- ML-based Pipeline for Pulsar Analysis (ML-PPA)
- Running container interactively in compute centres

PUNCH CrossTA, Aug. 21, 2024

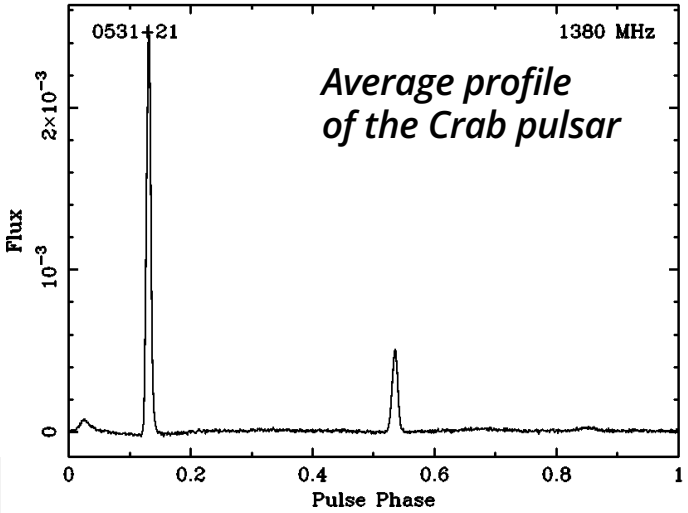
ML-PPA: Team

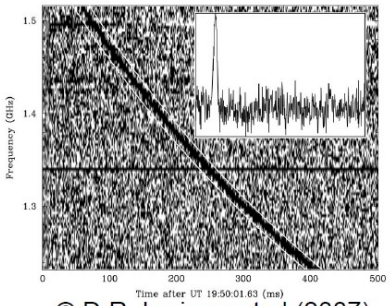
Gautam Dange (FIAS Frankfurt)
Lars Haupt (DZA Görlitz)
Andrei Kazantsev (MPIfR Bonn)
Tim Oelkers (HTW Berlin)
Yurii Pidopryhora (MPIfR Bonn)
Tanumoy Saha (HTW Berlin)
Marcel Trattner (HTW Berlin)

Frank Bertoldi (U Bonn)
Hermann Heßling (DZA Görlitz, HTW Berlin)

ML-PPA: Outline

Crab pulsar with surroundings





© D.R. Lorimer et al (2007)

A transient

Focus points

- New gen of radio telescopes threatens to flood us with data
- Search for transients, using pulsars as proxies
- Scalability of new data pipelines

