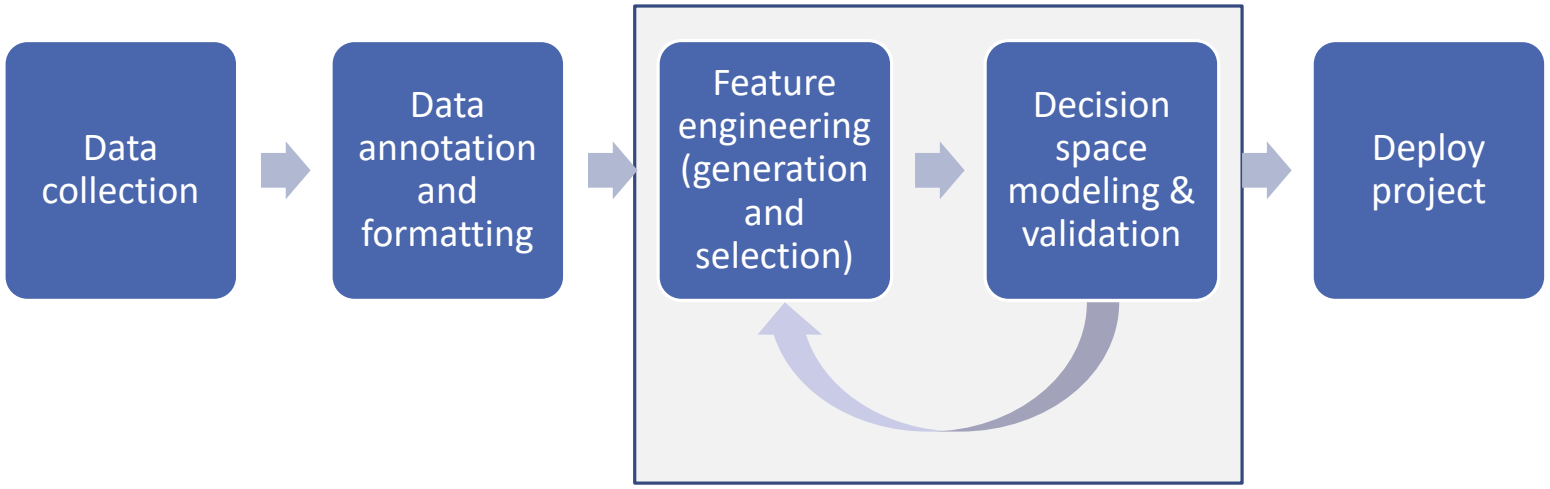
GENERALVISION

NeuroMem Application Deployment

LEARNING AND INFERENCE AS A SINGLE ENTITY

Application Development Workflow



User App or KB plug-in

Representative samples is all that is needed. Does not need to be massive but to give good insights on the variability of the project

