U.S. DEPARTMENT OF ENERGY
Office of Science

How to Build a Science UI:
Getting Started with the STRUDEL Design System

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March 8, 2024

https://strudel.science

https://ux.lbl.gov

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ALFRED P. SLOAN FOUNDATION

UX.lbl.gov SciData

Scientific Data Division

BERKELEY LAB[1]
Bringing Science Solutions to the World

What we will cover

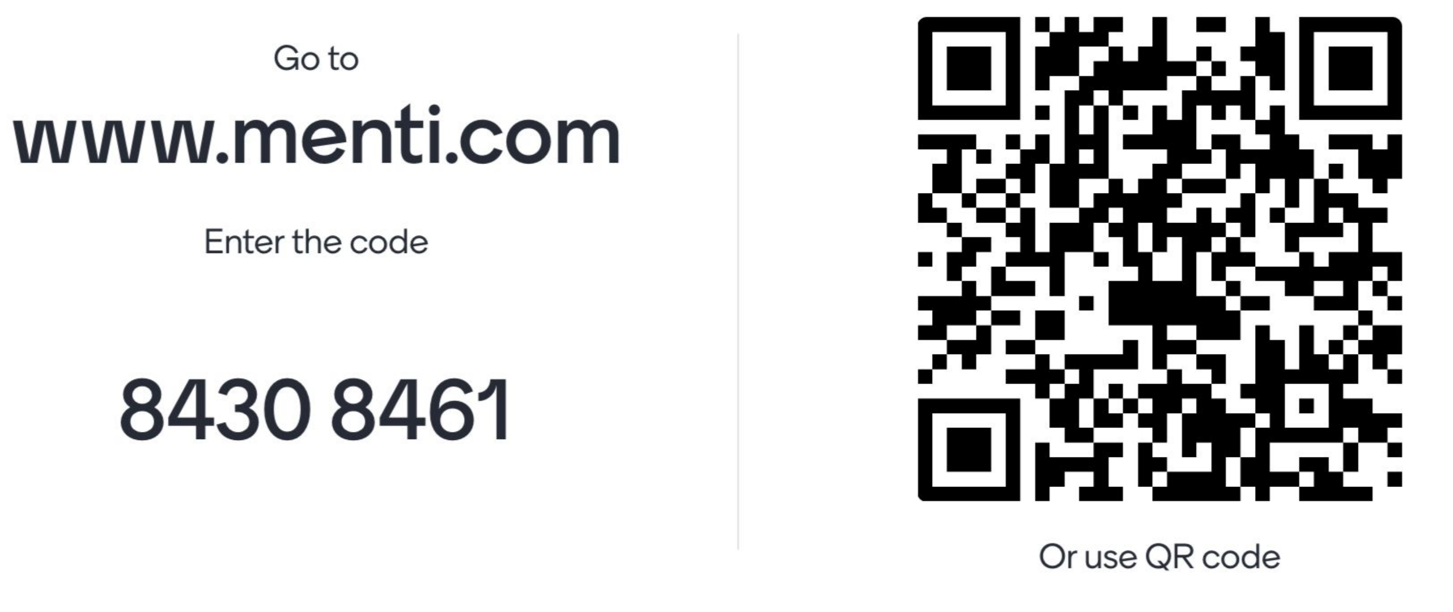
Part 1

1. About STRUDEL
2. The STRUDEL design system
3. Task Flow walkthrough

Part 2

1. What is STRUDEL Kit?
2. How to implement STRUDEL Task Flows with STRUDEL Kit
3. Get involved in the STRUDEL community

Menti



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Or use QR code

https://www.menti.com/als4oh2sxqa5

Team

UX designers and researchers, software engineers, and computer scientists employing UX for science at Berkeley Lab.

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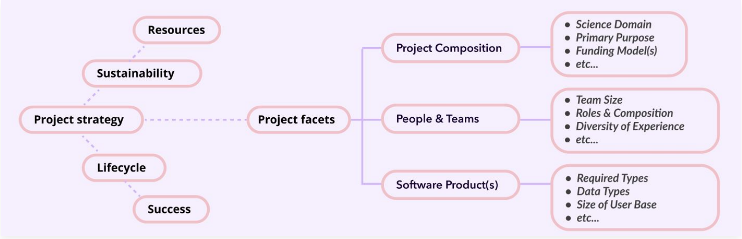
STRUDEL

ALFRED P. SLOAN
FOUNDATION

An open source project that enables teams to create user-centered software for scientific communities.

WIP

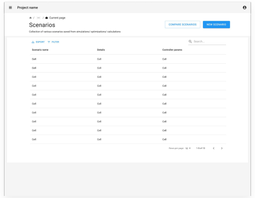


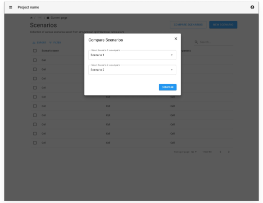
Typology of Scientific Software

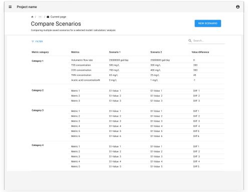
informing a strategic

Planning Framework

Beta







Design System

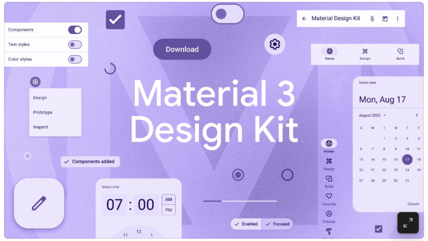
with

Task Flows

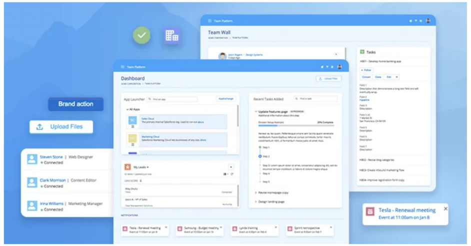
What is a design system?

A design system is a set of reusable components and patterns for designing and building UIs as well as guidelines on when and how to use them.

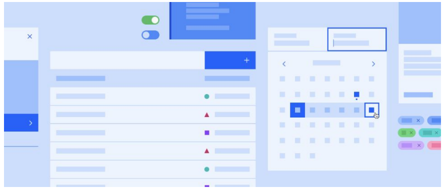
Design systems are commonly used in industry.



Google Material Design



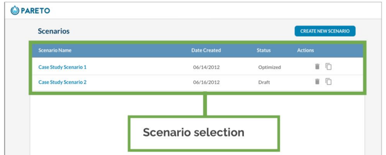
Salesforce Lightning Design

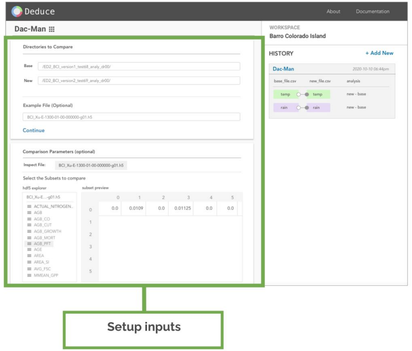


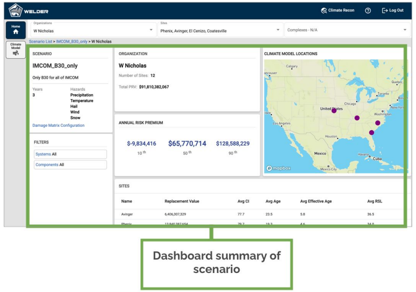
IBM Carbon Design

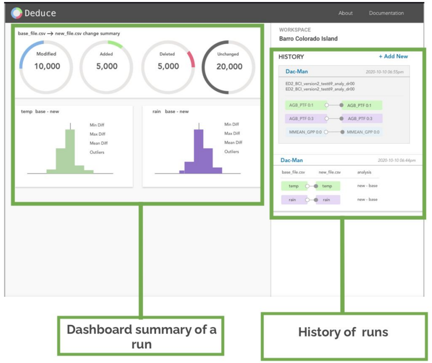
Atlassian Design System

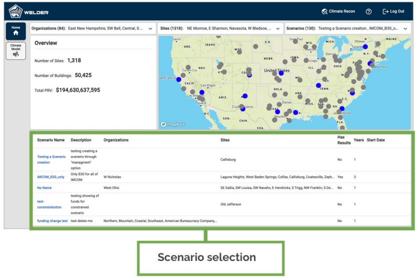
Motivation - recognized common patterns in science UIs

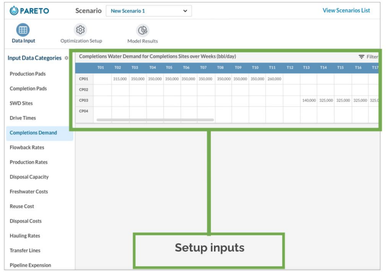


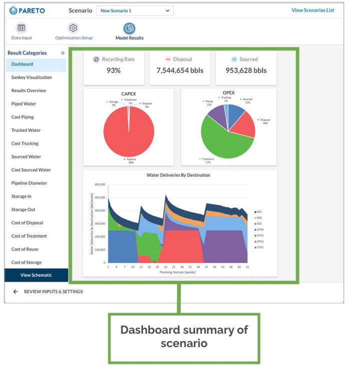


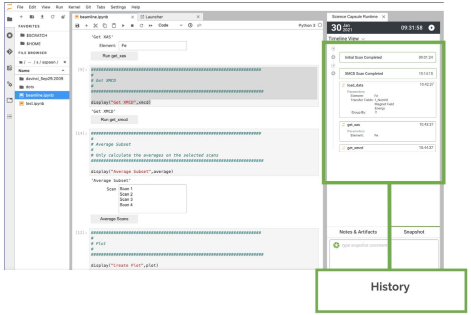












Scenario Selection

Select Inputs

Dashboard summary of results

History

What is unique about the STRUDEL design system?

Designed specifically for scientific UIs

Enables building UIs applicable across different scientific domains

Focuses on the larger flow & function of UI

Gives you a jump start to think about entire UI flow rather than starting from scratch

Designed by experts to empower scientists

Informed by our collective UX experience in the sciences to help democratize UX practices

Task Flows

Task Flow: series of steps represented by screens which helps user to accomplish a particular task in the scientific software's user interface

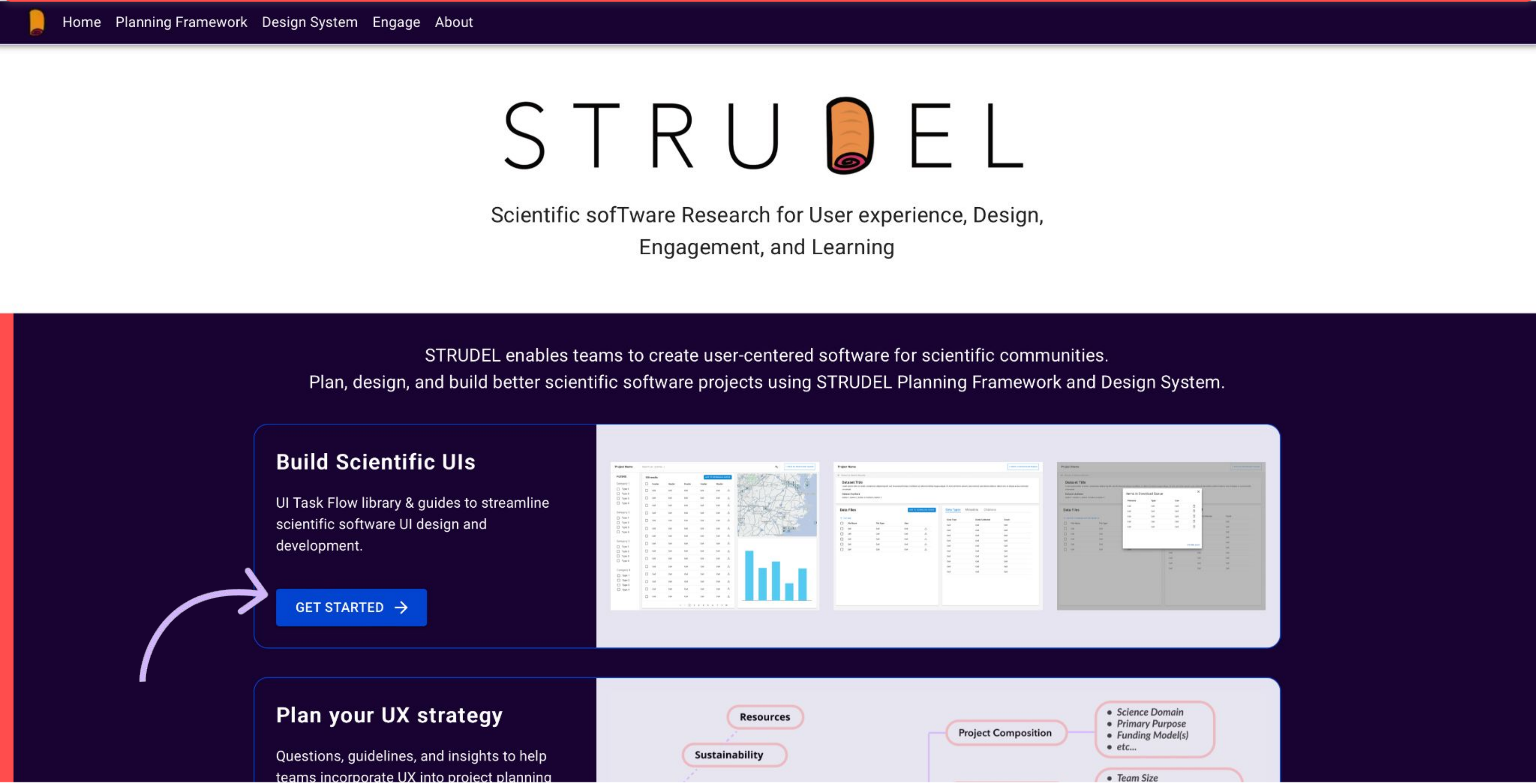
Similar Task Flows exist across various types of scientific software.

Analysis	Data	Exploration	Community Contributions
Run Computation	Explore Data	Monitor Activity	
Run Interactive Computation	Explore Data Repositories	Track State	
Compare Data	Contribute Data	Manage Account	

“UI to setup, run, and display results for a computational diff tool for large datasets”

- Input datasets
- Specify method and parameters to calculate diff
- Graphs & plots as diff results

https://strudel.science



STRUDEL

Scientific sofTware Research for User experience, Design, Engagement, and Learning

STRUDEL enables teams to create user-centered software for scientific communities.
Plan, design, and build better scientific software projects using STRUDEL Planning Framework and Design System.

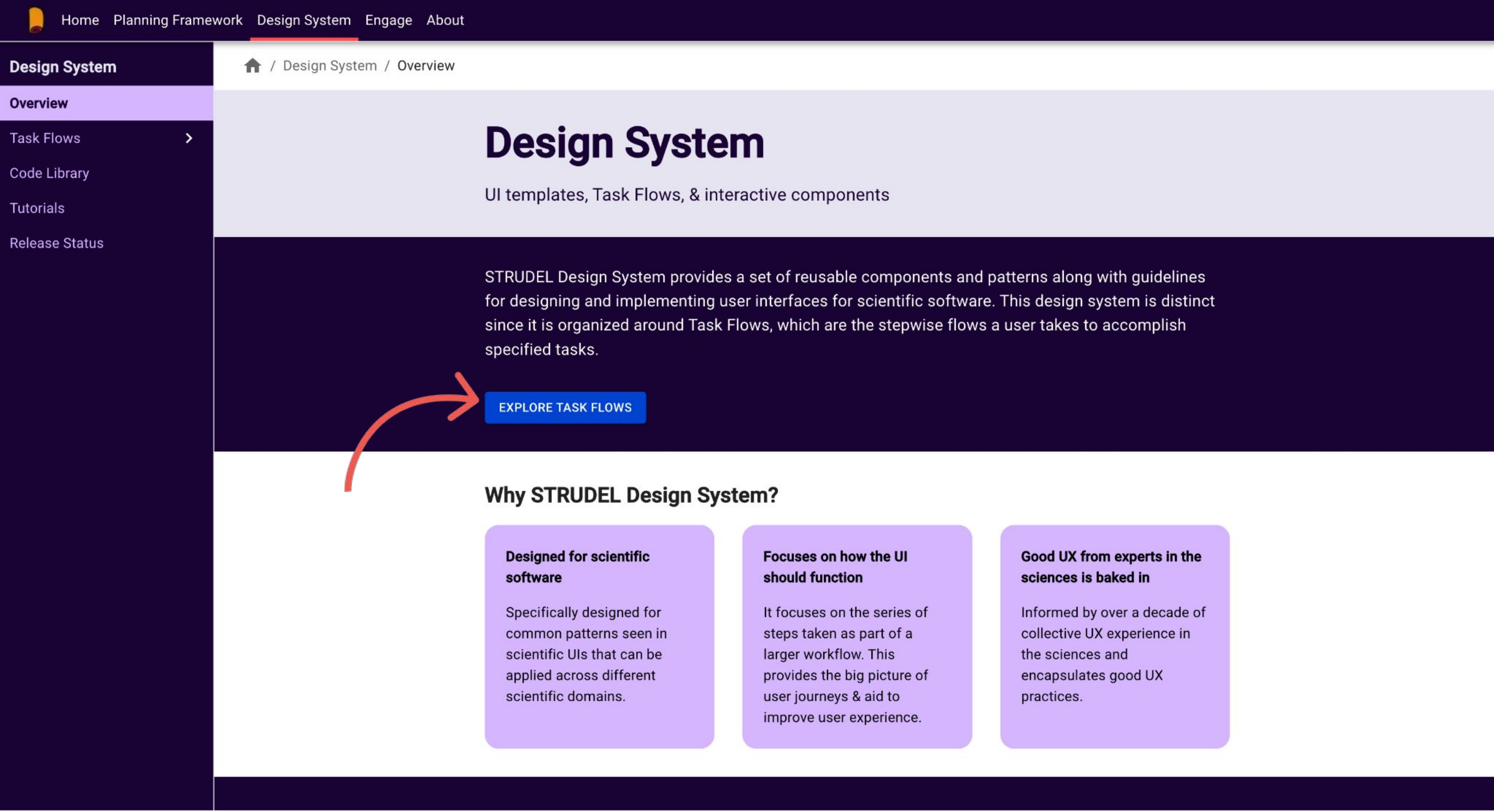
Build Scientific UIs

UI Task Flow library & guides to streamline scientific software UI design and development.

