

Pedestal Predictions Using Neural Networks

PEI Summer Project
Jinjin Zhao

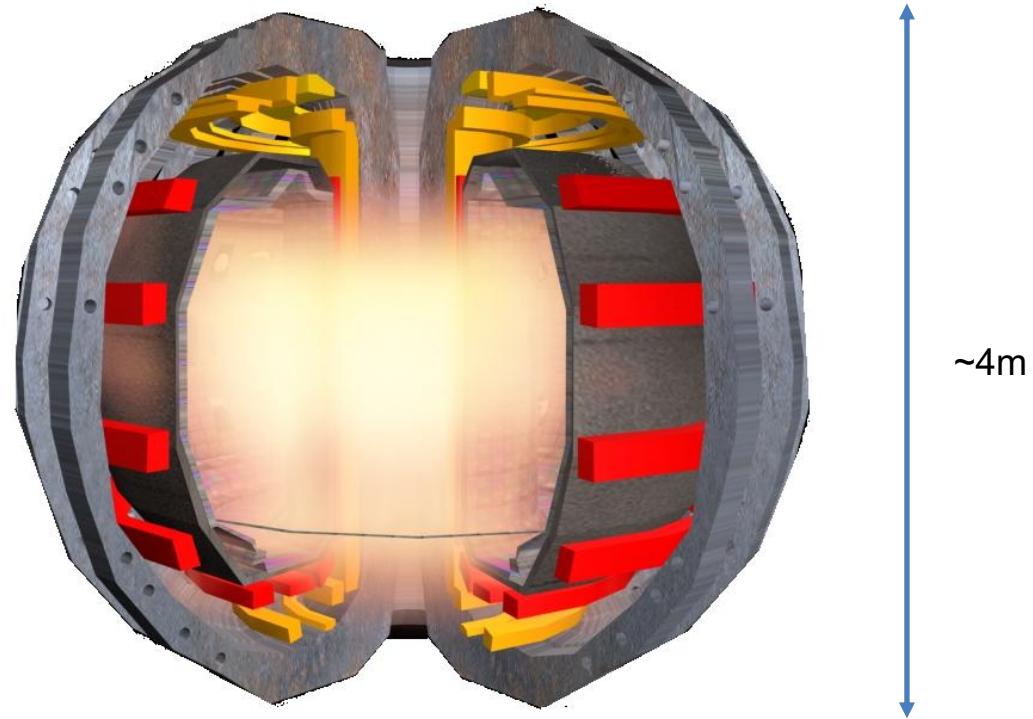


Princeton
Environmental
Institute

Context

- **Summer Location:**
 - Princeton Plasma Physics Lab
 - Fusion and plasma research laboratory
- **Research Focus:**
 - Use neural networks to learn about fusion properties
 - Specifically focused on predicting one part of the plasma (pedestal layer) of a specific type of machine (tokamaks)
- **Data Processing:**
 - Two years of experiments on a tokamak machine in San Diego (DIII-D)
- **Neural Network Finalized Design:**
 - Multitask neural network with five outputs