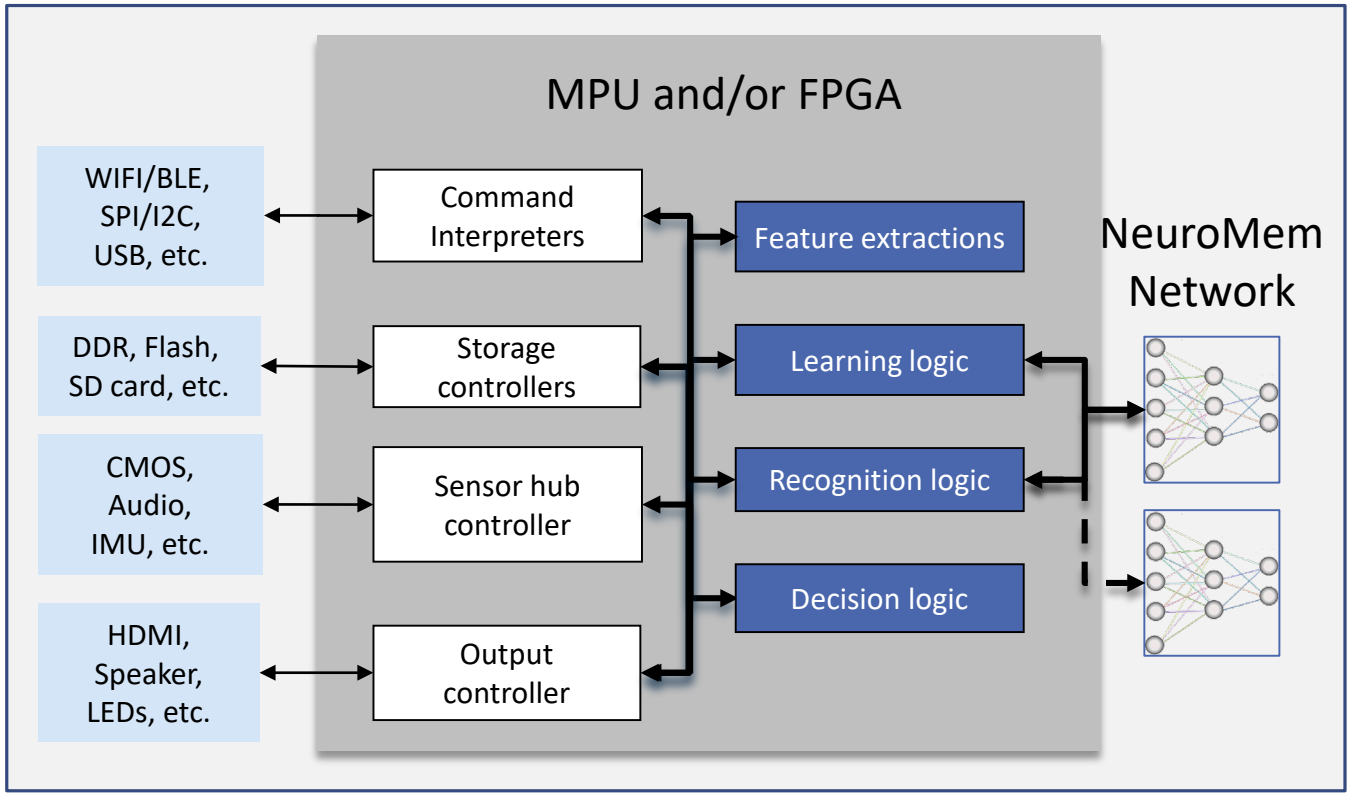
Knowledge Builder (KB) or User App

Automated feature generator and training of the neurons to deliver targeted accuracy and throughout

