

LEGaTO Approach

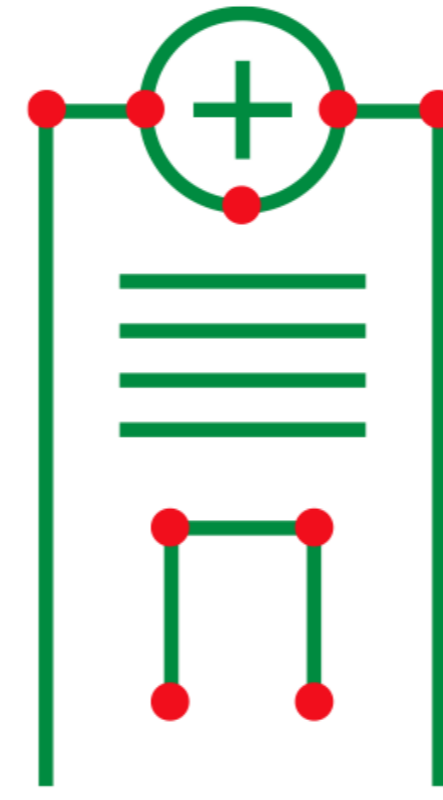
Starting with Made-in-Europe mature software stack, and optimizing this stack to support energy-efficiency

Integrated software stack supporting task-based programming model

Computing on a commercial cutting-edge European-developed CPU-GPU-FPGA heterogeneous hardware substrate and FPGA-based Dataflow Engines (DFE)

One order of magnitude improvement in energy-efficiency for heterogeneous hardware through the use of energy optimized-programming model and runtime.

LEGaTO Use Cases



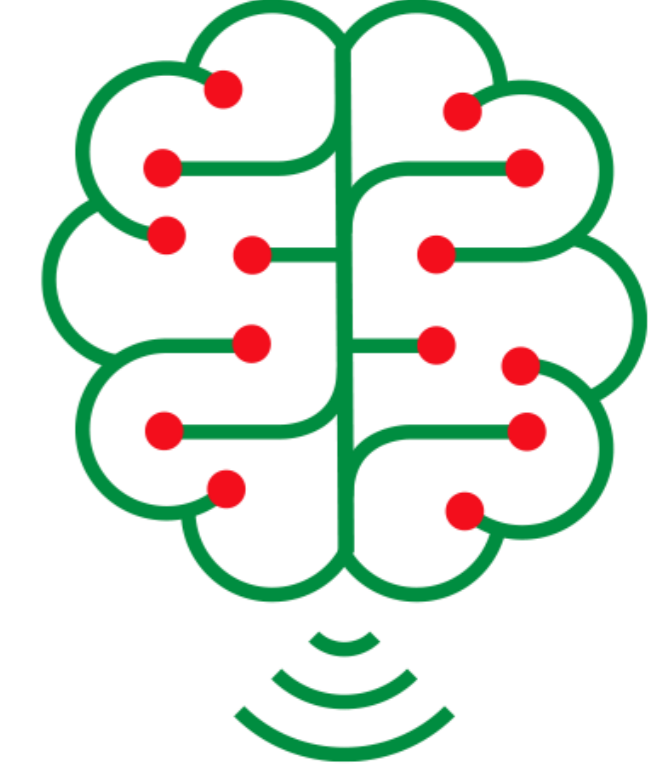
Healthcare

Will demonstrate not only a decrease in energy consumption but also an increase in healthcare application resilience and security.



IoT for smart homes and cities

The LEGaTO project software-hardware framework for the IoT will demonstrate ease of programming and energy savings in smart homes and smart cities applications.

