

# Cavity Detection Tool (CADET)



# Motivation

---

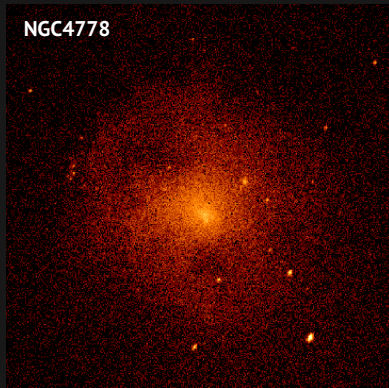


$$E = 4pV$$

$$P_{\text{jet}} = \frac{E}{t_{\text{sound}}}$$

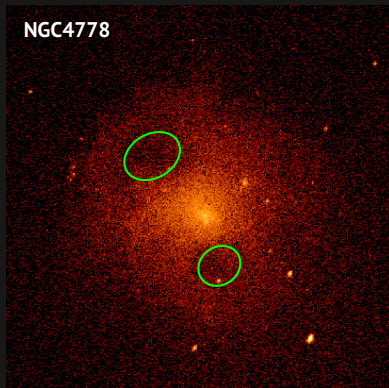
# Motivation

---



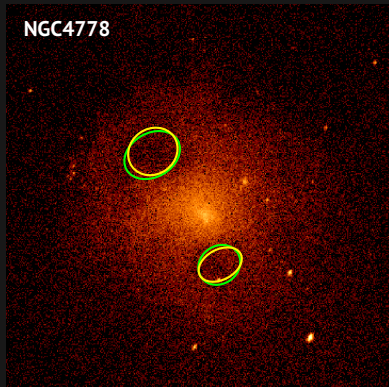
# Motivation

---



# Motivation

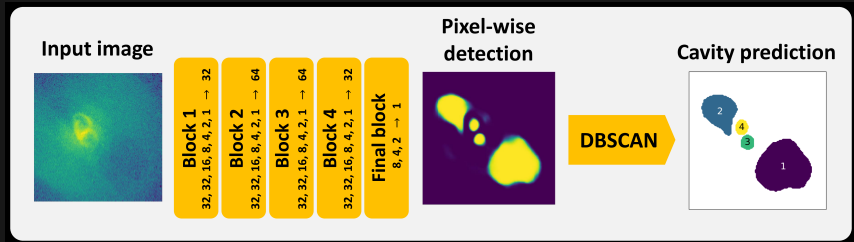
---





# Cavity Detection Tool (CADET)

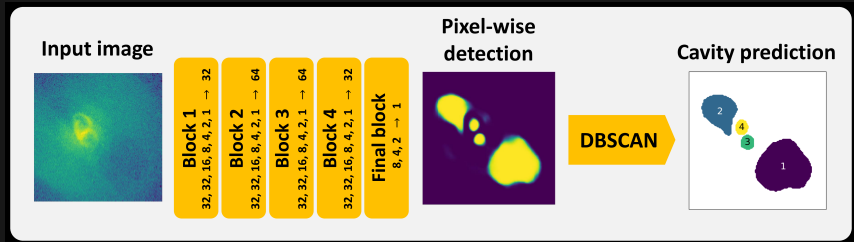
[github.com/tomasplsek/CADET](https://github.com/tomasplsek/CADET)



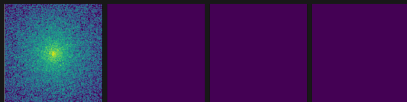
- CNN + DBSCAN
- artificial dataset
  - 3D  $\beta$ -model
  - ellipsoidal cavities
  - bright rims, sloshing
  - 300k images (50 % cavities)

# Cavity Detection Tool (CADET)

[github.com/tomasplsek/CADET](https://github.com/tomasplsek/CADET)