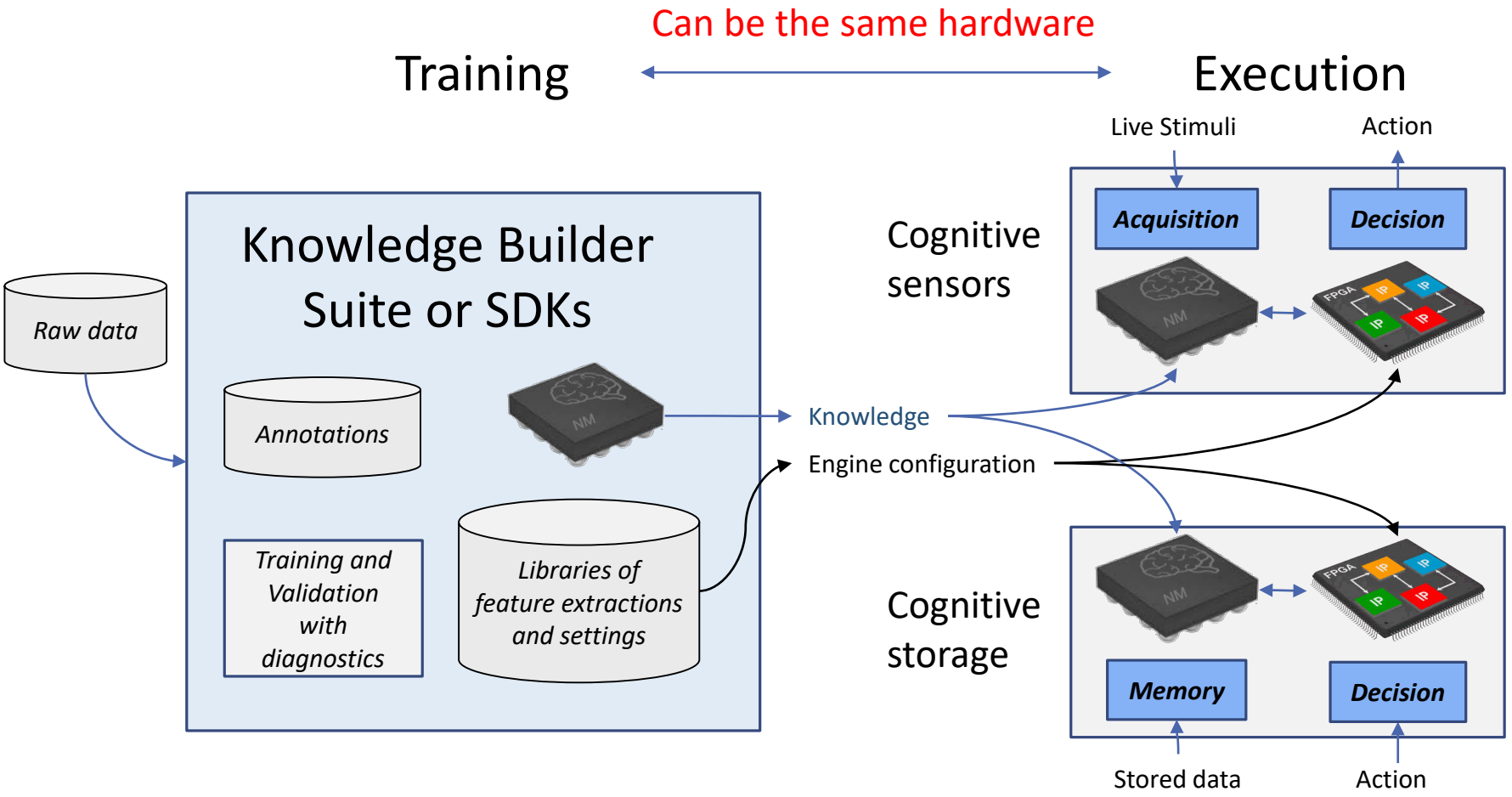
User App or KB plug-in

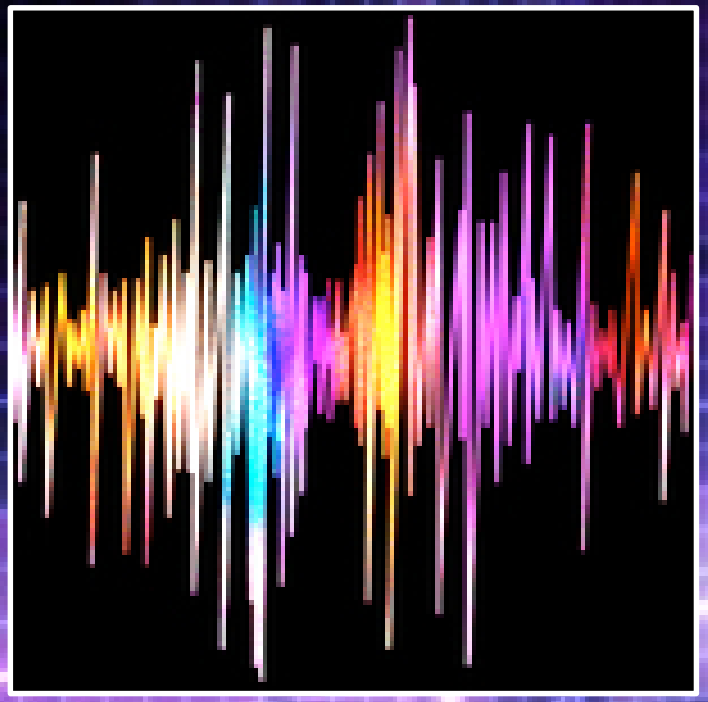
Export portable knowledge file and configuration file describing the engine
Customization of outputs and data logging

Typical Hardware Platform



System Deployment





Toolchain example #1: Signal expert

EEG, EKG, IMU, Audio, Voice…

Collection & Annotation

1) Define your categories

User categories

Reset

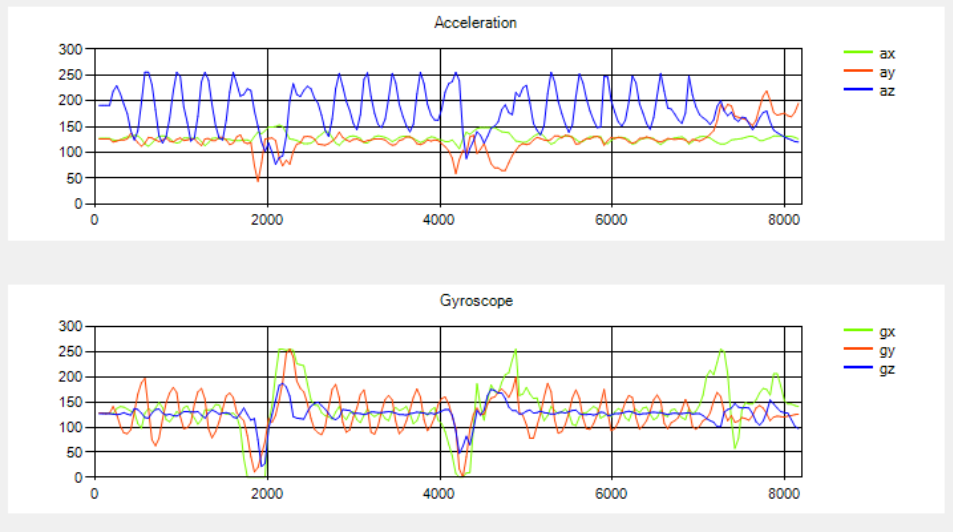
	Name	Color
	n/a	
	Load calibration	
	Pre-wash	
	Normal wash	
	Deliocate spin	
*		

