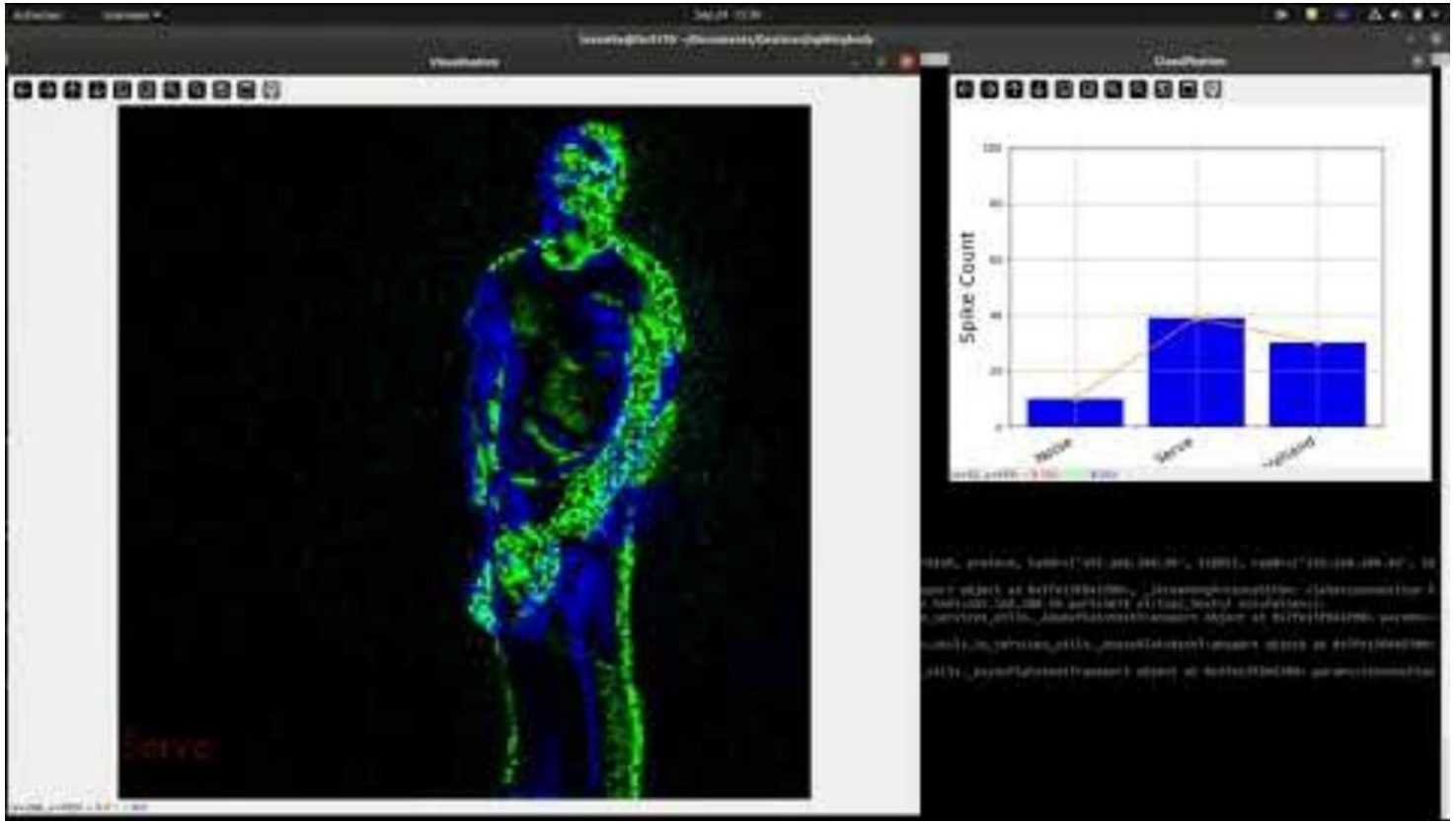
- Kamera-basierte Motion Capture und Bewegungsanalyse
- Sitz in Unterschleißheim
- Simi möchte Bewegungsanalyse in XR für Trainer einbetten

EEvAct: Early Event-Based Action Recognition with High-Rate Two-Stream Spiking Neural Networks. Michael Neumeier , Jules Lecomte , Nils Kazinski , Soubarna Banik , Bing Li und Axel von Arnim, ICONS 2025. IEEE Press.

