Developing Machine Learning Algorithms for Inferring Upstream Separatrix Density at JET

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Link to poster:

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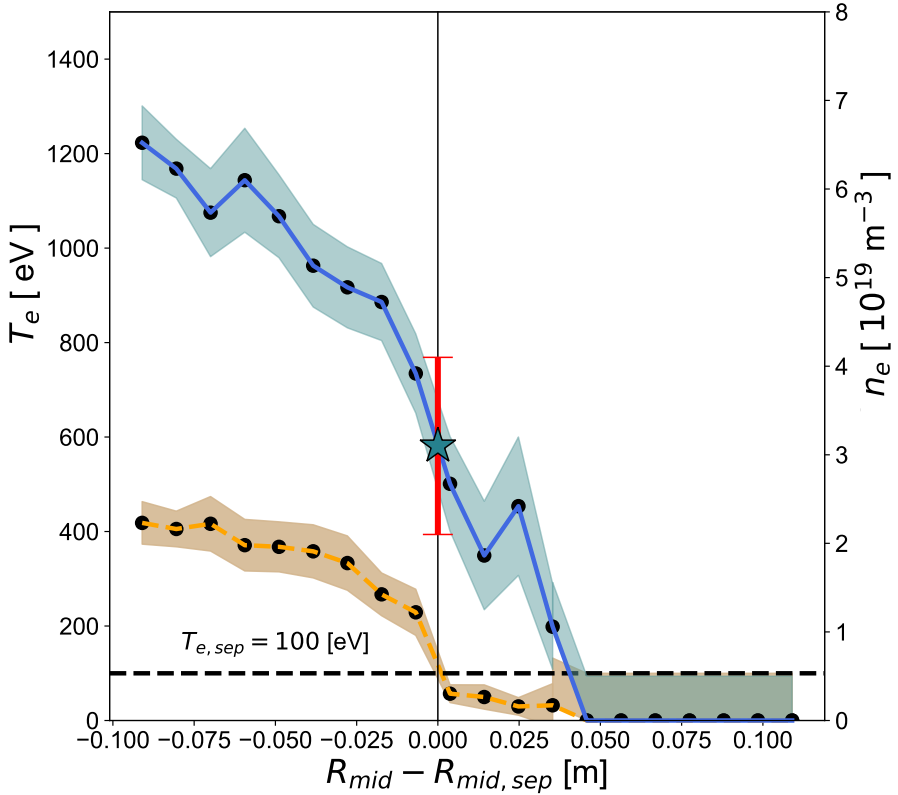
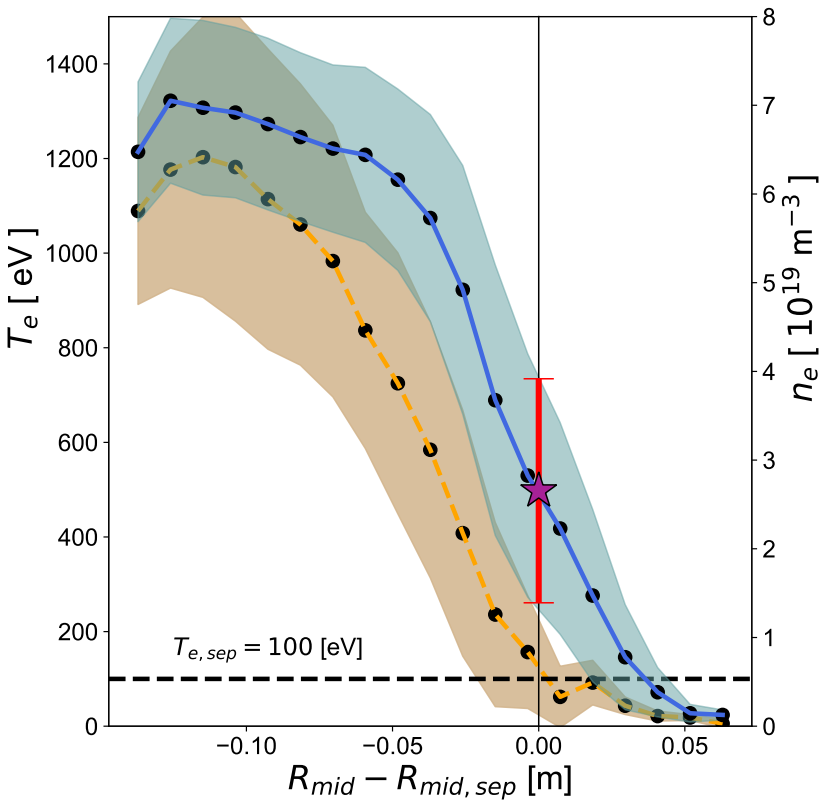
A turing test, one of these profiles was generated using deep learning, and one is real