2) Select your sensors

Sensors selection

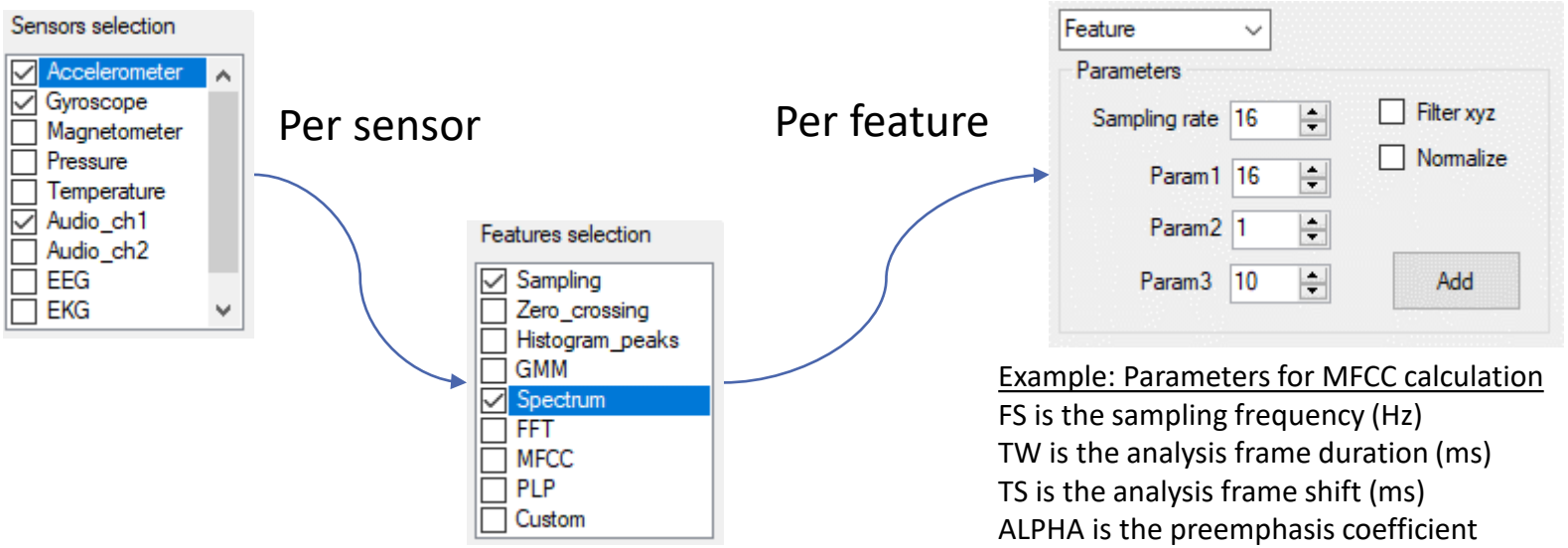
- [x] Accelerometer
- [x] Gyroscope
- [ ] Magnetometer
- [ ] Pressure
- [ ] Temperature
- [ ] Audio_ch1
- [ ] Audio_ch2
- [ ] EEG
- [ ] EKG

3) Collect sensor data



4) Annotate sensor data with categories

Feature Selection



GMM: Gaussian Mixture Model
MFCC: Mel Freq Ceptrum Coeff
PLP: Perceptual Linear Prediction

<u>Example: Parameters for MFCC calculation</u>
FS is the sampling frequency (Hz)
TW is the analysis frame duration (ms)
TS is the analysis frame shift (ms)
ALPHA is the preemphasis coefficient
WINDOW is a analysis window function handle
R is the frequency range (Hz) for filterbank analysis
M is the number of filterbank channels
N is the number of cepstral coefficients
L is the liftering parameter