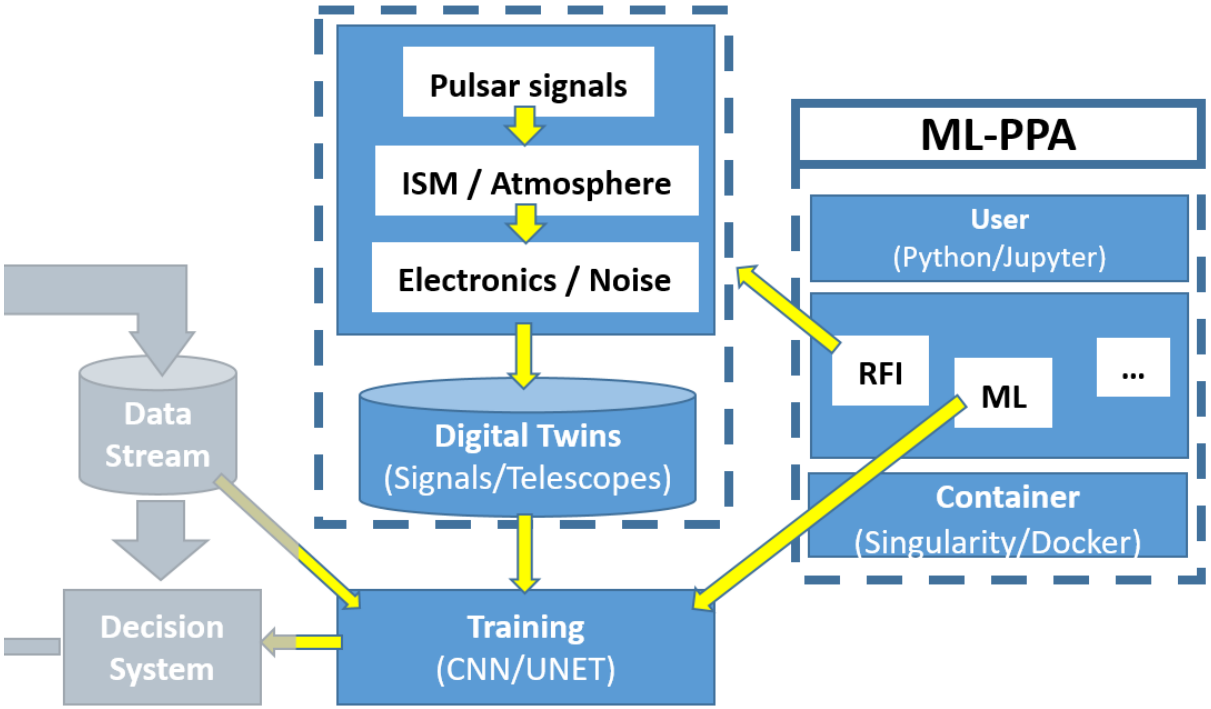
100m Effelsberg radio telescope

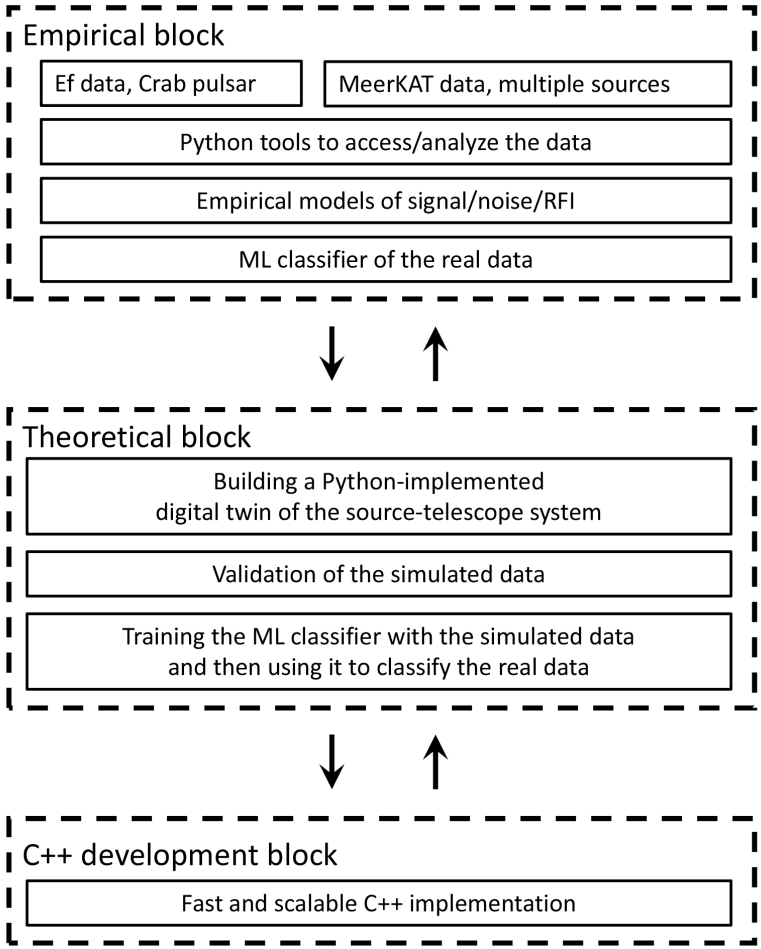
MeerKAT array (South Africa)

ML-PPA: Outline

Architecture: 3 software layers

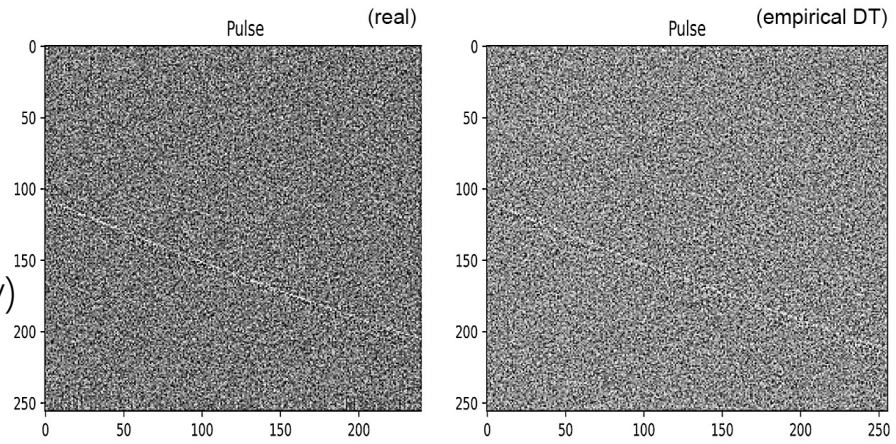
- middle layer: modules for simulation of pulsar signals from source to telescope, and for generation of Digital Twins (DT)
- bottom layer: creation of (Singularity) container

