DESIGNSAFE-CI

A NATURAL HAZARDS ENGINEERING COMMUNITY

A New Cyberinfrastructure for the Natural Hazards Community

DESIGNSAFE-CI A NATURAL HAZARDS ENGINEERING COMMUNITY

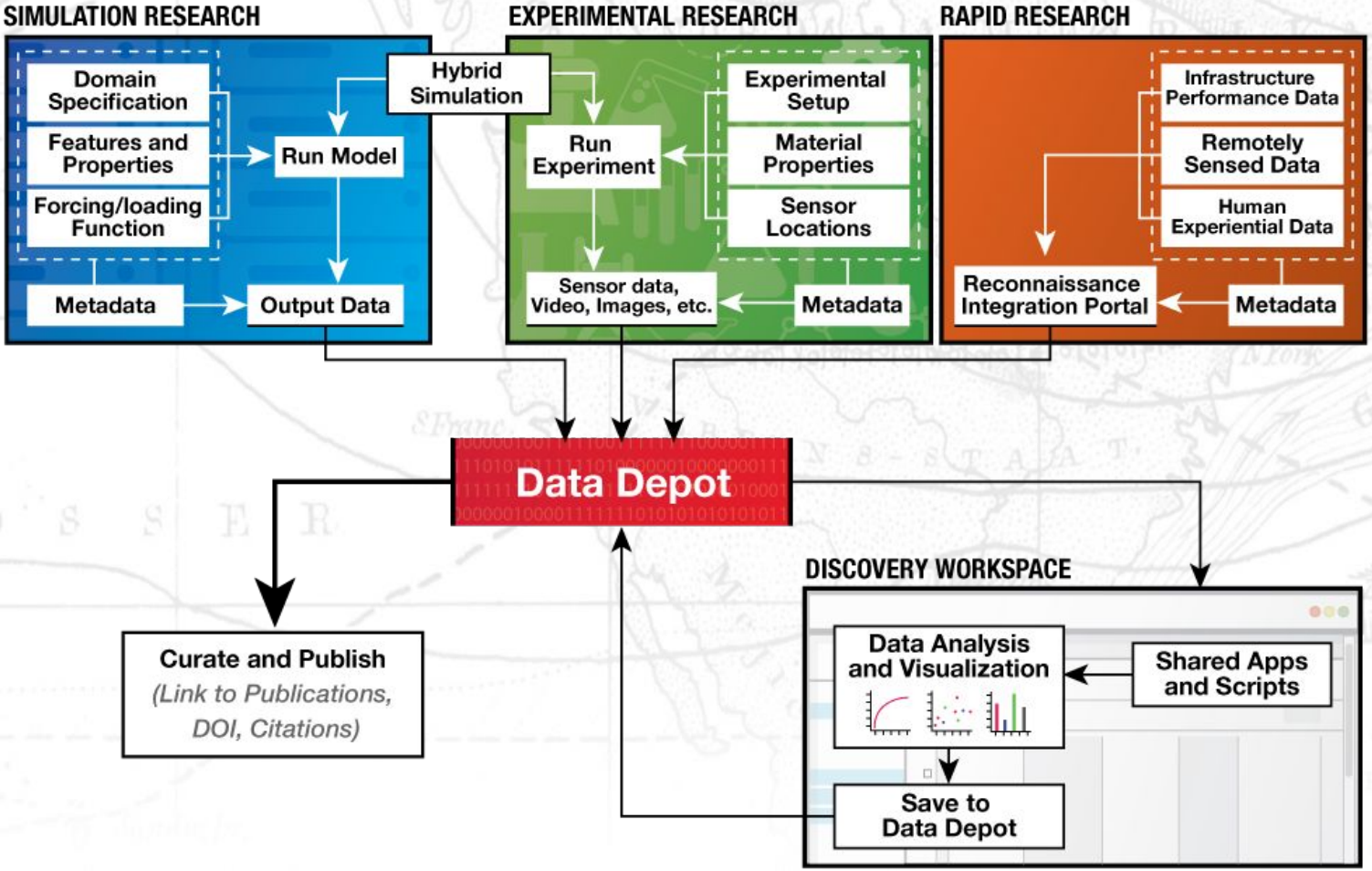
TEXAS The University of Texas at Austin

TACC RICE Florida Tech

DesignSafe Vision

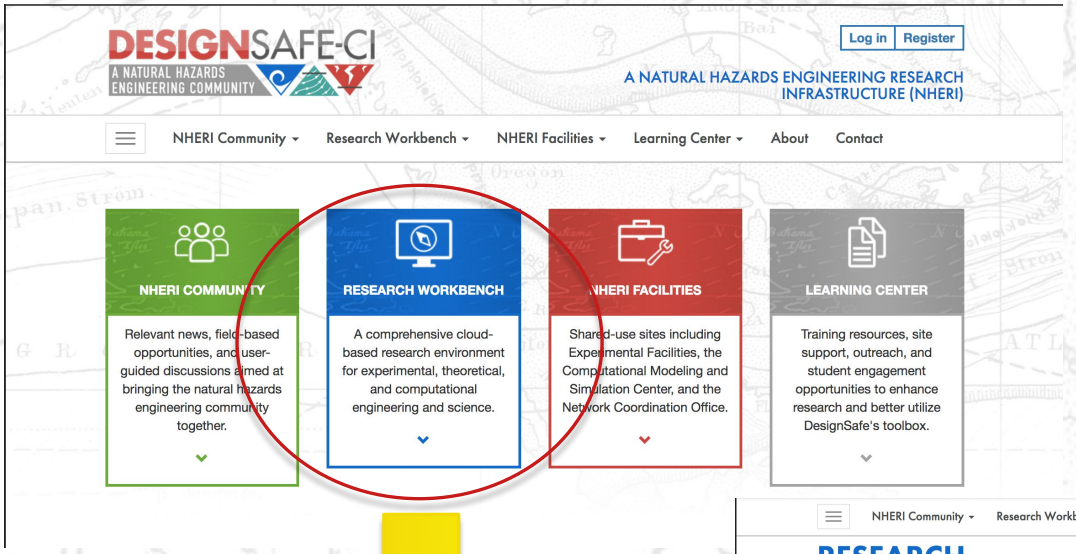
- A CI that is an integral and dynamic part of research discovery
- Cloud-based tools that support the analysis, visualization, and integration of diverse data types
  - Key to unlocking the power of “big data”
- Support end-to-end research workflows and the full research lifecycle
- Enhance, amplify, and link the capabilities of the other NHERI components

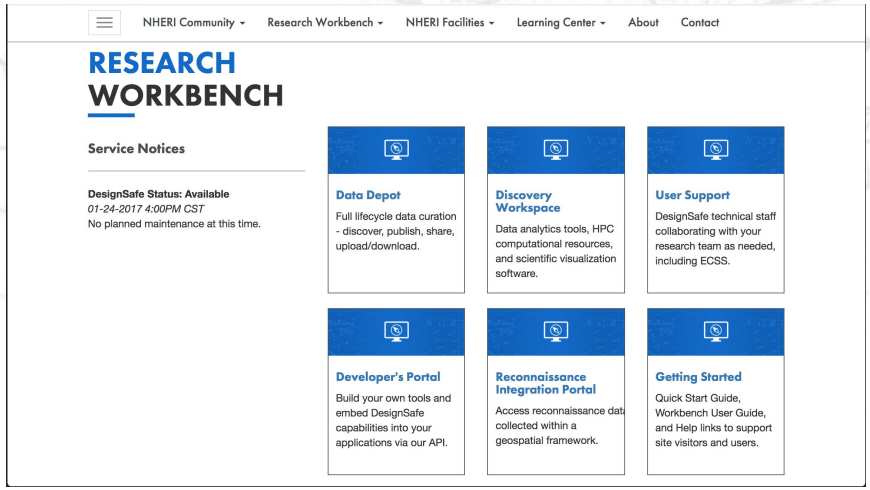
DesignSafe: Enabling Research



DesignSafe: Walkthrough

DesignSafe: The Research Workbench





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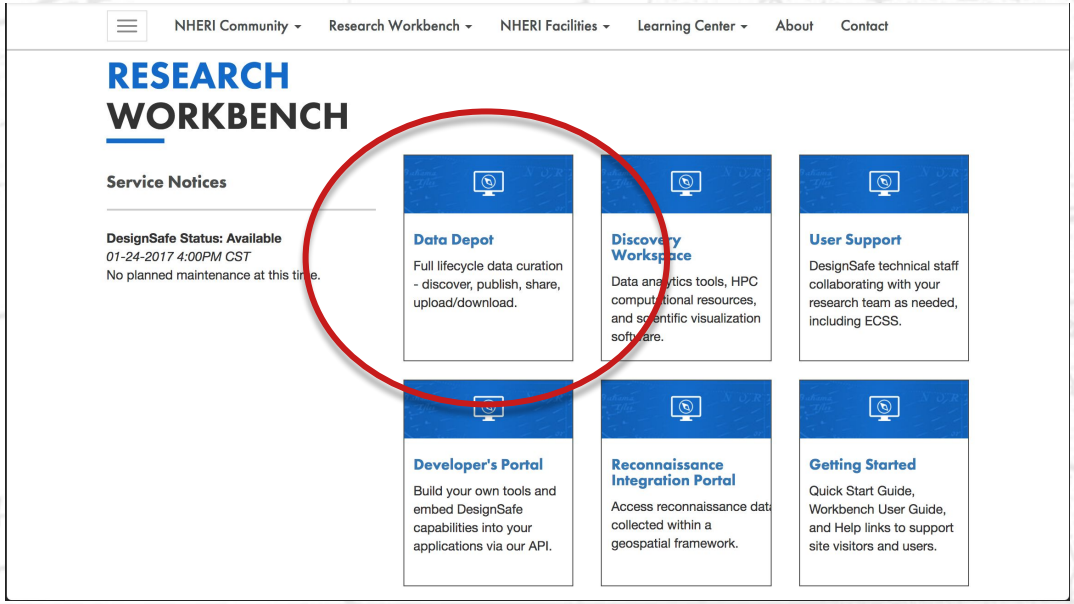
DesignSafe: The Data Depot