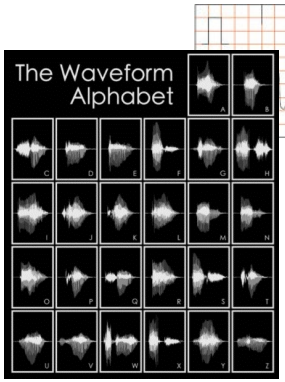
Modeling, Validation, Usage

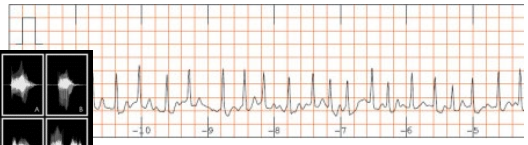
LEARNING

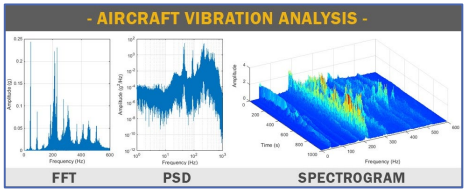
Predefined knowledge

Supervised annotations

Unsupervised novelty learning







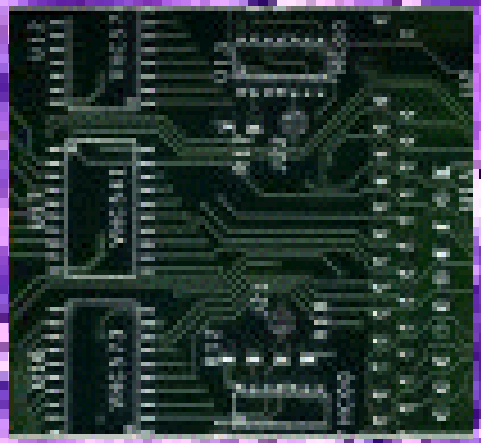
RECOGNITION

Classification

- Verification of a known sequence such as P, Q, R, S and T wave of an EEG
- Anomaly detection with redundancy of single or multiple features

Identification

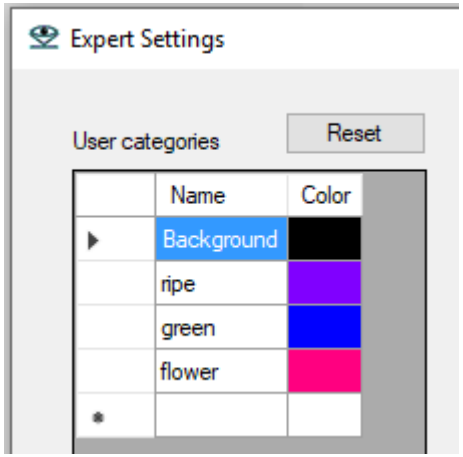
- Report of a specific category or sequence of categories (ex: keyword spotting)



Toolchain example #2: Visual expert

Collection & Annotation

1) Define your categories



2) Collect images

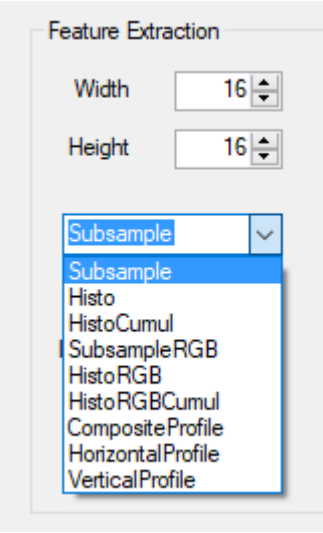
3) Annotate objects or areas with categories

Expert definition

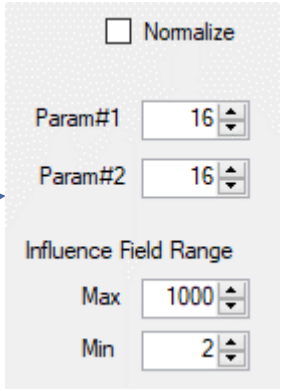
Single expert

- 1 nominal size + 1 feature + parameters

Per expert



Per feature



Multiple experts

- Add inter-expert consolidation rules if applicable
  - Minimum consensus
  - Priorities
  - Sequential rules
  - Combinatorial rules
  - Etc.