GET STARTED →

Plan your UX strategy

Questions, guidelines, and insights to help teams incorporate UX into project planning



Design System

UI templates, Task Flows, & interactive components

STRUDEL Design System provides a set of reusable components and patterns along with guidelines for designing and implementing user interfaces for scientific software. This design system is distinct since it is organized around Task Flows, which are the stepwise flows a user takes to accomplish specified tasks.

Why STRUDEL Design System?

Designed for scientific software

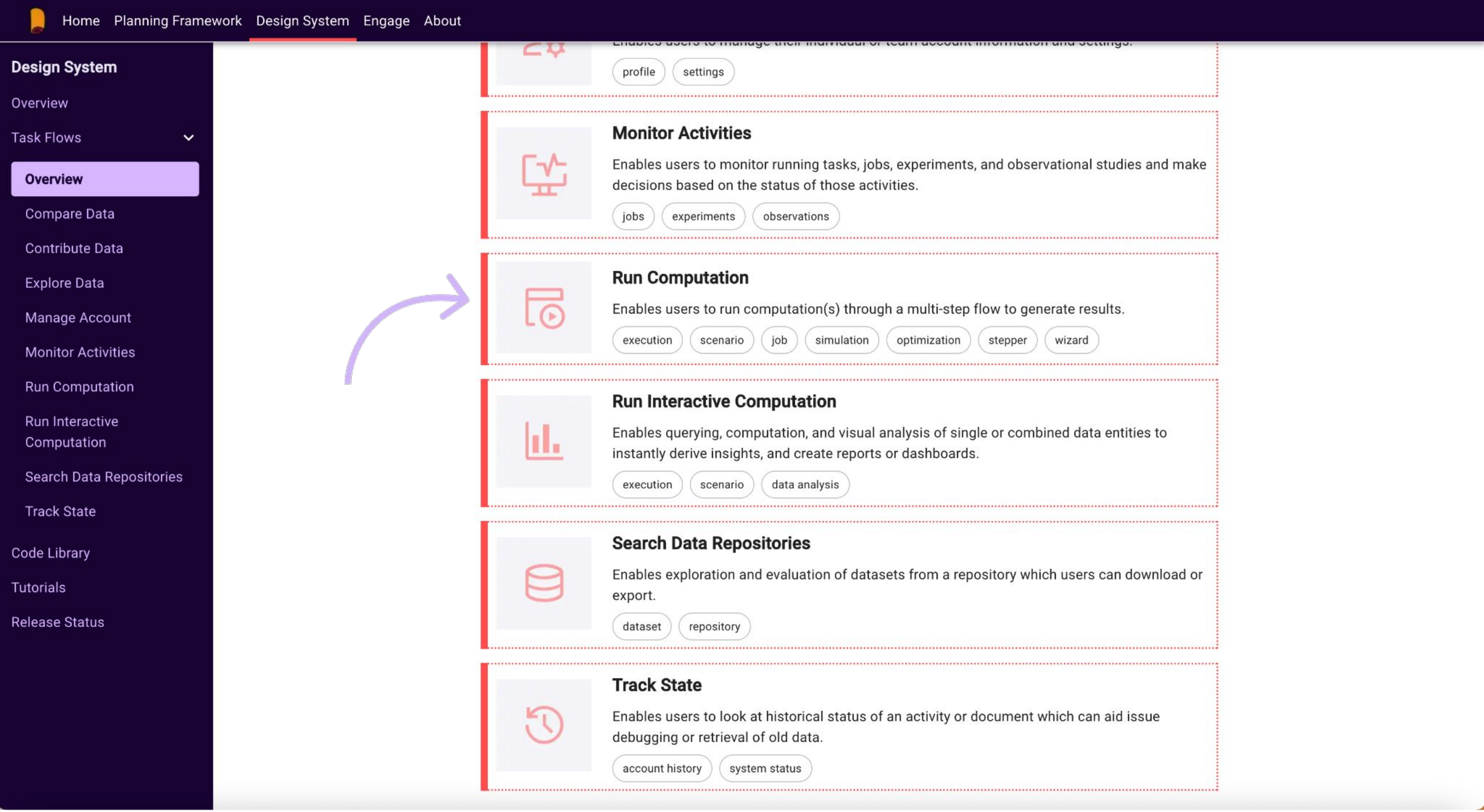
Specifically designed for common patterns seen in scientific UIs that can be applied across different scientific domains.

Focuses on how the UI should function

It focuses on the series of steps taken as part of a larger workflow. This provides the big picture of user journeys & aid to improve user experience.

Good UX from experts in the sciences is baked in

Informed by over a decade of collective UX experience in the sciences and encapsulates good UX practices.



Enables users to manage their individual or team account information and settings.

profile | settings

Monitor Activities

Enables users to monitor running tasks, jobs, experiments, and observational studies and make decisions based on the status of those activities.

jobs | experiments | observations

Run Computation

Enables users to run computation(s) through a multi-step flow to generate results.

execution | scenario | job | simulation | optimization | stepper | wizard

Run Interactive Computation

Enables querying, computation, and visual analysis of single or combined data entities to instantly derive insights, and create reports or dashboards.

execution | scenario | data analysis

Search Data Repositories

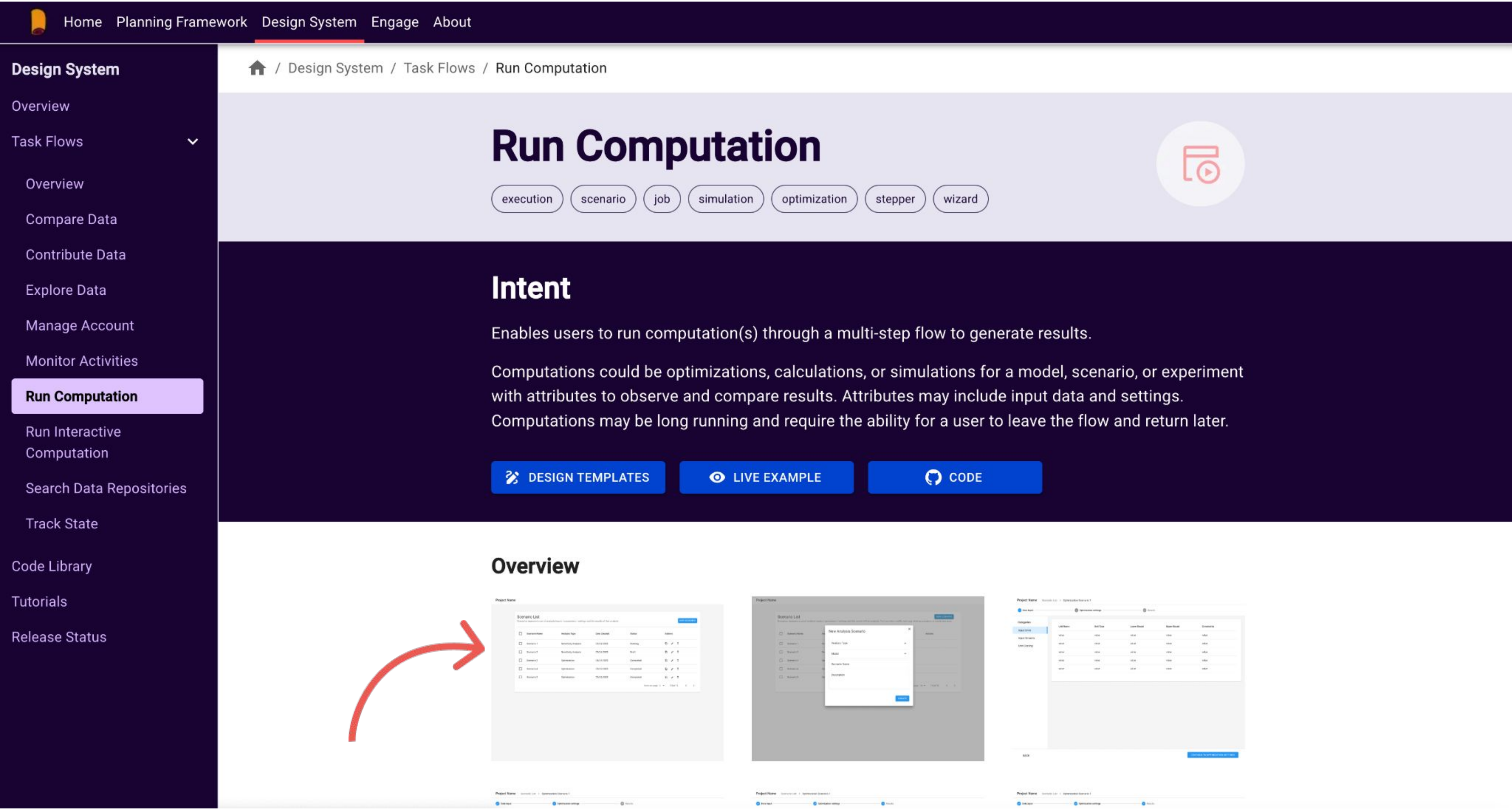
Enables exploration and evaluation of datasets from a repository which users can download or export.

dataset | repository

Track State

Enables users to look at historical status of an activity or document which can aid issue debugging or retrieval of old data.

account history | system status



Run Computation

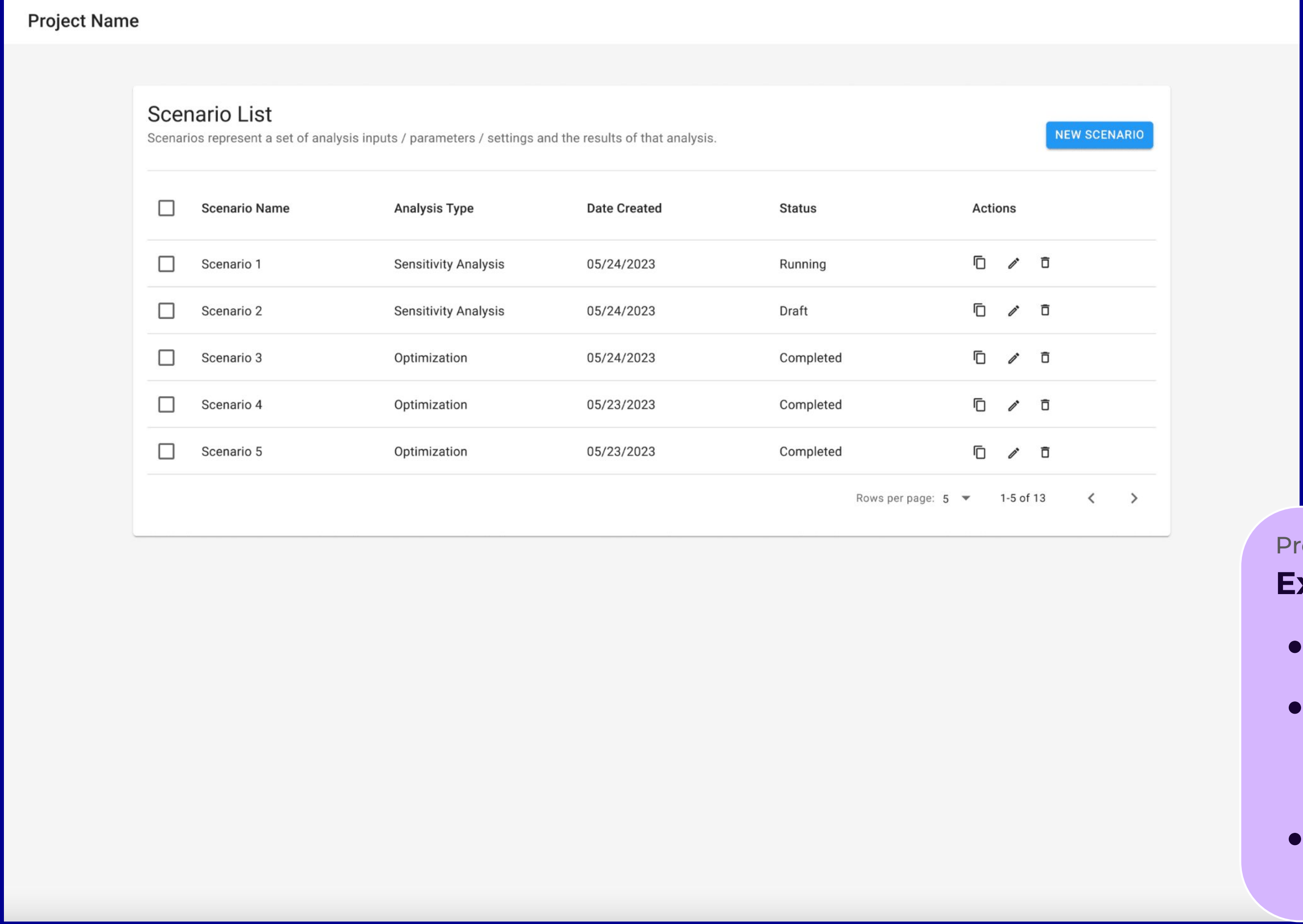
Intent

Enables users to run computation(s) through a multi-step flow to generate results.

Computations could be optimizations, calculations, or simulations for a model, scenario, or experiment with attributes to observe and compare results. Attributes may include input data and settings. Computations may be long running and require the ability for a user to leave the flow and return later.

Overview

Run Computation (1 of 6) - Scenario List



Project Name

Scenario List

Scenarios represent a set of analysis inputs / parameters / settings and the results of that analysis.

□	Scenario Name	Analysis Type	Date Created	Status	Actions
□	Scenario 1	Sensitivity Analysis	05/24/2023	Running	
□	Scenario 2	Sensitivity Analysis	05/24/2023	Draft	
□	Scenario 3	Optimization	05/24/2023	Completed	
□	Scenario 4	Optimization	05/23/2023	Completed	
□	Scenario 5	Optimization	05/23/2023	Completed	

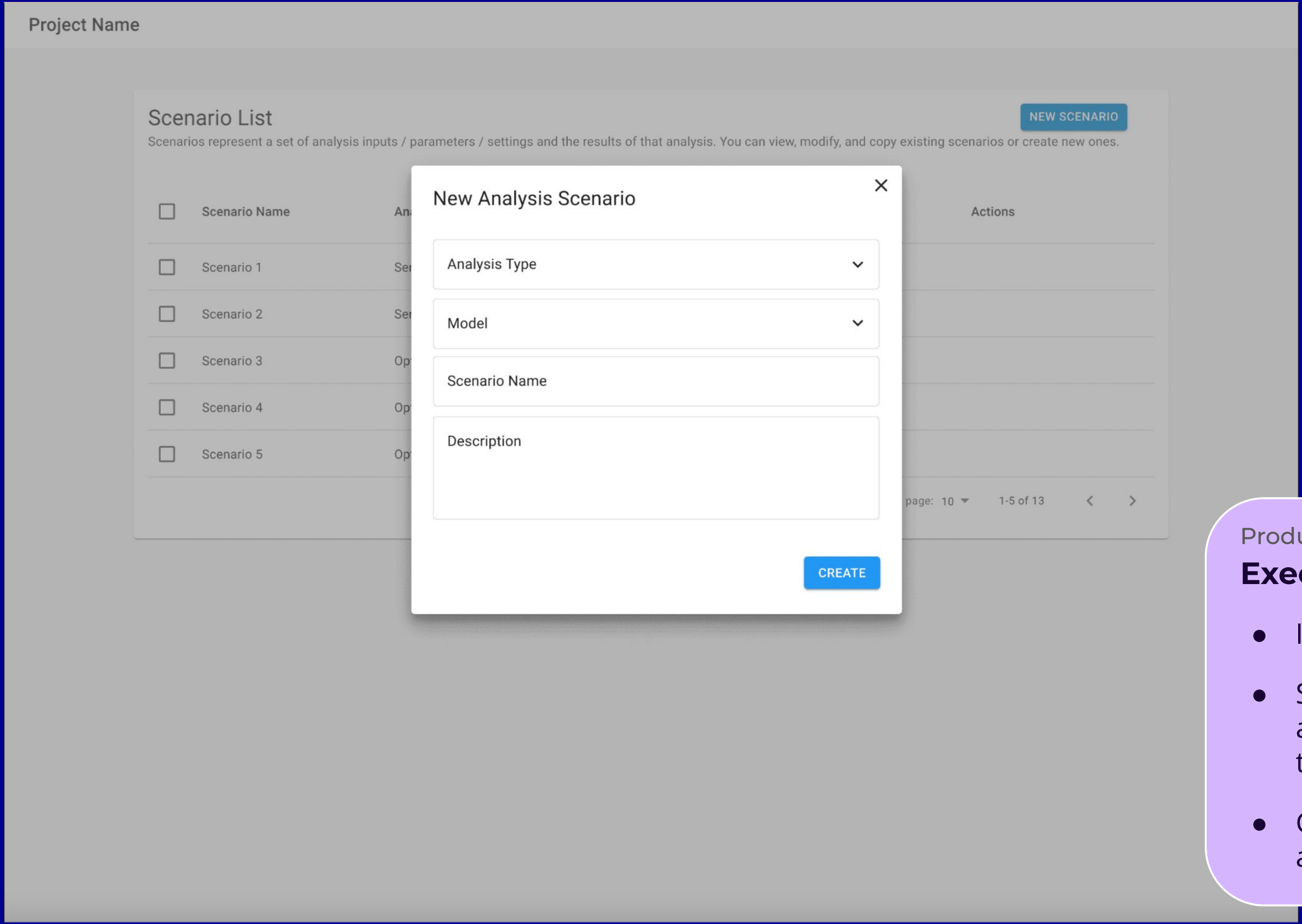
Rows per page: 5 ▾ 1-5 of 13 ‹ ›

Product Needs :

Execute diff tool

- Input datasets
- Specify method and parameters to calculate diff
- Graphs & plots as diff results

Run Computation (2 of 6) - New Scenario



Project Name

Scenario List

Scenarios represent a set of analysis inputs / parameters / settings and the results of that analysis. You can view, modify, and copy existing scenarios or create new ones.

