

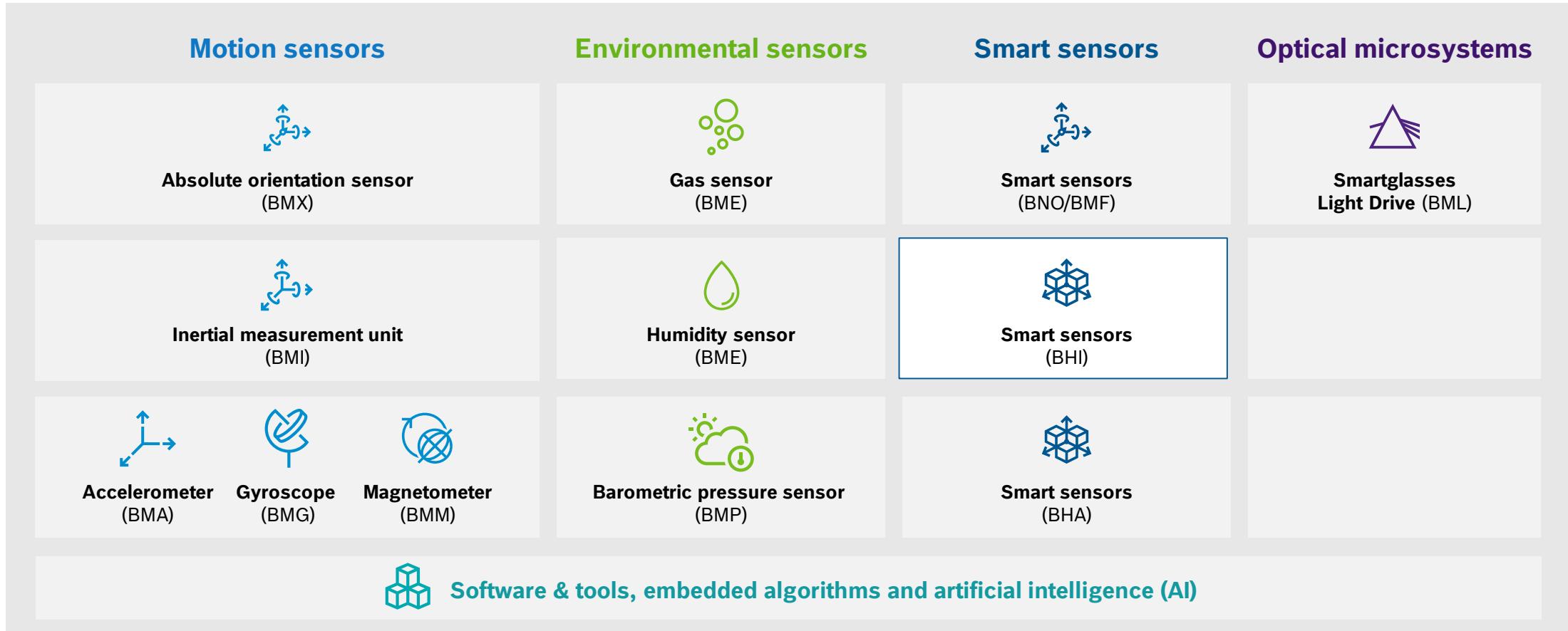
# BHI260AP

## SELF-LEARNING AI SENSOR

BOSCH SENSORTEC

# Smart sensors

## Bosch Sensortec portfolio



# Smart sensors

## Product variants

2nd Gen  
1st Gen

Product name	Sensor fusion (BSX3)	Sensor fusion (BSX4)	PDR1.0	PDR2.0	Swim	Self-learning AI
BHI260AP (Pro)		✓		✓	✓	✓
BHI260AB (Basis)		✓				
BHI160BP (PDR1)	✓		✓			
BHI160B (Basis)	✓					