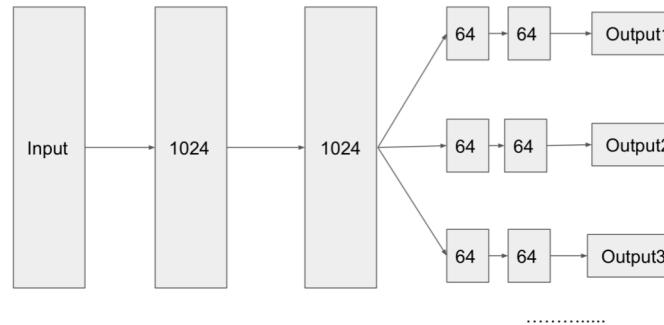
DIII-D Tokamak



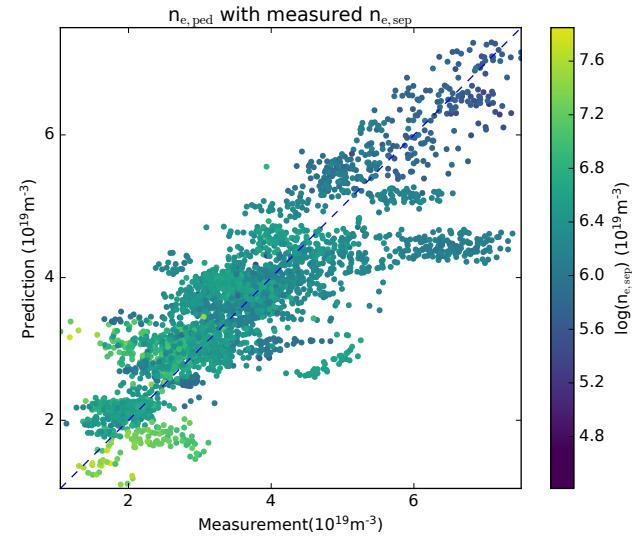
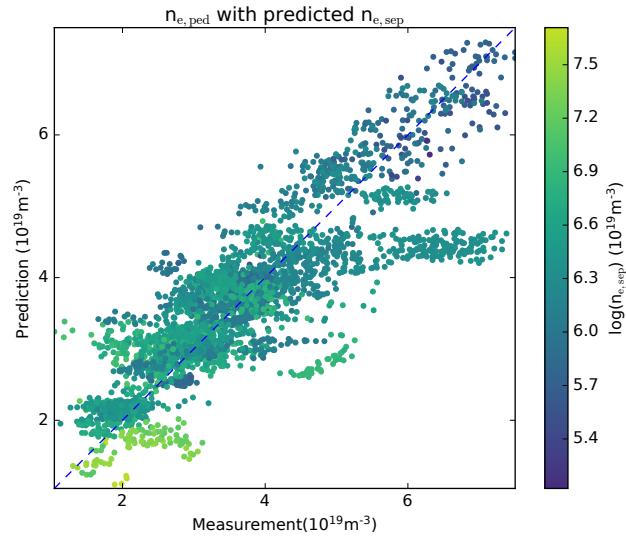
Details on My Contributions

- Modified a pre-existing database extraction workflow
- Preprocess data into appropriate structures and calculations
- Created and tested multiple neural network structures

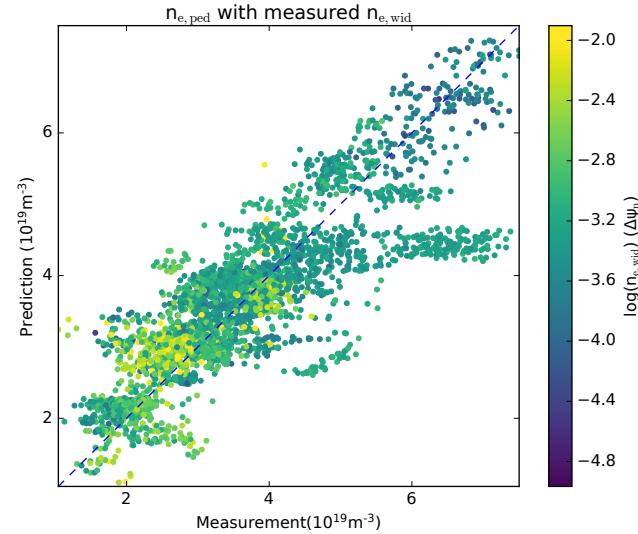
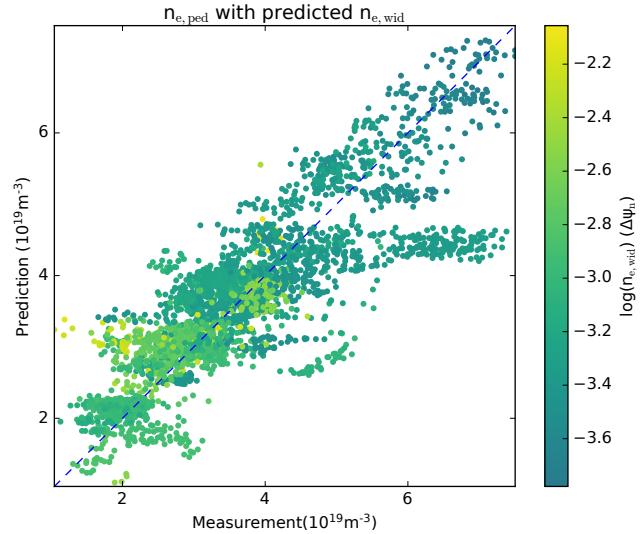
**Neural Network
Layer Structure**



Results



Results



Summary of Experience

- **Introduced me to the research environment**
- **Taught me a lot about fusion and the state of fusion research**
- **Gained experience in working with real data and applying neural networks to a scientific problem**
- **Working to extend to this into a thesis project**

Acknowledgments

- **Princeton Environmental Institute**
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