



SKA DATA CHALLENGES

SKACH Winter Meeting – 22 January 2024

Artwork by Sandbox Studio, Chicago

LIST OF CHALLENGES

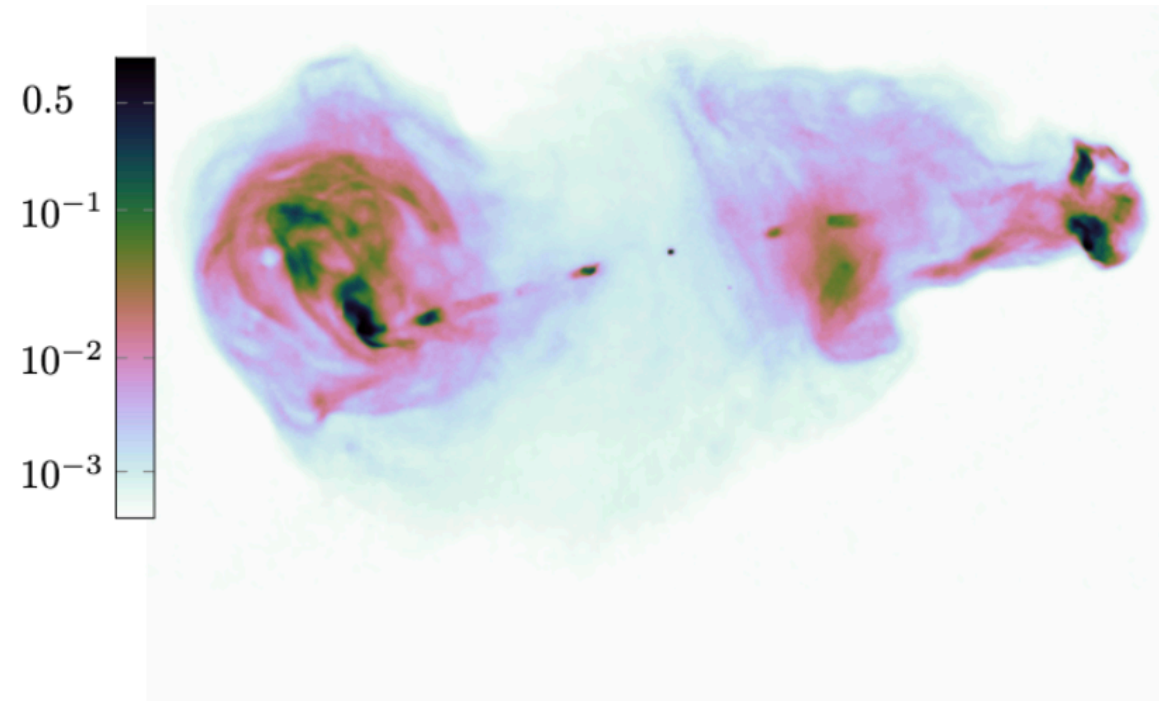
- **SDC1:** 2D radio galaxy classification
 - <https://www.skao.int/en/464/ska-science-data-challenge-1>
- **SDC2:** 3D radio galaxy characterization
 - <https://sdc2.skao.int/>
- **SDC3a:** EoR foreground removal, Recently finished in fall 2024.
 - <https://sdc3.skao.int/>
- **SDC3b:** EoR cosmological parameter inference, Expected to launch Q1 2024
 - <https://sdc3.skao.int/challenges/inference>
- **SDC4:** Magnetism (scope still being defined)
 - Progress on sky models, propagation models, telescope & error models
 - Kick-off possibly mid-2024

The data from old challenges are very useful for testing and validating ML techniques!

