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- ▶ WGAN model learning mapping from DM to H_I trained on hydrodynamical simulations
- ▶ Combination of high resolution cosmological boxes and zoom-in simulations for robust emulation across large range of scales
- ▶ Concept:
Train on high resolution data
Apply on DM simulation of arbitrary size (upscaling)

- ▶ 10-20% accurate predictions down to galactic scales (tens of kpc) for CDDF, power- and bispectrum
- ▶ Halo-free method, but robust reconstruction of halo-based quantities like HI to halo mass relation
 → Possible applications for future H_I observational studies
- ▶ Allows to probe halo masses down to $\sim 10^8 M_{\odot}$

- ▶ Offers upscaling capabilities to enrich large dark matter volumes with H_I
- ▶ Upscaling not only in box size but also in resolution of H_I maps (3.6 ckpc/h resolution limit)
- ▶ Offers possibility to quickly generate large, high resolution H_I mock density maps for future observational studies
- ▶ Comparatively fast prediction timescales of a few minutes