Modeling, Validation, Usage

LEARNING

Predefined knowledge

Supervised annotations

Unsupervised learning of significant features

RECOGNITION

Identification

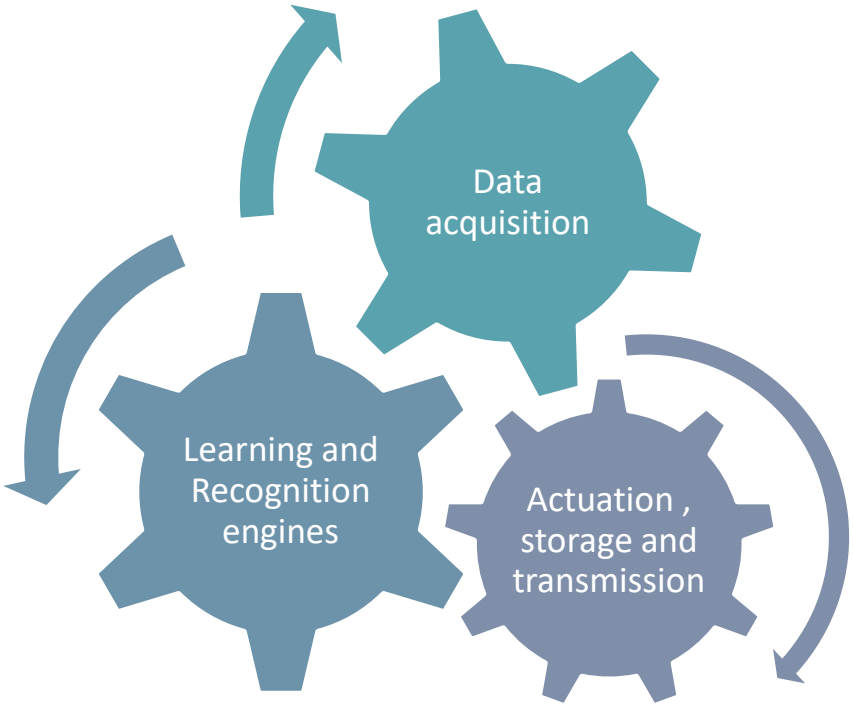
Classification

Anomaly or novelty detection

Verification of a known sequence of objects

Template matching

Tracking



Deployment workflow

Workflow with cascaded experts

Novelty expert

- Trained on empty hallway
- Queried continuously to report XY positions of novelties (incoming objects in field of view)

Silhouette expert

- Trained to recognized silhouettes of persons and dogs
- Queried to report positive identifications at the XY locations provided by the Novelty expert

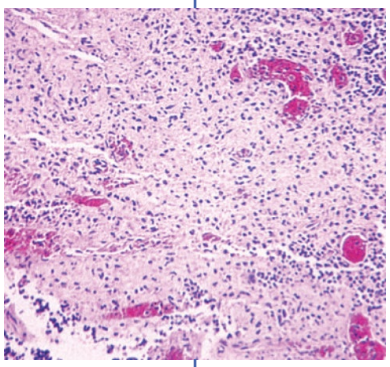
Tracking expert #1

Tracking expert #2

Tracking expert #n

- Launch of a tracking expert per silhouette identified by the Silhouette expert
- Unsupervised learning of the target
- Queried to report trajectory

Workflow with redundant experts



Color expert

- Trained on the color feature of the cellular tissue
- Queried to segment the image per color labels