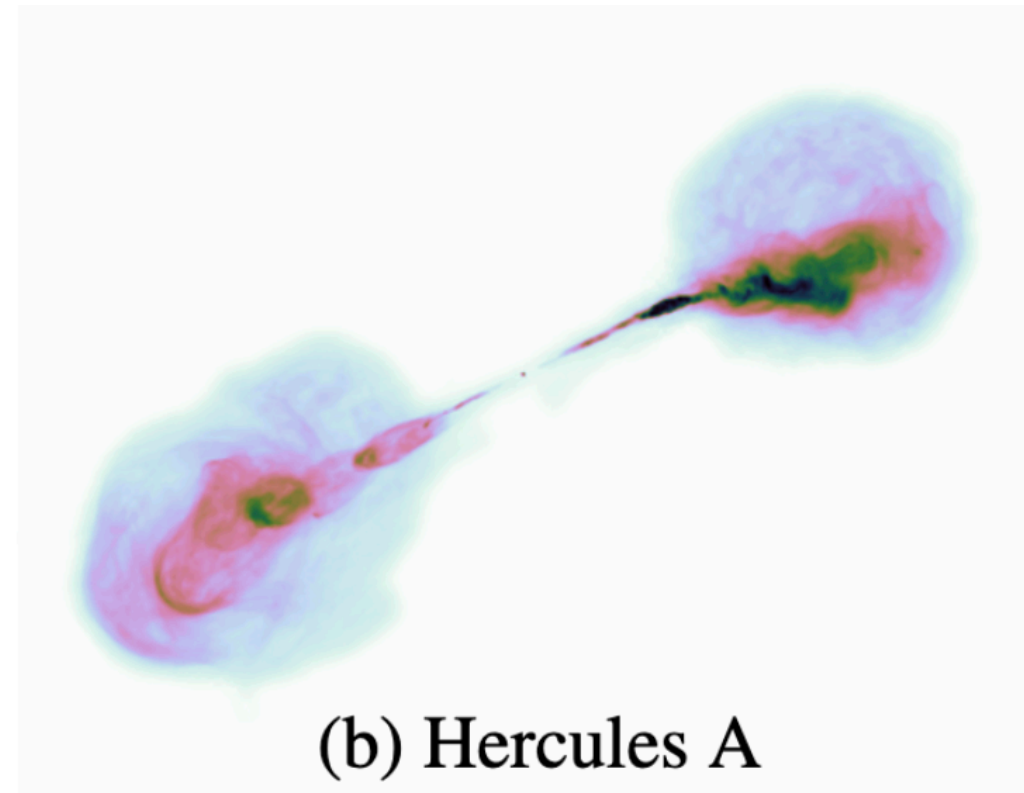
HERE IN SWITZERLAND...

- KARABO library includes lots of effects for simulating observations: system noise, primary beam, ionospheric screen, etc
 - Used for training EPFL SDC3 Neural Network
- A lot of work on AI for radio astronomy in SKACH
- Any interest in developing public datasets to support these projects in CH and abroad?
- Ideas:
 - Radio galaxy catalog with high dynamic range, including calibration errors, measurement effects, etc
 - 21cm IM?
 - Anything else?