☐	Scenario Name	An	Actions
☐	Scenario 1	Se	
☐	Scenario 2	Se	
☐	Scenario 3	Op	
☐	Scenario 4	Op	
☐	Scenario 5	Op	

page: 10 ▾ 1-5 of 13 ‹ ›

New Analysis Scenario

Analysis Type ⌄

Model ⌄

Scenario Name

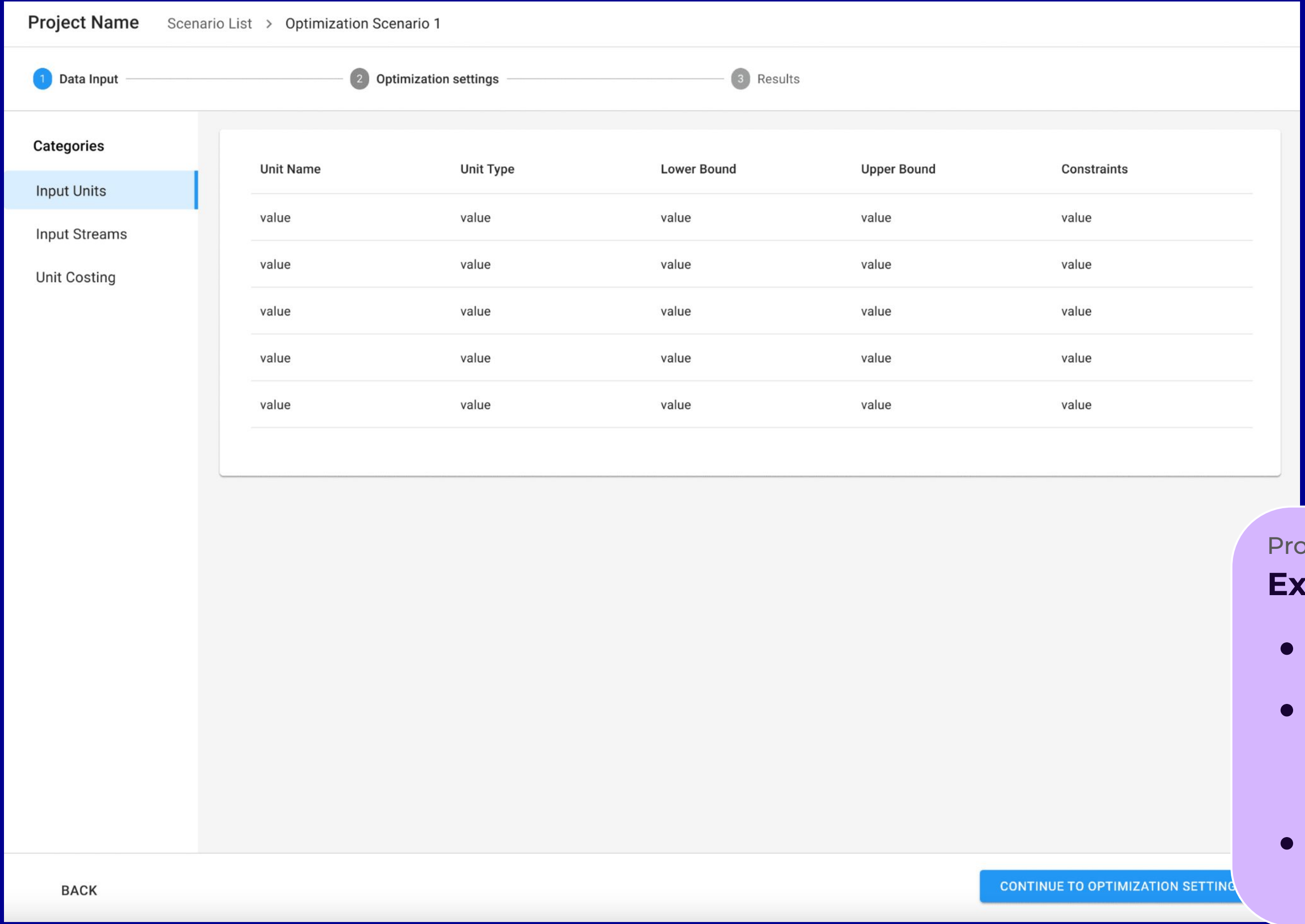
Description

Product Needs :

Execute diff tool

- Input datasets
- Specify method and parameters to calculate diff
- Graphs & plots as diff results

Run Computation (3 of 6) - Inputs Configuration



Project Name Scenario List > Optimization Scenario 1

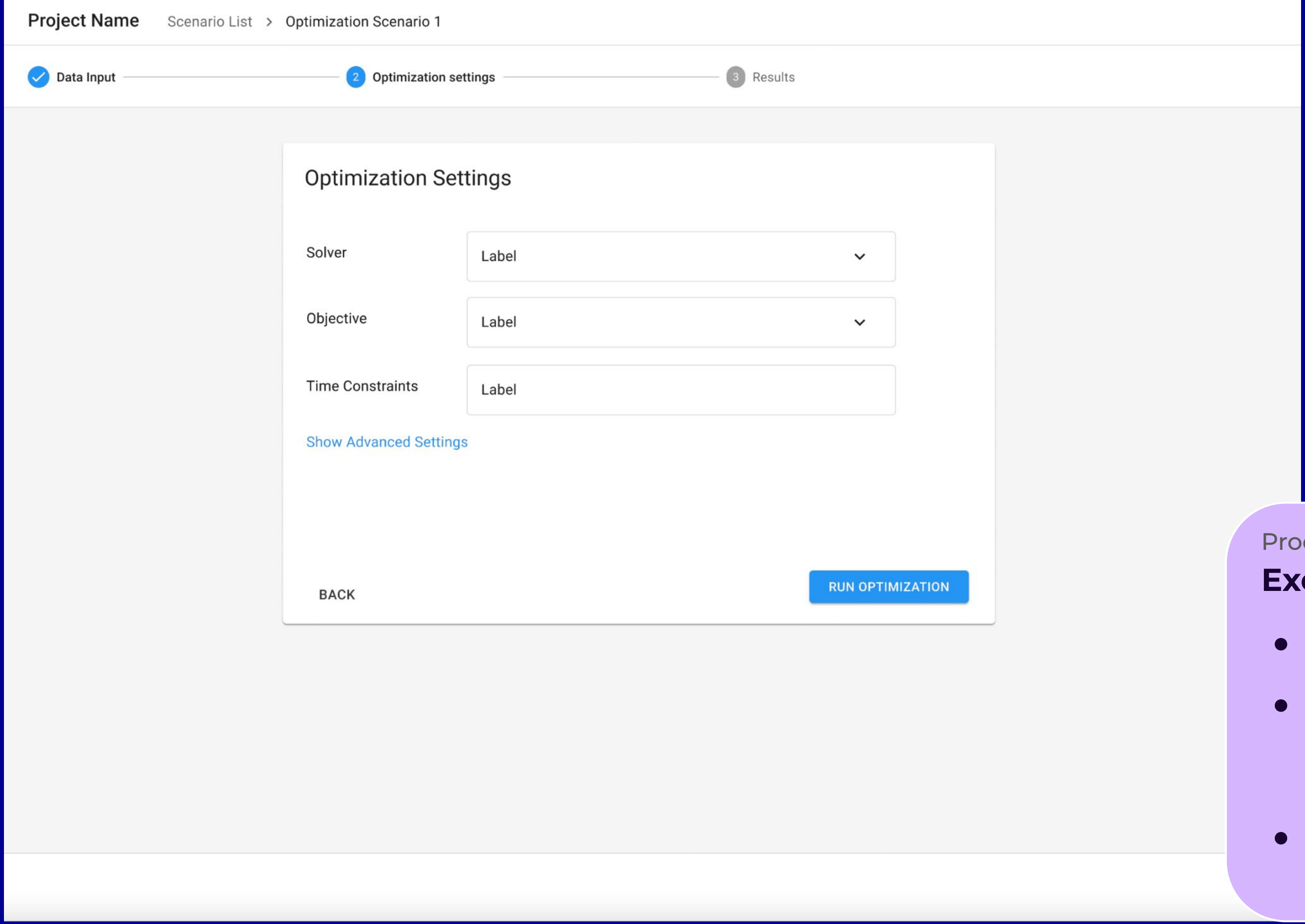
Unit Name	Unit Type	Lower Bound	Upper Bound	Constraints
value	value	value	value	value
value	value	value	value	value
value	value	value	value	value
value	value	value	value	value
value	value	value	value	value

Product Needs :

Execute diff tool

- Input datasets
- Specify method and parameters to calculate diff
- Graphs & plots as diff results

Run Computation (4 of 6) - Settings Configuration



Optimization Settings

Solver: Label

Objective: Label

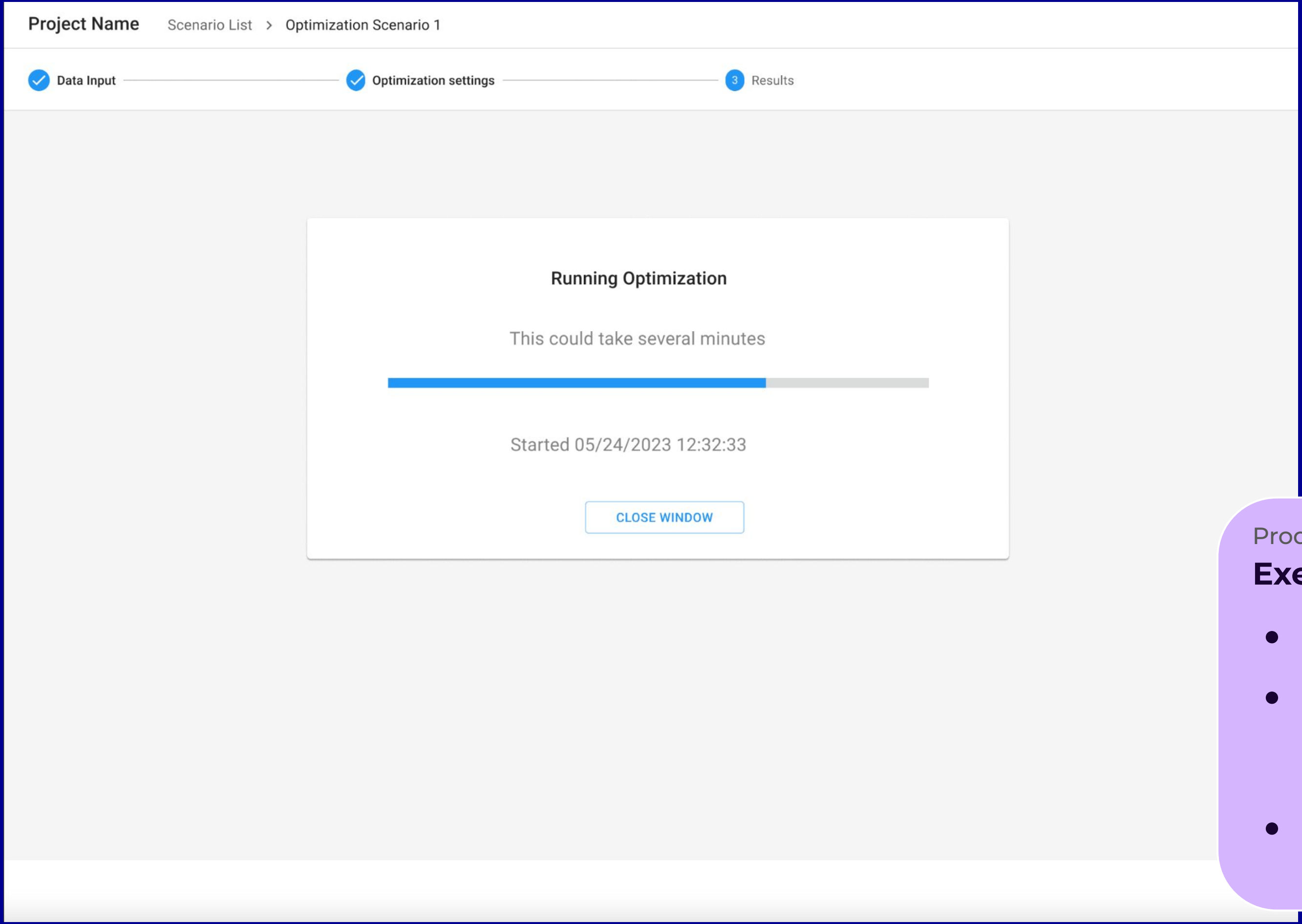
Time Constraints: Label

Product Needs :

Execute diff tool

- Input datasets
- Specify method and parameters to calculate diff
- Graphs & plots as diff results

Run Computation (5 of 6) - Execution Progress



Running Optimization

This could take several minutes

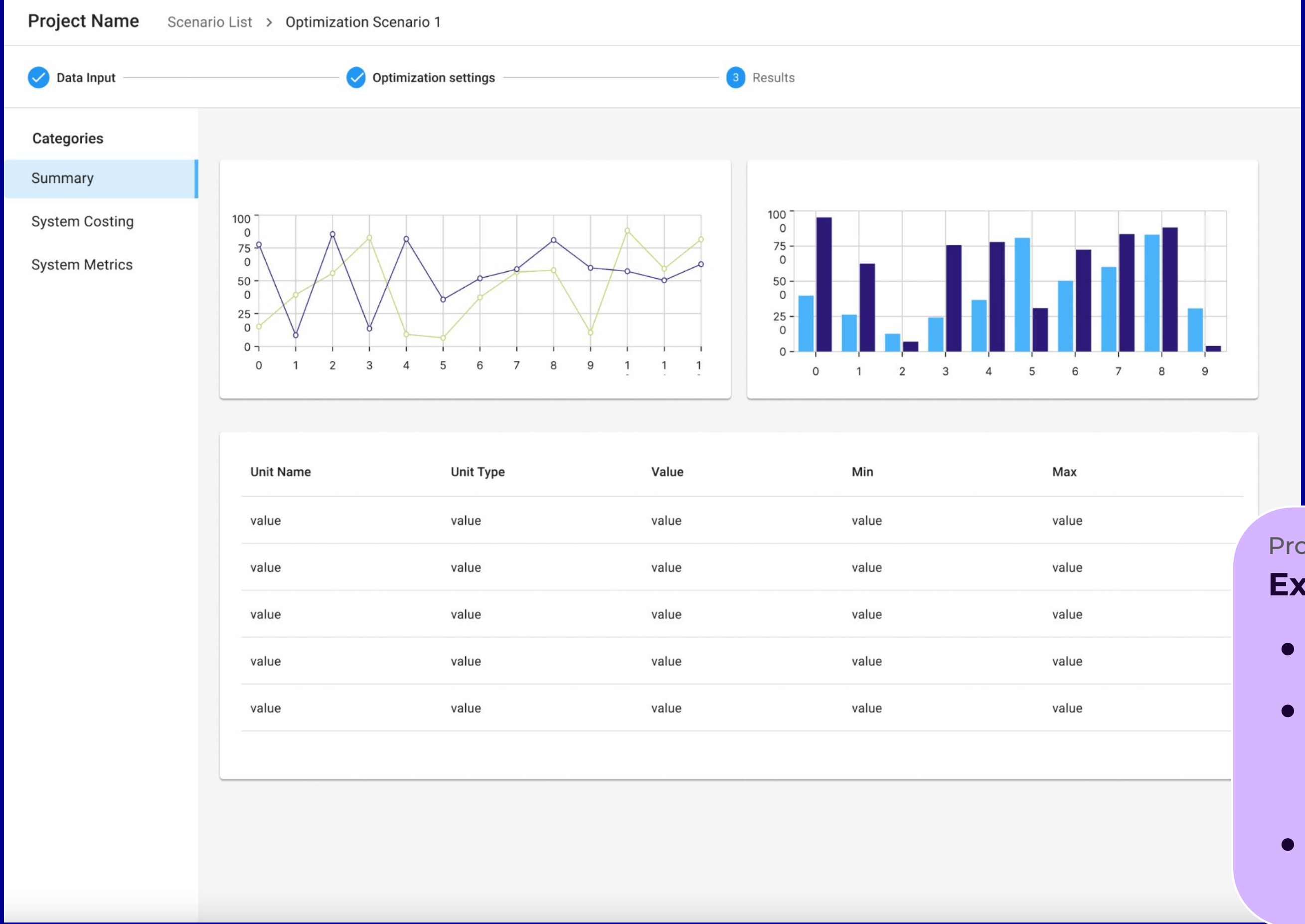
Started 05/24/2023 12:32:33

Product Needs :

