Overcoming challenges: leveraging machine learnings for efficient modeling of divertor plasmas – Ben Zhu (Lawrence Livermore National Laboratory, USA)

Motivations

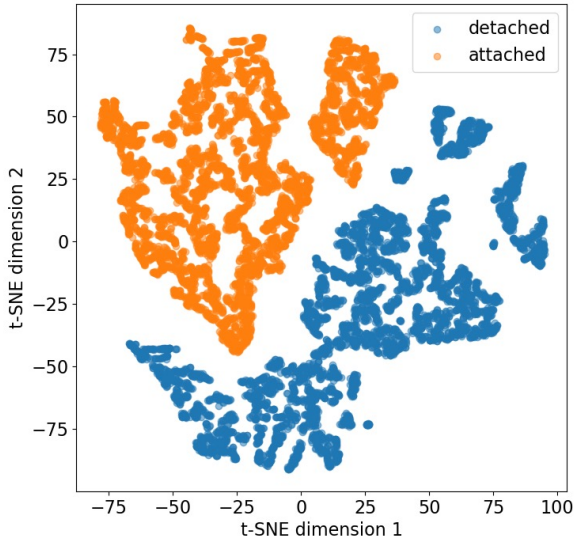
- Magnetic confinement fusion needs fast and reliable divertor plasma models to bridge the gap between fusion performance and heat exhaust. While existing models are either too slow or too crude, the emerging ML technique offers an alternative approach.

Results

- A pilot study confirms that divertor plasma has a low-dimensional latent space representation that could be leveraged for surrogate model development.
- The prototype ML divertor model tailored for KSTAR tokamak detachment control is close for initial deployment.

Challenges

- Divertor plasma contains rich physics and is highly nonlinear; requirements on both model accuracy and speed.



t-SNE visualization of two divertor plasma states (detached, attached) with latent space representations in pilot study.