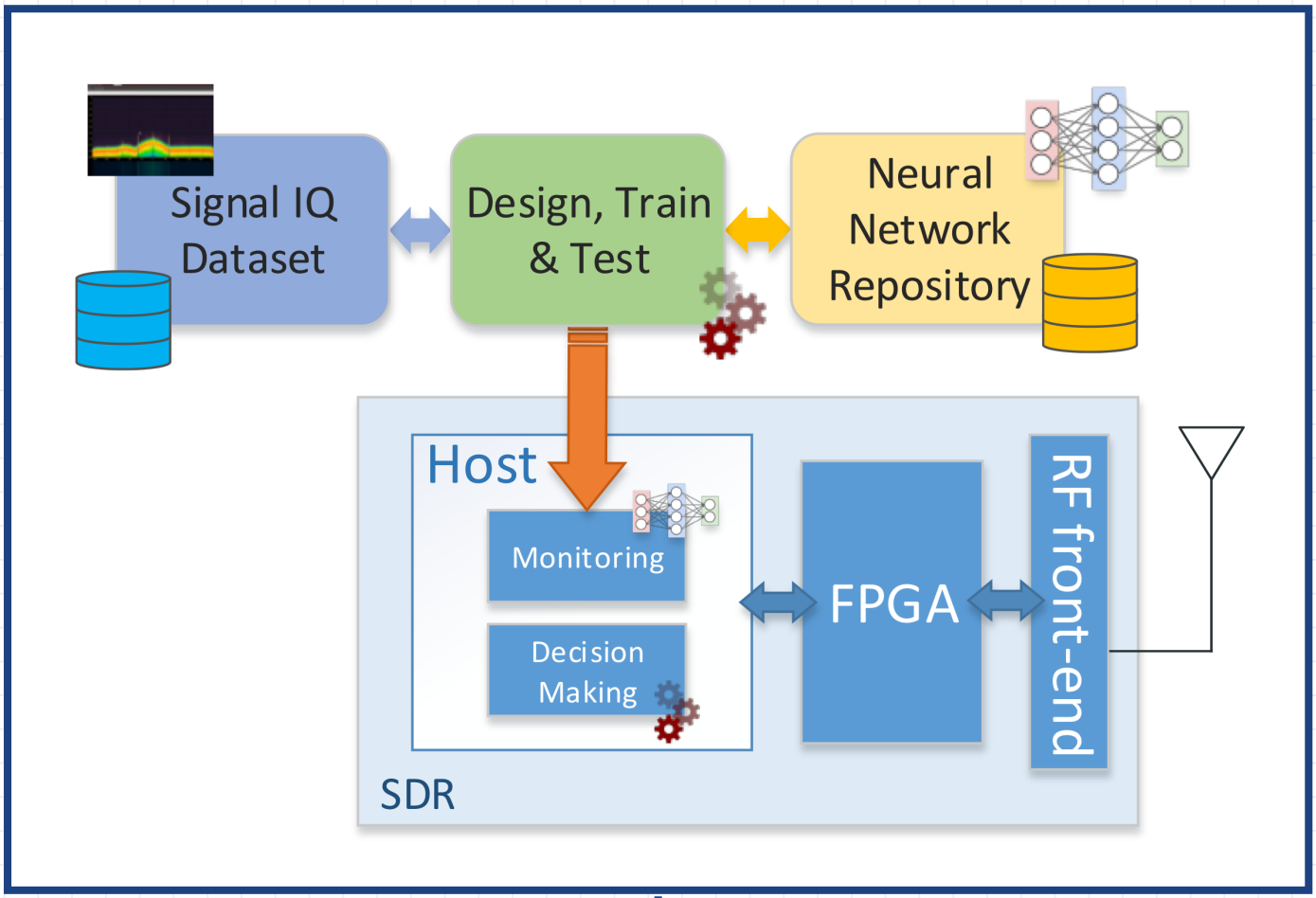
Orca

Orchestration and Reconfiguration Control Architecture

BASIC SDR CONTROL PLANE FUNCTIONALITY

Build SDR control plane:

Providing flexible monitoring and analysis tools for resource management



Spectrum monitoring prototyping platform for experiments on RAT identification and parameter estimation

- Several host-based algorithms based on deep learning
- Flexible reconfiguration of monitoring algorithms
- Platform automates data collection and labeling tasks for training and testing of

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CONTEXT

Traditionally, Radio Access Networks (RANs) were designed with a limited number of scenarios and services in mind. With the adoption of concepts such as SDR, SDN, and slicing, we are witnessing an increased reuse of radio resource infrastructure for multiple, distinct types of RATs, and applications. However, in spectrum sharing contexts, such reconfiguration capabilities raise new challenges in interference coordination, and policy enforcement. Spectrum monitoring will become an important tool in addressing such issues, as it enables the identification of RATs and interference sources present in the radio environment, and optimization of radio devices spectrum access schemes. Spectrum monitoring and signal classification are not entirely new ideas; however, with recent breakthroughs in the area of machine learning and the market adoption of concepts such as SDR and virtualization, it may be finally possible to implement these capabilities in existing radio networks in a sufficiently flexible and cost-effective manner.

UNIQUE SELLING POINT

With this offer, we aim to analyse, test and provide different deep learning algorithms that can be instantiated in radio devices assisting them in their tasks of waveform and RAT recognition and parameter estimation. In particular, we will provide:

- deep learning architectures and weights for RAT classification and parameter estimation.
- ability to instantiate at runtime the provided algorithms in existing SDRs by slicing the available physical radio and hardware computational resources.

OPPORTUNITIES

- Development of an automated RF signal samples collection, labelling and storage framework for training and testing of new machine learning-based algorithms for modulation recognition tasks.
- Through the provided software-based reconfigurable monitoring tools, radio devices may identify the different types of RATs present in their environment, and leverage such information to optimize their own channel access mechanisms.
- Leveraging concepts of slicing and virtualization, spectrum monitoring nodes can be dynamically instantiated in an already established radio network. Spectrum monitoring may then become a new type of service that regulators benefit from in their policy design and enforcement activities, without the deployment costs of a dedicated sensing network.

REFERENCES

The signal classification training and testing framework will be implemented in the well-established GNU Radio SDR platform [1], using USRP boards as RF front-ends. For the design and instantiation of deep learning algorithms will make use of the Caffe [2] and Tensorflow [3] libraries.

1 https://www.gnuradio.org/about/

2 http://caffe.berkeleyvision.org/

3 https://www.tensorflow.org/