



# Patient Specific Framework for Biomedical Signal Management

Serkan Kiranyaz, Moncef Gabbouj,  
and Morteza Zabihi

Tampere University of Technology

September 25, 2015

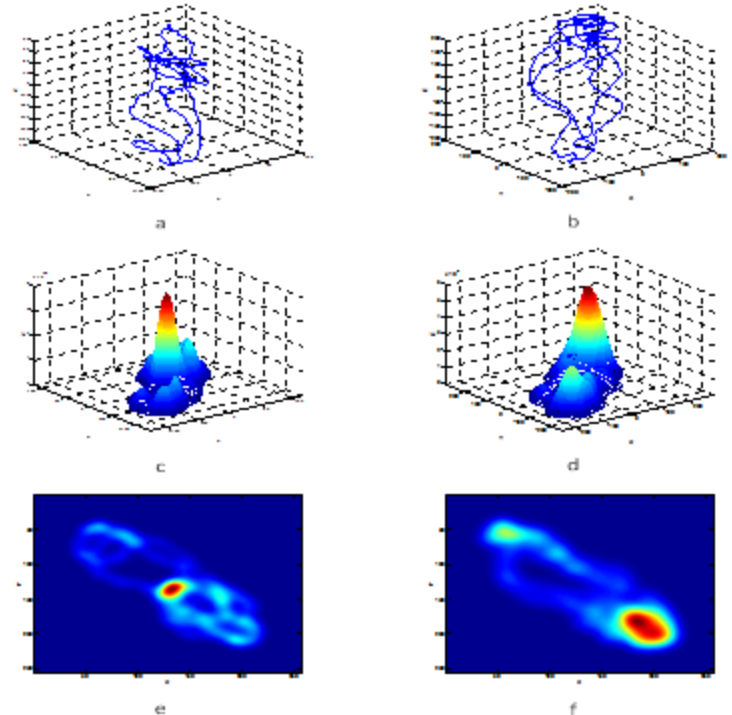
# Need

- Personalized healthcare services
  - Health monitoring in daily life
    - Elderly, athletes, casual trainers
  - Human Machine Interface
    - Rehabilitation, motor assistance, biofeedback
  - Medical Environments
    - Operating rooms, epilepsy monitoring units



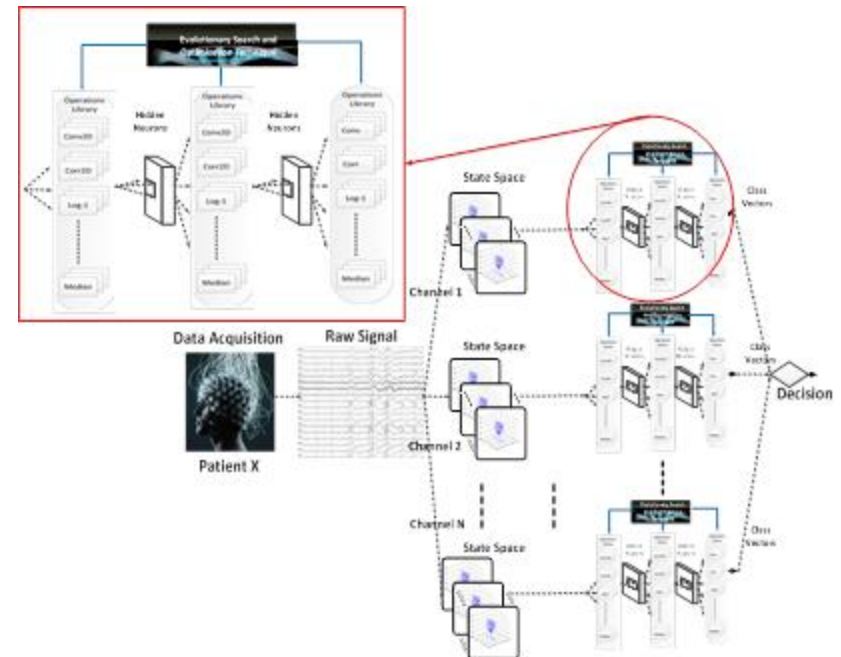
# Objectives

- The main innovation will be to “**learn**” and “**mimic**” a human medical expert’s ability to visualize and detect anomalies in a patient’s possibly large biomedical data using novel approaches in
  - Nonlinear dynamics
  - Large-scale machine learning



# Objectives

- Develop a framework that:
  - Enhancement performance over state-of-the-art methods, while
  - Keeping low computational complexity.





# Approach

- Surveying the dynamics of biomedical signals using geometrical nonlinear features
- Realization of potential capability of the “Divide and Conquer” paradigm and the corresponding topologies of ONNs
- GPU programming and efficient utilization of system resources
- Realization and integration into the final system

# Uniqueness

- Long-term recordings, physiological and non-physiological noise, and unbalanced classes pose a serious threat to the efficiency of biomedical signal analysis. Therefore, our method:
  - “learn” and “mimic” a human medical expert’s ability
  - Outperform the state-of-the-art methods
  - Open up new horizons such as considering the final product as a wearable device



# Impact

## Bio-signals are:

- Cost-effectiveness
- High temporal resolution
- Wide applications from anomaly detection to biometrics

## Market Place:

- The efficient implementation of the proposed approach, especially using GPU programming makes it suitable for portable system, which consequently covers much wider groups for healthcare.