A place to host the full lifecycle for data curation: discover, publish, share, upload/download, collaborate

The Data Depot is a multi-purpose data repository for experimental, simulation, and field data that uses a flexible data model applicable to diverse and large data sets and is accessible from other DesignSafe-ci components

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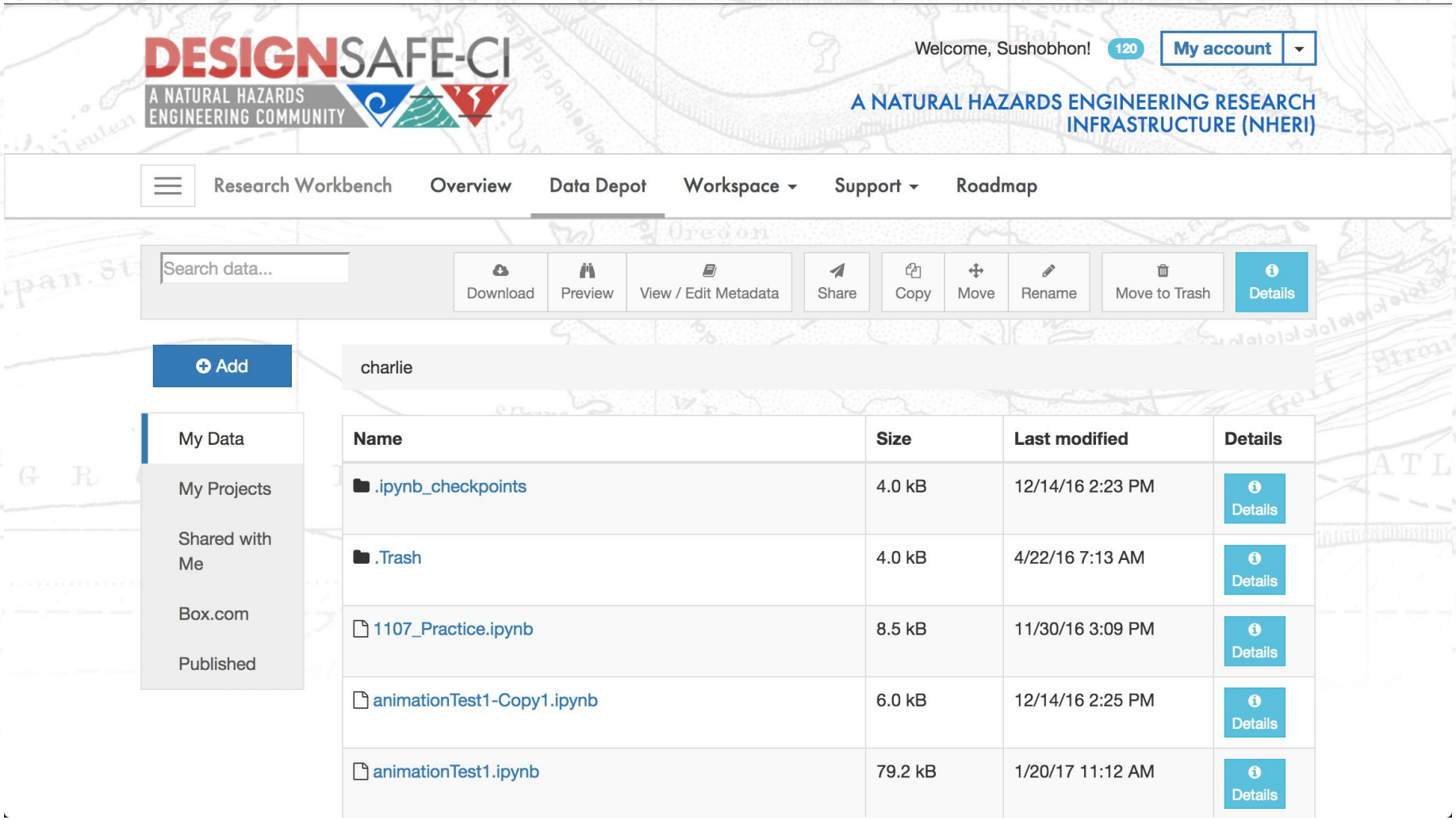
DesignSafe: The Data Depot



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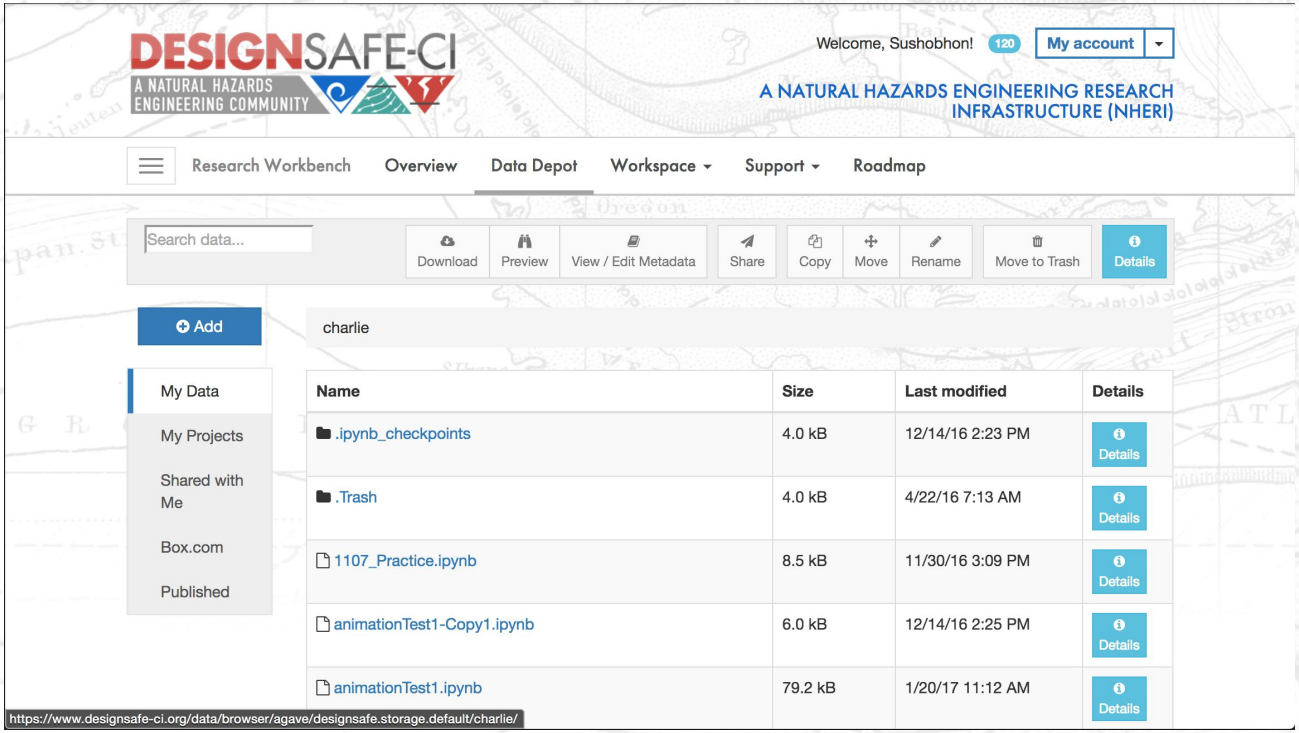
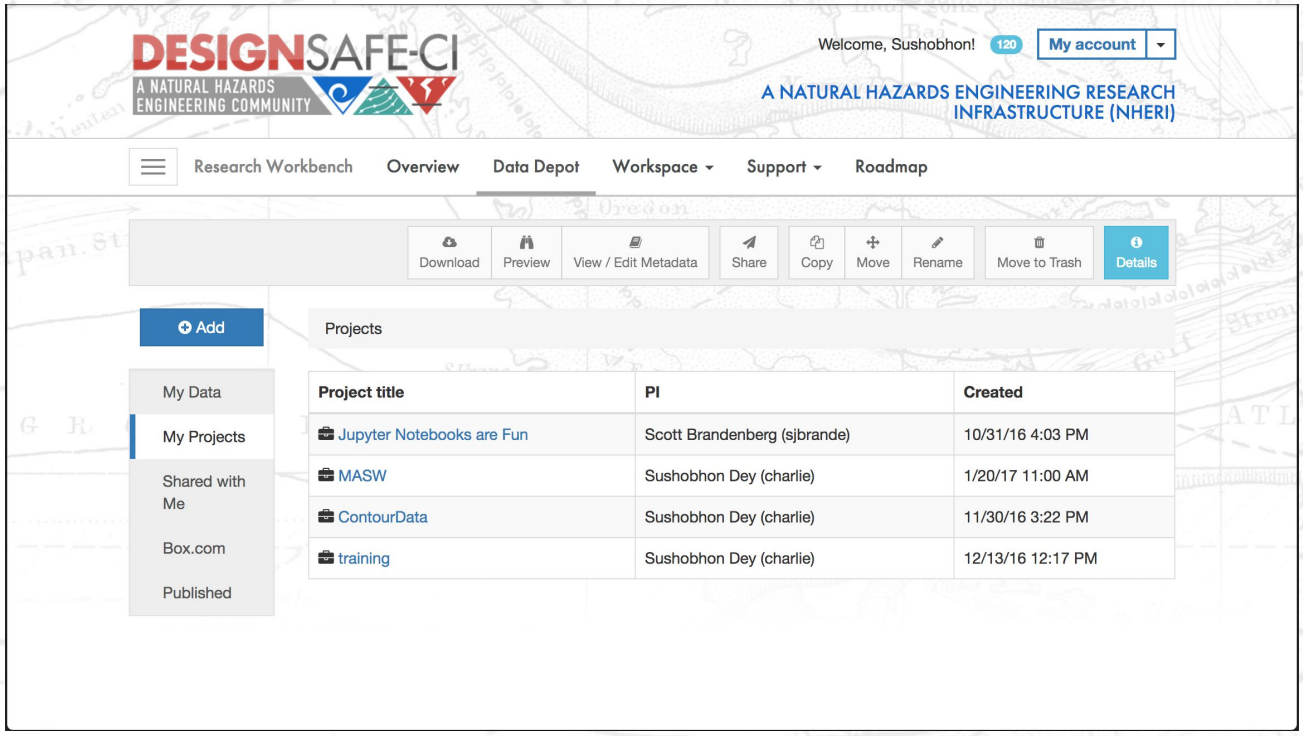
DesignSafe: My Data