DIFFUSE EMISSION EXAMPLES



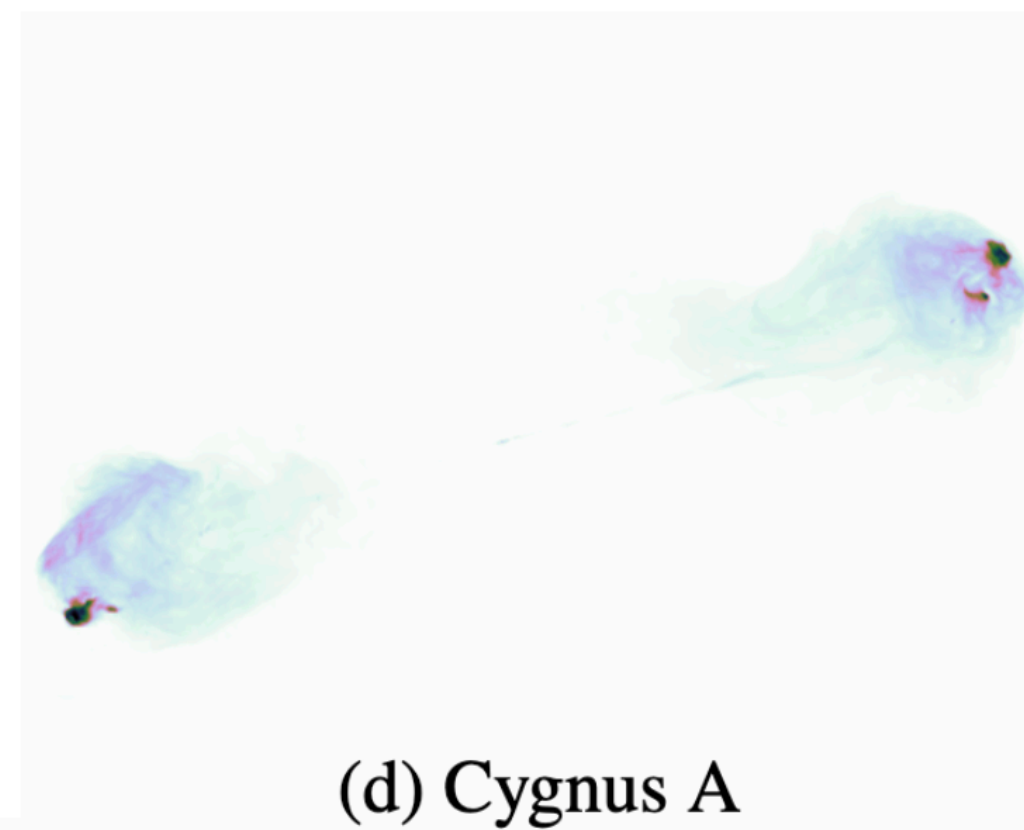
(a) 3c353



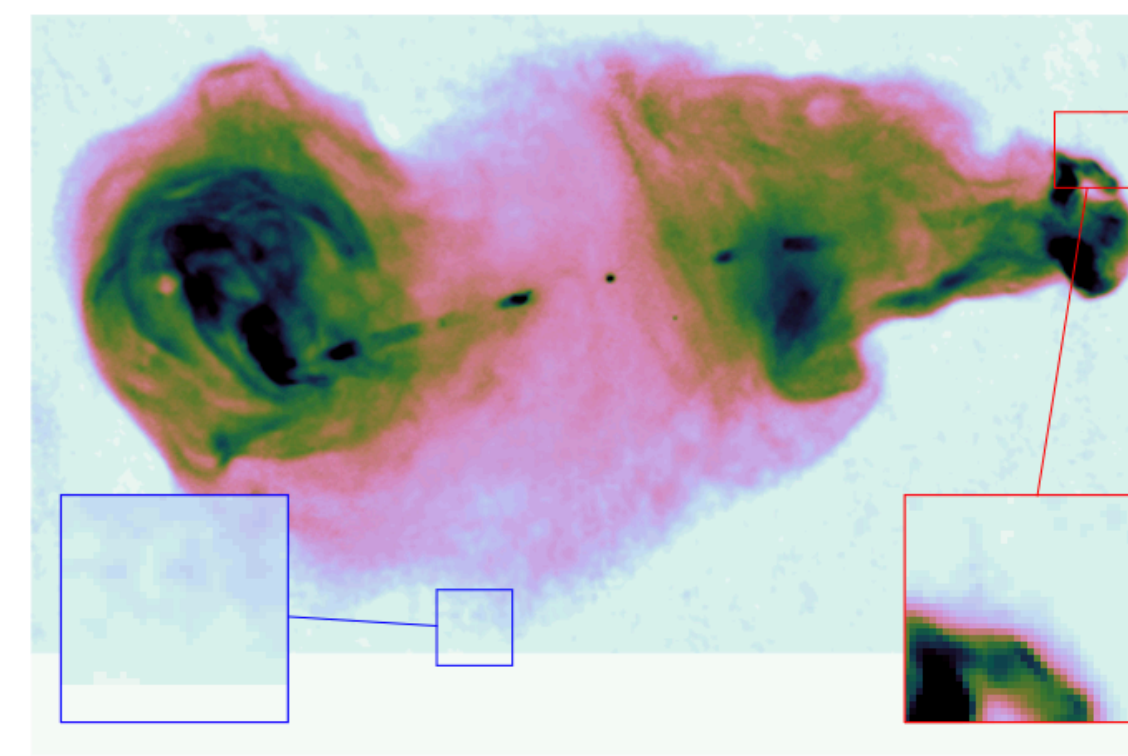
(b) Hercules A



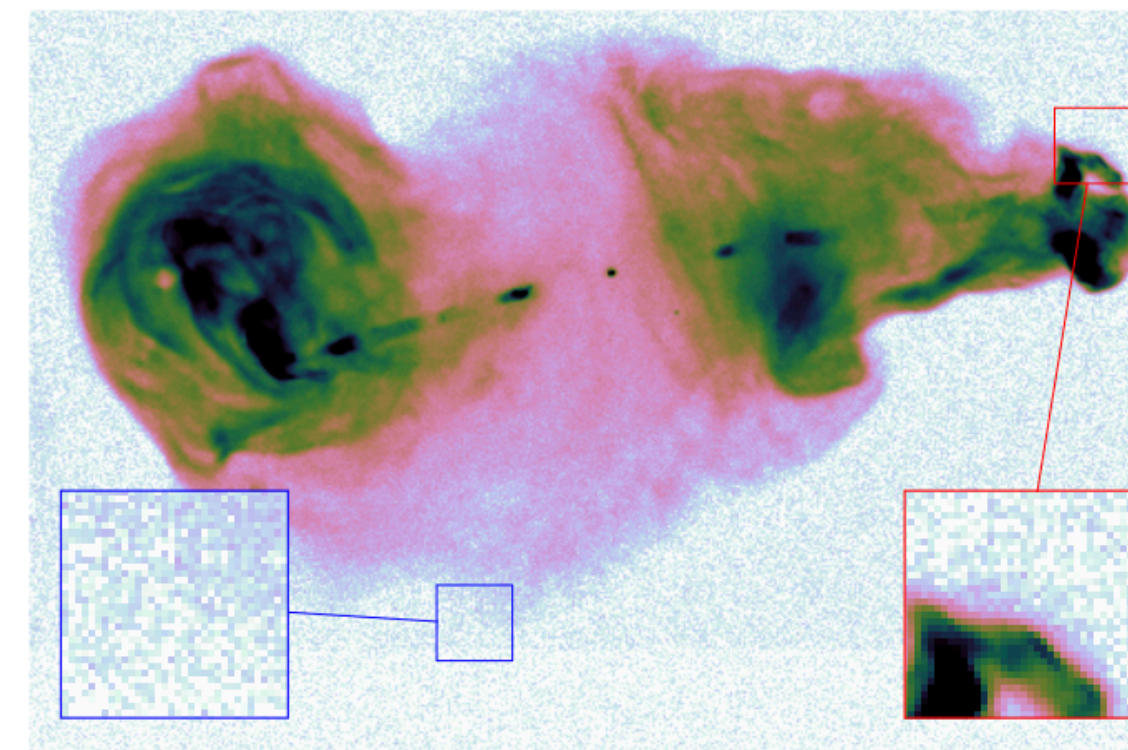