SpikingBody: Aktionserkennung für Tennis-Spieler

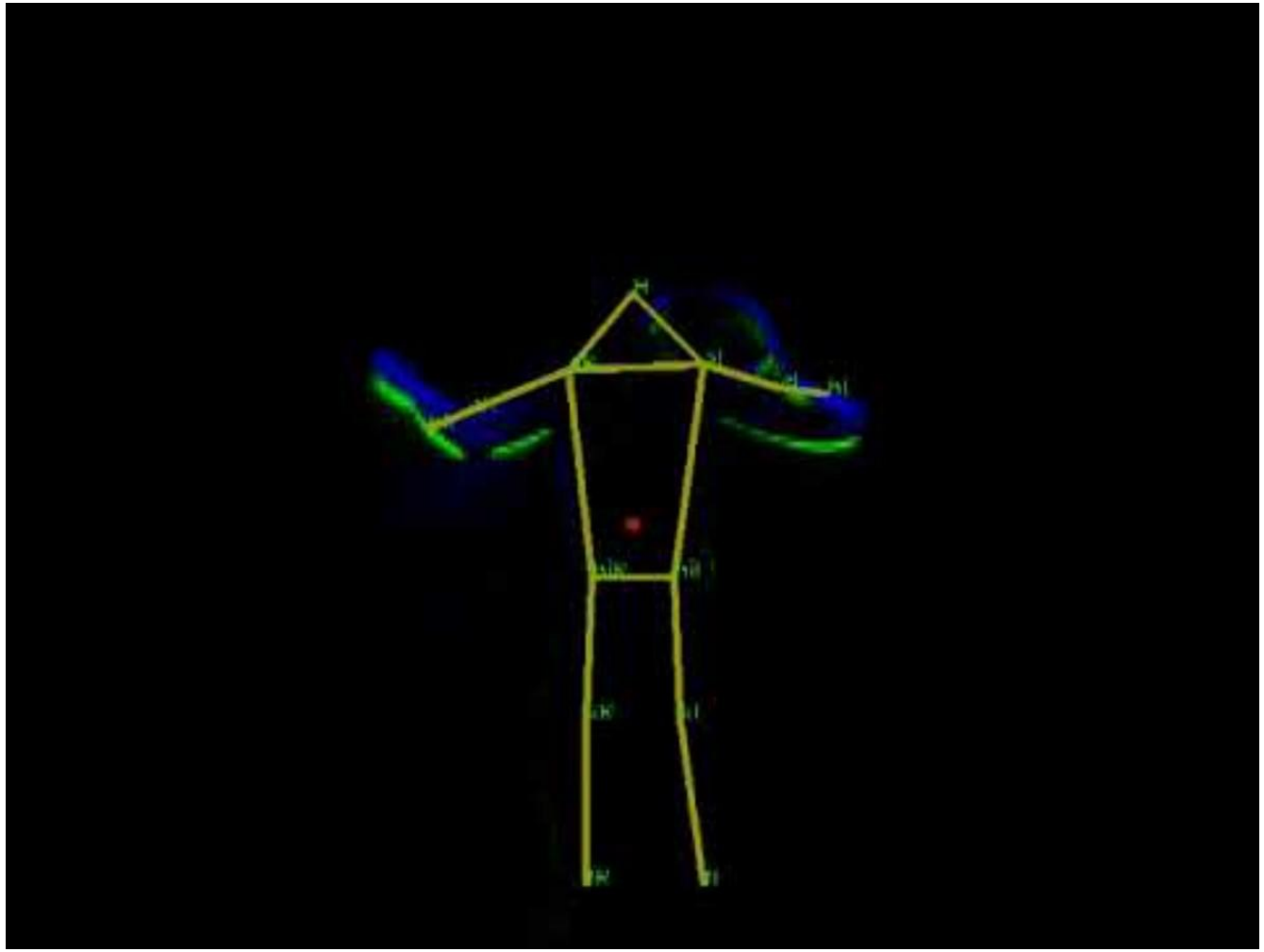


https://www.youtube.com/watch?v=iE7HkCifGD8



https://www.youtube.com/watch?v=ms0htu9zmDo

SpikingBody: Einzelkamera Event-basierte Skelett-Rekonstruktion

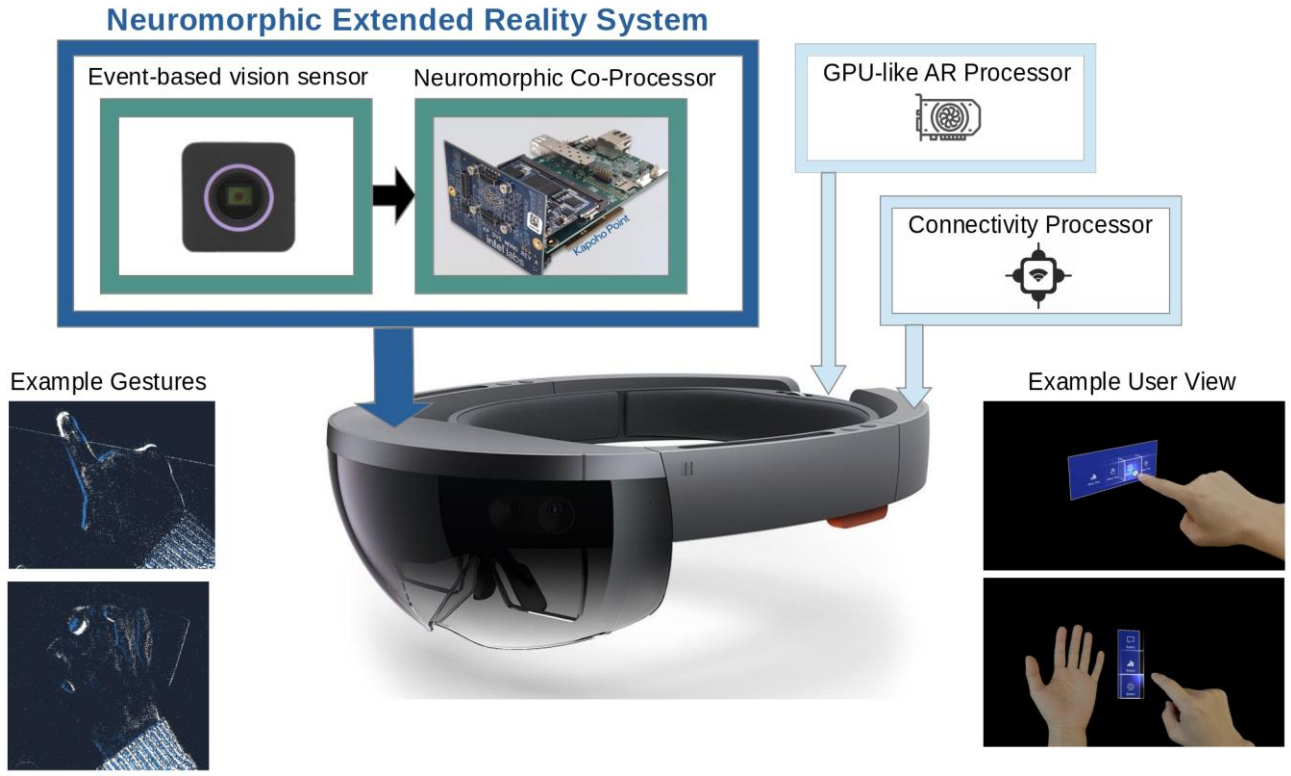


https://www.youtube.com/watch?v=Fv1jxN-bPZw

EMMANÜELA

Neuromorphic für XR

Motivation



Gesten- oder Aktionserkennung