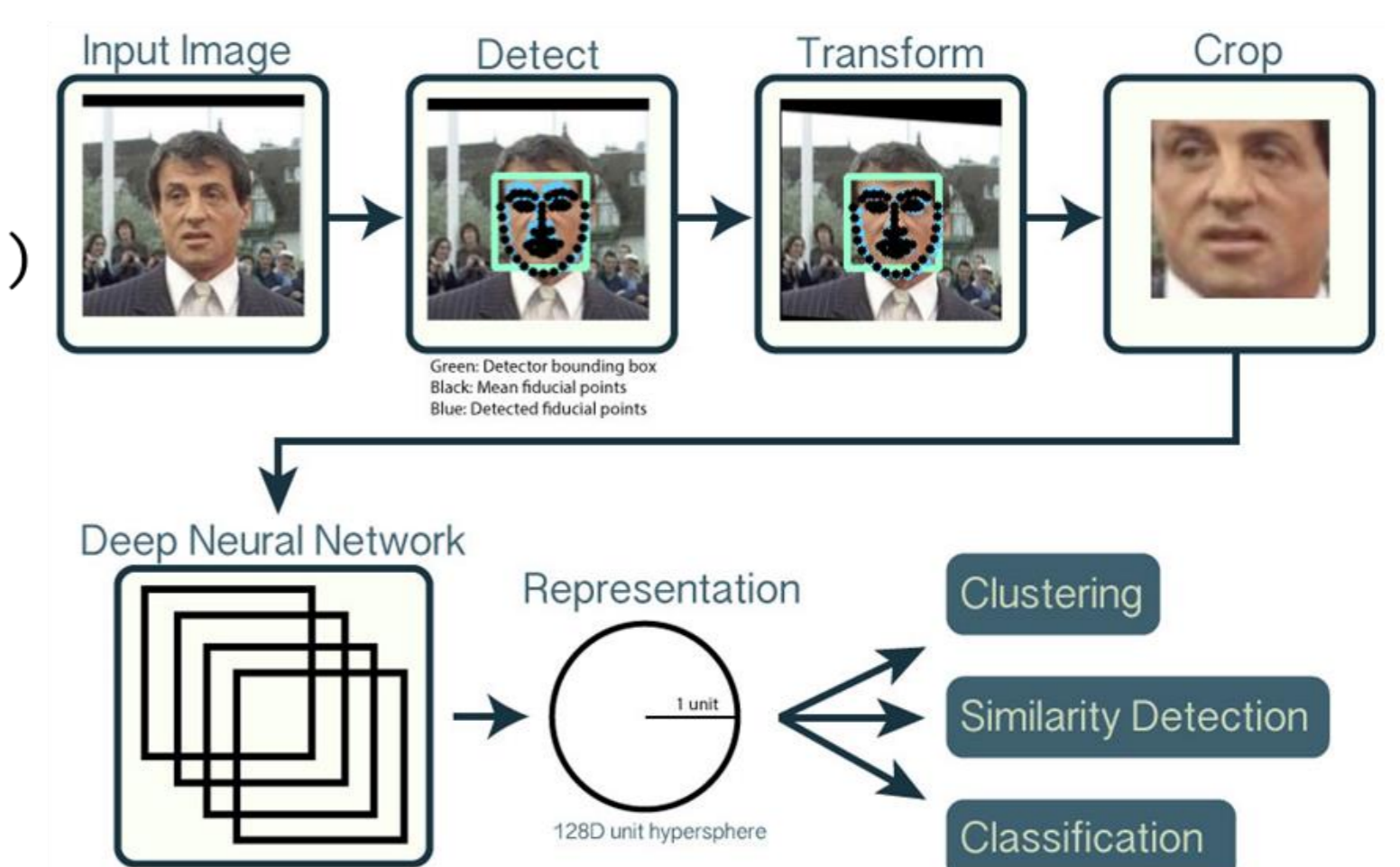


Machine Learning

Will improve energy efficiency by employing accelerators and tuning the accuracy of computations at runtime using CNN and LSTM.

Smart Homes and Machine Learning

- Behaviour Prediction and Anomaly Detection
 - Implemented within the LEGaTO timeframe
 - Fundamental sensor systems recently integrated
- Libraries for Smart Home Use Case
 - Image processing
 - Presence detection and face recognition
 - Speech recognition
- Algorithms for used Libraries
 - Morphological operations
 - Fast Fourier transformations
 - OpenCV
- Image Processing
 - OpenCV
 - ICL (computer vision algorithms)
- Speech Recognition
 - CMUSphinx (recently, may be replaced)
 - DeepSpeech
 - Google API (not local)
- Face Recognition
 - OpenFace