Execute diff tool

- Input datasets
- Specify method and parameters to calculate diff
- Graphs & plots as diff results

Run Computation (6 of 6) - Results Dashboard



Project Name Scenario List > Optimization Scenario 1

✓ Data Input — ✓ Optimization settings — 3 Results

Categories

- Summary
- System Costing
- System Metrics

Unit Name	Unit Type	Value	Min	Max
value	value	value	value	value
value	value	value	value	value
value	value	value	value	value
value	value	value	value	value
value	value	value	value	value

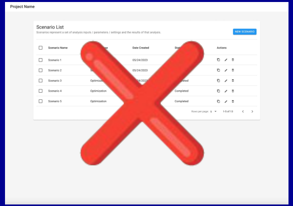
Product Needs :

Execute diff tool

- Input datasets
- Specify method and parameters to calculate diff
- Graphs & plots as diff results

“UI to setup, run, and display results for a computational diff tool for large datasets”

Scenario List



Project Name

Scenario List

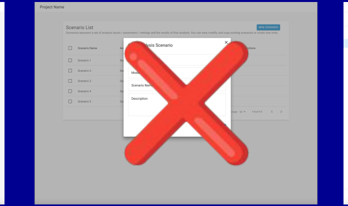
Scenarios represent a set of analysis inputs / parameters / settings and the results of that analysis.

NEW SCENARIO

□	Scenario Name	...pe	Date Created	Stat...	Actions
□	Scenario 1		05/24/2023		
□	Scenario 2		05/24/2023		
□	Scenario 3	Optimiza...	...4/2023	...eted	
□	Scenario 4	Optimization		Completed	
□	Scenario 5	Optimization		Completed	

Rows per page: 5 ▾ 1-5 of 13 ‹ ›

New Scenario



Project Name

Scenario List

Scenarios represent a set of analysis inputs / parameters / settings and the results of that analysis. You can view, modify, and copy existing scenarios or create new ones.

NEW SCENARIO

...lysis Scenario ✕

Mode...

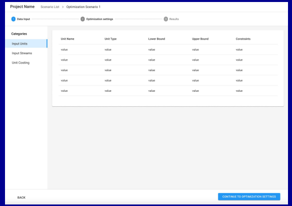
Scenario Nam...

Description

□	Scenario Name	An...	...ctions
□	Scenario 1	Sc...	
□	Scenario 2	Sc...	
□	Scenario 3	Op...	
□	Scenario 4	Op...	
□	Scenario 5	Op...	

...page: 10 ▾ 1-5 of 13 ‹ ›

Inputs Config



Project Name Scenario List > Optimization Scenario 1

1 Data Input — 2 Optimization settings — 3 Results

Categories

Input Units

Input Streams

Unit Costing

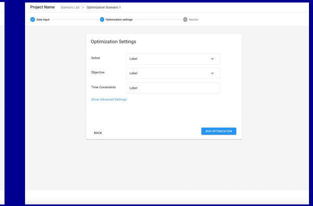
Unit Name	Unit Type	Lower Bound	Upper Bound	Constraints
value	value	value	value	value
value	value	value	value	value
value	value	value	value	value
value	value	value	value	value
value	value	value	value	value

BACK

CONTINUE TO OPTIMIZATION SETTINGS

Input datasets

Settings Config



Project Name Scenario List > Optimization Scenario 1

✓ Data Input — 2 Optimization settings — 3 Results

Optimization Settings

Solver: Label ⌄

Objective: Label ⌄

Time Constraints: Label

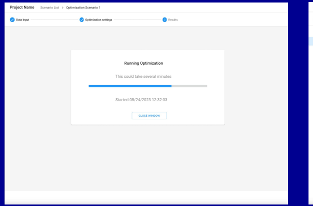
Show Advanced Settings

BACK

RUN OPTIMIZATION

Specify method and parameters to calculate diff

Execution Progress



Project Name Scenario List > Optimization Scenario 1

✓ Data Input — ✓ Optimization settings — 3 Results

Running Optimization

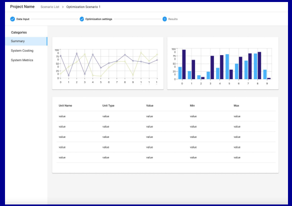
This could take several minutes

Started 05/24/2023 12:32:33

CLOSE WINDOW

May take a long time to run

Results Dashboard



Project Name Scenario List > Optimization Scenario 1

✓ Data Input — ✓ Optimization settings — 3 Results

Categories

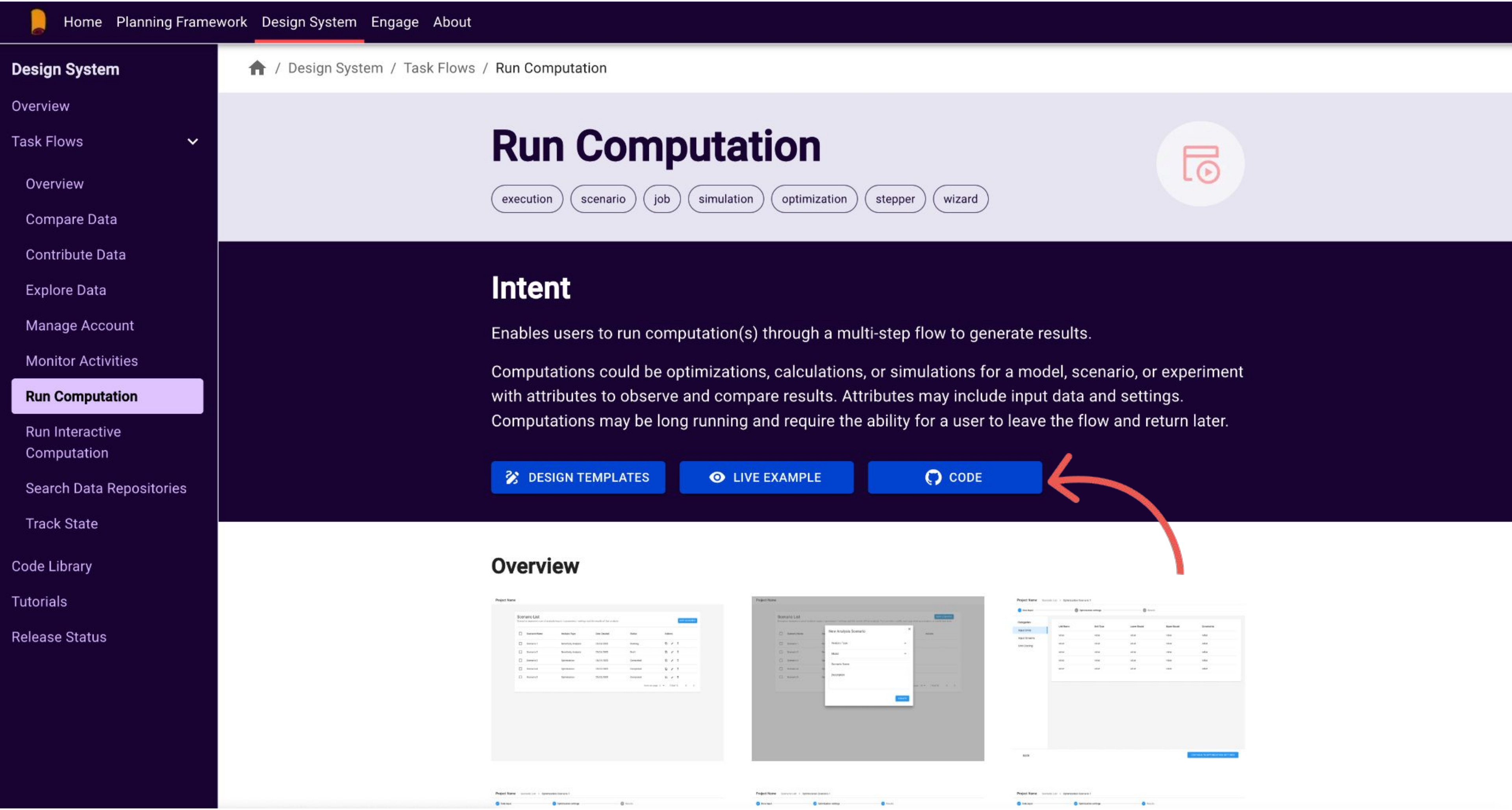
Summary

System Costing

System Metrics

Unit Name	Unit Type	Value	Min	Max
value	value	value	value	value
value	value	value	value	value
value	value	value	value	value
value	value	value	value	value
value	value	value	value	value

Graphs & plots as diff results



Run Computation

Intent

Enables users to run computation(s) through a multi-step flow to generate results.

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Overview

Task Flows

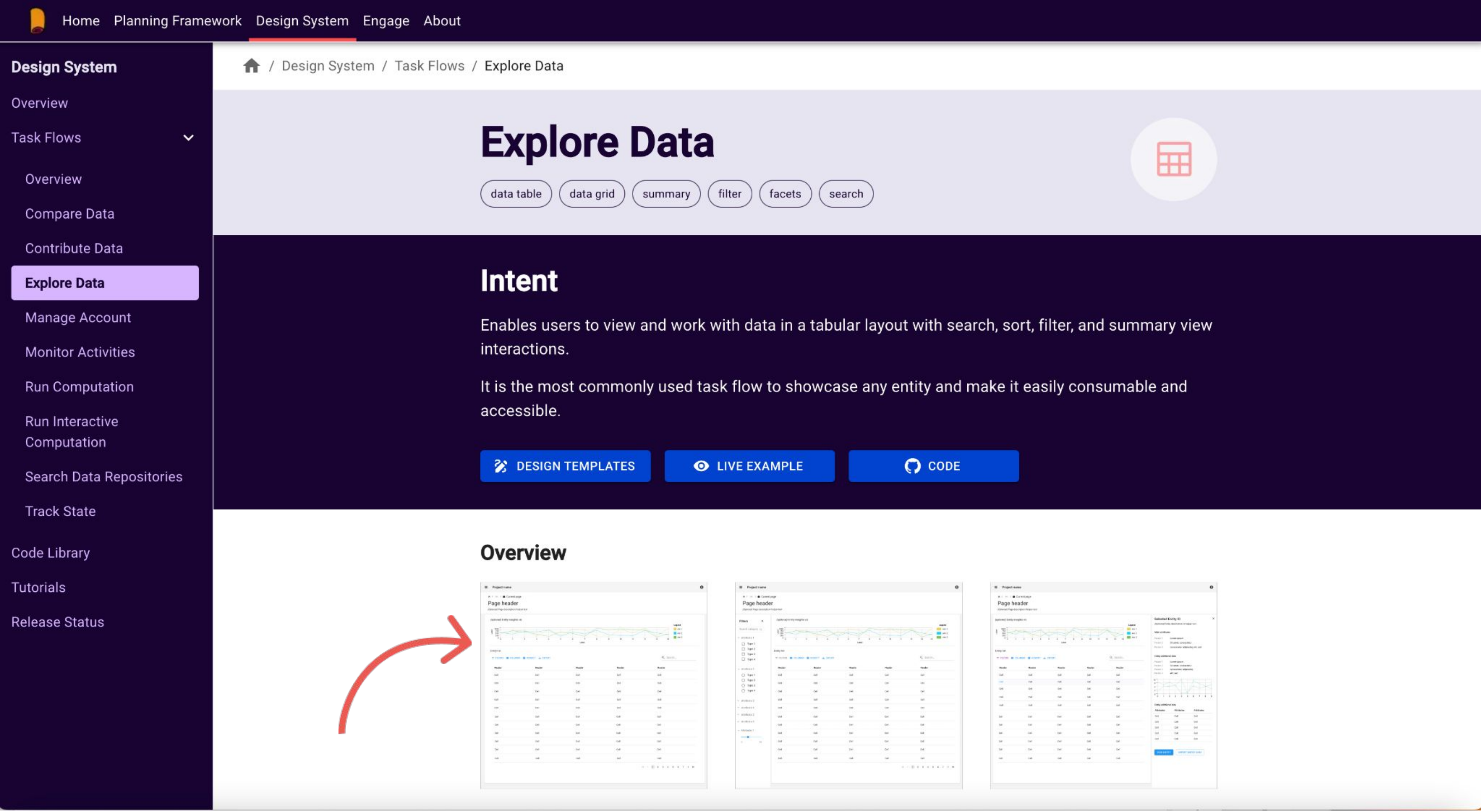
Task Flow: series of steps represented by screens which helps user to accomplish a particular task in the scientific software’s user interface

Similar Task Flows exist across various types of scientific software.

Analysis	Data	Exploration	Community Contributions
Run Computation	Explore Data	Monitor Activity	
Run Interactive Computation	Explore Data Repositories	Track State	
Compare Data	Contribute Data	Manage Account	

“Public website to share a dataset about planets”

- See all the planets in my dataset
- View planet details along with images and plots for that planet



Explore Data

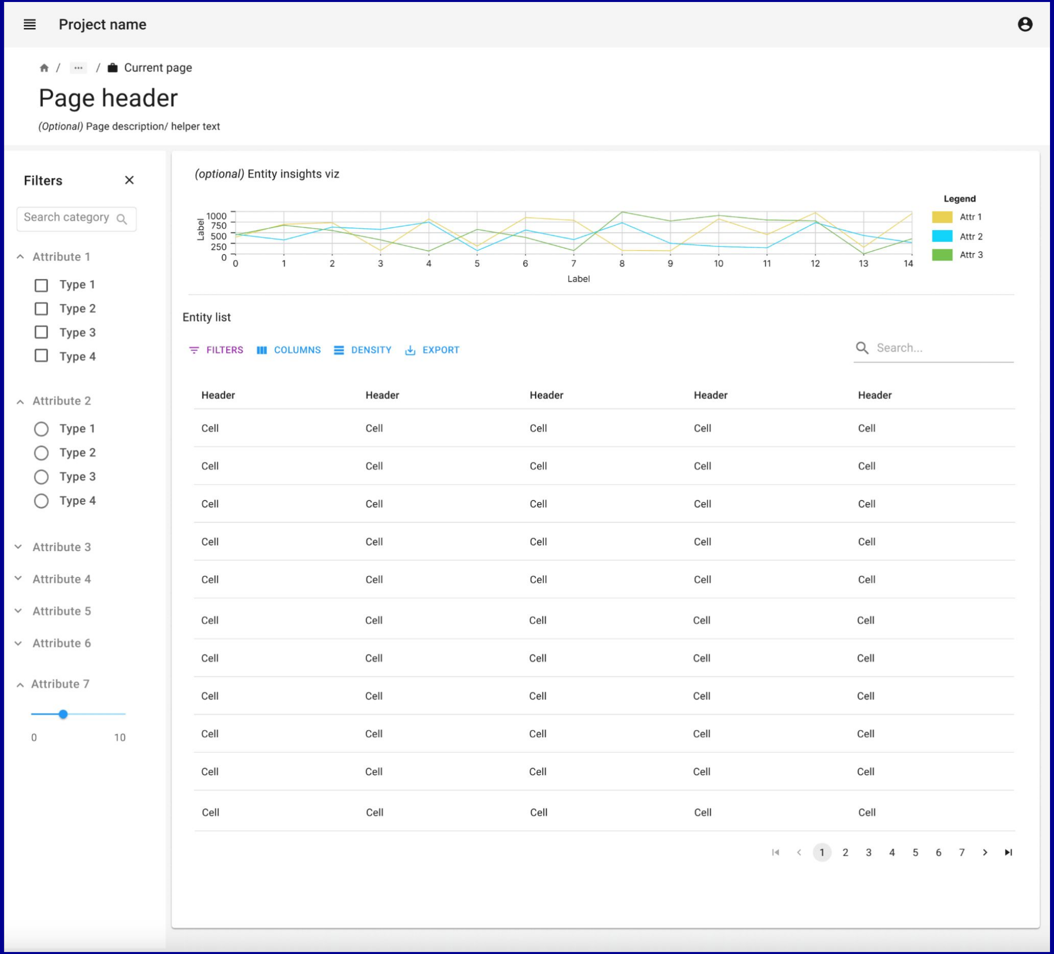
Intent

Enables users to view and work with data in a tabular layout with search, sort, filter, and summary view interactions.