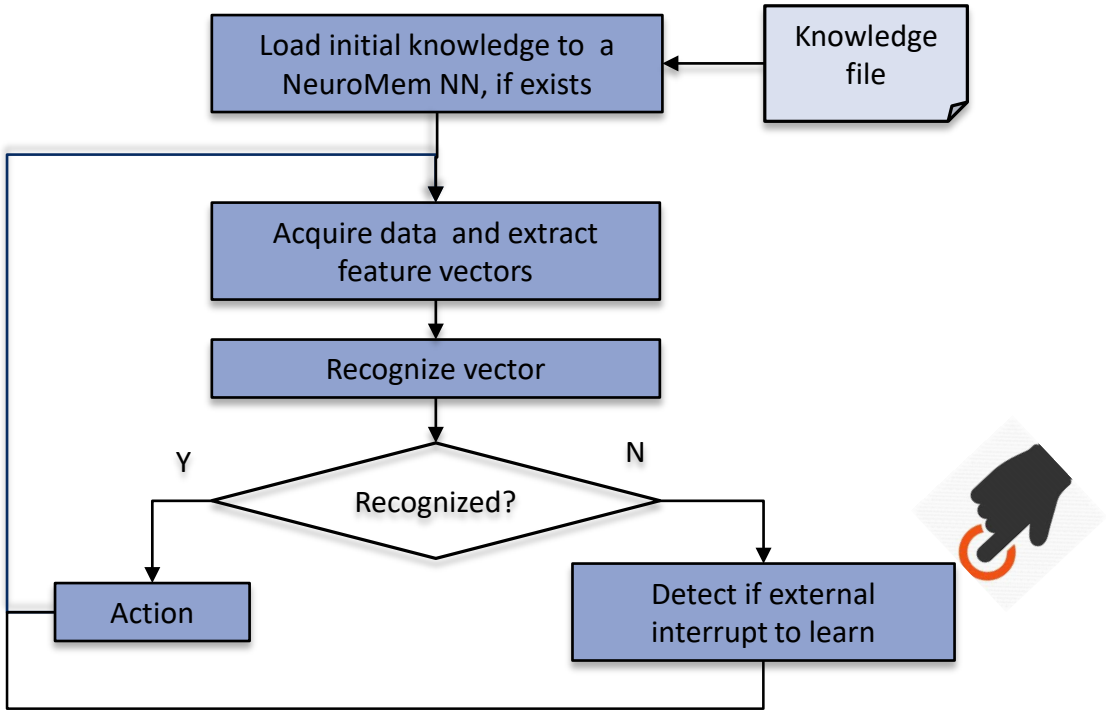
Texture expert

- Trained on the texture of the cellular tissue
- Queried to segment the image per texture labels

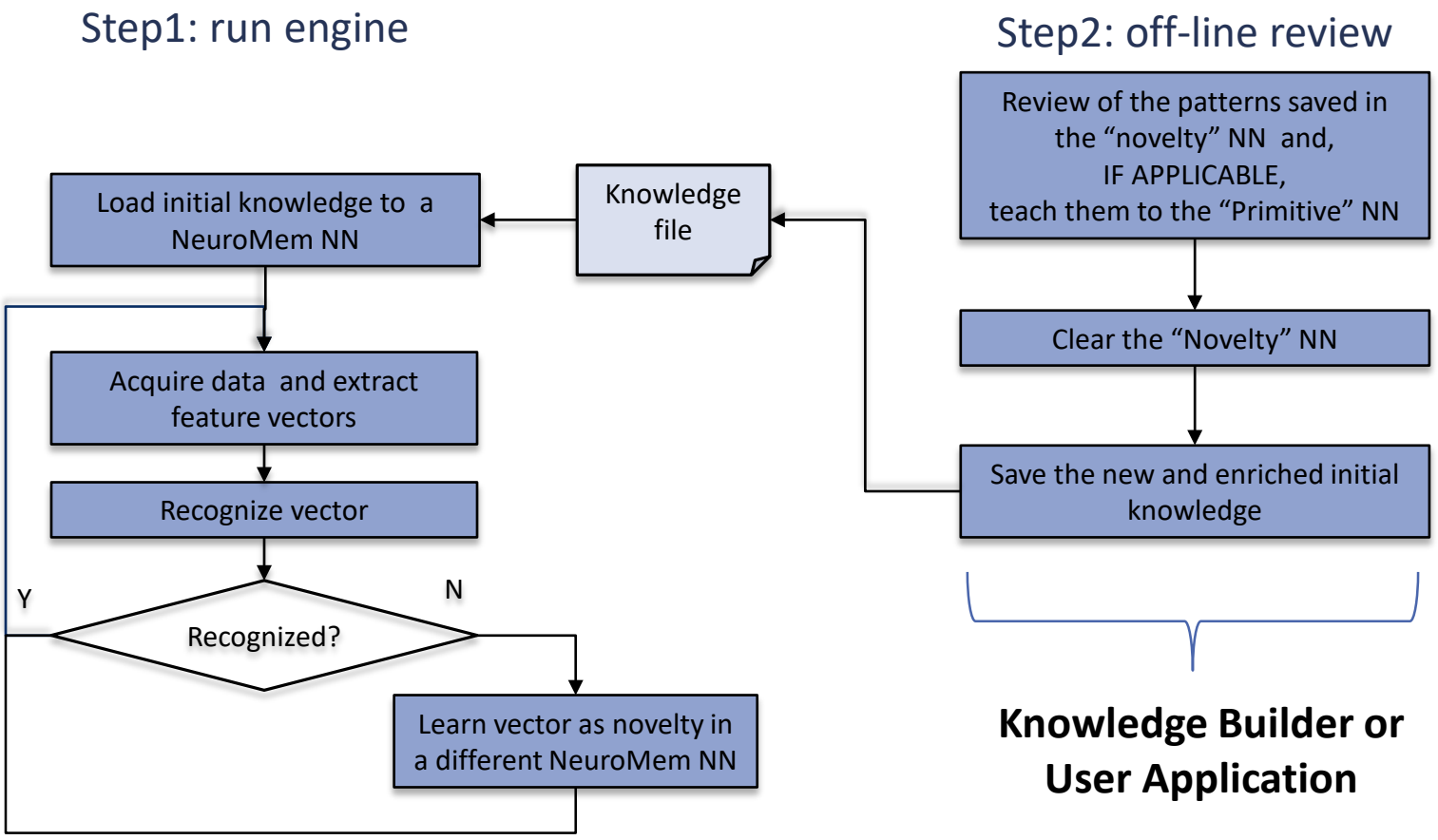
Rule based Consolidation Or **New Visual Expert**