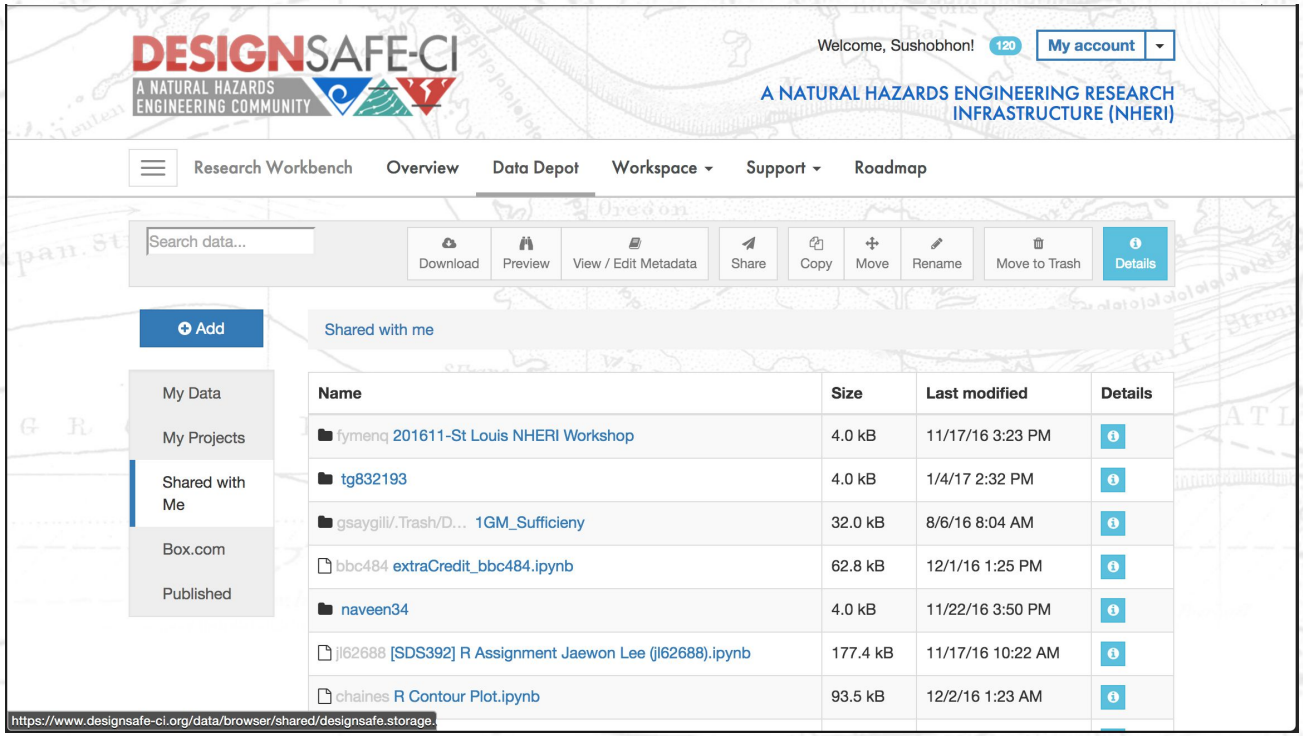
My Data is a place for you to save your files, from scripts to data to reports to photographs; everything you need to do you research.

DesignSafe: My Projects



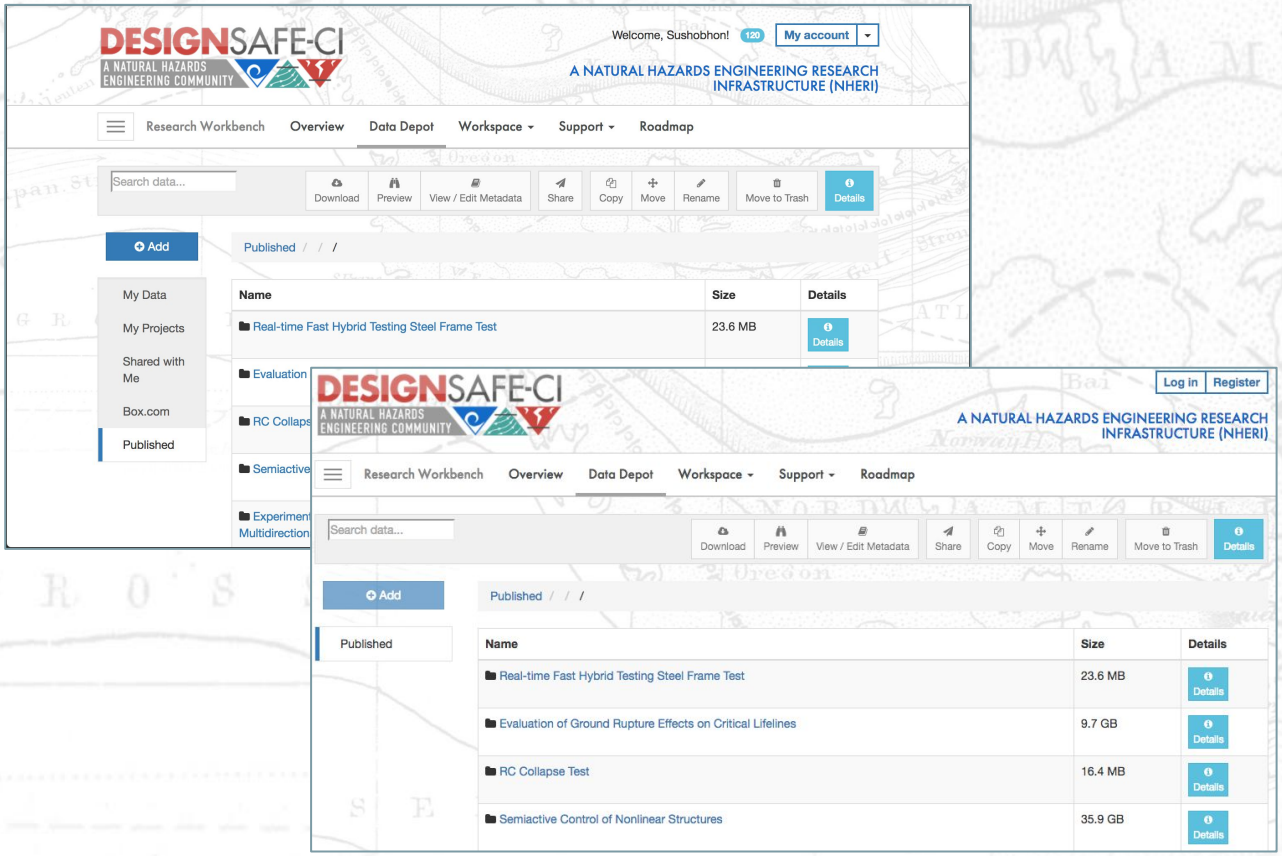
My Projects is a new feature created to enable collaboration on projects with multiple users.

