IceNet - demonstrating data-driven climate science for real-world applications
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British Antarctic Survey, collaborating with the Alan Turing Institute, has been a leader in development of environmental AI with IceNet: a cutting-edge system for sea ice forecasting. Sea ice forecasts are critical to safe operations for marine industry and conservation, in the Arctic and Antarctic. Significant value comes from predicting when and where freezing and thawing takes place and how much sea ice will occur. IceNet provides this ability utilising deep learning, associating sea ice conditions in response to environmental conditions, and allowing predictions to be made. This approach to environmental AI allows faster access to predictions than traditional modelling and is generalisable to predict many other environmental conditions.

IceNet is comprised of multiple tiers of infrastructure running in multiple locations and is under continual development. It is not simply a deep learning model, but implements all the additional infrastructure required for "MLOps" (machine learning operations), post processing and API access, end user application hosting and real-world use case integration. At Climate Informatics 2023 we'd like to demonstrate how deep learning, climate science and best practice software engineering have been combined for IceNet, and hopefully demonstrate the value in building software sustainably to allow for future expansion in similar projects.

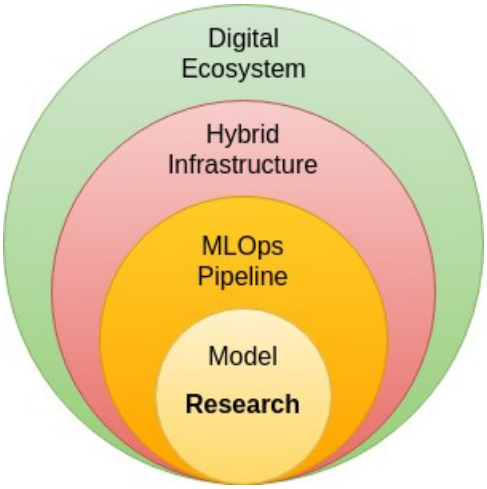

Figure 1: Layers of the IceNet Onion

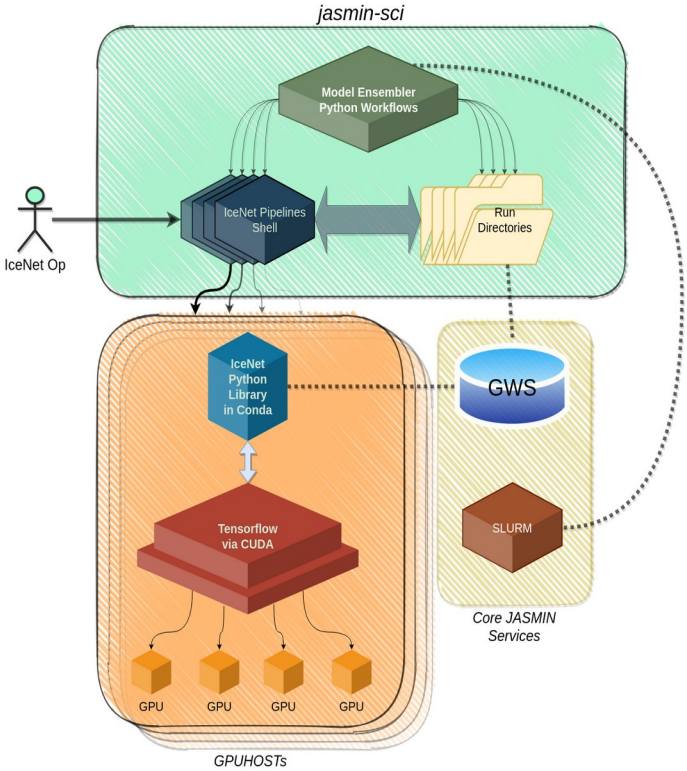

Figure 2: Software Architecture w.r.t JASMIN

We will focus on the various layers of the IceNet onion (see Figure 1) and can discuss and elaborate on the development of the machine learning environments that support the model execution (see Figure 2.) There will be opportunity to understand how we manage and deploy multiple environments to support the data/MLOps pipeline. We can describe why and how we approach running various tiers of software on various HPC platforms (for example BAS, JASMIN and cloud compute facilities.) Finally, we describe the real-world integrations and use cases for sea ice forecasts and how generalisability opens the door to future exploitation and adaptability without re-engineering. Underpinning all this is, is the importance of best practice software engineering and the underpinnings of software sustainability principles.