Network-centric Data Stream Processing

Distributed Intelligence

Predictive Computing
Network-centric Data Stream Processing

**Challenge:** Time-optimized Data Stream Processing

**Objective:** Optimally Decide when to Process

**Funded Project:** H2020/MSCA INNOVATE

- **Methodology:** Delay-Tolerant Data Stream Processing
  - Find the **optimal time** to infer: pattern classification; concept drift; anomaly/novelty/outliers detection,…
  - Principles of **Optimal Stopping Theory**

- **Methodology:** Time-optimized Task Offloading
  - Find the **optimal** Mobile Edge-Computing server for task/analytics offloading

- **Methodology:** Edge-centric Selective Analytics
  - Engage **only relevant** Edge Nodes for assigning predictive Modeling & Analytics over **relevant** local data
Distributed Intelligence at the Edge

**Challenge:** Energy-aware Distributed Knowledge Inference

**Objective:** Increase network lifetime pushing Inference at the Edge

**Funded Project:** EU/GNFUV

- **Methodology:** Self-organization Algorithms for Constrained Networks (e.g., UxVs, WSNs)
  - Particle Swarm Optimization
  - Local Inference and Local Function Approximation Models
  - Consensus Algorithms for Knowledge/Model Fusion

- **Methodology:** Edge-centric Statistical Learning
  - **Exploitation:** sensing & computing capability of UxVs to collaboratively infer knowledge
  - **Distributed** Statistical Learning Models (Model Diversity, Model Update, & Federated Learning)

Flock of USVs

USVs Experimentation Testbed Skaramagas, Athens.
Predictive Computing

**Challenge:** Dataless Large-scale Statistical Learning

**Objective:** Extract Knowledge from Data **without** Data Access

**Funded Project:** EPSRC/CLDS

- **Methodology:** Query-driven Predictive Analytics
  - **Predict** the query’s output by **learning** from past queries
  - **Benefits:** avoid query execution, reduce data transfer, optimize network & computational resources

- **Methodology:** Data Relevance (Small Data is Big Data)
  - **Key:** identify analysts’ **relevant** data regions of interest
  - **Key:** extract knowledge by interpolating **only** relevant data

- **Methodology:** Dataless Explanation & Exploitation of Analyti
  - **Key:** exploratory analytics via sequential **learning**
  - **Key:** exploit the explanation space via **computational** intelligence
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