# Self-learning AI sensor Fitness user's pain points

## Multiple activities



## Limited time of coach



## Manual tracking



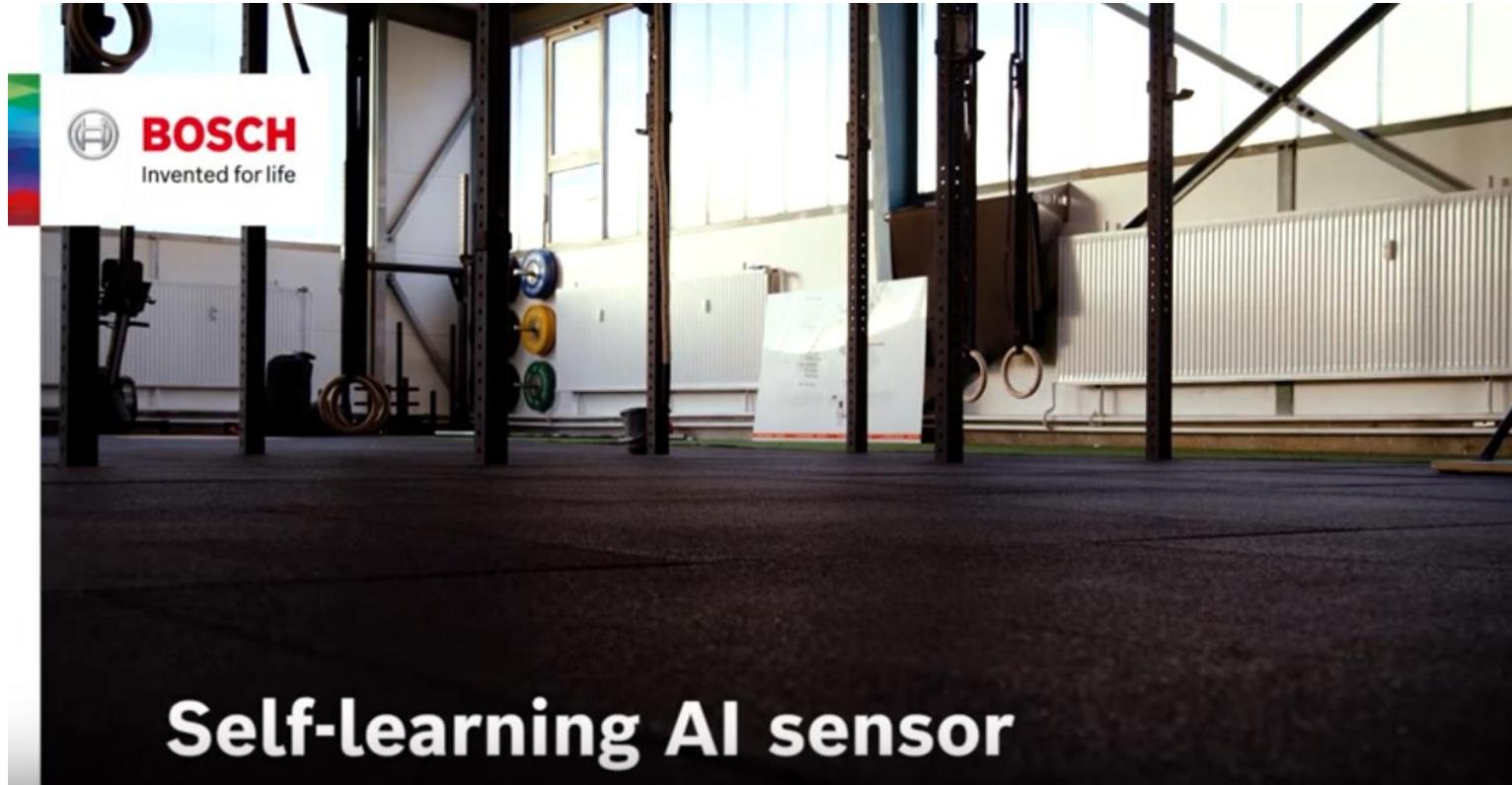
**Classical tracking systems fail:** Variety of machines and body activities, home workouts, switching among activities, demographics and individual user energy levels

