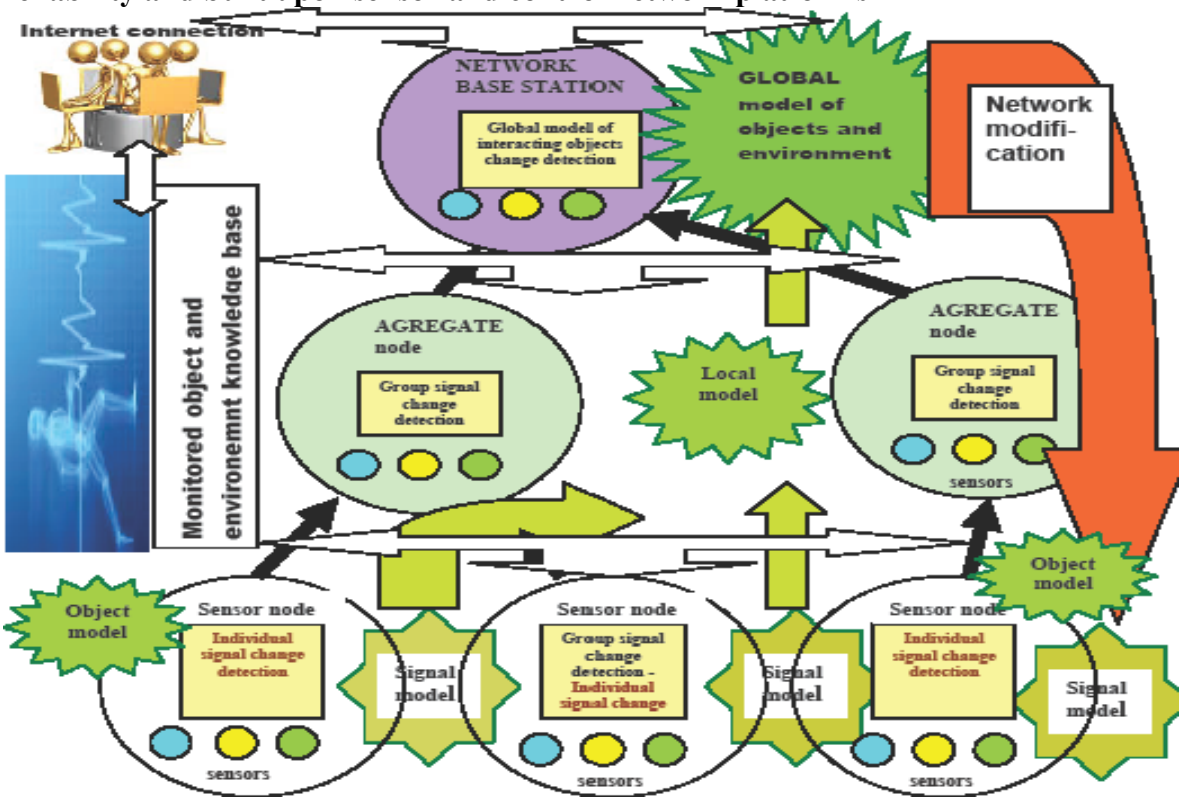
My RESEARCH INTERESTS concentrate on:

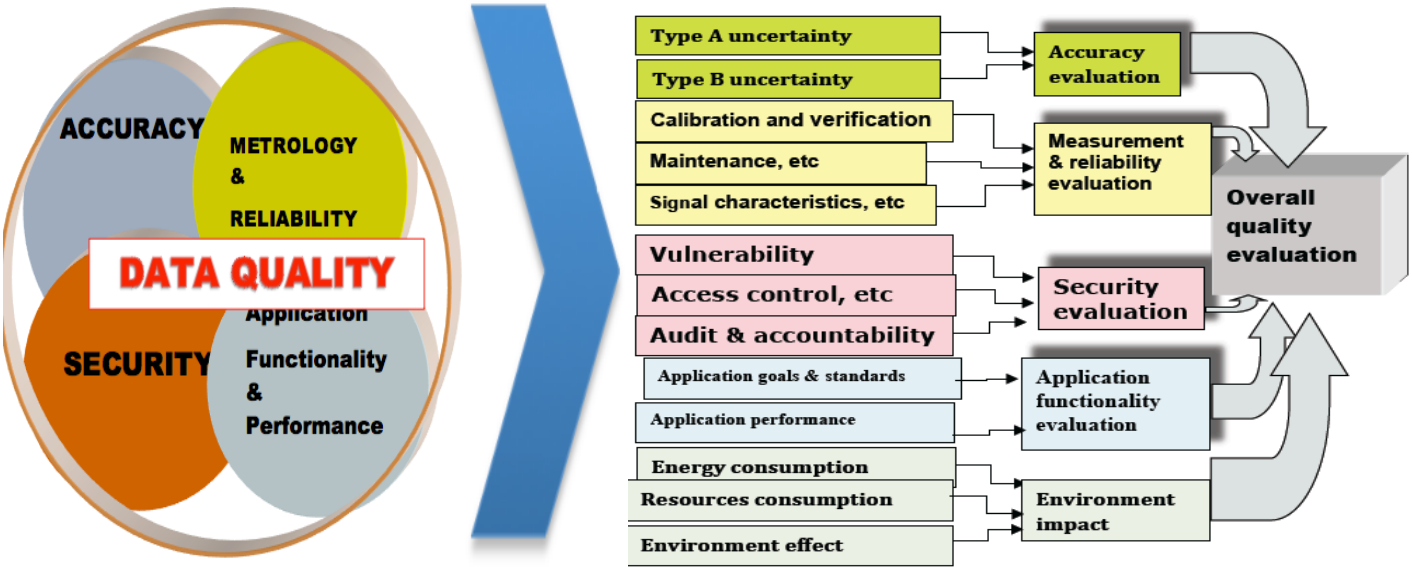
Design and implementation of novel cyber-physical systems with an enhanced functionality, security and reliability and built upon sensor and control network platforms