DesignSafe: Shared with Me



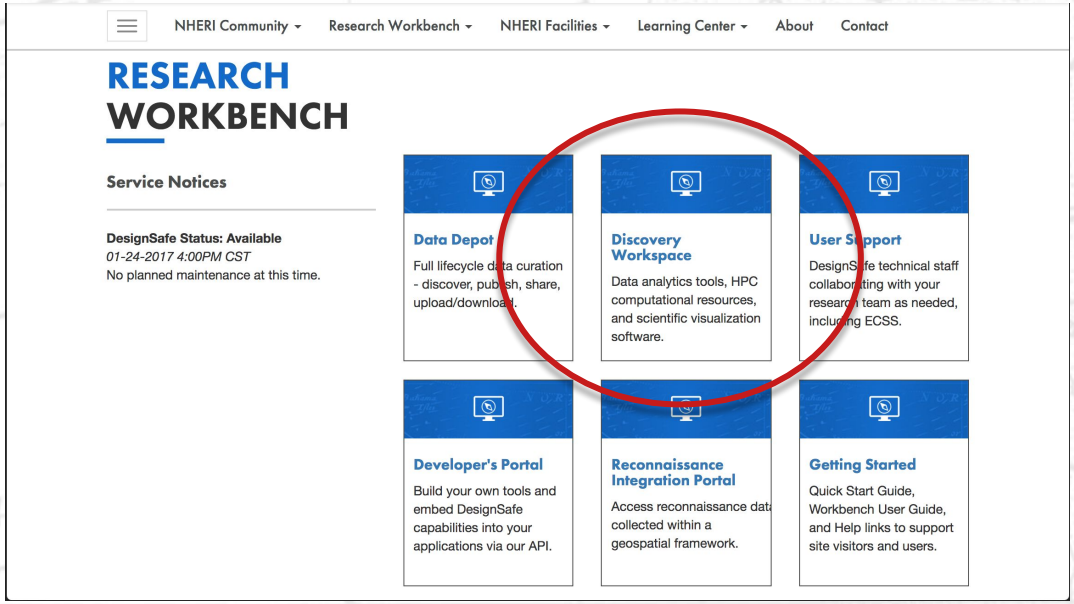
Differing from ***My Projects***, which is meant for collaboration, ***Shared with Me*** are files explicitly *shared* with you by other users in the DesignSafe community

DesignSafe: Published



Published data is publicly available data which can be utilized by the Designsafe community in their own research. A Designsafe account is not required to search and access the publicly available datasets

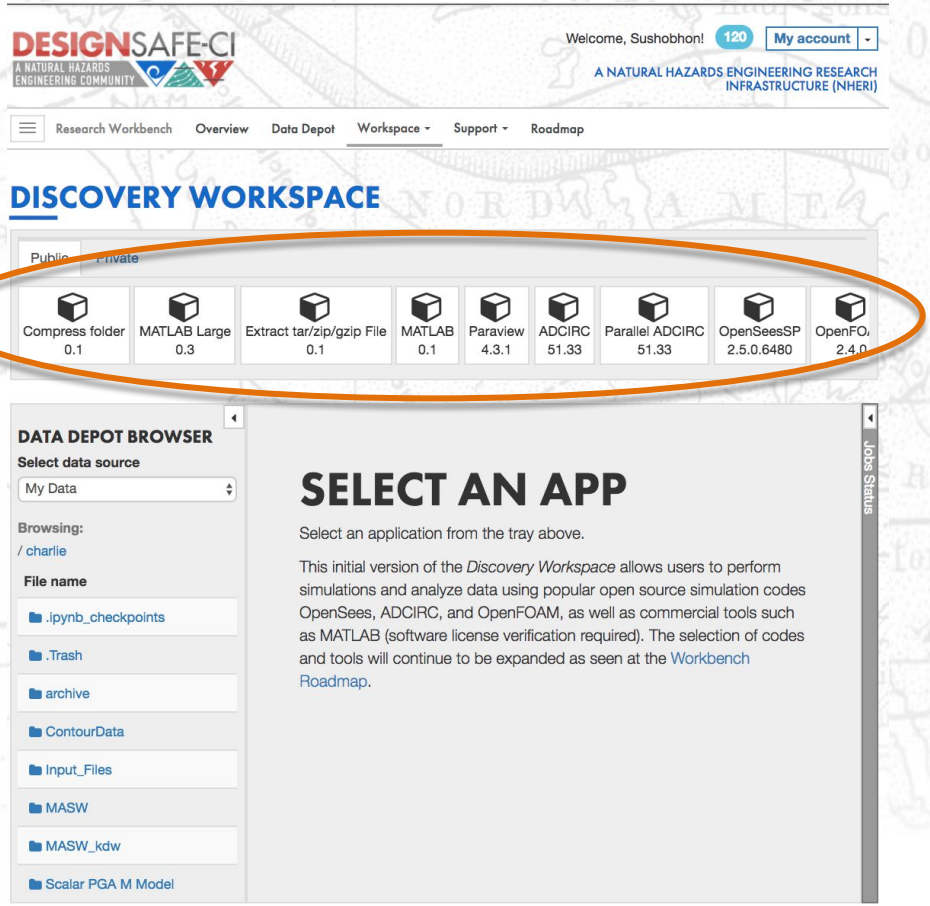
DesignSafe: Discovery Workspace



A place for you to do your research.

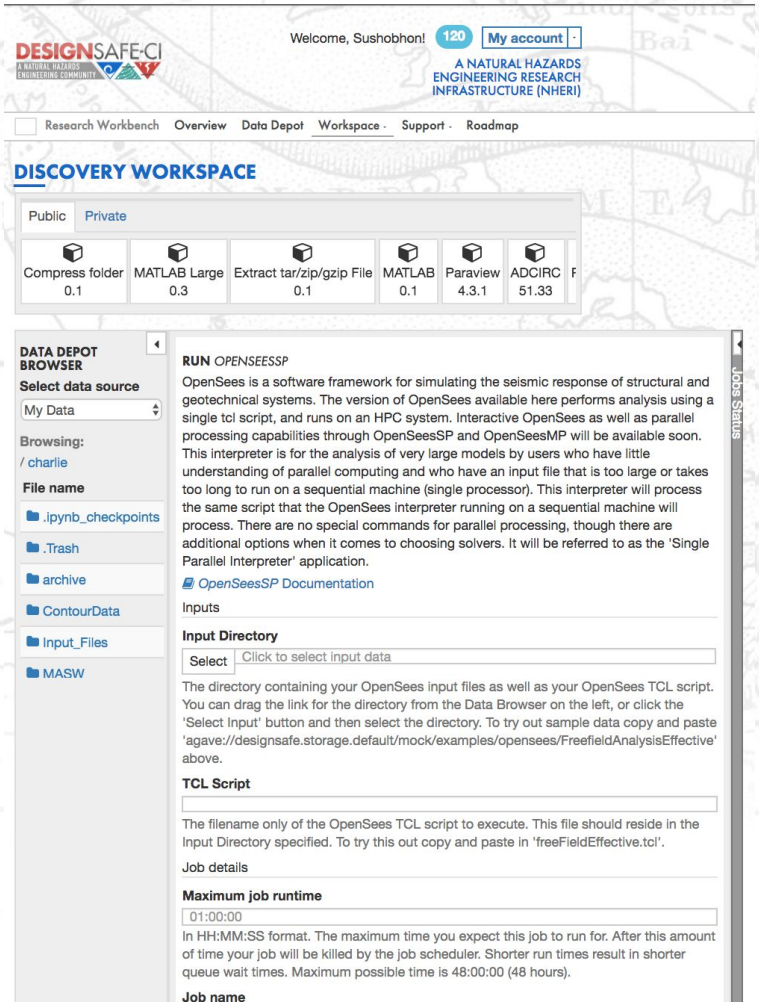
The Discovery Workspace allows users to perform simulations and analyze data using popular open source simulation codes OpenSees, ADCIRC, and OpenFOAM, as well as commercial tools such as MATLAB.

