Scientific Data Analysis Application

CU Capstone Project

Group of 6 senior computer science students working to create a python based data analysis web application.

Project Sponsor: Brian Bonnlander
Visualization and Enabling Technologies Section

- Hannah Keller
- Seongmin Choi
- Robert Crimi
- Connor Guerrieri
- Bo Han
- Hannah Thomas

Reproducibility without expertise

"Many users of climate model outputs need to make decisions on how or whether to respond to climate change. In some cases within institutions, where the reality or importance of climate change is not universally acknowledged."?

Project Goal

Create a web application that allows users to easily and intuitively:

- Create visual data workflows
- Run small workflows
- Automate scientific expertise
- Access intermediate workflow results
- Utilize multiple analysis languages

Next Steps

- Implement other steps
- Unit Conversion
- Thresholds
- Download
- Load existing workflow
- Delete step
- Save options

Final Design

Architecture

- Ncgm
- Raster workflow
- NCL
- Qt
- MongoDB
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Project Goal

Create a web application that allows users to easily and intuitively
- Create visual data workflows
- Execute workflows
- Automate scientific expertise
- Access intermediate workflow results
- Utilize multiple analysis languages

Final Design

- Tool Research
- Web Frameworks
- Analysis Tools
- Workflow Builders

First Attempt

- Subplot
- NCL
- Toolset workflow

Architecture

- Node
- Yajil workflow
- NCL
- Workflow
- MongoDB

Second Attempt

Next Steps

- Implement other steps
- Unit Conversion
- Thresholds
- Download
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"Many users of climate model outputs need to make decisions on how or whether to respond to climate change, in some cases within institutions where the reality or importance of climate change is not universally acknowledged."

Committee on a National Strategy for Advancing Climate Modeling
Project Goal

Create a web application that allows users to easily and intuitively:

- Create visual data workflows
- Reproduce workflows
- Automate scientific expertise
- Access intermediate workflow results
- Utilize multiple analysis languages
First Attempt
Final Design

Subset Minimum Temperature

Aggregate 1

Unit Conversion 1

Unit Conversion 2

Aggregate 2

Plot 1

Download 1

Subset Data

Simulation Type
- NCEP

Variable
- Daily Average Sea Ice Temperature
- Maximum Daily 10-Meter Wind Speed
- Maximum Daily Surface Air Temperature

Region
- Southwest Corner
  - Latitude
  - Longitude

- Northeast Corner
Architecture

- Nodelink
- Pyutilib.workflow
- NCL
- R
- MongoDB
Next Steps

- Implement other steps
  - Unit Conversion
  - Thresholds
  - Download
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DEMO
Thank You

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Project Goal

Create a web application that allows users to easily and intuitively
- Create visual data workflows
- Render scientific workflows
- Automate scientific expertise
- Access intermediate workflow results
- Utilize multiple analysis languages

Reproducibility without expertise

"Many users of climate model output need to make decisions on how or whether to respond to climate change. In some cases WRF/HIN models produce climate change is not universally accessible."

Architecture

- Nickedeb
- Pynvolve workflow
- NCL
- R
- MongoDB

Next Steps

- Implement other steps
- Unit Conversion
- Thresholds
- Download
- Load existing workflow
- Delete step
- Save options