It is the most commonly used task flow to showcase any entity and make it easily consumable and accessible.

Overview

Explore Data (1 of 3) - Entity List



Project name

/ ··· / Current page

Page header

(Optional) Page description/ helper text

Filters ✕

Search category

Attribute 1

- □ Type 1
- □ Type 2
- □ Type 3
- □ Type 4

Attribute 2

- ○ Type 1
- ○ Type 2
- ○ Type 3
- ○ Type 4

Attribute 3

Attribute 4

Attribute 5

Attribute 6

Attribute 7

0 10

(optional) Entity insights viz

Entity list

FILTERS COLUMNS DENSITY EXPORT

Search...

Header	Header	Header	Header	Header
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell

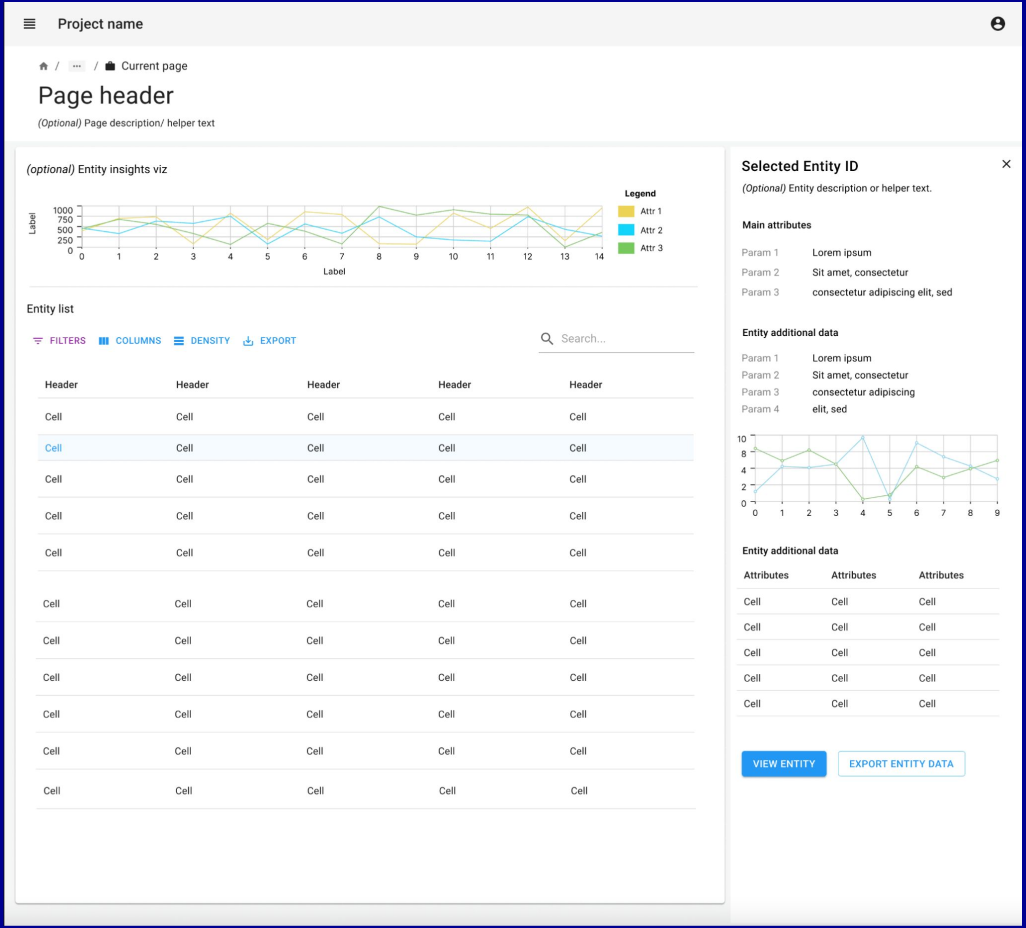
1 2 3 4 5 6 7

Product Needs :

Planets data website

- See all the planets in my dataset
- View planet details along with images and plots for that planet

Explore Data (2 of 3) - Details Preview



Project name

/ ··· / Current page

Page header

(Optional) Page description/ helper text

(optional) Entity insights viz

Entity list

Header	Header	Header	Header	Header
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell
Cell	Cell	Cell	Cell	Cell

Selected Entity ID

(Optional) Entity description or helper text.

Main attributes

Param 1	Lorem ipsum
Param 2	Sit amet, consectetur
Param 3	consectetur adipiscing elit, sed

Entity additional data

Param 1	Lorem ipsum
Param 2	Sit amet, consectetur
Param 3	consectetur adipiscing
Param 4	elit, sed

Entity additional data

Attributes	Attributes	Attributes
Cell	Cell	Cell
Cell	Cell	Cell
Cell	Cell	Cell
Cell	Cell	Cell
Cell	Cell	Cell

Product Needs :

Planets data website

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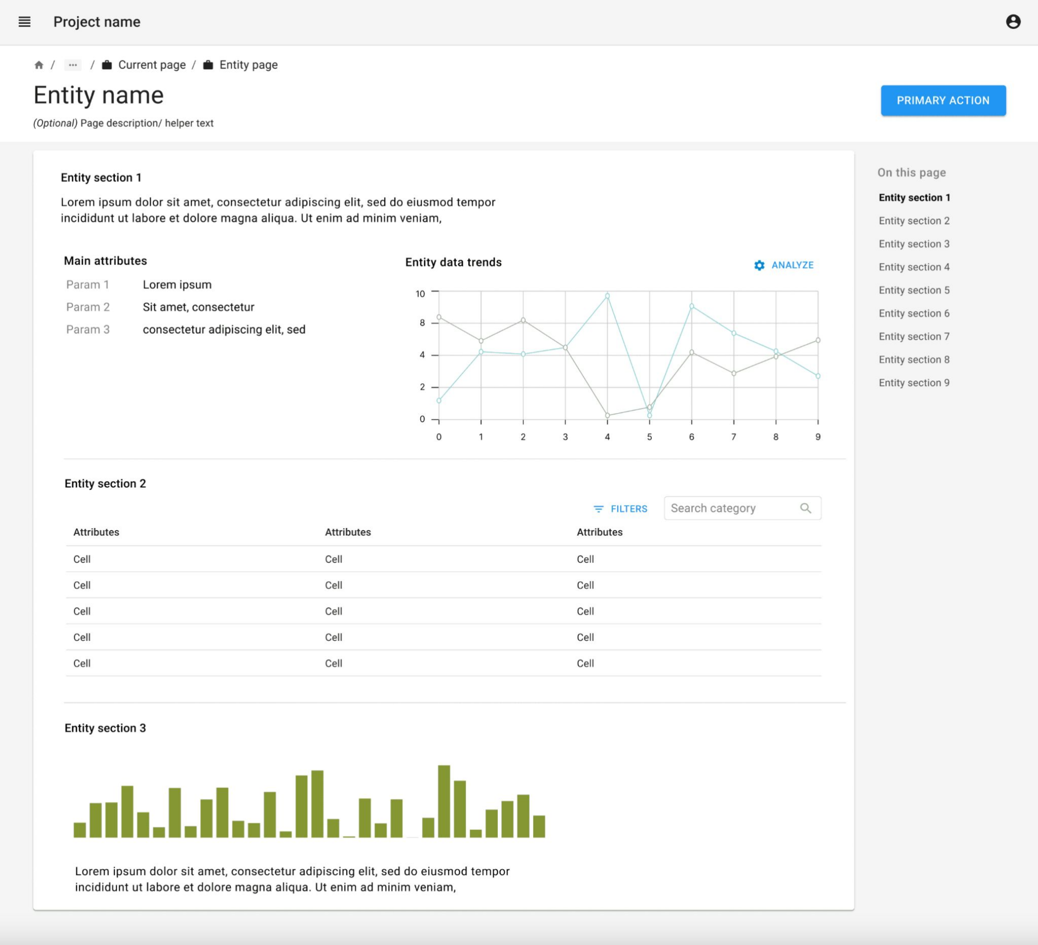
- View planet details along with images and plots for that planet

Explore Data (3 of 3) - Full Details



Entity name

(Optional) Page description/ helper text

Entity section 1

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam,

Main attributes

Param 1	Lorem ipsum
Param 2	Sit amet, consectetur
Param 3	consectetur adipiscing elit, sed

Entity data trends

Entity section 2

Attributes	Attributes	Attributes
Cell	Cell	Cell
Cell	Cell	Cell
Cell	Cell	Cell
Cell	Cell	Cell
Cell	Cell	Cell

Entity section 3

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam,

On this page

- **Entity section 1**
- Entity section 2
- Entity section 3
- Entity section 4
- Entity section 5
- Entity section 6
- Entity section 7
- Entity section 8
- Entity section 9

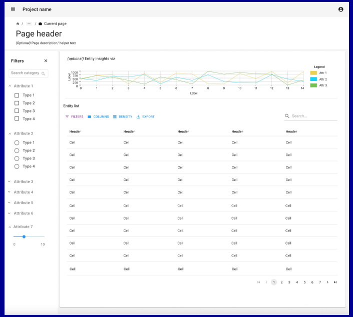
Product Needs :

Planets data website

- See all the planets in my dataset
- View planet details along with images and plots for that planet

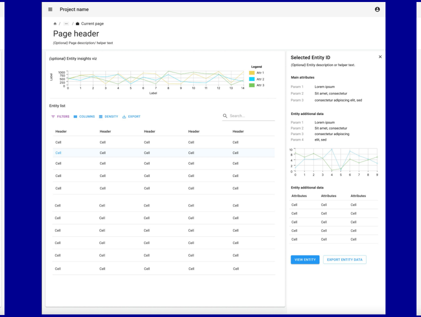
“Public website to share a dataset about planets”

Entity Table



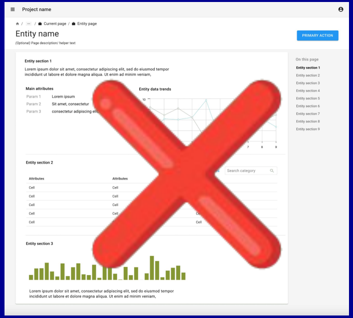
See all the planets in my dataset

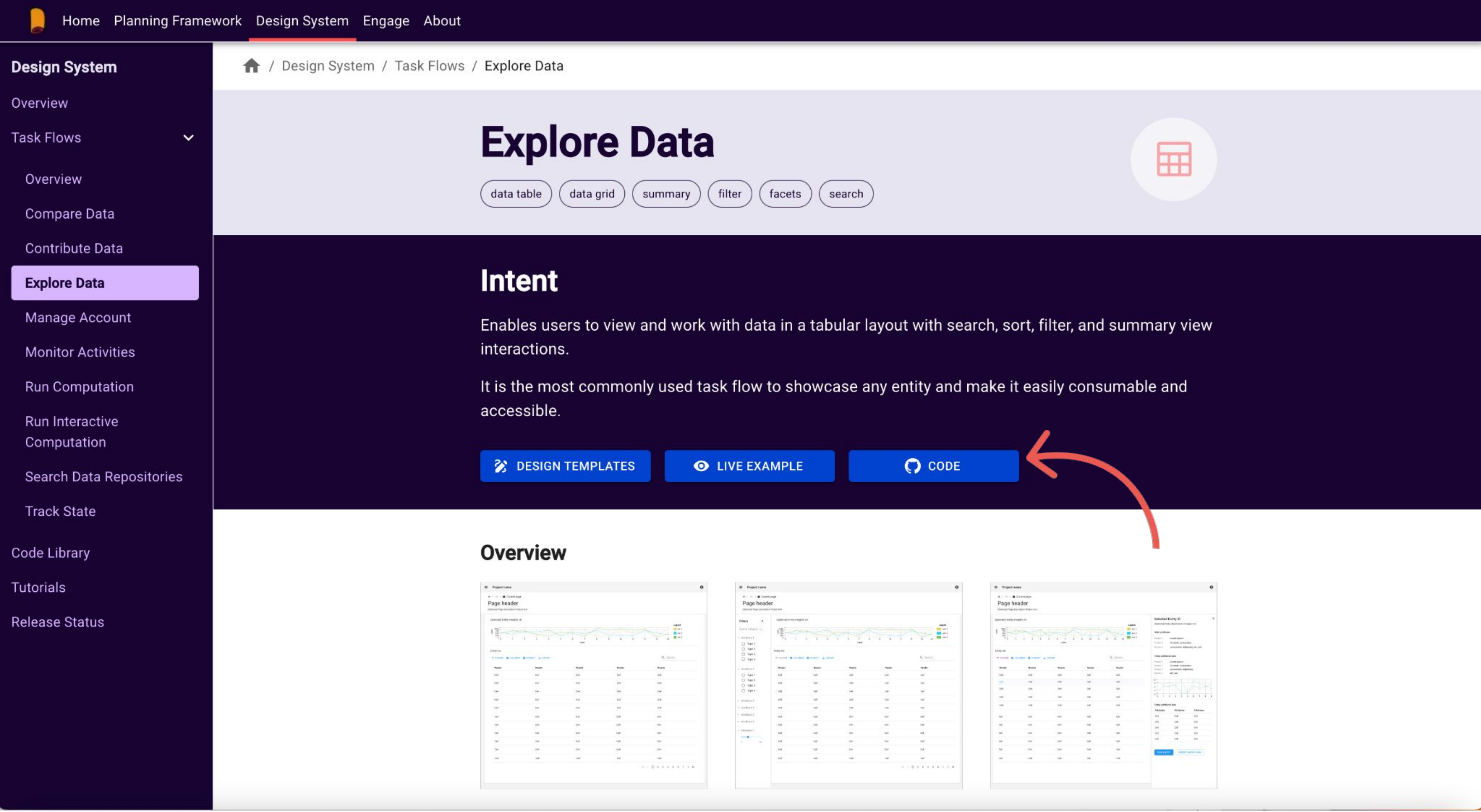
Details Preview



View planet details along with images and plots for that planet

Full Details





Explore Data

Intent

Enables users to view and work with data in a tabular layout with search, sort, filter, and summary view interactions.

It is the most commonly used task flow to showcase any entity and make it easily consumable and accessible.

Overview

Part 2

STRUDEL Kit

What we will cover

Part 1

1. About STRUDEL
2. The STRUDEL design system
3. Task Flow walkthrough

Part 2

1. What is STRUDEL Kit?
2. How to implement STRUDEL Task Flows with STRUDEL Kit
3. Get involved in the STRUDEL community

What is STRUDEL Kit?

Open Source Software Toolkit

An open source software development kit for building web applications from the STRUDEL Task Flows.

Low-code command line starter tool

Includes a simple command line tool to generate template code for apps and task flows.

React templates, STRUDEL Tech Stack, and curated resources

Extensible React templates, modern stack of open source tools, and curated resources to help you build.

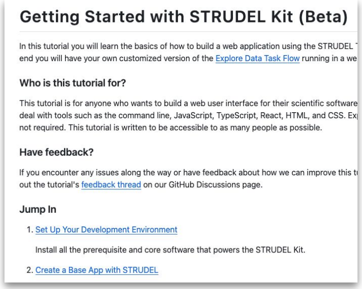
React + Material UI Components

React

The library for web and native user interfaces

Implementation Walkthrough

Detailed Tutorial ➡



Getting Started with STRUDEL Kit (Beta)

In this tutorial you will learn the basics of how to build a web application using the STRUDEL
end you will have your own customized version of the Explore Data Task Flow running in a we

Who is this tutorial for?

This tutorial is for anyone who wants to build a web user interface for their scientific software
deal with tools such as the command line, JavaScript, TypeScript, React, HTML, and CSS. Ex
not required. This tutorial is written to be accessible to as many people as possible.

Have feedback?

If you encounter any issues along the way or have feedback about how we can improve this t
out the tutorial's feedback thread on our GitHub Discussions page.

Jump In

1. Set Up Your Development Environment

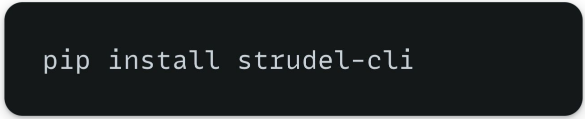
   Install all the prerequisite and core software that powers the STRUDEL Kit.