# Self-learning AI sensor Software solutions

System power	Unique features	Scalability	Data quality
<ul style="list-style-type: none"><li>▶ In-sensor features</li><li>▶ Step count</li><li>▶ (Wrist)Wake-up</li><li>▶ Multi-tap</li><li>▶ Activity status</li><li>▶ PDR+GPS fusion</li></ul> 	<ul style="list-style-type: none"><li>▶ Activity tracking<ul style="list-style-type: none"><li>▶ Automatic</li><li>▶ Extensible</li><li>▶ Personalized</li></ul></li></ul> 	<ul style="list-style-type: none"><li>▶ Standalone modules of fusion</li><li>▶ Flexibility in product specific choices<ul style="list-style-type: none"><li>▶ Performance vs. power</li><li>▶ Features vs. size</li></ul></li></ul> 	<ul style="list-style-type: none"><li>▶ In-use calibration</li><li>▶ Distortion detection</li><li>▶ Multi-sensor fusion</li></ul> 

# Self-learning AI sensor

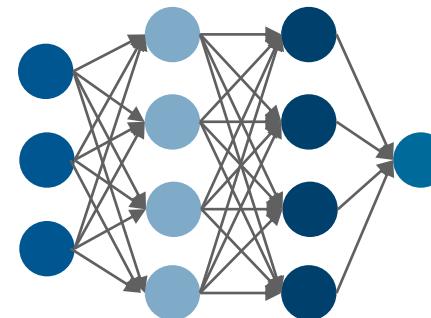
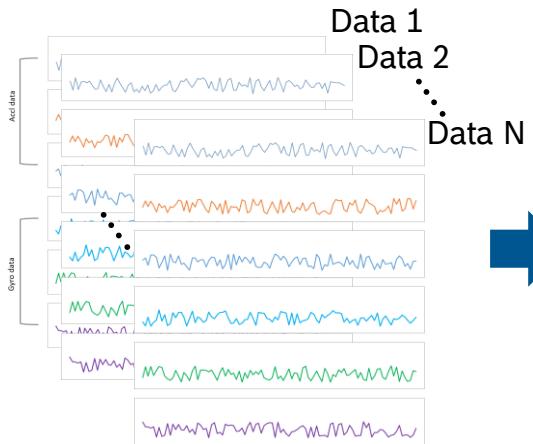
## Video