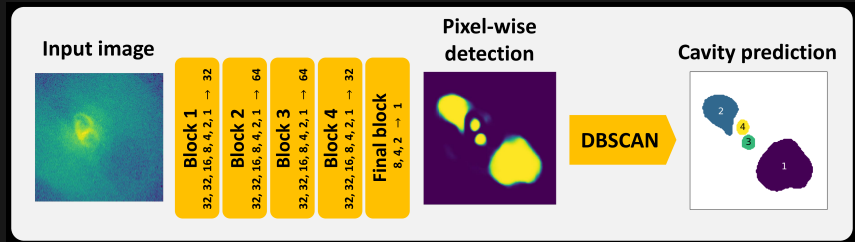
- CNN + DBSCAN
- artificial dataset
  - 3D  $\beta$ -model
  - ellipsoidal cavities
  - bright rims, sloshing
  - 300k images (50 % cavities)





# Cavity Detection Tool (CADET)

[github.com/tomasplsek/CADET](https://github.com/tomasplsek/CADET)

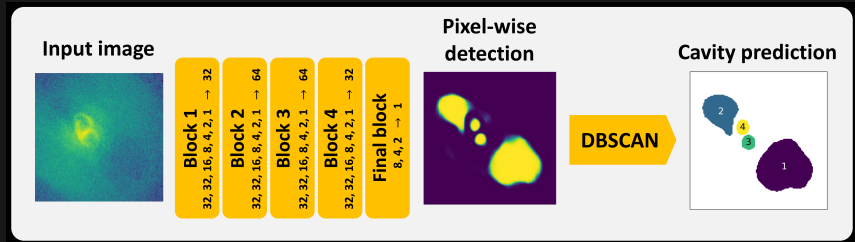


- CNN + DBSCAN
- artificial dataset
  - 3D  $\beta$ -model
  - ellipsoidal cavities
  - bright rims, sloshing
  - 300k images (50 % cavities)

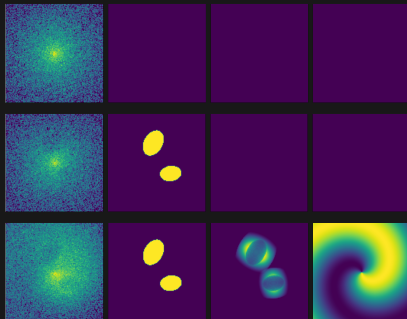


# Cavity Detection Tool (CADET)

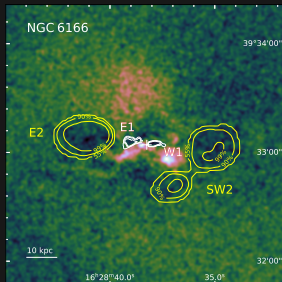
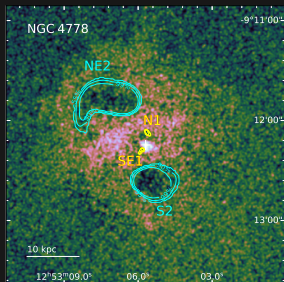
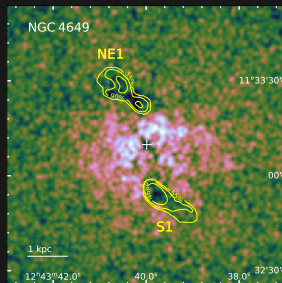
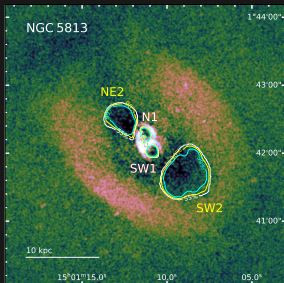
[github.com/tomasplsek/CADET](https://github.com/tomasplsek/CADET)



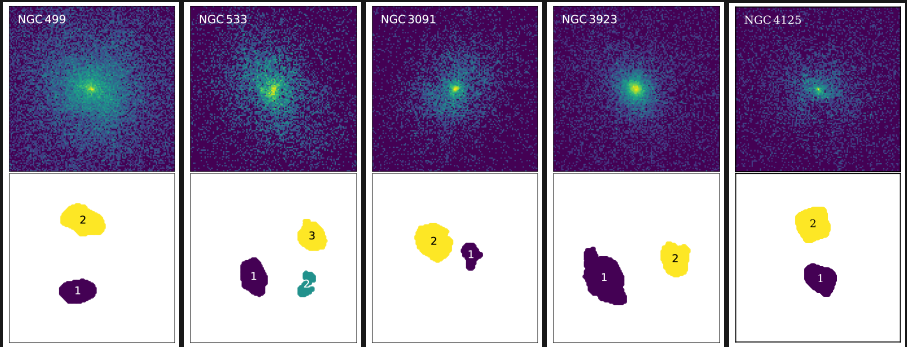
- CNN + DBSCAN
- artificial dataset
  - 3D  $\beta$ -model
  - ellipsoidal cavities
  - bright rims, sloshing
  - 300k images (50 % cavities)