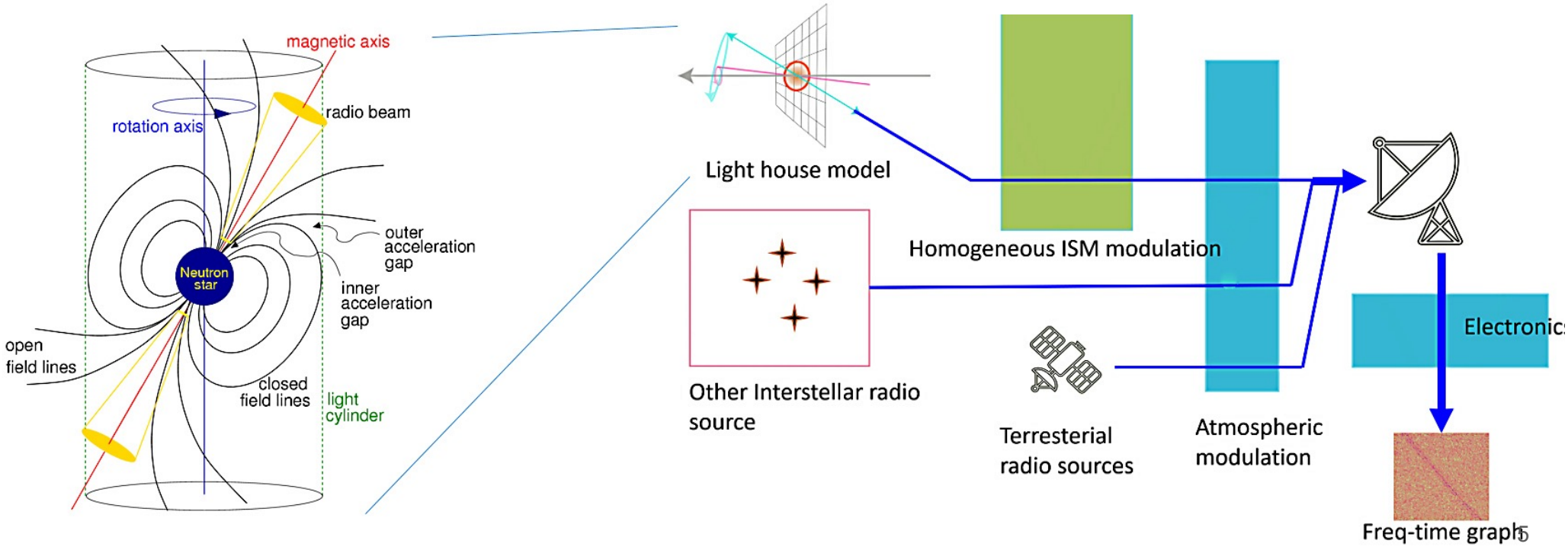




ML-PPA: Digital Twins (DT)

2 types of DT: **physics-driven** (main) and **empirical** (auxiliary)