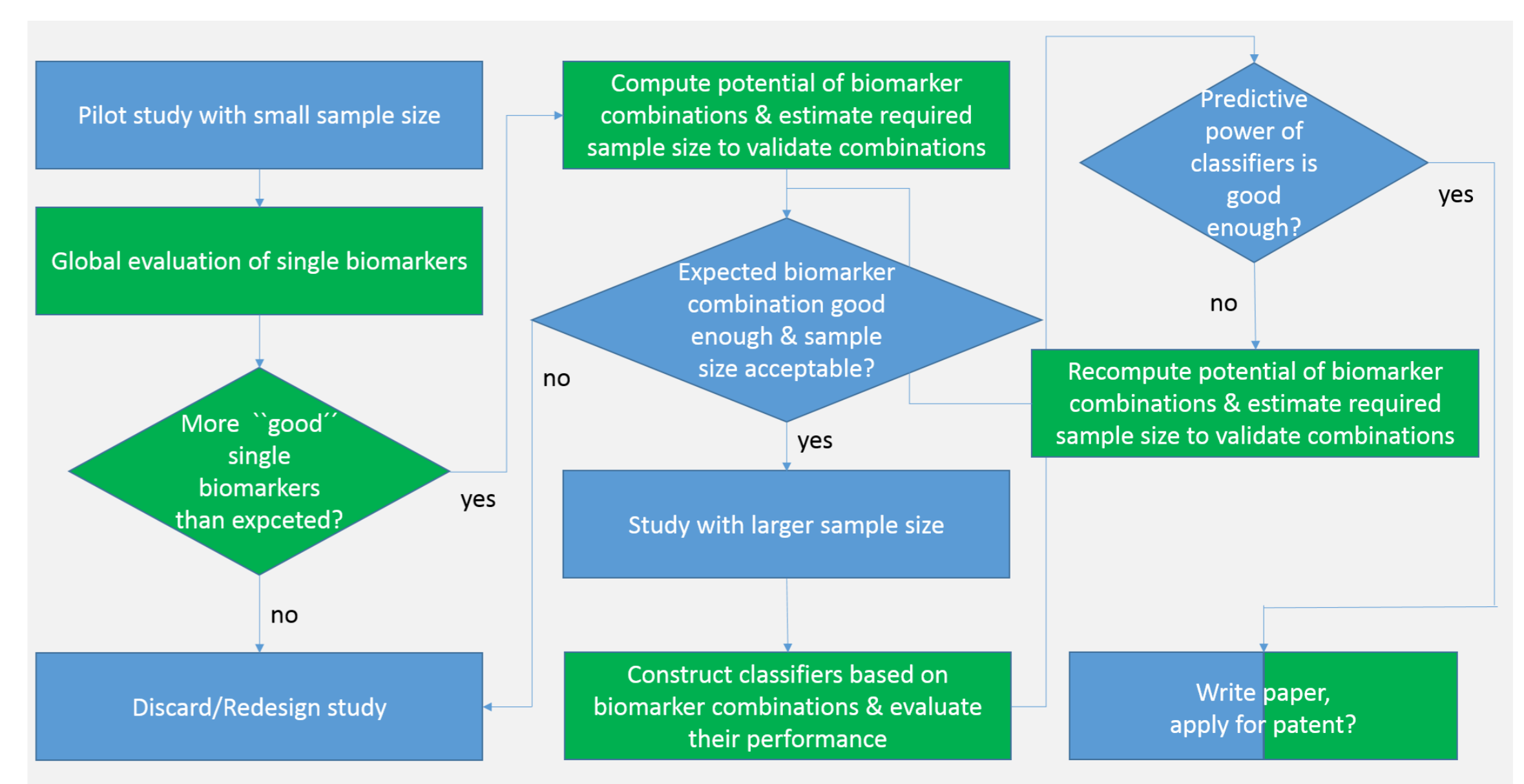


Healthcare

• Typical question: Based on measurements of cell products (mRNA, μ RNA, proteins, peptides, metabolites, ...) from healthy patients and patients with a specific disease, can we identify a single cell product to distinguish the healthy patients from the ones with the disease with high certainty?

• Answer: For infectious diseases sometimes. When we find unique cell products from a specific pathogen, we can be (almost) sure about an infection with the corresponding pathogen. Otherwise, there is usually no single biomarker.

• Modified question: Is there a combination of cell products which can be used to distinguish the healthy patients from the ones with the disease with high certainty?



Smart Cities

- Monitoring of urban air quality through CFD simulations
- Nowcasting prediction (short-range forecast - 2h/6h)
- Investigate to which extent this model can be operational
- Delivery of air quality information through visualization tools