2. Create a Base App with STRUDEL

Implement a STRUDEL Task Flow

Setup

1. Install strudel-cli



```
pip install strudel-cli
```

Implement a STRUDEL Task Flow

Setup

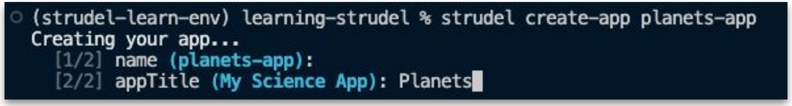
1. Install strudel-cli

```
pip install strudel-cli
```

2. Create a STRUDEL base app

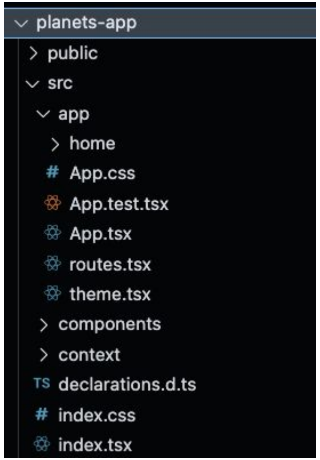
```
strudel create-app planets-app
```

Prompts from *create-app*



```
○ (strudel-learn-env) learning-strudel % strudel create-app planets-app
  Creating your app...
    [1/2] name (planets-app):
    [2/2] appTitle (My Science App): Planets
```

Generated files



```
⌄ planets-app
  > public
  ⌄ src
    ⌄ app
      > home
      # App.css
        App.test.tsx
        App.tsx
        routes.tsx
        theme.tsx
    > components
    > context
    TS declarations.d.ts
    # index.css
      index.tsx
```

Implement a STRUDEL Task Flow

Setup

1. Install strudel-cli

```
pip install strudel-cli
```

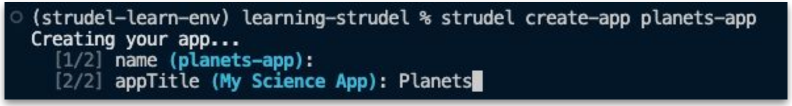
2. Create a STRUDEL base app

```
strudel create-app planets-app
```

```
npm install
```

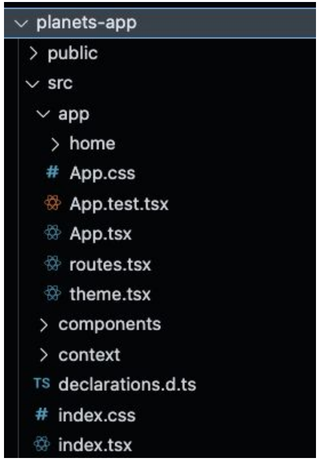
```
npm start
```

Prompts from *create-app*



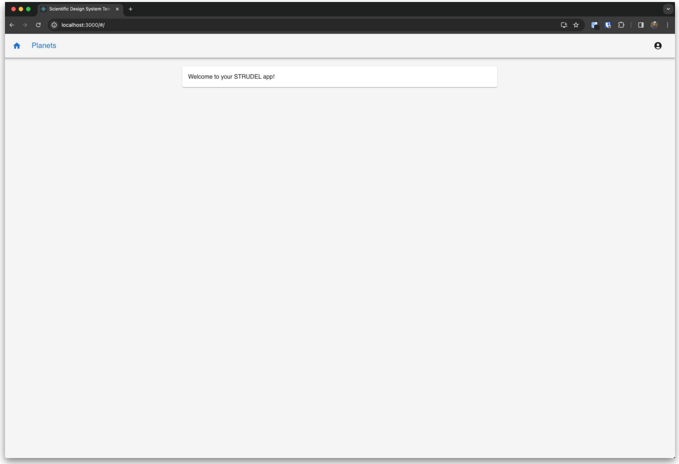
```
○ (strudel-learn-env) learning-strudel % strudel create-app planets-app
  Creating your app...
    [1/2] name (planets-app):
    [2/2] appTitle (My Science App): Planets
```

Generated files



```
∨ planets-app
  > public
  ∨ src
    ∨ app
      > home
      # App.css
      App.test.tsx
      App.tsx
      routes.tsx
      theme.tsx
    > components
    > context
    TS declarations.d.ts
    # index.css
    index.tsx
```

Initial home page

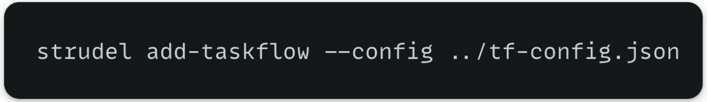


Welcome to your STRUDEL app!

Implement a STRUDEL Task Flow

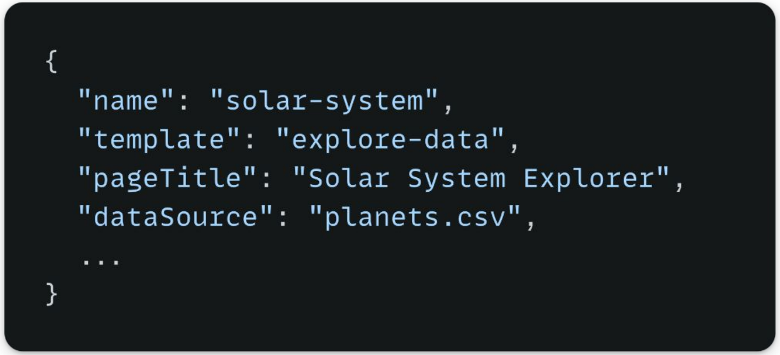
Setup

3. Add a Task Flow to your app



```
strudel add-taskflow --config ../tf-config.json
```

tf-config.json (Task Flow Configuration)



```
{
  "name": "solar-system",
  "template": "explore-data",
  "pageTitle": "Solar System Explorer",
  "dataSource": "planets.csv",
   ...
}
```

Implement a STRUDEL Task Flow

Setup

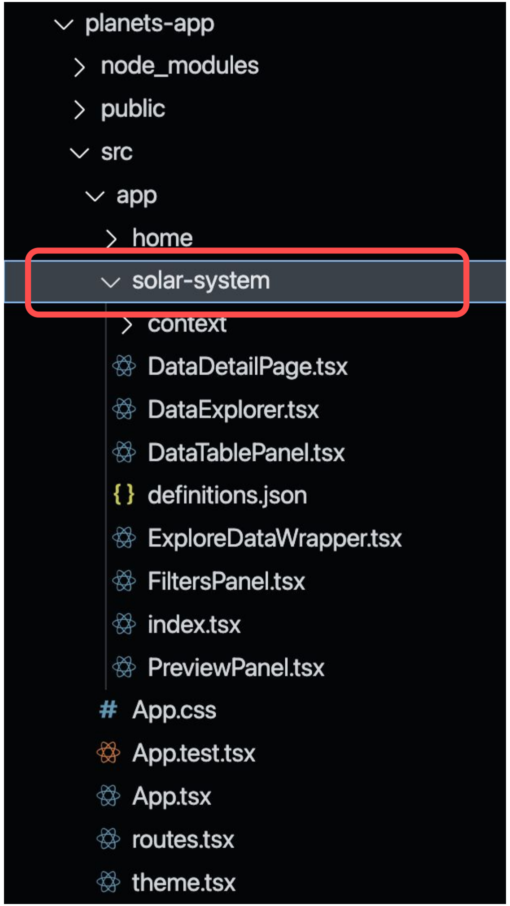
3. Add a Task Flow to your app

```
strudel add-taskflow --config ../tf-config.json
```

tf-config.json (Task Flow Configuration)

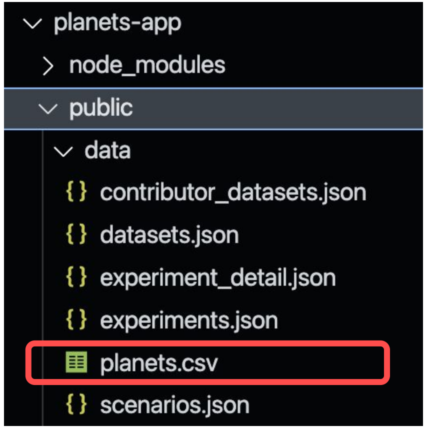
```
{
  "name": "solar-system",
  "template": "explore-data",
  "pageTitle": "Solar System Explorer",
  "dataSource": "planets.csv",
  ...
}
```

Generated files



```
planets-app
  node_modules
  public
  src
    app
      home
      solar-system
        context
        DataDetailPage.tsx
        DataExplorer.tsx
        DataTablePanel.tsx
        definitions.json
        ExploreDataWrapper.tsx
        FiltersPanel.tsx
        index.tsx
        PreviewPanel.tsx
      App.css
      App.test.tsx
      App.tsx
      routes.tsx
      theme.tsx
```

Data source placement



```
planets-app
  node_modules
  public
    data
      contributor_datasets.json
      datasets.json
      experiment_detail.json
      experiments.json
      planets.csv
      scenarios.json
```

Implement a STRUDEL Task Flow
Setup

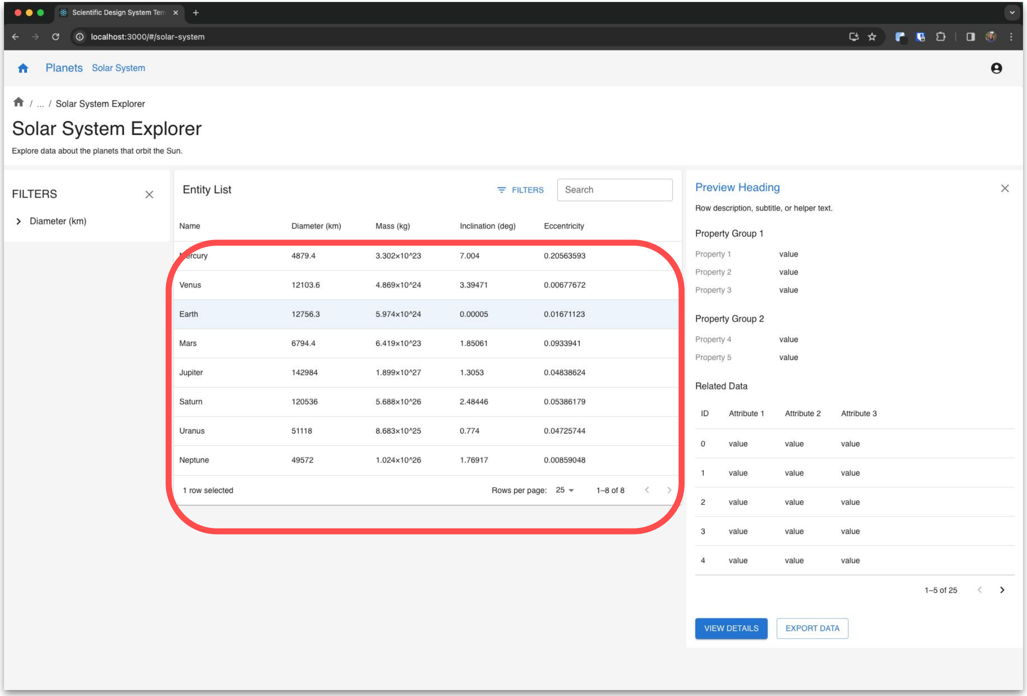
3. Add a Task Flow to your app

```
strudel add-taskflow --config ../tf-config.json
```

tf-config.json (Task Flow Configuration)

```
{
  "name": "solar-system",
  "template": "explore-data",
  "pageTitle": "Solar System Explorer",
  "dataSource": "planets.csv",
  ...
}
```

Initial solar-system Task Flow


Scientific Design System Tem
localhost:3000/#/solar-system
Planets
Solar System
/ ... / Solar System Explorer

Solar System Explorer

Explore data about the planets that orbit the Sun.

FILTERS

› Diameter (km)

Entity List

FILTERS

Search

Name	Diameter (km)	Mass (kg)	Inclination (deg)	Eccentricity
Mercury	4879.4	3.302x10^23	7.004	0.20563593
Venus	12103.6	4.869x10^24	3.39471	0.00677672
Earth	12756.3	5.974x10^24	0.00005	0.01671123
Mars	6794.4	6.419x10^23	1.85061	0.0933941
Jupiter	142984	1.899x10^27	1.3053	0.04838624
Saturn	120536	5.688x10^26	2.48446	0.05386179
Uranus	51118	8.683x10^25	0.774	0.04725744
Neptune	49572	1.024x10^26	1.76917	0.00859048

1 row selected   Rows per page: 25   1–8 of 8

Preview Heading

Row description, subtitle, or helper text.

Property Group 1

Property 1	value
Property 2	value
Property 3	value

Property Group 2

Property 4	value
Property 5	value

Related Data

ID	Attribute 1	Attribute 2	Attribute 3
0	value	value	value
1	value	value	value
2	value	value	value
3	value	value	value
4	value	value	value

1–5 of 25

VIEW DETAILS   EXPORT DATA

Implement a STRUDEL Task Flow
Setup

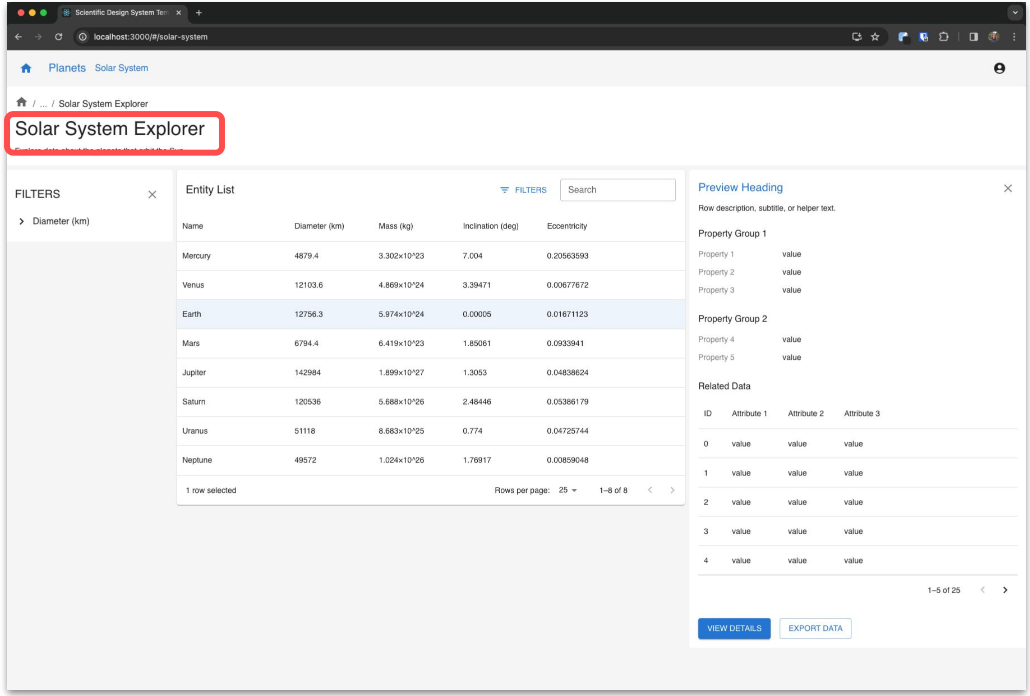
3. Add a Task Flow to your app

```
strudel add-taskflow --config ../tf-config.json
```

tf-config.json (Task Flow Configuration)

```
{
  "name": "solar-system",
  "template": "explore-data",
  "pageTitle": "Solar System Explorer",
  "dataSource": "planets.csv",
  ...
}
```

Initial solar-system Task Flow


Scientific Design System Tem
localhost:3000/#/solar-system
Planets
Solar System
/ ... / Solar System Explorer
FILTERS
Search
Preview Heading
VIEW DETAILS
EXPORT DATA

Solar System Explorer

FILTERS

Diameter (km)

Entity List

Name	Diameter (km)	Mass (kg)	Inclination (deg)	Eccentricity
Mercury	4879.4	3.302x10^23	7.004	0.20563593
Venus	12103.6	4.869x10^24	3.39471	0.00677672
Earth	12756.3	5.974x10^24	0.00005	0.01671123
Mars	6794.4	6.419x10^23	1.85061	0.0933941
Jupiter	142984	1.899x10^27	1.3053	0.04838624
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Uranus	51118	8.683x10^25	0.774	0.04725744
Neptune	49572	1.024x10^26	1.76917	0.00859048

1 row selected Rows per page: 25 1–8 of 8

Preview Heading

Row description, subtitle, or helper text.