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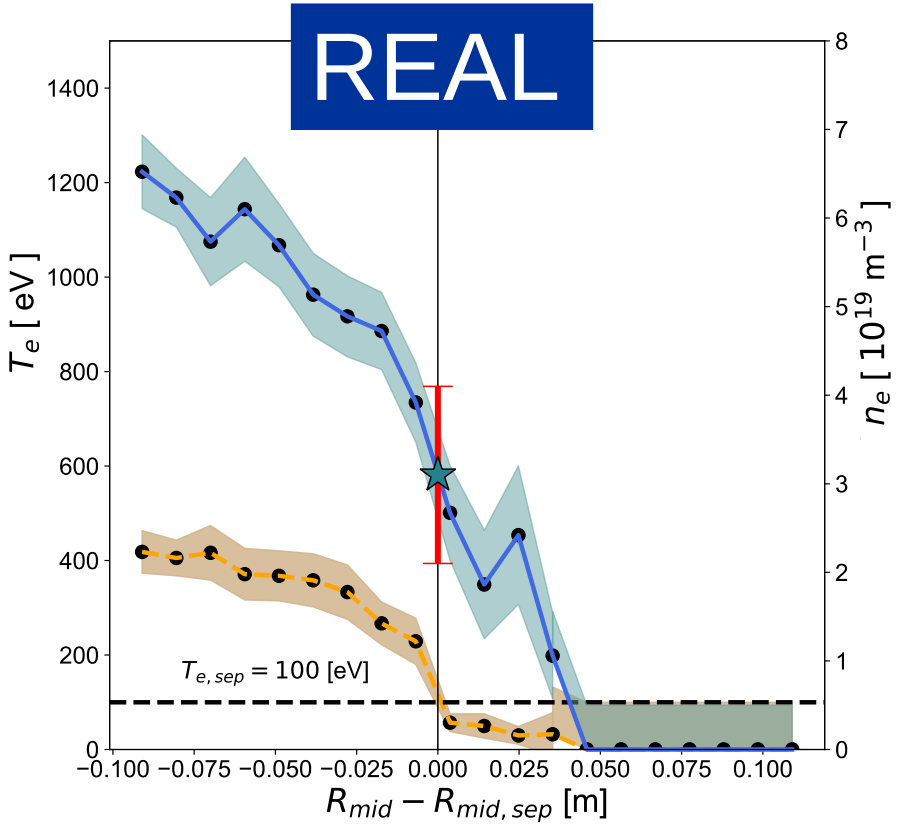
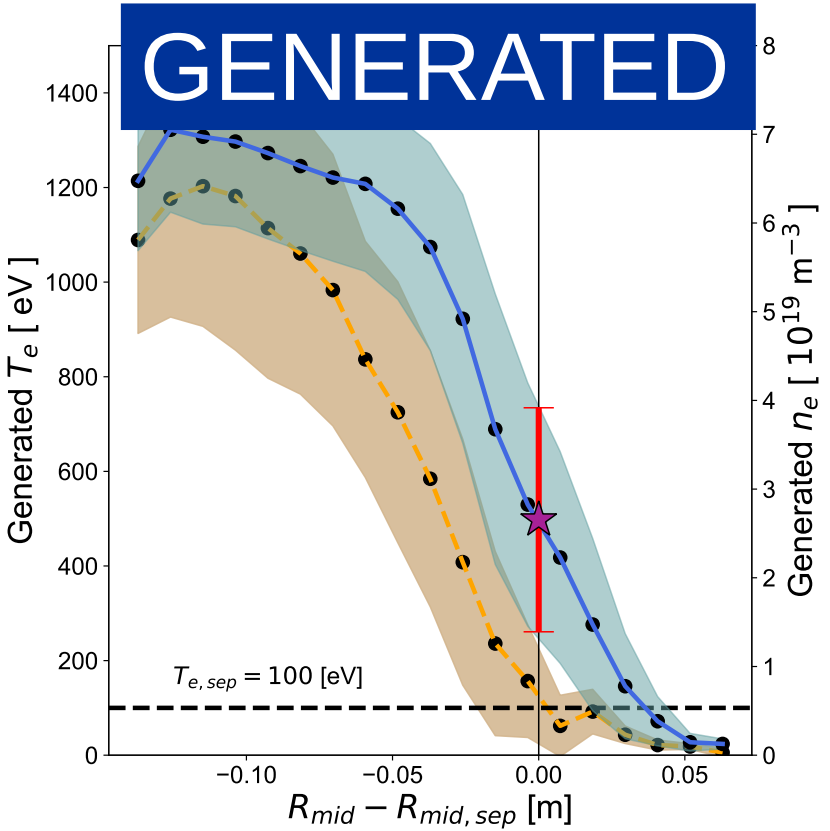
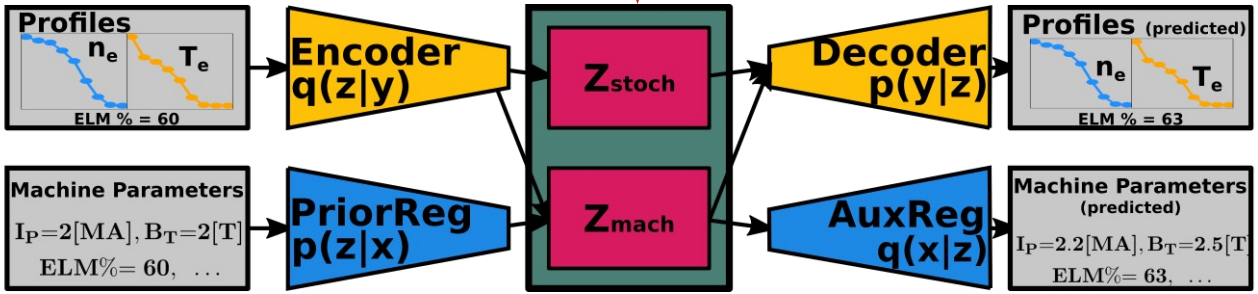