DesignSafe: Applications



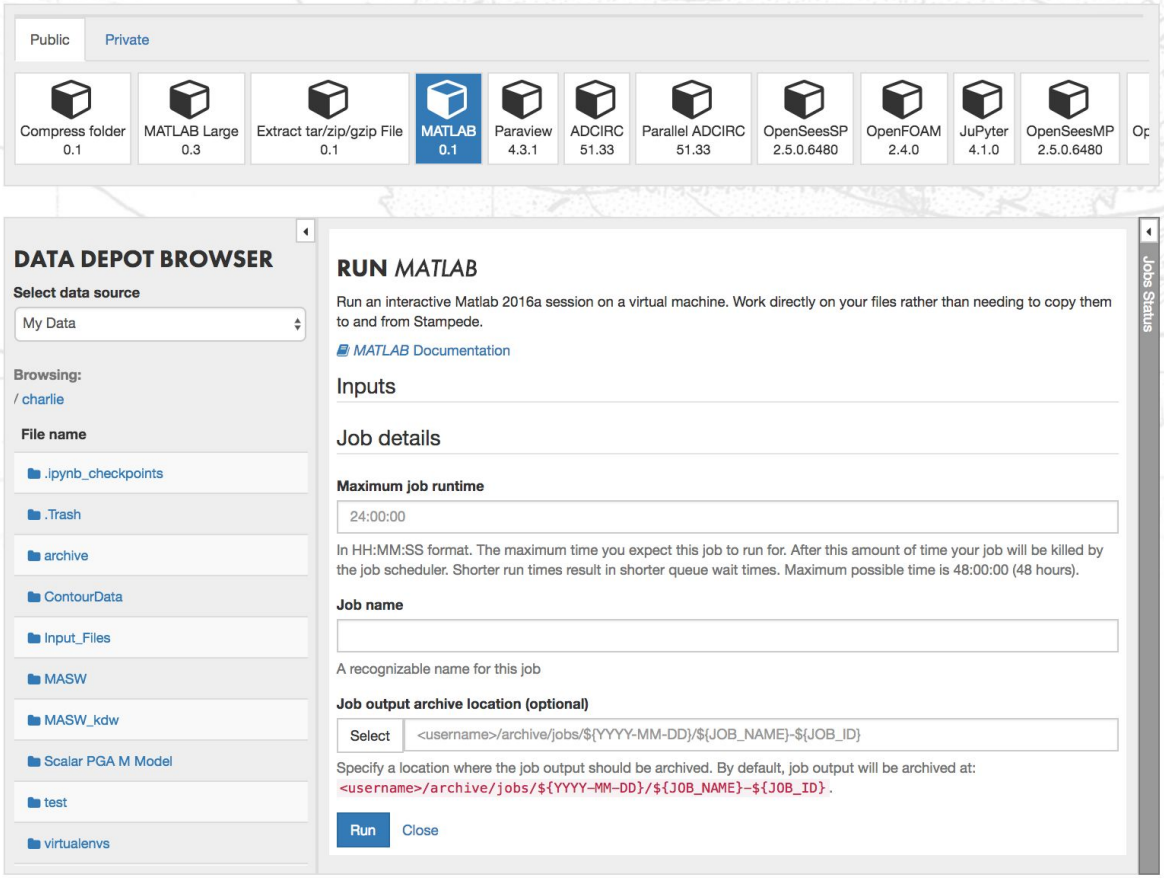
At the top of the Discovery Workspace, you'll see the Application Bar, all the publicly available applications are shown here. Each applications links to documentation providing details of that particular app.

DesignSafe: Applications

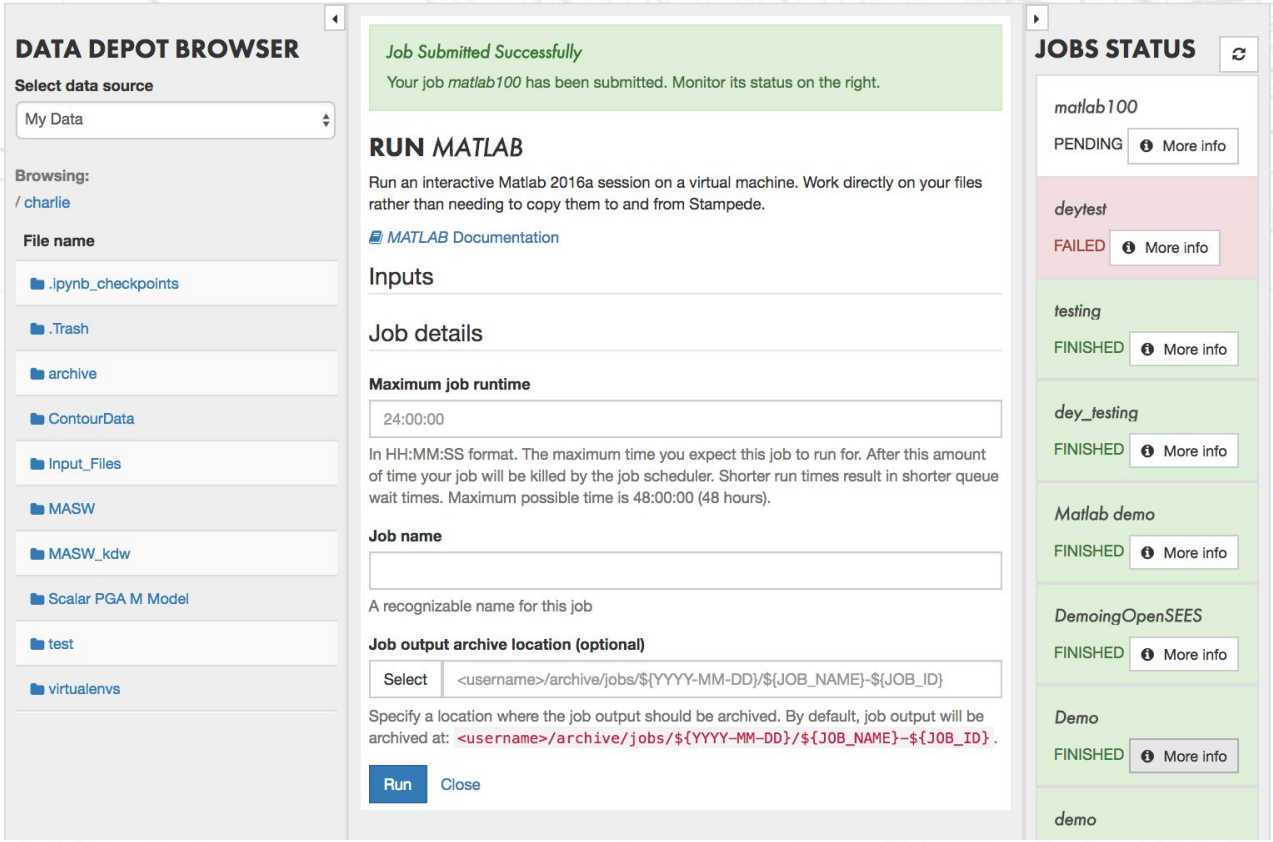


Each applications links to documentation providing details of that particular app. To execute an app, fill out the necessary criteria on the form, and click RUN