# Self-learning AI sensor Activity pattern learning



Fitness activity sample

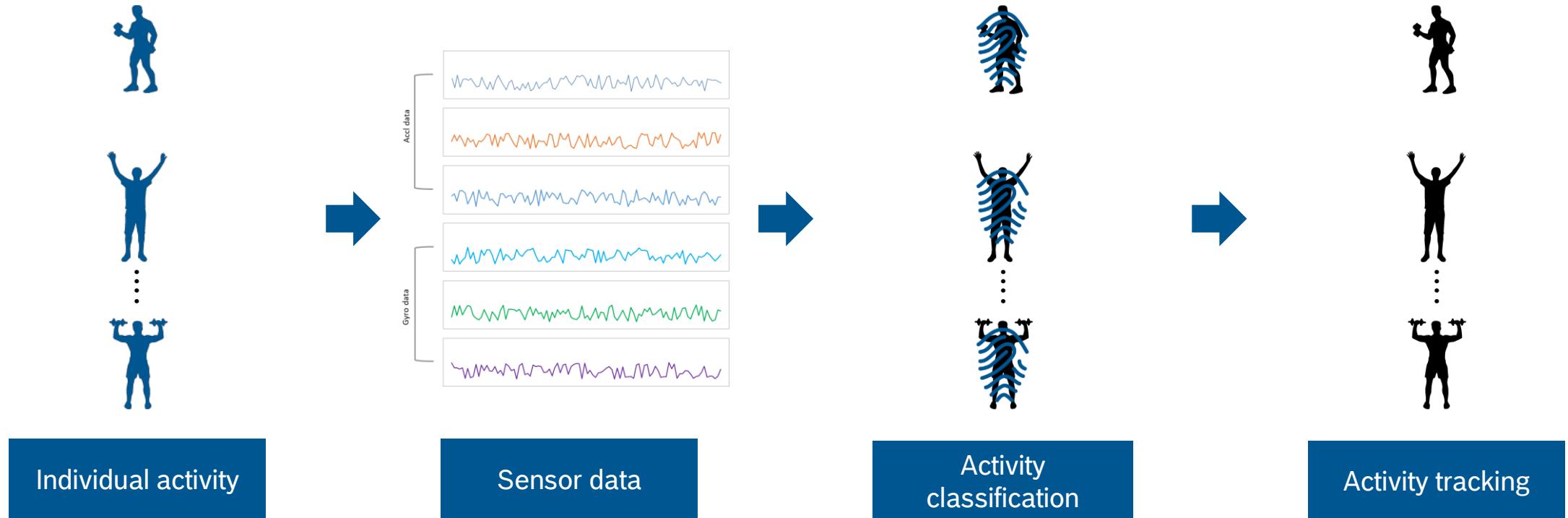


Signal processing

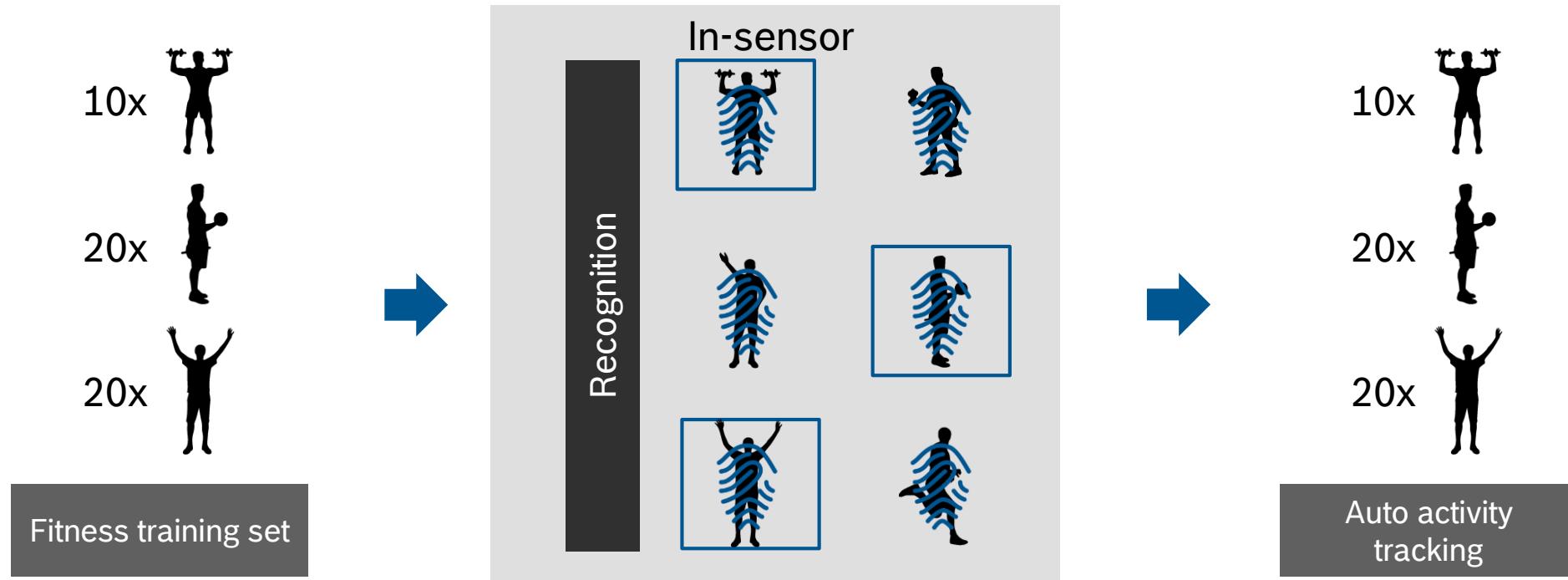


Activity pattern

# Self-learning AI sensor Activity pattern recognition

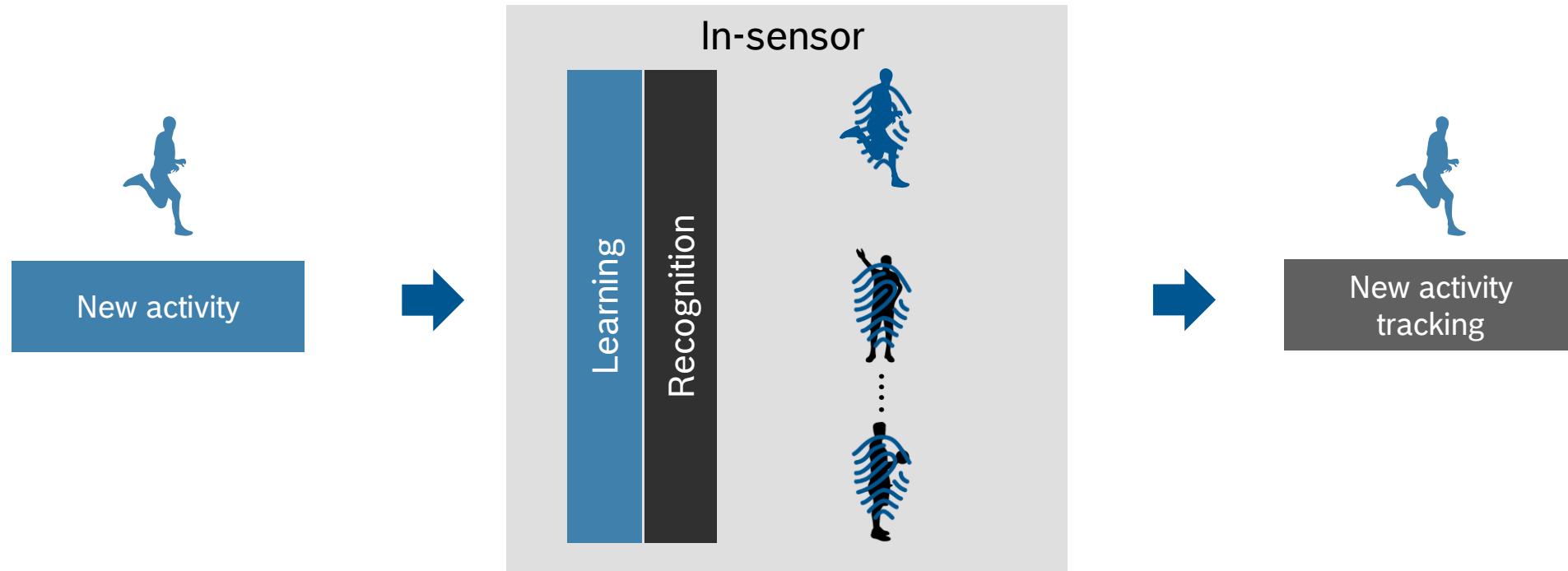


