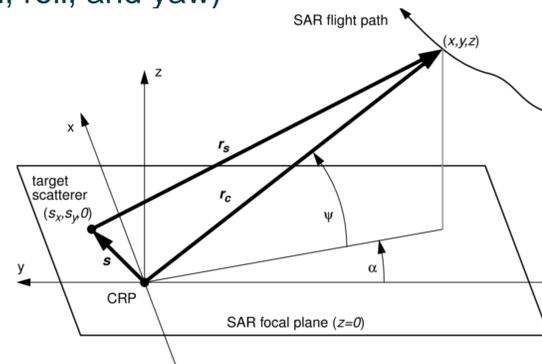


Smart SAR

Project

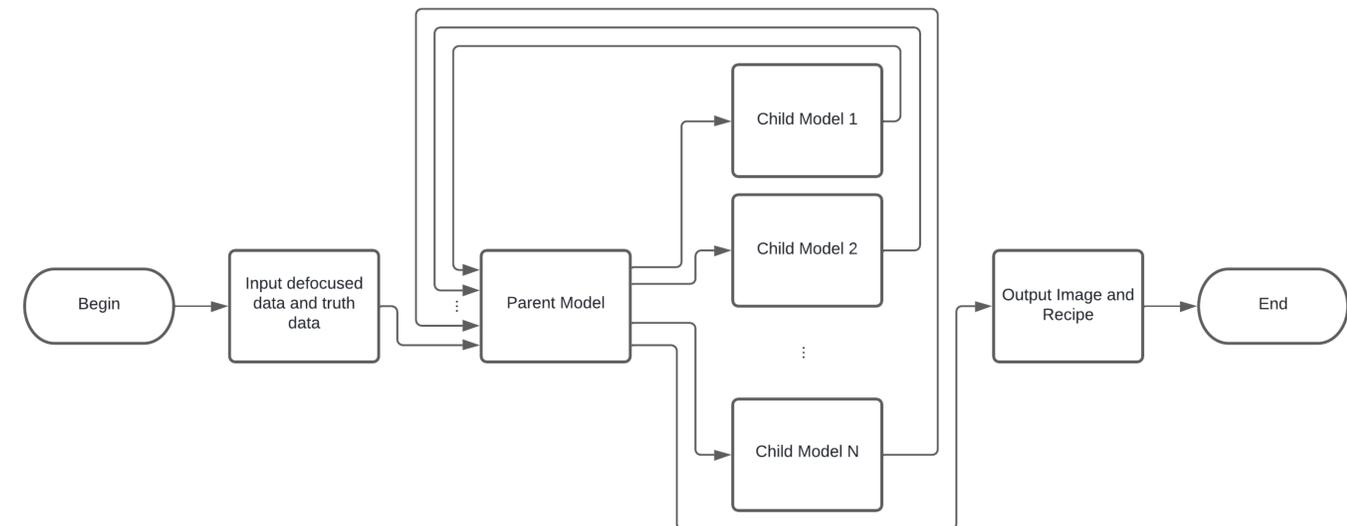
Smart SAR uses machine learning techniques to focus radar data.

- Focusing SAR data requires geometric/physical information or auxiliary (aux) data (velocity, pitch, roll, and yaw)



- Using machine learning, we can estimate the aux data and focus parameters to focus without any recorded aux data

System



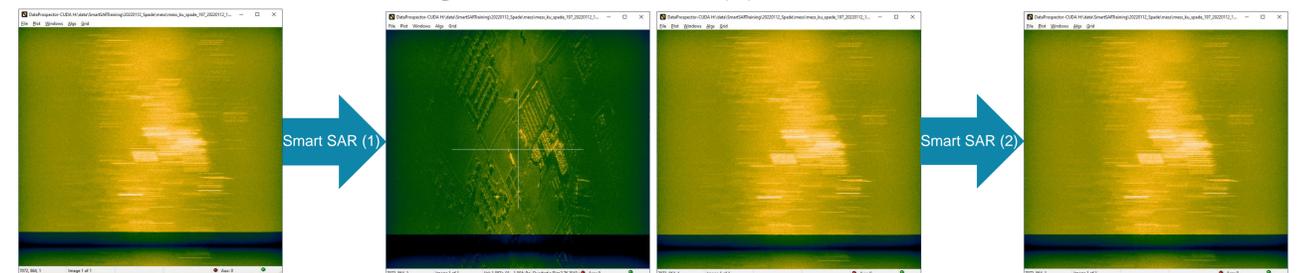
Methods

Create a hierarchical machine learning environment by:

- Implementing child models with a fully convolutional neural network
- Training a child model to handle every individual focusing algorithm
- Implementing a parent model using the OpenAI Gym reinforcement learning environment
- Training the parent model to analyze input data and determine what focuses to apply (what child models to use) and in what order to apply the focuses
- Connecting the child models to the parent model to completely focus the image

Conclusion

Smart SAR does well at focusing with a model overtrained with highly correlated data (1), but fails for when trained using uncorrelated data (2):



Future work:

- Research and implement physics-based approach to estimate the geometry of the transmitter, receiver, and target
- Synthesize data under new k-spaces using the physics model

Learned:

- How to implement machine learning models using TensorFlow and Keras
- SAR phase is statistically random, so we need to focus on the geometry and not the image data itself