# Testing on real data

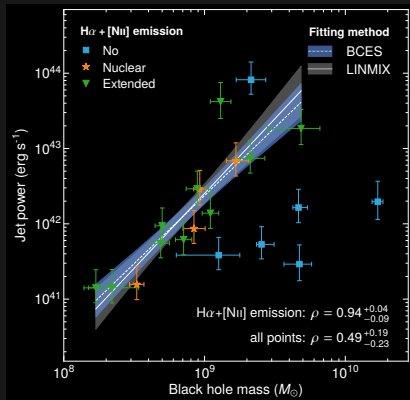


# Looking for new X-ray cavities

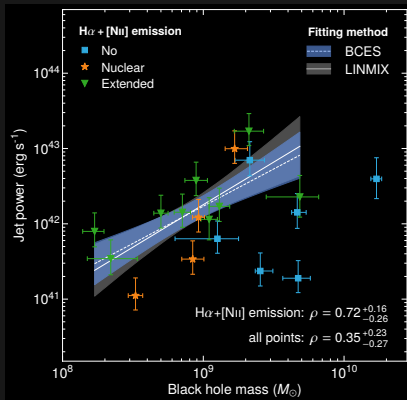


# Correlation with SMBH mass

## Radio lobes



## X-ray cavities (CADET)



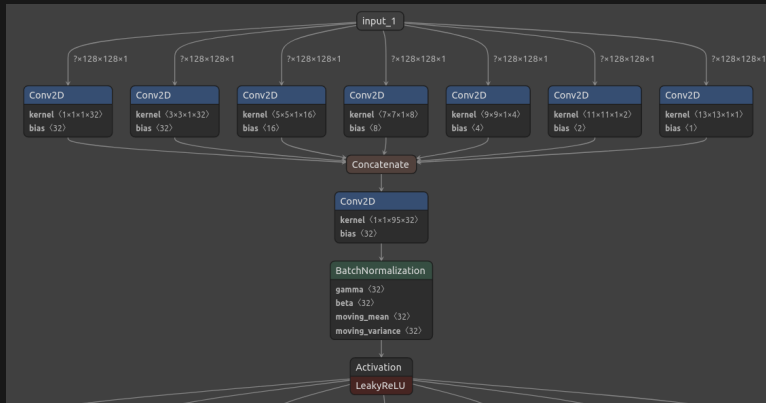
Plšek et al. 2022

# Todo

---

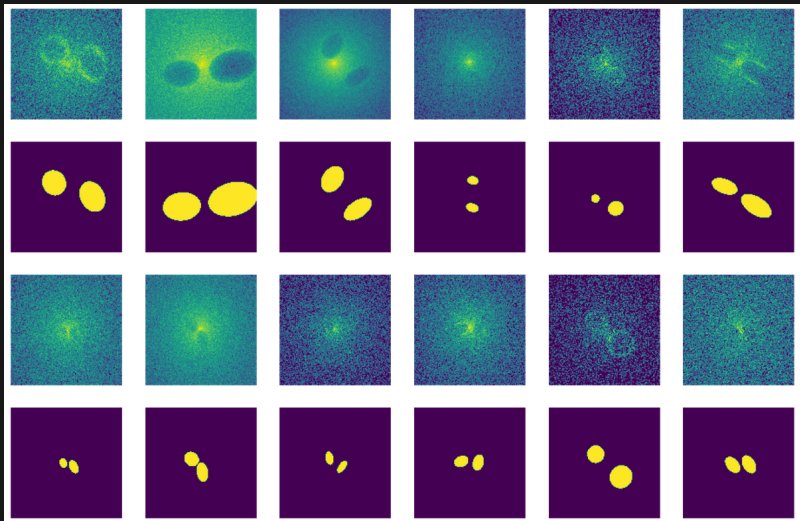
- add more features / improve existing
- estimate cavity significance
- regularise number and shape of predictions
- use "real" simulations for training ?
- output 3D predictions ?