Example: Monitored objects models generation and distribution over a sensor network platform. The figure demonstrates both information and knowledge generation flows, where green (dark) objects and arrows represent the knowledge development while black/white objects and arrows show the physical objects and information flows and wide white arrows levels of models and information (local, aggregate and global). The model could be employed for improving application functionality as well as the technology itself

Source: **L. Reznik, Von Pless, G.; Al Karim, T**. *Distributed Neural Networks for Signal Change Detection: On the Way to Cognition in Sensor Networks*, IEEE Sensors Journal, Volume 11 , Issue 3, March 2011, pp. 791-798

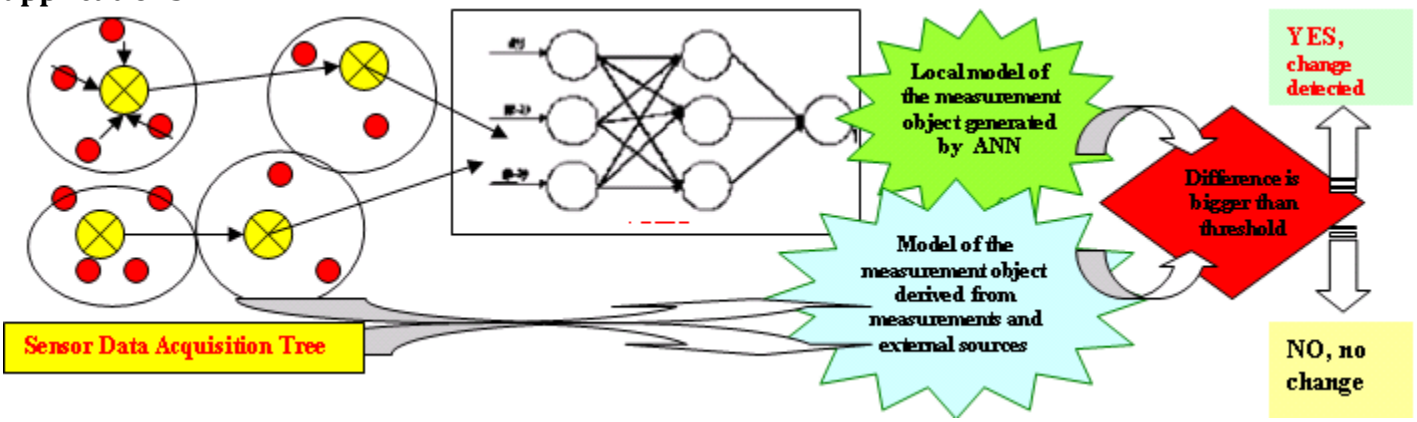
Research and development of system and data quality evaluation techniques integrating various factors, from accuracy and reliability to security and safety



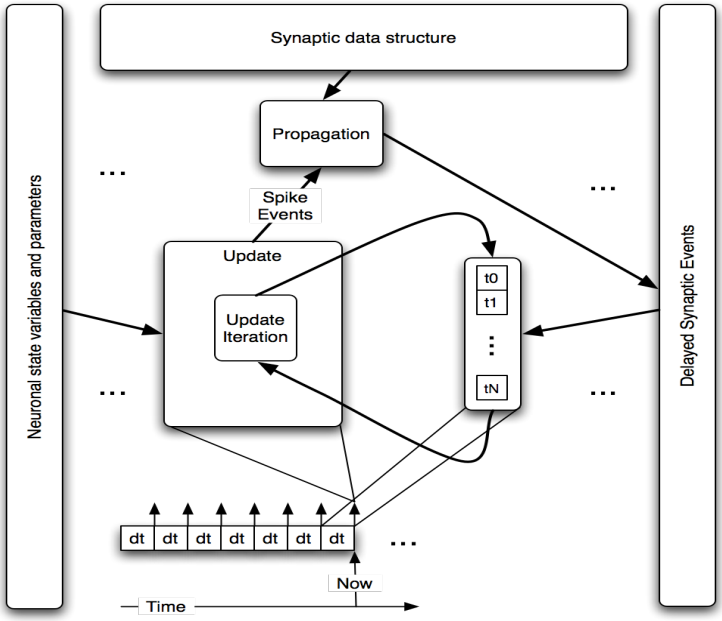
Example : Integral quality evaluation procedures in cyber-physical systems