Schnell

Energiesparsam

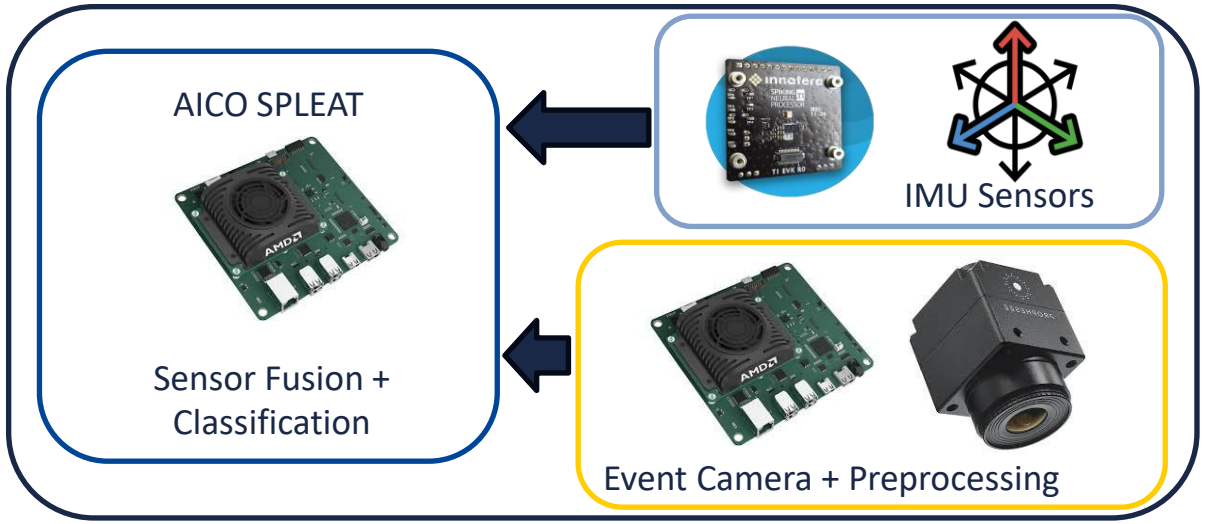
Präzise

Adaptiv

Neuromorphic Sensoren, Algorithmen und Hardware

Demonstratorkonzept

Neuromorphic Sensor für XR



will be prototypically attached
to Meta Quest 3

Use-Case:
XR Aktionserkennung

Drittperson:

Ego-Perspektive:

EMMANÜELA

Demo-Teaser

Contact:
vonarnim@fortiss.org

Neuromorphic is a key technology for Edge-AI

Thank you