Property Group 1

Property 1	value
Property 2	value
Property 3	value

Property Group 2

Property 4	value
Property 5	value

Related Data

ID	Attribute 1	Attribute 2	Attribute 3
0	value	value	value
1	value	value	value
2	value	value	value
3	value	value	value
4	value	value	value

1–5 of 25

Implement a STRUDEL Task Flow
Setup

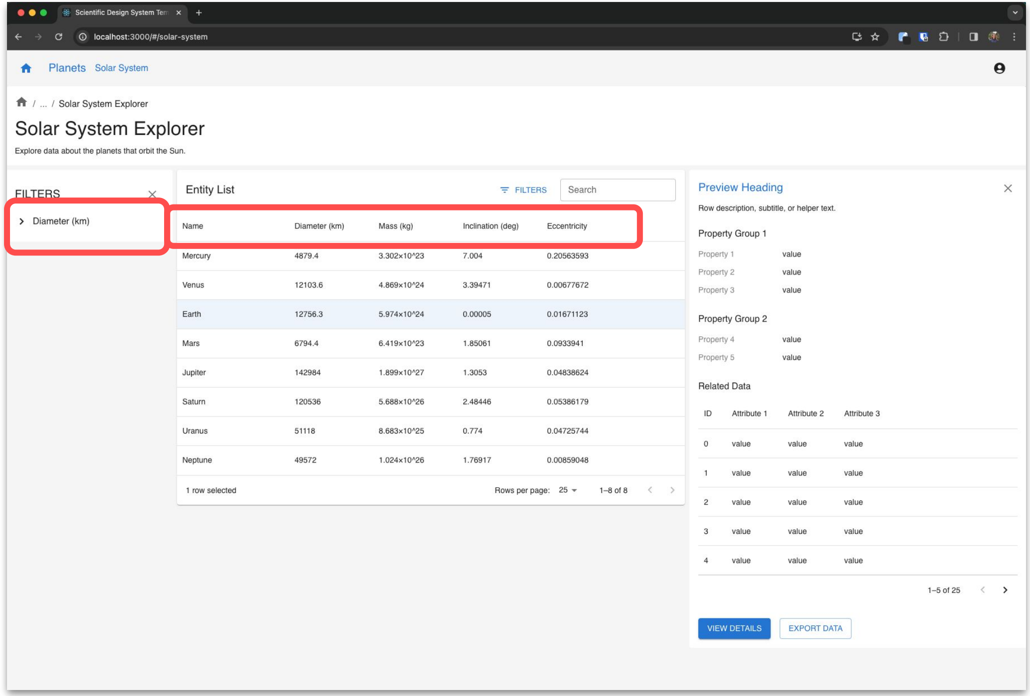
3. Add a Task Flow to your app

```
strudel add-taskflow --config ../tf-config.json
```

tf-config.json (Task Flow Configuration)

```
{
  "name": "solar-system",
  "template": "explore-data",
  "pageTitle": "Solar System Explorer",
  "dataSource": "planets.csv",
  ...
}
```

Initial solar-system Task Flow



Scientific Design System Tem
localhost:3000/#/solar-system
Planets
Solar System
/ ... / Solar System Explorer

Solar System Explorer

Explore data about the planets that orbit the Sun.

FILTERS

› Diameter (km)

Entity List

Name	Diameter (km)	Mass (kg)	Inclination (deg)	Eccentricity
Mercury	4879.4	3.302x10^23	7.004	0.20563593
Venus	12103.6	4.869x10^24	3.39471	0.00677672
Earth	12756.3	5.974x10^24	0.00005	0.01671123
Mars	6794.4	6.419x10^23	1.85061	0.0933941
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Uranus	51118	8.683x10^25	0.774	0.04725744
Neptune	49572	1.024x10^26	1.76917	0.00859048

1 row selected   Rows per page: 25   1–8 of 8

Preview Heading

Row description, subtitle, or helper text.

Property Group 1

Property 1	value
Property 2	value
Property 3	value

Property Group 2

Property 4	value
Property 5	value

Related Data

ID	Attribute 1	Attribute 2	Attribute 3
0	value	value	value
1	value	value	value
2	value	value	value
3	value	value	value
4	value	value	value

1–5 of 25

Implement a STRUDEL Task Flow

Setup

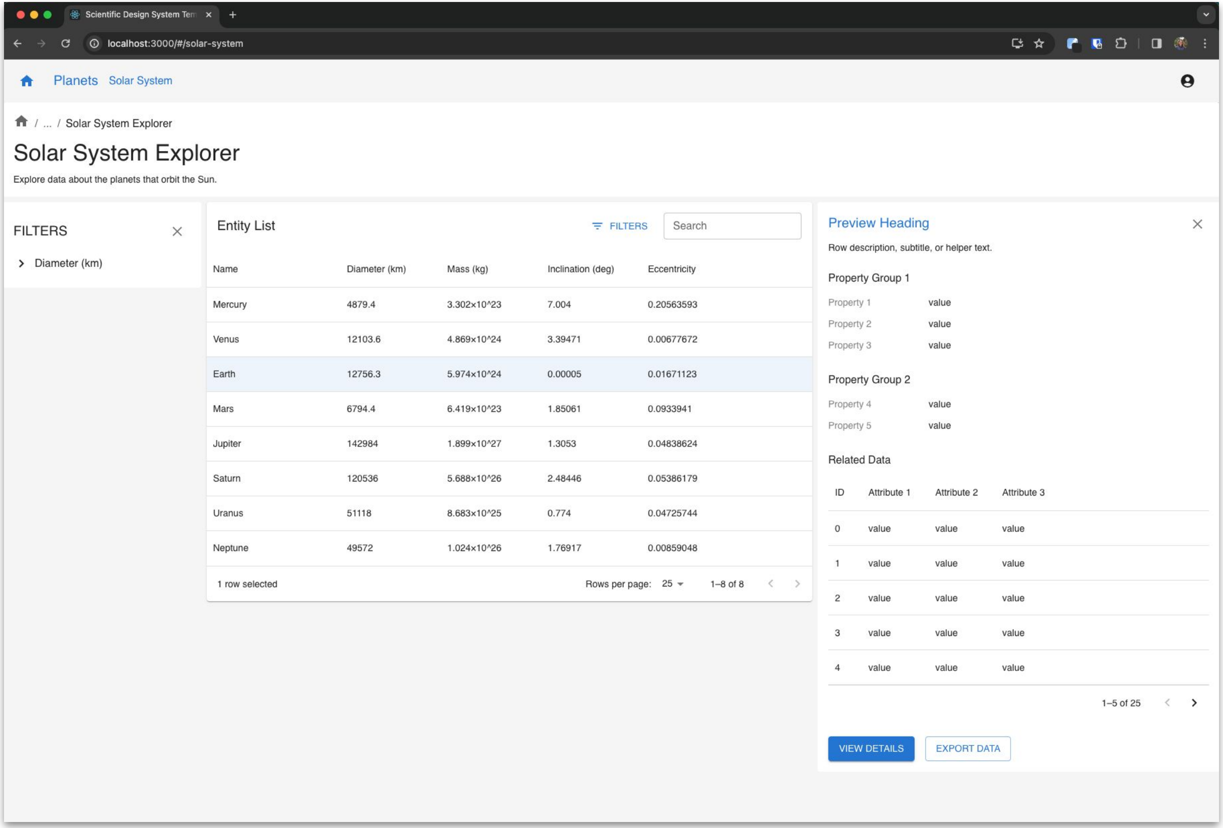
3. Add a Task Flow to your app

```
strudel add-taskflow --config ../tf-config.json
```

```
{
  "name": "my-second-taskflow",
  "template": "run-computation",
  ...
}
```

```
{
  "name": "my-other-explorer",
  "template": "explore-data",
  ...
}
```

Implement a STRUDEL Task Flow
Customization


Scientific Design System Tem
localhost:3000/#/solar-system
Planets
Solar System
/ ... / Solar System Explorer
FILTERS
Diameter (km)
FILTERS
Search
VIEW DETAILS
EXPORT DATA

Solar System Explorer

Explore data about the planets that orbit the Sun.

Entity List

Name	Diameter (km)	Mass (kg)	Inclination (deg)	Eccentricity
Mercury	4879.4	3.302×10^23	7.004	0.20563593
Venus	12103.6	4.869×10^24	3.39471	0.00677672
Earth	12756.3	5.974×10^24	0.00005	0.01671123
Mars	6794.4	6.419×10^23	1.85061	0.0933941
Jupiter	142984	1.899×10^27	1.3053	0.04838624
Saturn	120536	5.688×10^26	2.48446	0.05386179
Uranus	51118	8.683×10^25	0.774	0.04725744
Neptune	49572	1.024×10^26	1.76917	0.00859048

1 row selected Rows per page: 25 1–8 of 8

Preview Heading

Row description, subtitle, or helper text.

Property Group 1

Property 1	value
Property 2	value
Property 3	value

Property Group 2

Property 4	value
Property 5	value

Related Data

ID	Attribute 1	Attribute 2	Attribute 3
0	value	value	value
1	value	value	value
2	value	value	value
3	value	value	value
4	value	value	value

1–5 of 25

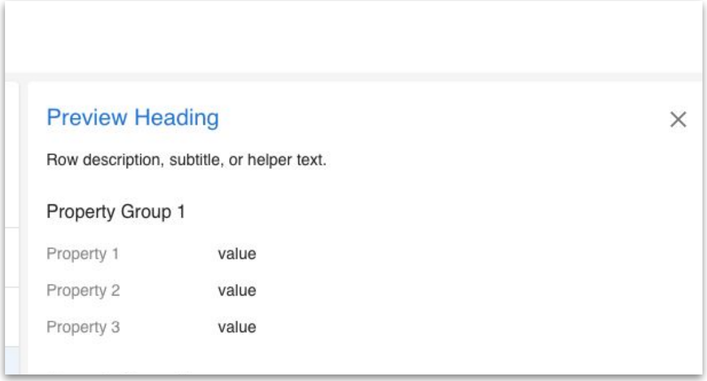
Implement a STRUDEL Task Flow

Customization

4. Customize and expand your Task Flow

Add dynamic data to the preview panel

Snippet of initial preview panel

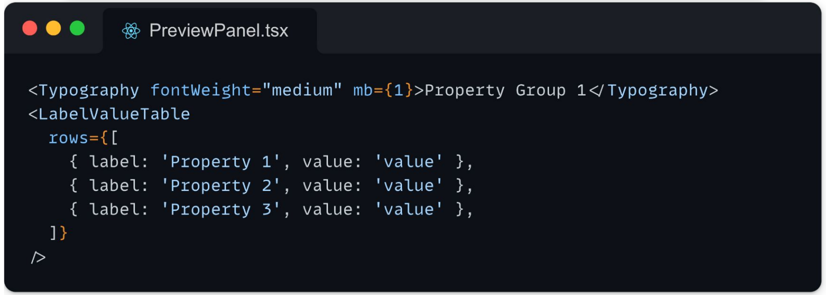


Preview Heading

Row description, subtitle, or helper text.

Property Group 1

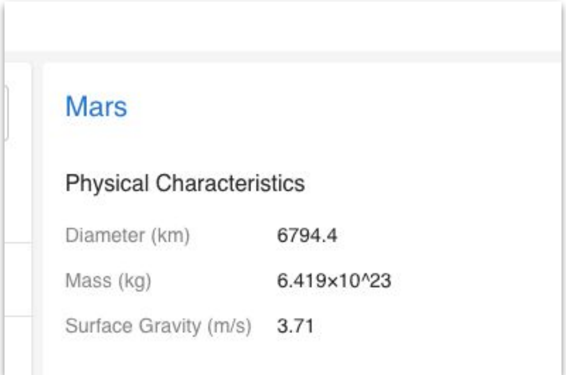
Property 1	value
Property 2	value
Property 3	value



PreviewPanel.tsx

```
<Typography fontWeight="medium" mb={1}>Property Group 1</Typography>
<LabelValueTable
  rows={[
    { label: 'Property 1', value: 'value' },
    { label: 'Property 2', value: 'value' },
    { label: 'Property 3', value: 'value' },
  ]}
/>
```

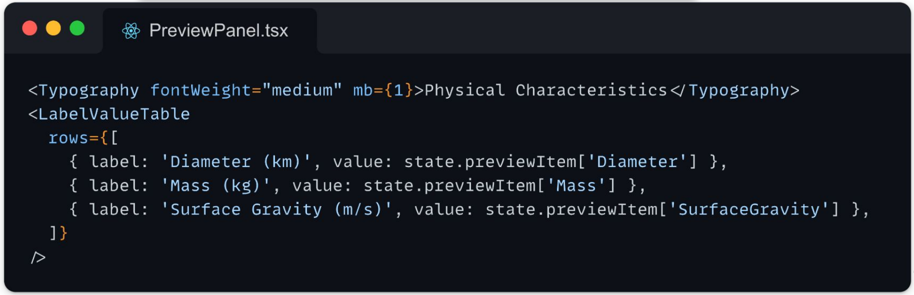
Snippet of customized preview panel



Mars

Physical Characteristics

Diameter (km)	6794.4
Mass (kg)	6.419x10^23
Surface Gravity (m/s)	3.71



PreviewPanel.tsx

```
<Typography fontWeight="medium" mb={1}>Physical Characteristics</Typography>
<LabelValueTable
  rows={[
    { label: 'Diameter (km)', value: state.previewItem['Diameter'] },
    { label: 'Mass (kg)', value: state.previewItem['Mass'] },
    { label: 'Surface Gravity (m/s)', value: state.previewItem['SurfaceGravity'] },
  ]}
/>
```

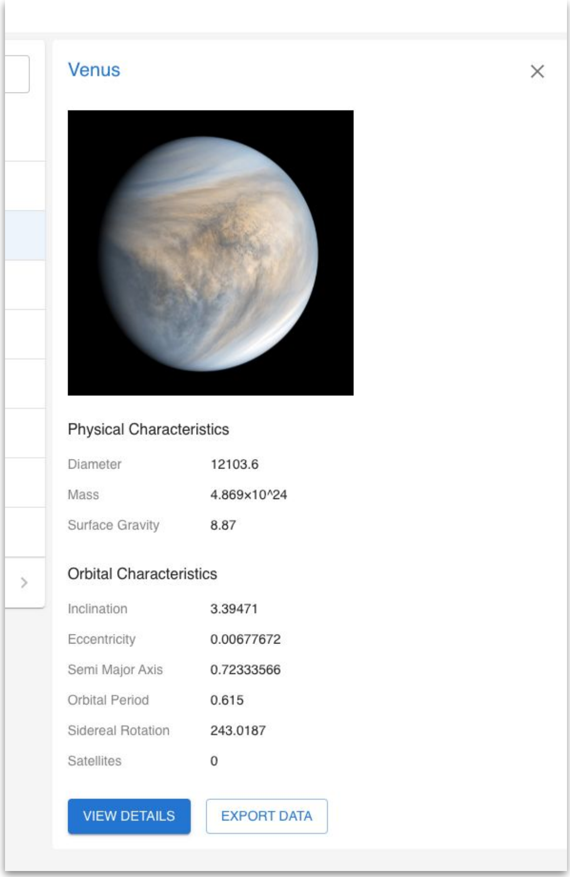
Implement a STRUDEL Task Flow

Customization

4. Customize and expand your Task Flow

Keep building out your Task Flow

- Remove sections
- Add dynamic images and figures
- Add new components and sections
- Add links



Physical Characteristics

Diameter	12103.6
Mass	4.869x10^24
Surface Gravity	8.87

Orbital Characteristics

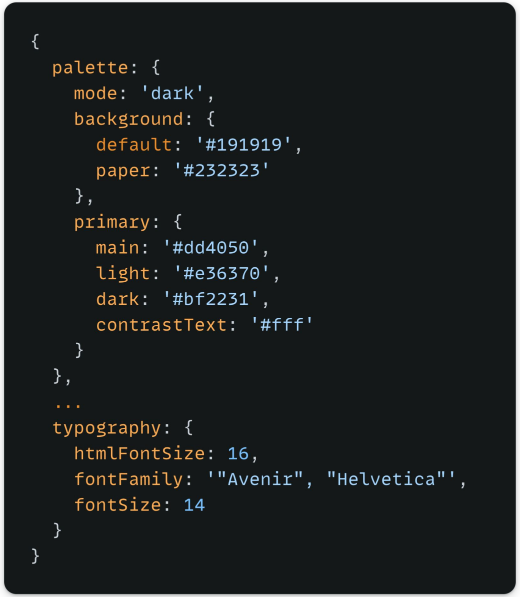
Inclination	3.39471
Eccentricity	0.00677672
Semi Major Axis	0.72333566
Orbital Period	0.615
Sidereal Rotation	243.0187
Satellites	0

Implement a STRUDEL Task Flow
Customization

5. Customize your theme and styles

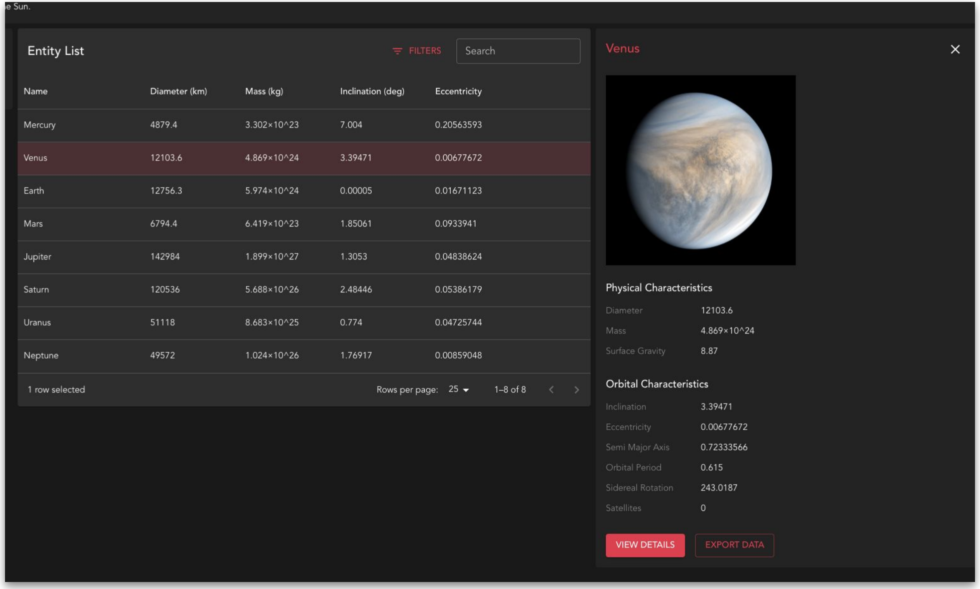
Modify the global theme

Theme configuration



```
{
  palette: {
    mode: 'dark',
    background: {
      default: '#191919',
      paper: '#232323'
    },
    primary: {
      main: '#dd4050',
      light: '#e36370',
      dark: '#bf2231',
      contrastText: '#fff'
    }
  },
  ...
  typography: {
    htmlFontSize: 16,
    fontFamily: '"Avenir", "Helvetica"',
    fontSize: 14
  }
}
```