# Self-learning AI sensor Product features – “Auto-track”



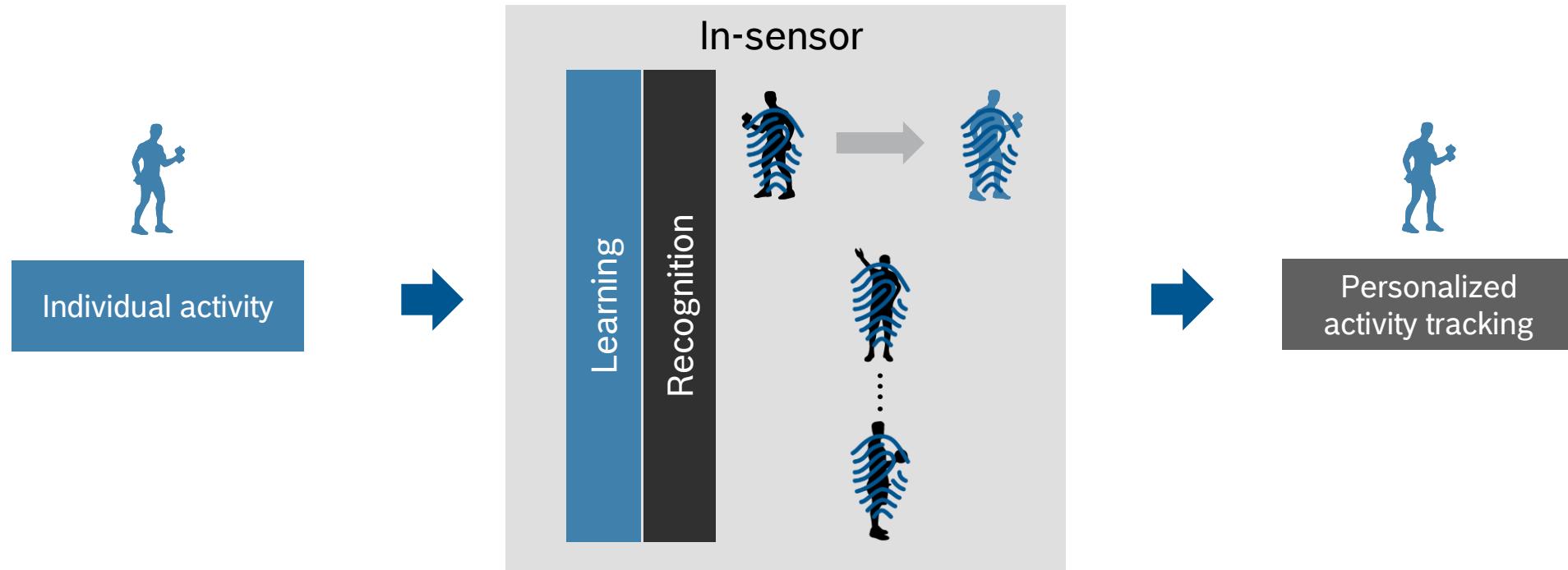
- Bosch Sensortec provides 10+ common patterns + learning & recognition built-in library based on sample data
- OEMs can customize / generate their own patterns directly using the sensor or offline
- OEMs can also enhance / add new patterns over the air without retraining the entire dataset

