A New Cyberinfrastructure for the Natural Hazards Community
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

SIMULATION RESEARCH
- Domain Specification
- Features and Properties
- Forcing/loading Function
- Metadata

Run Model

EXPERIMENTAL RESEARCH
- Hybrid Simulation
- Experimental Setup
- Material Properties
- Sensor Locations

Sensor data, Video, Images, etc.

RAPID RESEARCH
- Infrastructure Performance Data
- Remotely Sensed Data
- Human Experiential Data

Reconnaissance Integration Portal

Data Depot

Curate and Publish
(Link to Publications, DOI, Citations)

Data Analysis and Visualization

Shared Apps and Scripts

Save to Data Depot

Discovery Workspace

Florida Tech
DesignSafe: Walkthrough
DesignSafe: The Research Workbench

RESEARCH WORKBENCH

Service Notices

DesignSafe Status: Available
01-04-2017 4:00PM CST
No planned maintenance at this time.

Data Depot
Full lifecycle data creation - discover, publish, share, upload/download.

Discovery Workspace
Data analytics tools, HPC computational resources, and scientific visualization software.

Developer's Portal
Build your own tools and embed DesignSafe capabilities into your applications via our API.

Reconnaissance Integration Portal
Access reconnaissance data collected within a geospatial framework.

User Support
DesignSafe technical staff collaborating with your research team as needed, including ECSS.

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

### My Data

<table>
<thead>
<tr>
<th>Name</th>
<th>Size</th>
<th>Last modified</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>ipynb_checkpoints</td>
<td>4.0 kB</td>
<td>12/14/16 2:23 PM</td>
<td></td>
</tr>
<tr>
<td>Trash</td>
<td>4.0 kB</td>
<td>4/22/16 7:13 AM</td>
<td></td>
</tr>
<tr>
<td>1107_Practice.ipynb</td>
<td>8.5 kB</td>
<td>11/30/16 3:09 PM</td>
<td></td>
</tr>
<tr>
<td>animationTest1-Copy1.ipynb</td>
<td>6.0 kB</td>
<td>12/14/16 2:25 PM</td>
<td></td>
</tr>
<tr>
<td>animationTest1.ipynb</td>
<td>79.2 kB</td>
<td>1/20/17 11:12 AM</td>
<td></td>
</tr>
</tbody>
</table>
DesignSafe: My Projects

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

**DATA DEPOT BROWSER**

Select data source

- My Data

Browsing:

- / charlie

File name

- .pyrib_checkpoints
- .Trash
- archive
- ContourData
- Input_Files
- MABSW
- MABSW_locw
- Scaler PGA M Model
- test
- virtualus

**RUN MATLAB**

Run an interactive Matlab 2018a session on a virtual machine. Work directly on your files rather than needing to copy them to and from Stampede.

- MATLAB Documentation

**Inputs**

**Job details**

**Maximum job runtime**

24:00:00

In HH:MM:SS format. The maximum time you expect this job to run for. After this amount of time your job will be killed by the job scheduler. Shorter run times result in shorter queue wait times. Maximum possible time is 48:00:00 (48 hours).

**Job name**

A recognizable name for this job

**Job output archive location (optional)**

- Select
  - <username>/archive/jobs/<YYYY-MM-DD>/<JOB_NAME>-<JOB_ID>

Specify a location where the job output should be archived. By default, job output will be archived at:
- <username>/archive/jobs/<YYYY-MM-DD>/<JOB_NAME>-<JOB_ID>.

Run Close
**DesignSafe: MATLAB**

**DATA DEPOT BROWSER**

- Select data source: My Data
- Browsing: /charlie
- File name
  - .ipynb_checkpoints
  - .Trash
  - archive
  - ContourData
  - Input_Files
  - MASW
  - MASW_kdw
  - Scalar PGA M Model
  - test
  - virtualenvs

**RUN MATLAB**

Run an interactive Matlab 2016a session on a virtual machine. Work directly on your files rather than needing to copy them to and from Stampede.

- **MATLAB Documentation**

**Inputs**

**Job details**

- Maximum job runtime: 24:00:00

In HH:MM:SS format. The maximum time you expect this job to run for. After this amount of time your job will be killed by the job scheduler. Shorter run times result in shorter queue wait times. Maximum possible time is 48:00:00 (48 hours).

- **Job name**
  - A recognizable name for this job

- **Job output archive location (optional)**
  - Select: &lt;username&gt;/archive/jobs/$(YYYY-MM-DD)/$(JOB_NAME)-$(JOB_ID)
  - Specify a location where the job output should be archived. By default, job output will be archived at &lt;username&gt;/archive/jobs/$(YYYY-MM-DD)/$(JOB_NAME)-$(JOB_ID).

**JOBS STATUS**

- **matlab100**
  - PENDING
  - FAILED
- **daytest**
  - PENDING
- **testing**
  - FINISHED
- **day_test**
  - FINISHED
- **Matlab demo**
  - FINISHED
- **DemoingOpenSEES**
  - FINISHED
- **Demo**
  - FINISHED
- **demo**
  - FINISHED

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**DesignSAFE-CI**
**Texas**
**TACC**
**Rice**
**Florida Tech**
**DesignSafe: MATLAB**

![MATLAB Interface](image)

- **DATA DEPOT BROWSER**
  - Select data source: My Data
  - Browsing: / charlie

- **RUN MATLAB**
  - Your interactive session has started!
  - To connect to your interactive session, click the button below.
  - To end the job, quit the application (e.g., MATLAB) within the session.
  - Your files may take some time to appear in your archive directory after the job has completed.

- **JOBS STATUS**
  - matlab 100
  - PENDING

**Florida Tech**
DesignSafe: MATLAB
**DesignSafe: Jupyter**

![Image of DesignSafe: Jupyter interface](image-url)
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's Jupyter Hub is available to all DesignSafe users. Simply use your DesignSafe credentials to log in.

The Jupyter Notebook is a web application that allows you to create and share documents that contain live code, equations, visualizations and explanatory text. Uses include: data cleaning and transformation, numerical simulation, statistical modeling, machine learning and much more.

**START A JUPYTER SESSION**

1. Click the green "Start Server" button to launch a Jupyter session. When you are done working in Jupyter, click the red "Stop My Server" button.

```bash
jupyter
```

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[DesignSafe logo] [Texas Logo] [TACC Logo] [Rice Logo] [Florida Tech Logo]
DesignSafe: Jupyter

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START A JUPYTER SESSION
1. Click the green "Start Server" button to launch a Jupyter Notebook application.
2. Log in with your DesignSafe credentials.
DesignSafe: Jupyter

DesignSafe's Jupyter Hub is available to all DesignSafe users. Simply use your DesignSafe credentials to log in.

1. Click the green button to start the server.

Start My Server
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 `<em>`tags</em>`.</dd>`
  
    - 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?