# CADET architecture



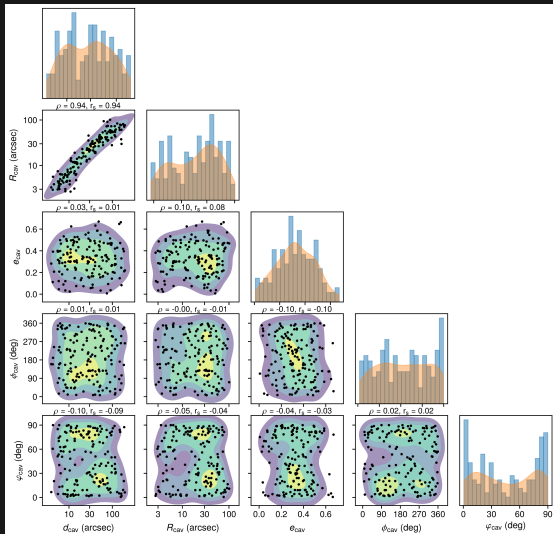
# Parameter distributions

---

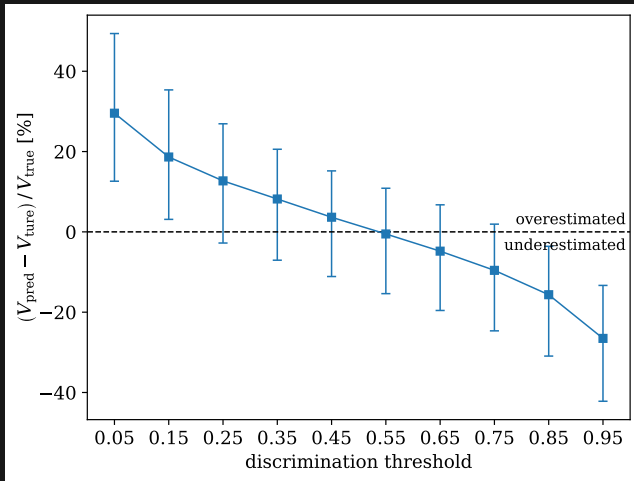




# Parameter distributions

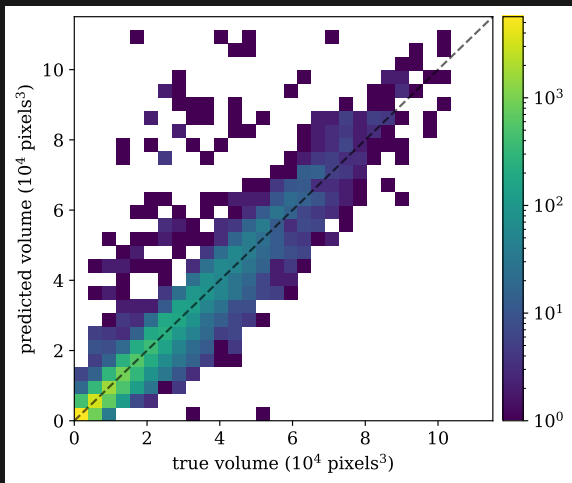


# Discrimination threshold



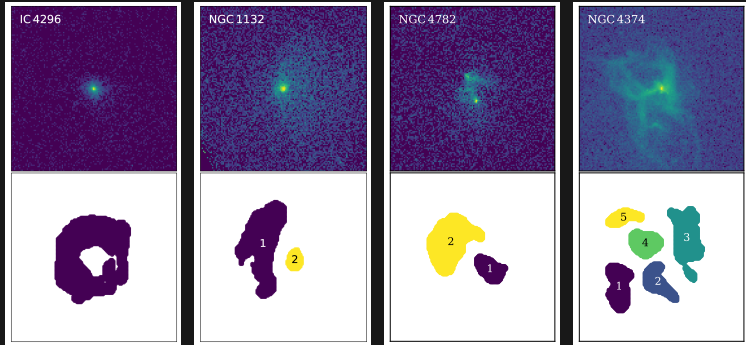
# Testing on artificial data

---



# False positive detections

---



# Distant galaxy clusters

---