# Self-learning AI sensor Product features – “Learn New” from user



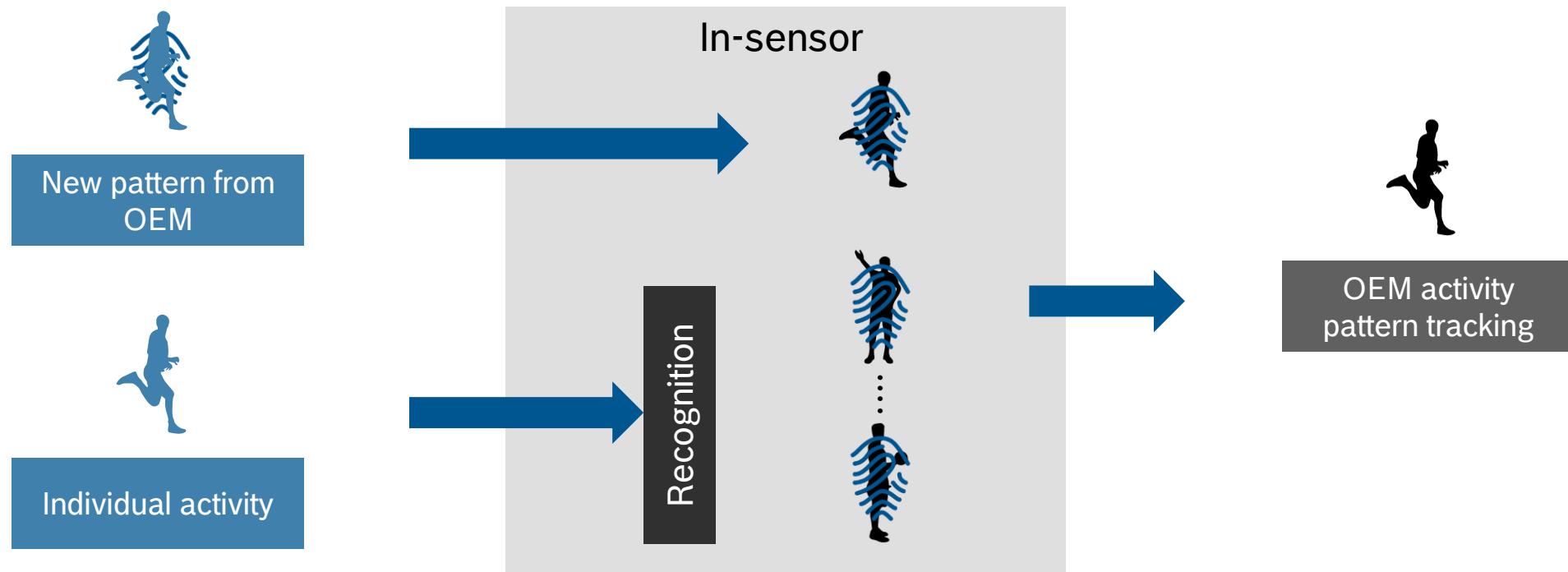
- ▶ Adding new activities by users does not need any changes in software / effort for OEMs
- ▶ Learning and recognition can be enabled / disabled dynamically with sensor API