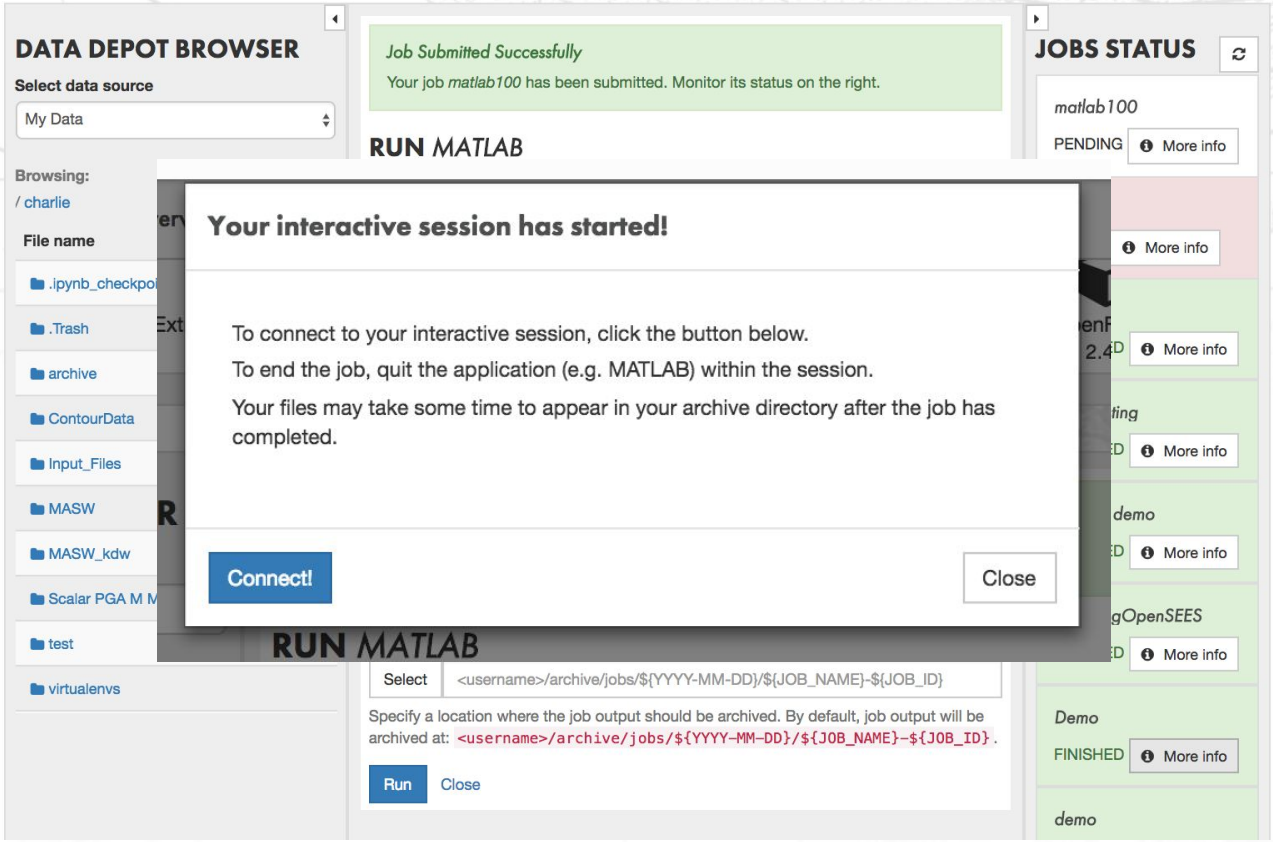
DesignSafe: MATLAB



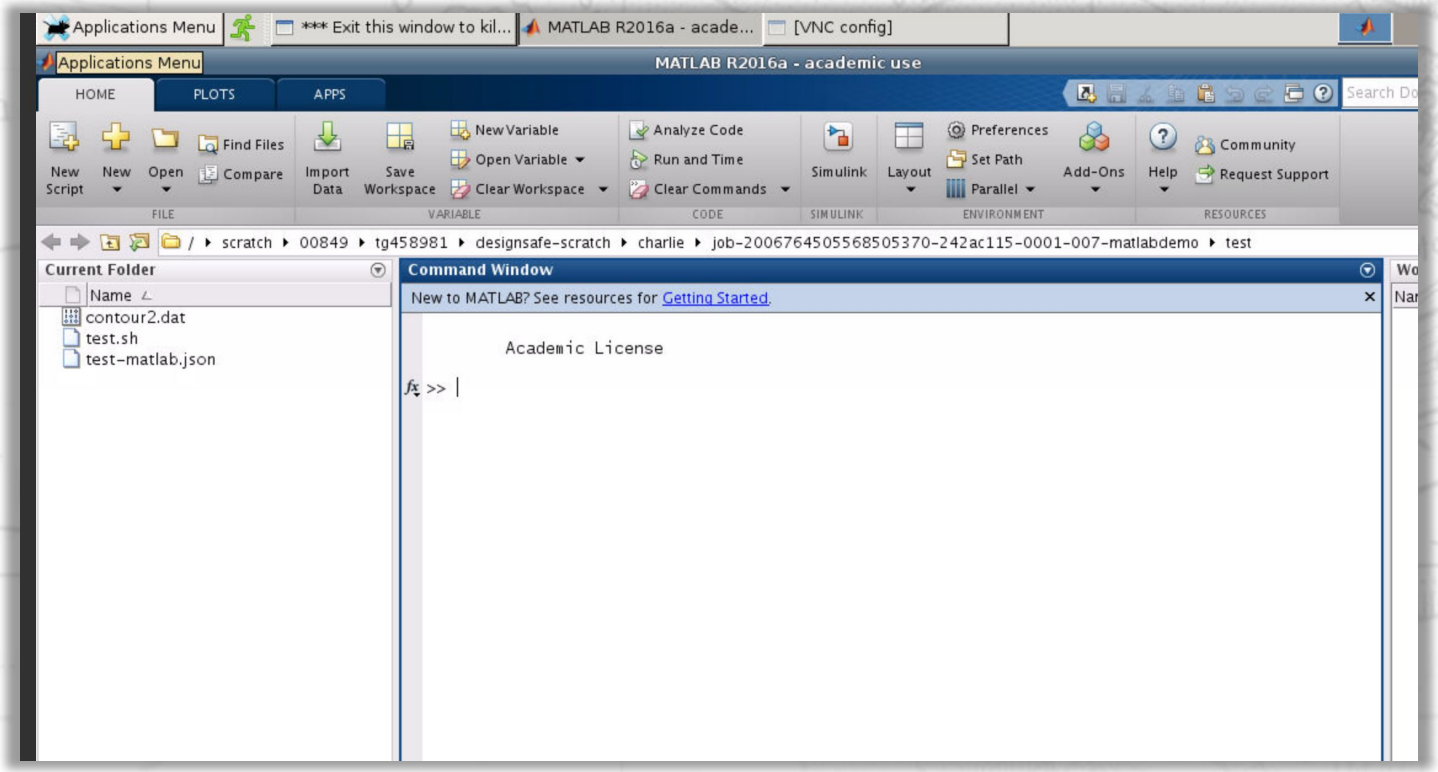
DesignSafe: MATLAB



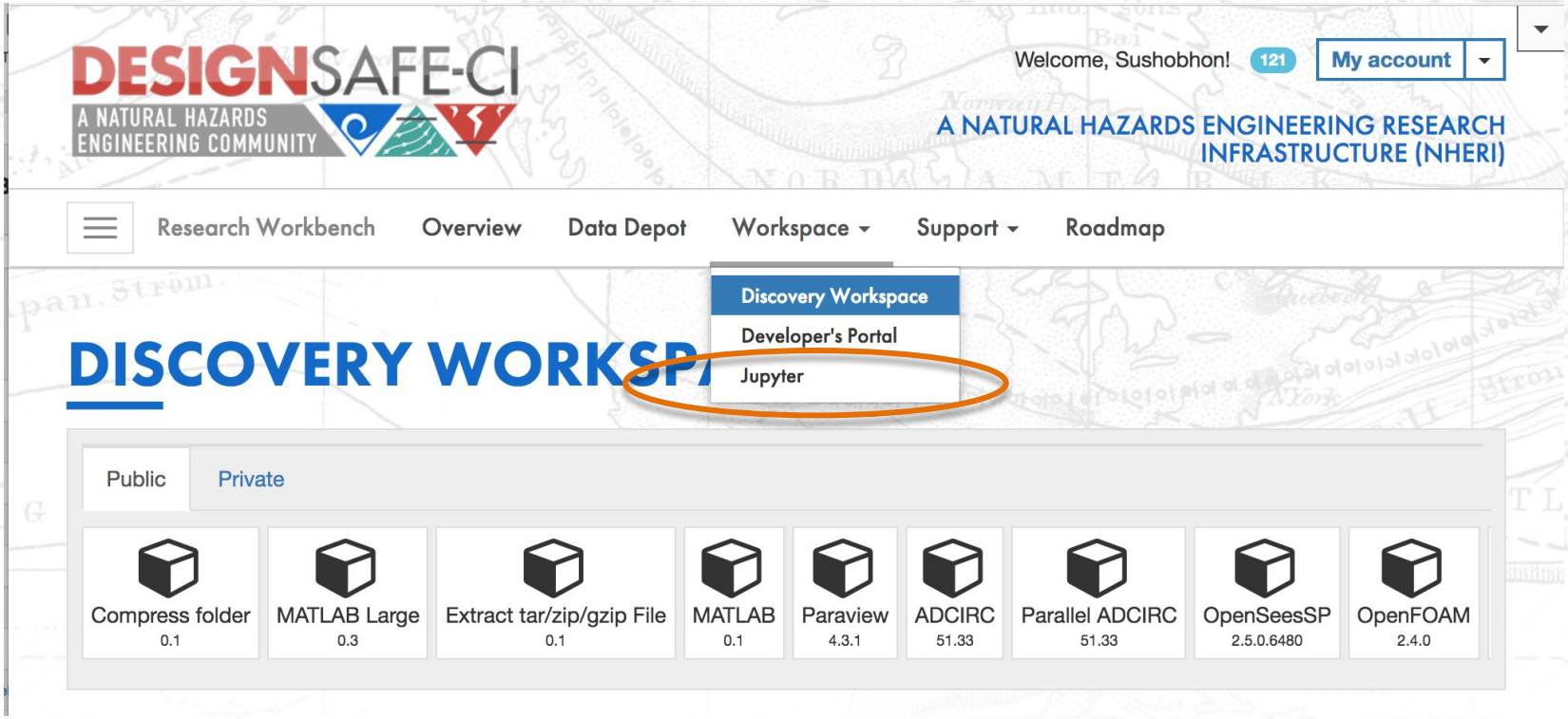
DesignSafe: MATLAB



DesignSafe: MATLAB



DesignSafe: Jupyter



What are Jupyter Notebooks?

A web-based, interactive computing tool for capturing the whole computation process: developing, documenting, and executing code, as well as communicating the results.

