Modelling / Simulation / Prediction of Dynamic Behavior

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Expertise: Machine Learning, AI, Simulation

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for example

- Usage Patterns
- System dynamics of technical components, e.g. a battery
- Reach of an electric car
  e.g. "Can I reach city A within 2 hours?"
  depending on
  - Battery state (as observed from previous usages)
  - Route profile
  - Behavior of the driver (as observed when driving similar routes)

Echo State Networks

patented by Fraunhofer IAIS

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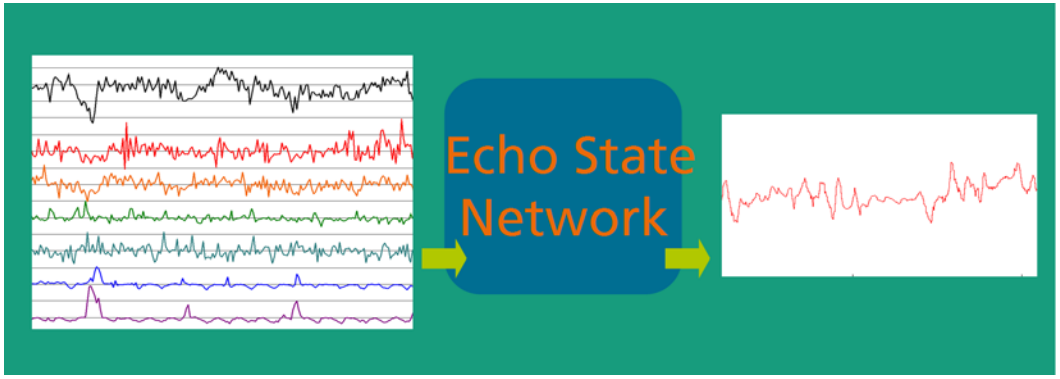

- ESNs are a universal method for **time series processing**
  e.g. system identification, prediction, system diagnosis, sensor data fusion.
- ESNs can model **highly non-linear** dynamics.
- ESNs exploits the power of Recurrent Neural Networks (RNNs)
  but instead of previous learning schemes,
  ESN **training is fast and** by far more **stable**.
- ESNs may be big (1000 nodes and more) **capable of learning non-linear, real-life systems**.
- ESNs have been applied for wind energy prediction, gas detection in freight containers, hand writing recognition, signal processing, robotics, and many more.