Through representation learning we construct a compressed representation of the plasma state

Learn a manifold of all possible plasma solutions in the **latent space**



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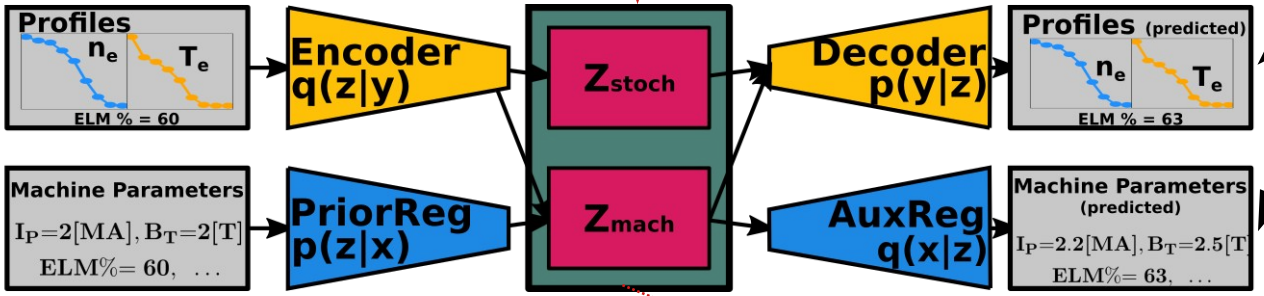
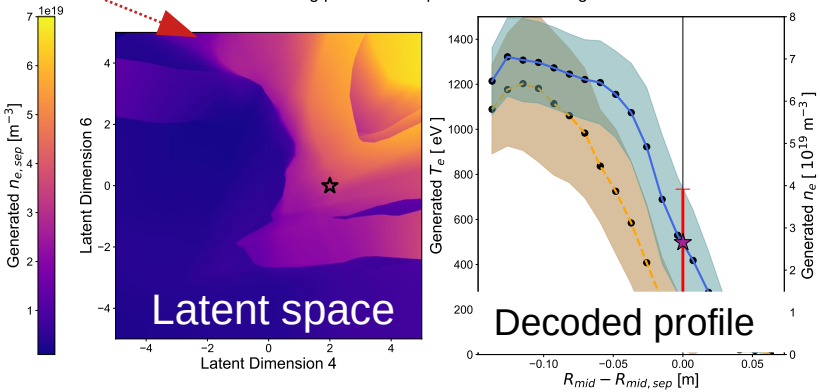
Decoding the latent space, we retrieve representation of plasma solution (profiles & machine parameters)