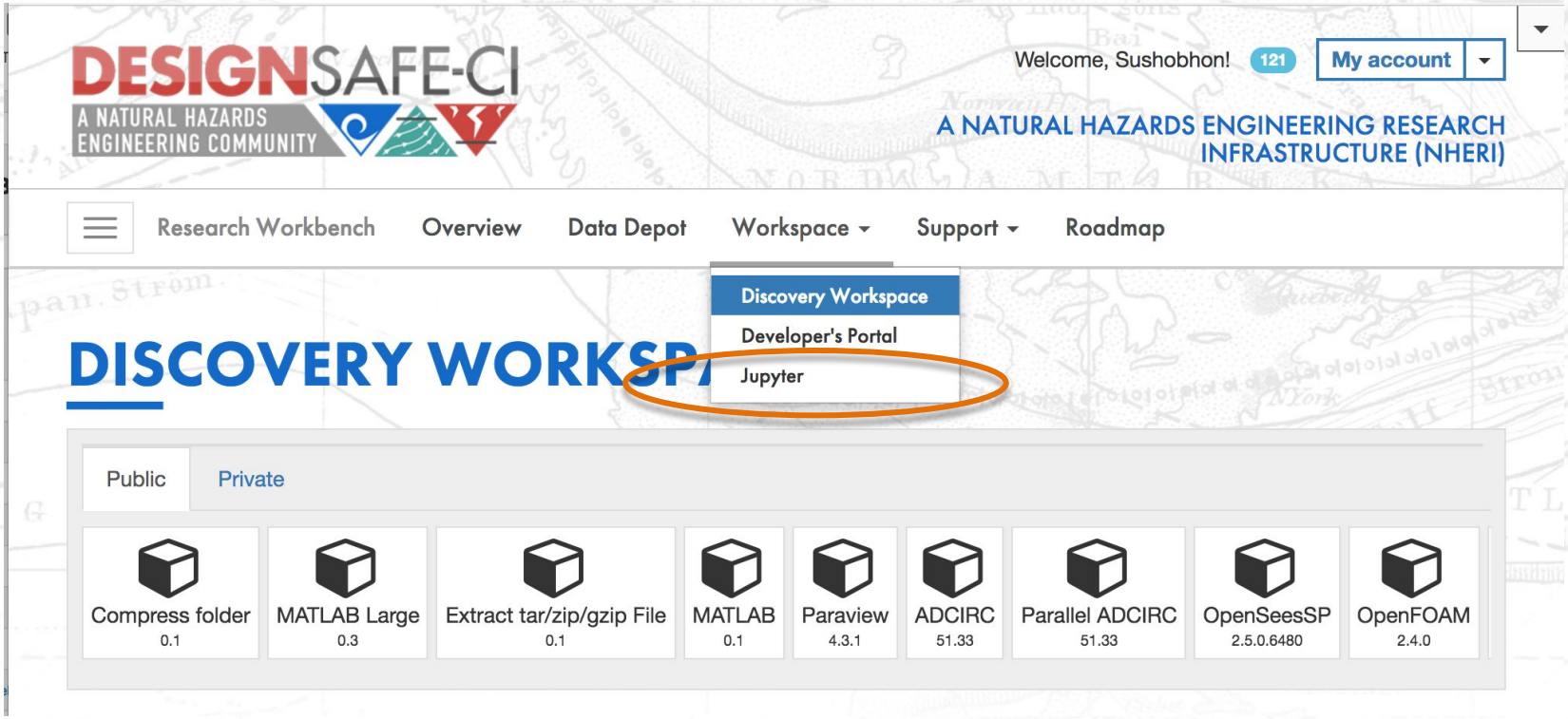
How do Jupyter Notebooks Work?

An open notebook has exactly one interactive session connected to a kernel which will execute code sent by the user and communicate back results. This kernel remains active if the web browser window is closed, and reopening the same notebook from the dashboard will reconnect the web application to the same kernel.

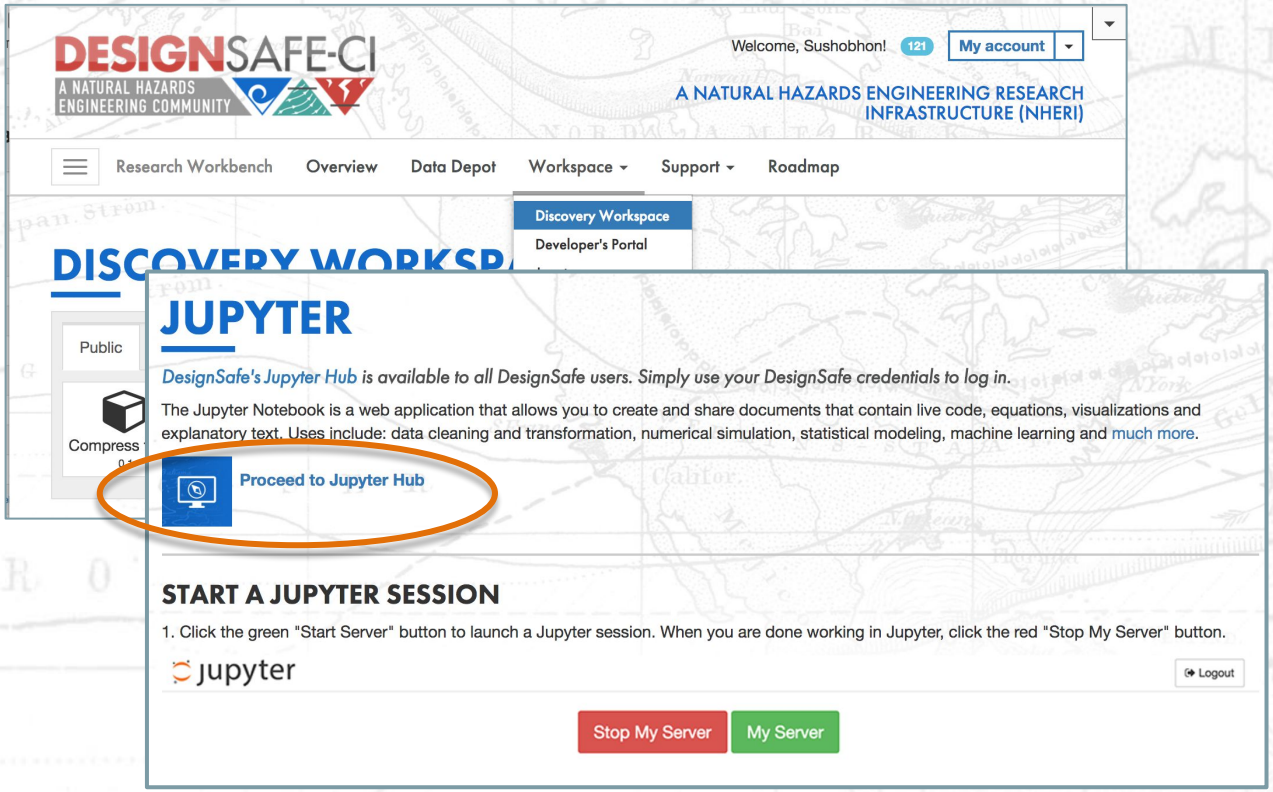
What's this mean?

Notebooks are an interface to kernel, the kernel executes your code and outputs back to you through the notebook. The kernel is essentially our programming language we wish to interface with.