(c) Centaurus A



(d) Cygnus A



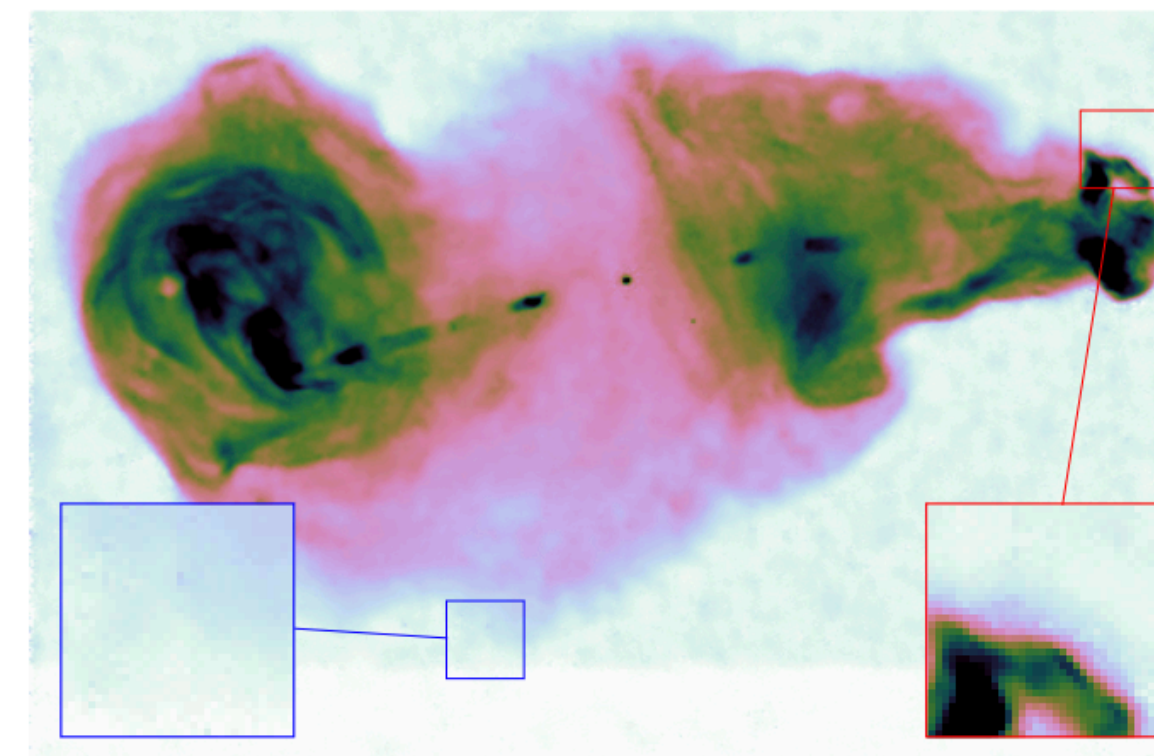
(a) Groundtruth



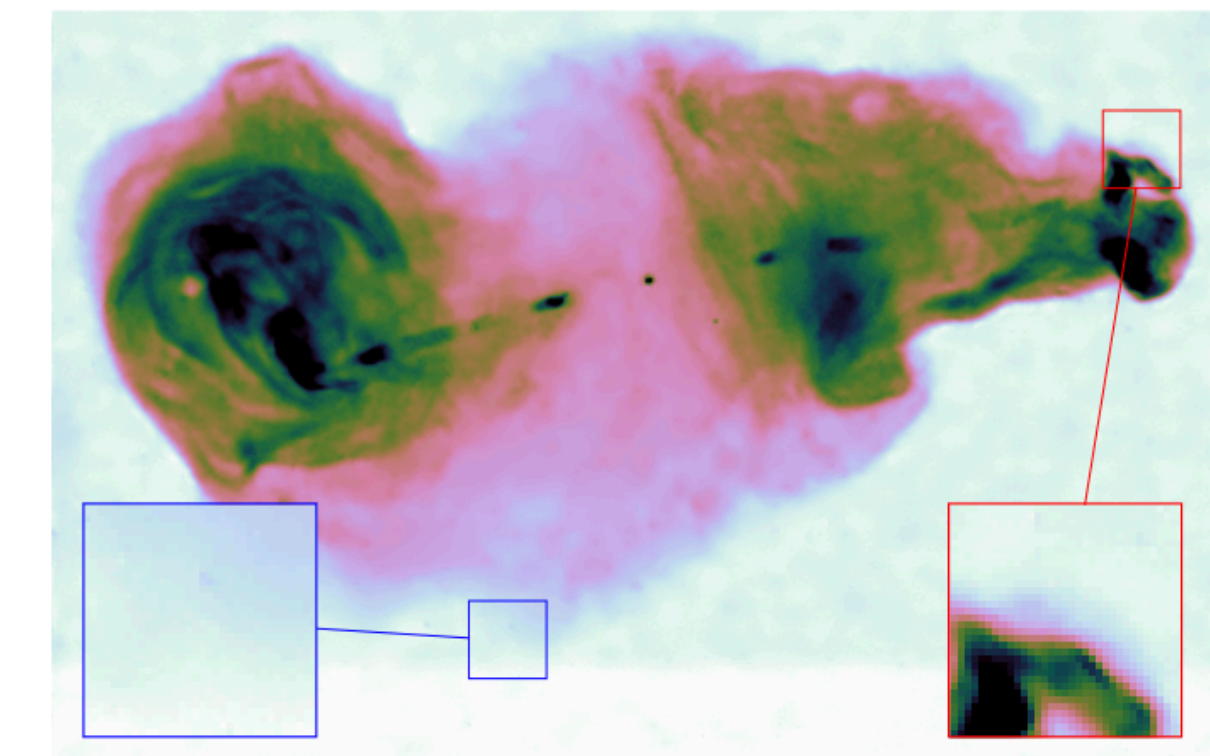
(b) Noisy image
(47.6 dB, 24.1 dB)



(c) Average sparsity prox. operator
(53.8 dB, 33.1 dB)



(d) AIRI- ℓ_2 denoiser
(53.7 dB, 35.1 dB)



(e) AIRI- ℓ_1 denoiser
(53.9 dB, 35.8 dB)