**Training and investigation notes for Weather Prediction Site (w.t. Maple)**

Collaborators:

Yvonne

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Saf

Tasks

***not including website and web design aspects***

1. ROM models generally, and CAEs specifically **Saf**
   1. Test several ROM models (including CAEs) and evaluate accuracy. Do optimization
   2. Test methods of stiffness reduction and evaluate latent space behavior with different activation functions
   3. Figure out spatial bit masking and other small stuff
   4. Work with NODE person to figure out structure of CAE and data processing person to find out input structure of weather data mesh
2. ROM-NODE model **Aditya, Yvonne (Henry) torchdiffeq**
   1. Determine the complexity needed in the NODE model to model weather
   2. Optimize activation functions and integration/adjoint integration methods
   3. Fit a NODE model to various ROM models for baseline weather dataset
   4. Create metrics that allow us to easily evaluate accuracy of models
   5. Work with ROM person to figure out how many variables to include
3. Data retrieval **Henry**
   1. Construct easy-to-maintain data pipeline to pull data from public sources
   2. Parallelize and optimize data pulling procedure to speed process
   3. Do database management so that data can be easily put into SQL database and pulled later
   4. Work with processing person to figure out which data to pull
4. Data processing and analysis **Yvonne**
   1. Perform optimization on IDW interpolation and other methods to preserve data integrity
   2. Determine stiffness of time dynamics in our data and evaluate quantitatively
   3. Figure out how many weather variables we need to track to have a good shot at a predictive model
   4. Work with ROM person to figure out scaling and database person for storage

Terms

**CAE:** convolutional autoencoder, a type of model reduction that uses spatial convolution

**ROM Model:** reduced order model (model), a model of time dynamics with less variables

**Latent Space:** the variables of your ROM (see above). If you reduced from 100 variables to 20, this would be the behavior of your 20 new variables

**NODE:** neural ODE, the neural network that calculates your ODE function for you

**IDW:** inverse distance weighting. A method of weighted interpolation for a mesh grid from scattered points