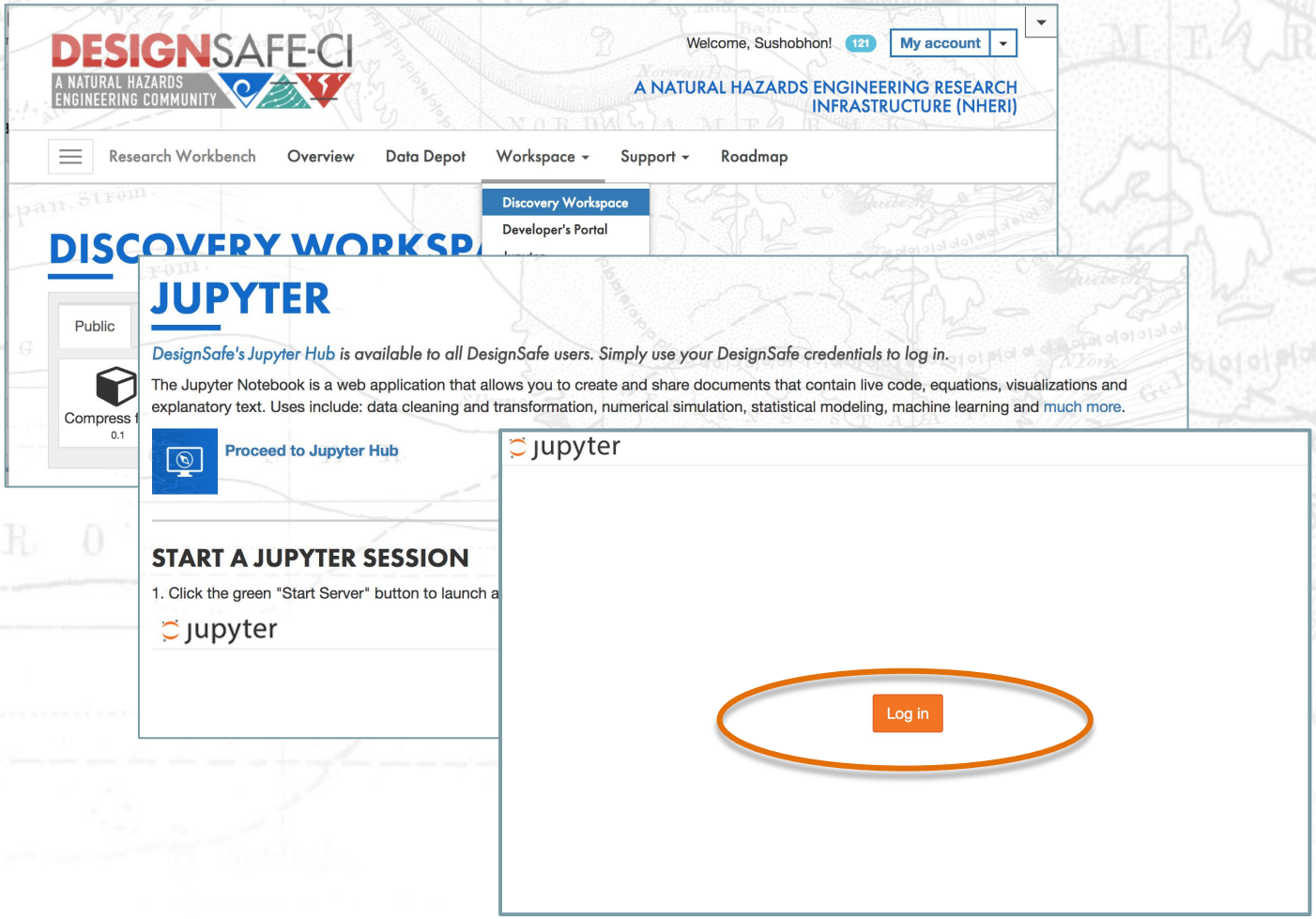
DesignSafe: Jupyter



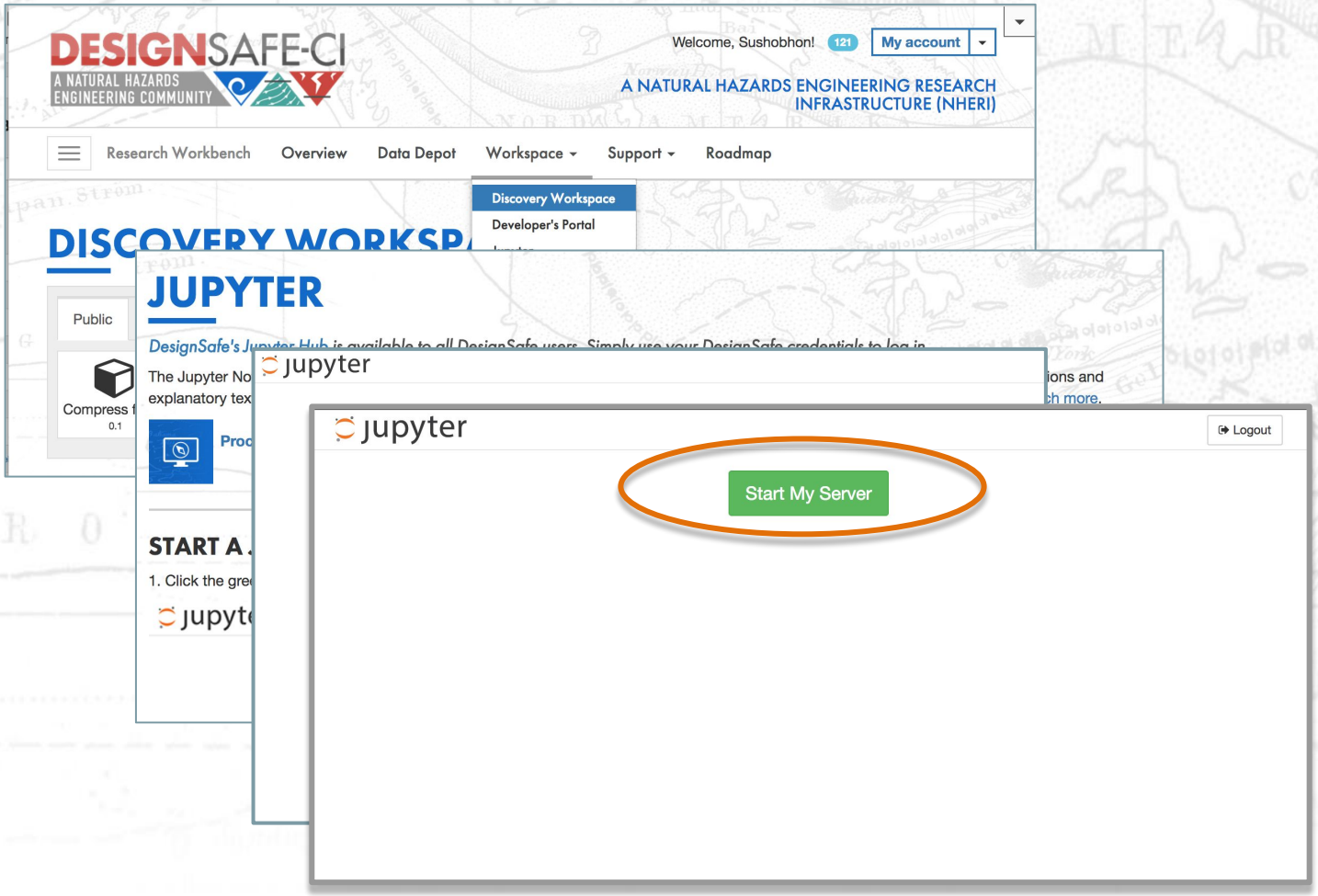
DesignSafe: Jupyter



DesignSafe: Jupyter



DesignSafe: Jupyter



DesignSafe: Jupyter

Jupyter Notebooks, Structure

- Code Cells
  - Code cells allow you to enter and run code
    Run a code cell using Shift-Enter

- Markdown Cells
  - Text can be added to Jupyter Notebooks using Markdown cells. Markdown is a popular markup language that is a superset of HTML.

Jupyter Notebooks, Structure

- Markdown Cells
  - You can add headings:
    - # Heading 1
      # Heading 2
      ## Heading 2.1
      ## Heading 2.2
  - You can add lists
    - 1. First ordered list item
      2. Another item
      · · * Unordered sub-list.
      1. Actual numbers don't matter, just that it's a number
      · · 1. Ordered sub-list
      4. And another item.

Jupyter Notebooks, Structure

- Markdown Cells
  - pure HTML
    - <dl>
      <dt>Definition list</dt>
      <dd>Is something people use sometimes.</dd>

      <dt>Markdown in HTML</dt>
      <dd>Does *not* work **very** well. Use HTML tags.</dd>
      </dl>
  - And even, Latex!
    - $e^{i\pi} + 1 = 0$

Jupyter Notebooks, Workflow

Typically, you will work on a computational problem in pieces, organizing related ideas into cells and moving forward once previous parts work correctly. This is much more convenient for interactive exploration than breaking up a computation into scripts that must be executed together, as was previously necessary, especially if parts of them take a long time to run.

Jupyter Notebooks, Workflow

- Let a traditional paper lab notebook be your guide:
  - Each notebook keeps a historical (and dated) record of the analysis as it's being explored.
  - The notebook is not meant to be anything other than a place for experimentation and development.
  - Notebooks can be split when they get too long.
  - Notebooks can be split by topic, if it makes sense.

Jupyter Notebooks, Shortcuts

- **`Shift-Enter`: run cell**
  - Execute the current cell, show output (if any), and jump to the next cell below. If `Shift-Enter`is invoked on the last cell, a new code cell will also be created. Note that in the notebook, typing `Enter` on its own *never* forces execution, but rather just inserts a new line in the current cell. `Shift-Enter` is equivalent to clicking the `Cell | Run` menu item.

Jupyter Notebooks, Shortcuts

- `Ctrl-Enter`: **run cell in-place**
  - Execute the current cell as if it were in “terminal mode”, where any output is shown, but the cursor *remains* in the current cell. The cell’s entire contents are selected after execution, so you can just start typing and only the new input will be in the cell. This is convenient for doing quick experiments in place, or for querying things like filesystem content, without needing to create additional cells that you may not want to be saved in the notebook.

Jupyter Notebooks, Shortcuts

- **`Alt-Enter`: run cell, insert below**
  - Executes the current cell, shows the output, and inserts a *new* cell between the current cell and the cell below (if one exists). (shortcut for the sequence `Shift-Enter`,`Ctrl-m a`. (`Ctrl-m a` adds a new cell above the current one.))
- **`Esc` and `Enter`: Command mode and edit mode**
  - In command mode, you can easily navigate around the notebook using keyboard shortcuts. In edit mode, you can edit text in cells.

DesignSafe: Hands On

- **Log in to DesignSafe**
- **Data Depot**
  - **Search Published data**
    - Navigate an experiment
    - View the Metadata
    - Preview/Download Files
  - **Navigate to My Data**
    - Upload files
    - Copy files
    - Share files with others
  - **Navigate to Projects**
    - Demonstrate creating a Project
    - Adding collaborators
    - Copying files in/out of a Project
- **Workspace**
    - View the available applications
    - Launch an application
    - Launch MATLAB
    - Launch Jupyter

DesignSafe: Thanks

Ellen Rathje, Tim Cockerill, Jamie Padgett, Scott Brandenberg, Dan Stanzione, Steve Mock, Josue Coronel, Craig Jansen, Joe Stubbs, Matt Stelmaszek, Hedda Prochaska, Joonyee Chuah

DesignSafe: Future Webinars

- Introduction to Python and Matplotlib
- Advanced Python
- Introduction to Data Analysis and Plotting with R
- Advanced R

For additional questions, feel free to contact us

- Email:
  training@designsafe-ci.org

- or fill out a ticket:
  https://www.designsafe-ci.org/help/tickets

DesignSafe: Questions?