→ Final identification

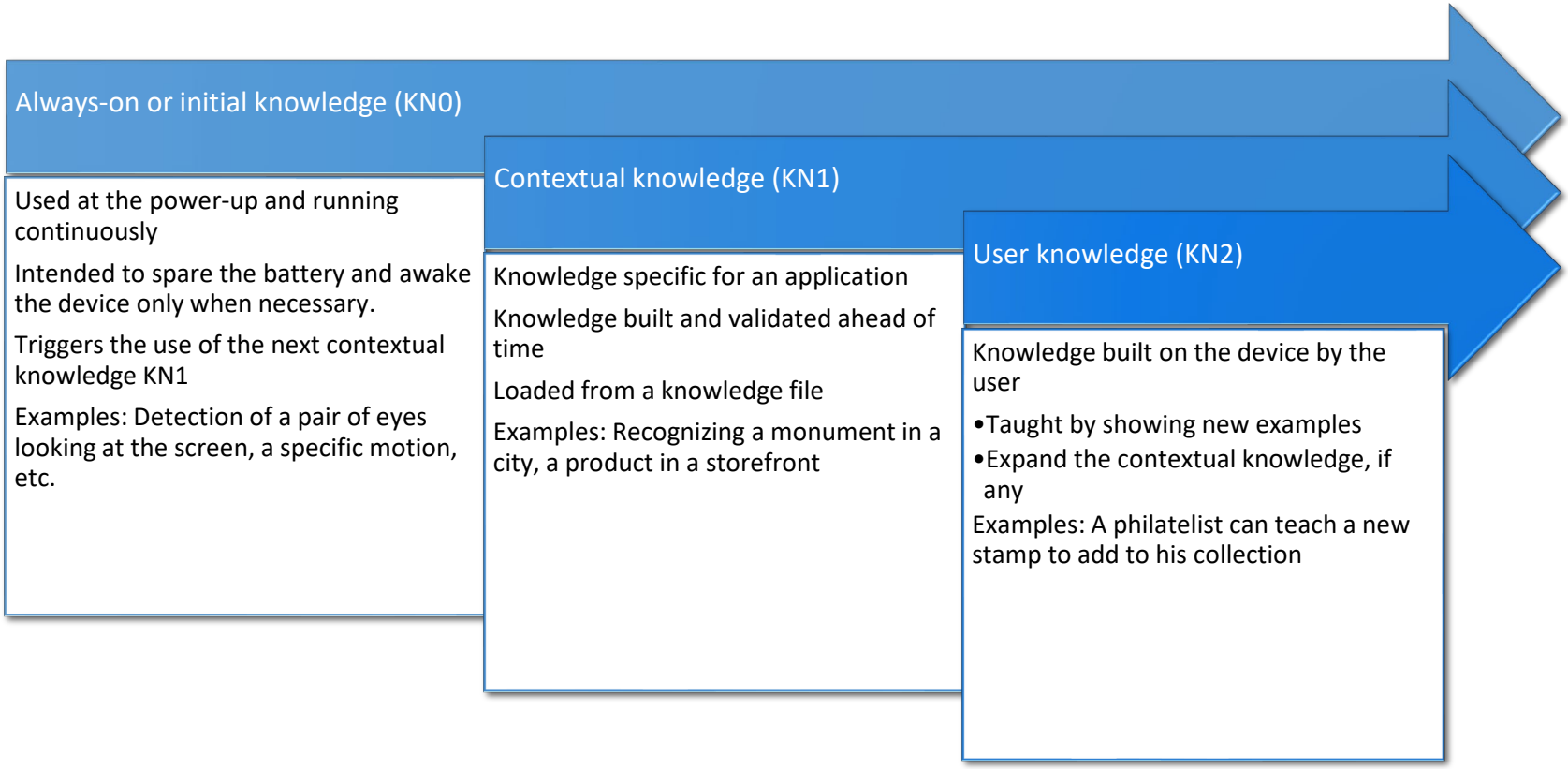
Workflow with Incremental real-time learning



Workflow with deferred novelty learning



Classes of Knowledge Bases



Examples of Knowledge and Configuration files

Canonic Knowledge

- Lexicons for Sentiment
- Lexicons for trademarks
- Logos for trademarks
- Airplane models
- Vehicle models
- Faces
- Facial expressions
- Sign languages
- Normal heartbeat

Canonic Configurations

- Identification
- Classification
- Novelty detection
- Template matching
- Pass/Fail
- Locate and count
- Locate and enumerate
- Track