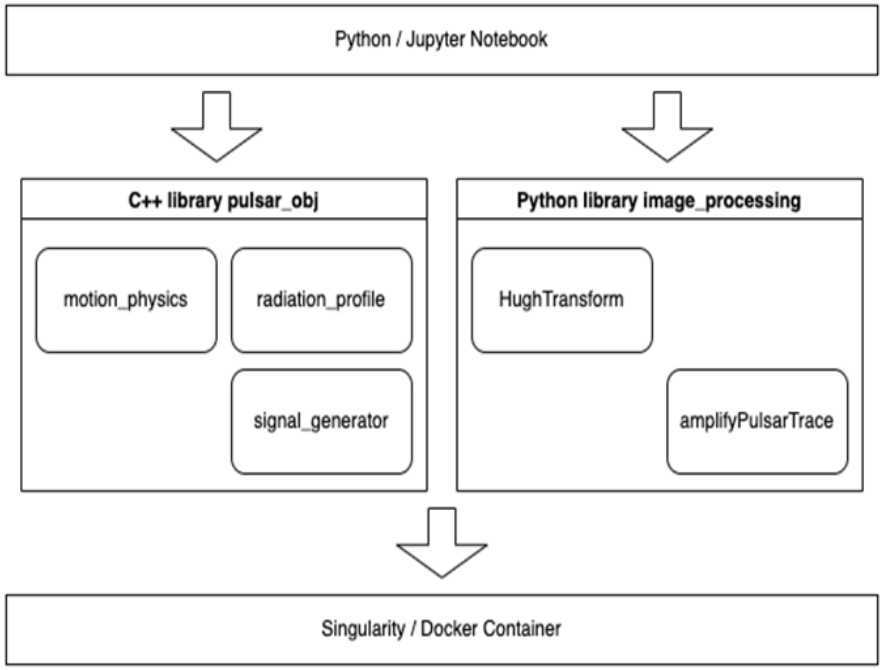
ML-PPA: Repository

Version 0.1 (https://gitlab-p4n.aip.de/punch_public/ml-ppa)

Modules

- PulsarDT: physics-based DT (Python)
- PulsarRFI_Gen: empirical DT (Python)
- PulsarRFI_NN: ML-classifier (Python)
- PulsarDT++: efficient, parallel-computing capable C++ implementation of all ML-PPA components

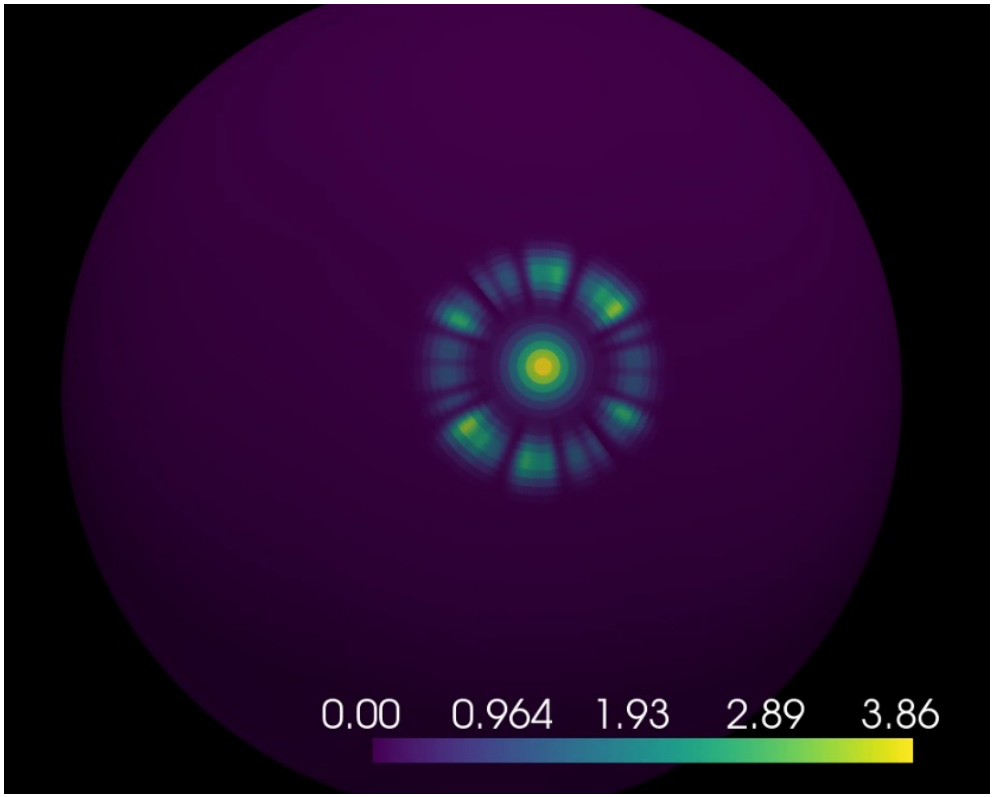
+ ~50 page **paper** with detailed description



ML-PPA: current activities & plans

current and future (v 0.2 in preparation)

- Data
  - more Effelsberg data (other pulsars)
  - MeerKAT data
- Physics-driven DT
  - better pulsar model (beam properties etc.)
  - improving ISM model
  - interface
- ML-classifier
  - improving low SNR performance (exploring different ML architecture)
  - de-dispersion (TransientX)
  - distributed training (HeAT, Horovod)



Running container interactively in compute centres

PUNCH NEWS

9th PUNCH4NFDI Newsletter

13 August 2024

The latest issue of the PUNCH4NFDI Newsletter has recently been published.

Read more

PUNCH4NFDI User Story

25 July 2024

Software to the data: Running container interactively in compute centres

Read more