# Self-learning AI sensor Product features – “Personalize”



- ▶ Users can personalize built-in activities to match their own style without changing the software
- ▶ Sensor API enables users to relearn & replace activities directly from the device
- ▶ Bosch Sensortec provides reference code / App to help enable personalization

# Self-learning AI sensor Product features – “Enhance”



- ▶ Bosch Sensortec provides 10+ common patterns + learning & recognition built-in library based on sample data
- ▶ OEMs can also enhance / add new patterns without modifying the software or needing the original dataset to enhance the device value

# Self-learning AI sensor

## Reference activities for self-learning and automatic tracking

#	Activity	Reference video
1	Bicep Curls Dumbbell	<a href="#">Link</a>
2	Bicep Curls Dumbbell Palm Face Front	<a href="#">Link</a>
3	Triceps Extensions Dumbbell	<a href="#">Link</a>
4	Bench Press Dumbbell	<a href="#">Link</a>
5	Crunches	<a href="#">Link</a>
6	Side Lateral Raise Dumbbell	<a href="#">Link</a>
7	Squats Bodyweight	<a href="#">Link</a>
8	Jumping Jacks	<a href="#">Link</a>
9	Kettlebell Swing	<a href="#">Link</a>
10	Row Machine	<a href="#">Link</a>
11	Lower Back	<a href="#">Link</a>
12	Russian Twist	<a href="#">Link</a>
13	Triceps Kickbacks	<a href="#">Link</a>
14	Chest Fly Dumbbell	<a href="#">Link</a>
15	Pull Over Dumbbell	<a href="#">Link</a>

# Self-learning AI sensor Evaluation system

## Reference software

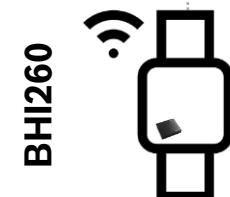
- ▶ Visualization via Android App
- ▶ BLE (AP): Streaming, load firmware

## BHI260AP

- ▶ Learning of new exercises
- ▶ Personalization & recognition of pre-trained exercises



Smartphone App



Fitness trackers / bands



Smart watches

# Self-learning AI sensor Summary: Key facts

Key performance factors		Bosch Sensortec self-learning AI software
Functionality  End-user experience	Learning (new activities)	Learning inside device → enables learning new activities from users
	Personalization of tracking	Learning inside device → enables full personalization to a user
	Tracking: number of activities	Large number of activities (typ. 10~50) tracked simultaneously
	Tracking: status / count	Both activity status and count for all activities
	In-field customization / enhancement	OEMs can also add new activities just by adding new patterns without changing the software
Design  Time to market	Data labelling	No need of labelling individual activity signals. Patterns are generated based on larger datasets with a cloud based simulator
	ML / AI and statistics	No need of manual selection and implementation of statistical features
	Design time customization	OEMs can customize and configure both patterns and software with a cloud based simulator during design

Self-learning AI software delivers a ***truly personalized experience*** with state-of-the-art edge-AI