Source: **L.Reznik** Integral Instrumentation Data Quality Evaluation: the Way to Enhance Safety, Security, and Environment Impact," 2012 IEEE International Instrumentation and Measurement Technology Conference, Graz, Austria, May 13-16, 2012, IEEE, 2012, pp. 2138 - 2143

Development of neural networks and machine learning models and methods for different applications.

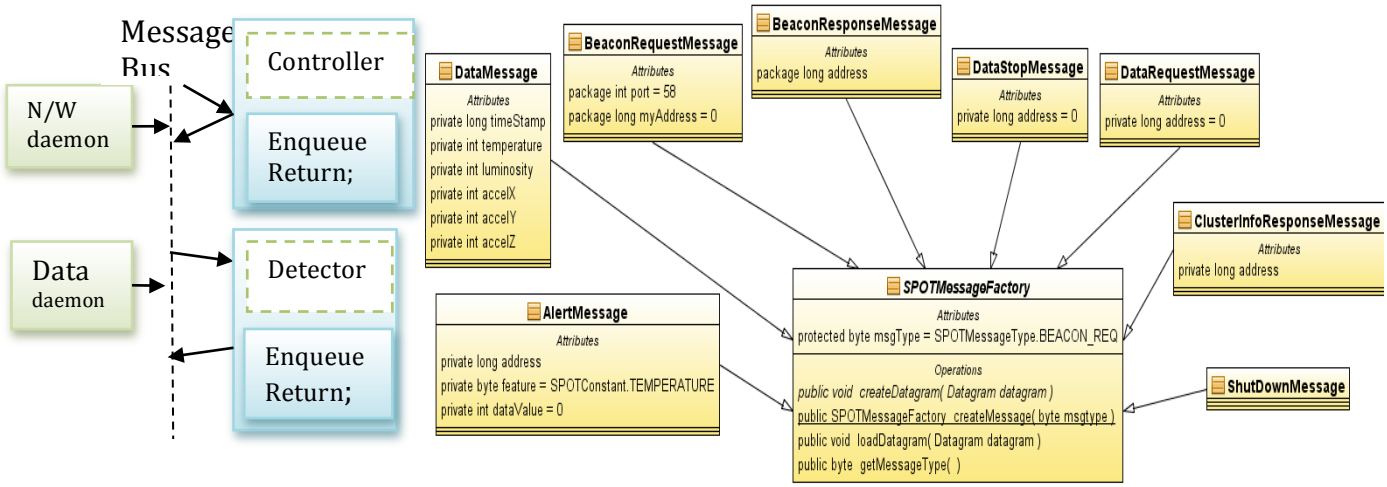


Example: Sensor network signal change detection based on comparison of the prediction model generated by a neural network from a recent history against the current measurement results acquired and communicated by a sensor network and/or their models acquired from other sources, e.g. expert opinions
Source: **L. Reznik, Von Pless, G.; Al Karim, T**. *Distributed Neural Networks for Signal Change Detection: On the Way to Cognition in Sensor Networks*, IEEE Sensors Journal, Volume 11 , Issue 3, March 2011, pp. 791-798



Example: Hybrid spiking neural network simulation execution flow. An integration step *dt* consists of iteration through time-sorted synaptic events *t0…tN* for every neuron in the network. At each iteration the update of model variables takes place relative to the time of a processed synaptic event. The value of *dt* is small enough (0.25 ms) so that a neuron can produce at most one spike event during this period. In the propagation phase all spike events are distributed to *Delayed Synaptic Events* data structure for future execution with appropriate weights and delays. The distribution is processed according to the map of synaptic connectivity.
Source: **D. Yudanov, M. Shaaban, R. Melton and L. Reznik** GPU-Based Simulation of Spiking Neural Networks with Real-Time Performance and High Accuracy, WCCI 2010, World Congress on Computational Intelligence, Barcelona, Spain, July 18 – 23, 2010

Design of intrusion detection and other security applications



Example: Message Bus architecture
and MessageFactory organization
in an Anomaly detection in Sensor Networks Framefork (SNADS)
Source: **L.Reznik and K.Nathan.** *A Framework for Measurement Anomaly Detection in Sensor Networks*, IEEE Sensors 2009 Conference, Christchurch, New Zealand, 25-29 October 2009, IEEE, pp.597-600