Generating profiles via representation learning



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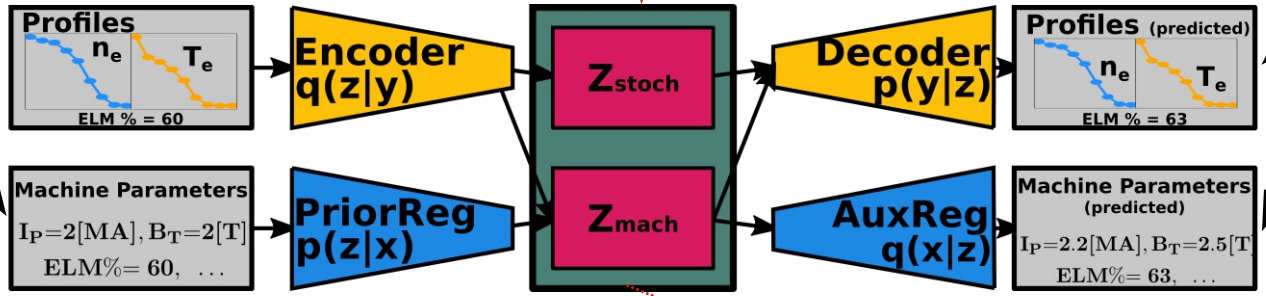

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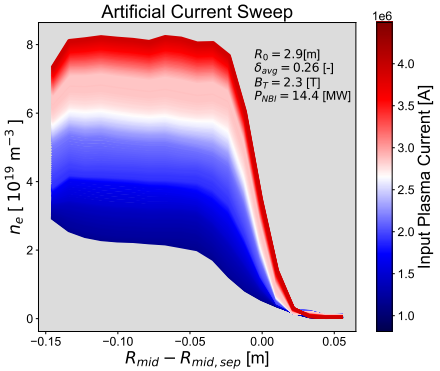

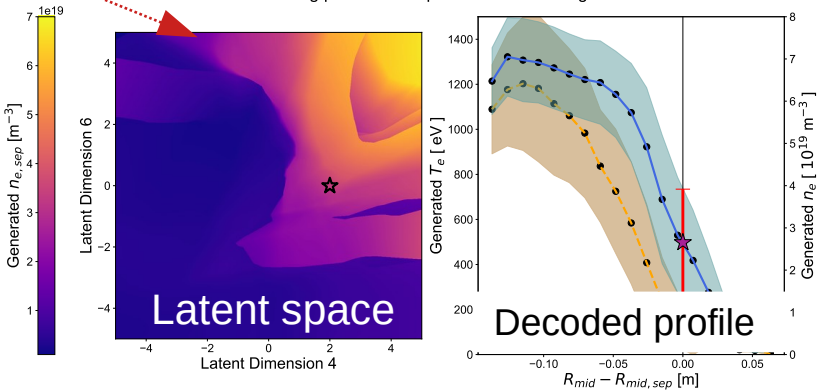

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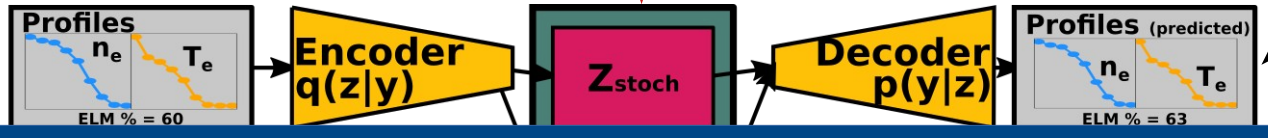

Control applications!

We also build a model for a direct mapping to nesep

$$f : X \rightarrow n_{e,sep}$$

X: Machine parameters

Plasma current, toroidal field, q95
Upper & lower triangularity, elongation
Major & minor radius, plasma volume,
Ohmic & NBI & ICRH power,
Gas puff,