Task Flow with modified palette



Name	Diameter (km)	Mass (kg)	Inclination (deg)	Eccentricity
Mercury	4879.4	3.302×10^23	7.004	0.20563593
Venus	12103.6	4.869×10^24	3.39471	0.00677672
Earth	12756.3	5.974×10^24	0.00005	0.01671123
Mars	6794.4	6.419×10^23	1.85061	0.0933941
Jupiter	142984	1.899×10^27	1.3053	0.04838624
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Uranus	51118	8.683×10^25	0.774	0.04725744
Neptune	49572	1.024×10^26	1.76917	0.00859048

1 row selected

Rows per page: 25 ▾ 1–8 of 8

Venus

Physical Characteristics

Diameter	12103.6
Mass	4.869×10^24
Surface Gravity	8.87

Orbital Characteristics

Inclination	3.39471
Eccentricity	0.00677672
Semi Major Axis	0.72333566
Orbital Period	0.615
Sidereal Rotation	243.0187
Satellites	0

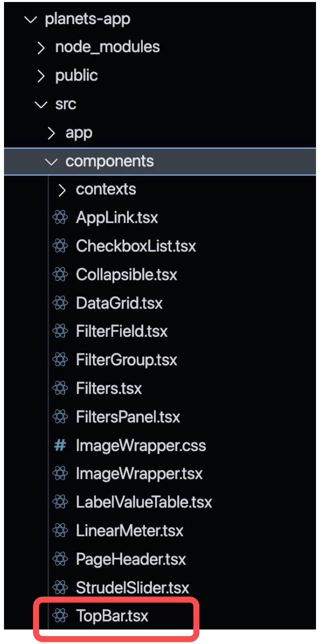
Implement a STRUDEL Task Flow

Customization

5. Customize your theme and styles

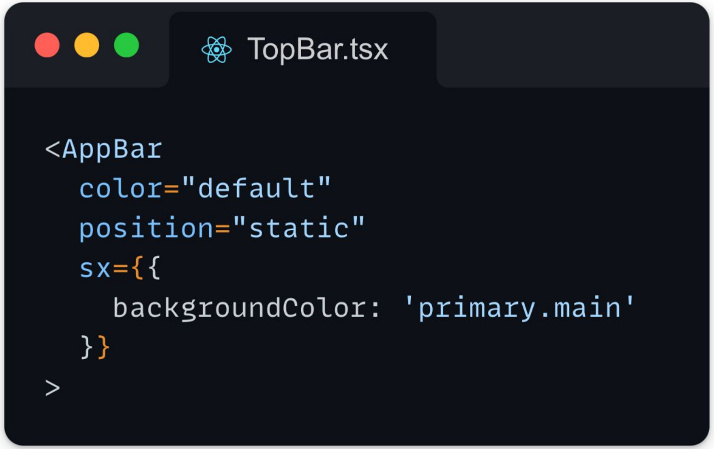
Modify the app navigation bar

App-wide components



```
planets-app
  node_modules
  public
  src
    app
    components
      contexts
      AppLink.tsx
      CheckboxList.tsx
      Collapsible.tsx
      DataGrid.tsx
      FilterField.tsx
      FilterGroup.tsx
      Filters.tsx
      FiltersPanel.tsx
      ImageWrapper.css
      ImageWrapper.tsx
      LabelValueTable.tsx
      LinearMeter.tsx
      PageHeader.tsx
      StrudelSlider.tsx
      TopBar.tsx
```

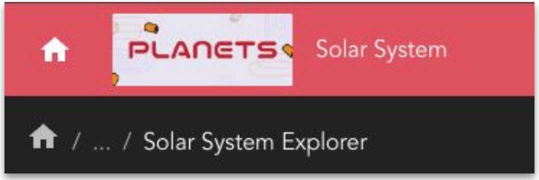
App navigation bar component



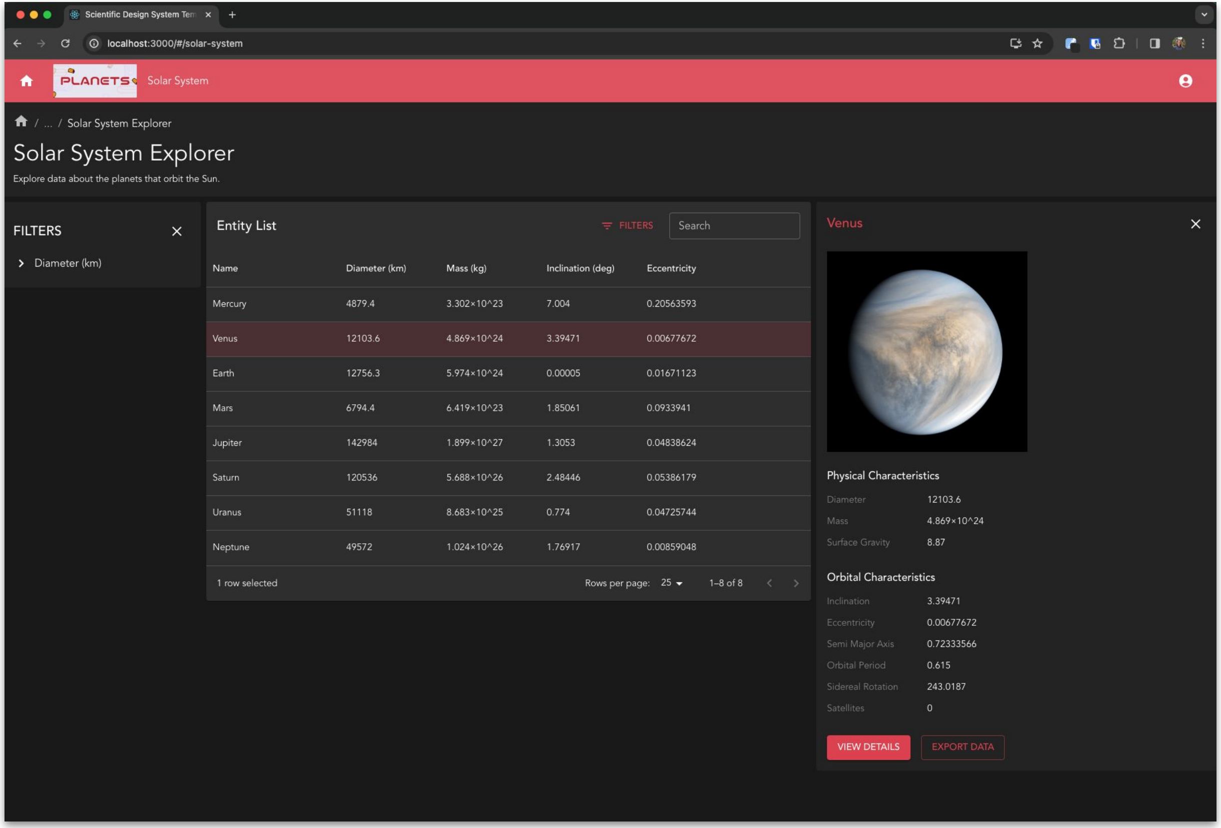
TopBar.tsx

```
<AppBar
  color="default"
  position="static"
  sx={{
    backgroundColor: 'primary.main'
  }}
>
```

Navigation bar with new color



Implement a STRUDEL Task Flow
Product


Scientific Design System Tem
localhost:3000/#/solar-system
PLANETS
Solar System
/ ... / Solar System Explorer
FILTERS
Search
VIEW DETAILS
EXPORT DATA

Solar System Explorer

Explore data about the planets that orbit the Sun.

FILTERS

› Diameter (km)

Entity List

Name	Diameter (km)	Mass (kg)	Inclination (deg)	Eccentricity
Mercury	4879.4	3.302×10^23	7.004	0.20563593
Venus	12103.6	4.869×10^24	3.39471	0.00677672
Earth	12756.3	5.974×10^24	0.00005	0.01671123
Mars	6794.4	6.419×10^23	1.85061	0.0933941
Jupiter	142984	1.899×10^27	1.3053	0.04838624
Saturn	120536	5.688×10^26	2.48446	0.05386179
Uranus	51118	8.683×10^25	0.774	0.04725744
Neptune	49572	1.024×10^26	1.76917	0.00859048

1 row selected   Rows per page: 25   1–8 of 8

Venus

Physical Characteristics

Diameter	12103.6
Mass	4.869×10^24
Surface Gravity	8.87

Orbital Characteristics

Inclination	3.39471
Eccentricity	0.00677672
Semi Major Axis	0.72333566
Orbital Period	0.615
Sidereal Rotation	243.0187
Satellites	0

Implement a Task Flow UI in one hour or less.

Configurable options, simple architecture, and beginner-friendly tutorials.

Accessible to many members of the scientific community.

Take your app as far as you need.

The Key Ingredients to the STRUDEL Kit

Process

Configure UI details with JSON.

Task Flow React **templates** as starting points.

Combine sections like **building blocks.**

Philosophy

Leverage the **open source tools** baked into the STRUDEL Tech Stack.

You should be in **control** of your app.

Decouple the data from the presentation; the backend from the frontend.

STRUDEL Kit Tech Stack

strudel-cli

Command-line tool for quickly generating Task Flow template code.

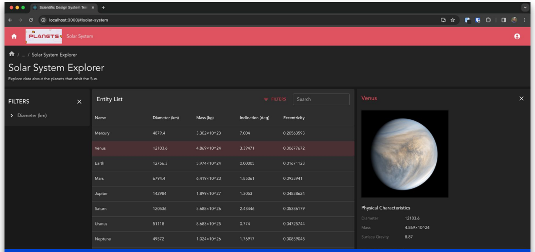
- Command line
- Python
- JSON
- Cookiecutter

STRUDEL React Templates

Code templates for building STRUDEL Task Flows using the React web library.

- JavaScript / TypeScript
- React
- Material UI Components
- Plotly.js

Continue Building: Add More Task Flows



⌂ / ... / Solar System Explorer

Solar System Explorer

Explore data about the planets that orbit the Sun.

FILTERS

› Diameter (km)

Entity List

FILTERS | Search

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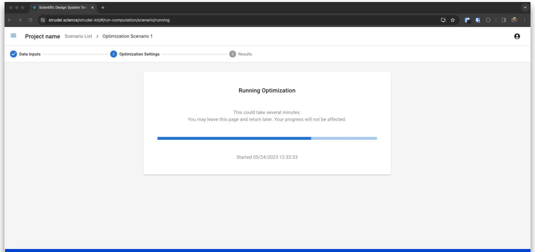
Venus

Physical Characteristics

Diameter	12103.6
Mass	4.869×10^24
Surface Gravity	8.87

Explore Data


Scientific Design System Tem
strudel.science/strudel-kit/#/run-computation/scenario/running

Project name Scenario List > Optimization Scenario 1

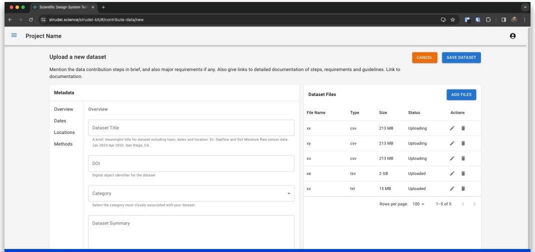
✓ Data Inputs — 2 Optimization Settings — 3 Results

Running Optimization

This could take several minutes.
You may leave this page and return later. Your progress will not be affected.

Started 05/24/2023 12:32:33

Run Computation


Scientific Design System Tem
strudel.science/strudel-kit/#/contribute-data/new

Project Name

Upload a new dataset

CANCEL | SAVE DATASET

Mention the data contribution steps in brief, and also major requirements if any. Also give links to detailed documentation of steps, requirements and guidelines. Link to documentation.

Metadata

Overview
Dates
Locations
Methods

Overview

Dataset Title

A brief, meaningful title for dataset including topic, dates and location. Ex: Sapflow and Soil Moisture Raw sensor data. Jan 2023-Apr 2023. San Diego, CA.

DOI

Digital object identifier for the dataset

Category

Select the category most closely associeted with your dataset.

Dataset Summary

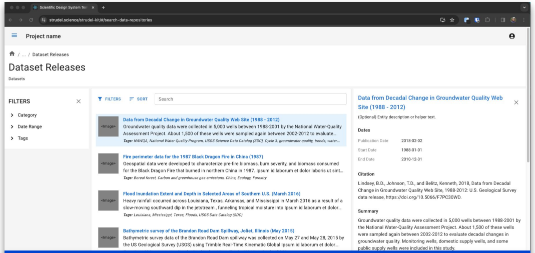
Dataset Files

ADD FILES

File Name	Type	Size	Status	Actions
xx	csv	213 MB	Uploading	✎ 🗑
xy	csv	213 MB	Uploading	✎ 🗑
xs	csv	213 MB	Uploading	✎ 🗑
xe	tsv	2 GB	Uploaded	✎ 🗑
xz	txt	15 MB	Uploaded	✎ 🗑

Rows per page: 100 ▾ 1–5 of 5 ‹ ›

Contribute Data


Scientific Design System Tem
strudel.science/strudel-kit/#/search-data-repositories

Project name

⌂ / ... / Dataset Releases

Dataset Releases

Datasets

FILTERS

› Category
› Date Range
› Tags

FILTERS SORT Search

Data from Decadal Change in Groundwater Quality Web Site (1988 - 2012)
Groundwater quality data were collected in 5,000 wells between 1988-2001 by the National Water-Quality Assessment Project. About 1,500 of these wells were sampled again between 2002-2012 to evaluate...
Tags: NAWQA, National Water Quality Program, USGS Science Data Catalog (SDC), Cycle 3, groundwater quality, trends, water...

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Geospatial data were developed to characterize pre-fire biomass, burn severity, and biomass consumed for the Black Dragon Fire that burned in northern China in 1987. Ipsum id laborum et dolor laboris ut sint...
Tags: Boreal forest, Carbon and greenhouse gas emissions, China, Ecology, Forestry

Flood Inundation Extent and Depth in Selected Areas of Southern U.S. (March 2016)
Heavy rainfall occurred across Louisiana, Texas, Arkansas, and Mississippi in March 2016 as a result of a slow-moving southward dip in the jetstream , funneling tropical moisture into Ipsum id laborum et dolor...
Tags: Louisiana, Mississippi, Texas, Floods, USGS Data Catalog (SDC)

Bathymetric survey of the Brandon Road Dam Spillway, Joliet, Illinois (May 2015)
Bathymetric survey data of the Brandon Road Dam spillway was collected on May 27 and May 28, 2015 by the US Geological Survey (USGS) using Trimble Real-Time Kinematic Global Ipsum id laborum et dolor...

Data from Decadal Change in Groundwater Quality Web Site (1988 - 2012)

(Optional) Entity description or helper text.

Dates

Publication Date	2018-02-02
Start Date	1988-01-01
End Date	2010-12-31

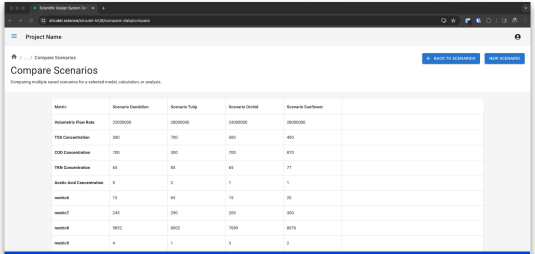
Citation

Lindsey, B.D., Johnson, T.D., and Belitz, Kenneth, 2018, Data from Decadal Change in Groundwater Quality Web Site, 1988-2012: U.S. Geological Survey data release, https://doi.org/10.5066/F7PC30WD.

Summary

Groundwater quality data were collected in 5,000 wells between 1988-2001 by the National Water-Quality Assessment Project. About 1,500 of these wells were sampled again between 2002-2012 to evaluate decadal changes in groundwater quality. Monitoring wells, domestic supply wells, and some public supply wells were included in this study.

Search Data Repositories


Scientific Design System Tem
strudel.science/strudel-kit/#/compare-data/compare

Project Name

⌂ / ... / Compare Scenarios

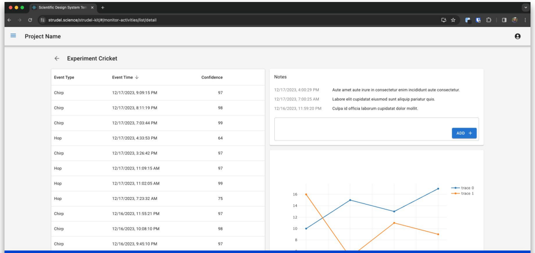
← BACK TO SCENARIOS | NEW SCENARIO

Compare Scenarios

Comparing multiple saved scenarios for a selected model, calculation, or analysis.

Metric	Scenario Dandelion	Scenario Tulip	Scenario Orchid	Scenario Sunflower
Volumetric Flow Rate	25000000	28000000	33000000	28000000
TSS Concentration	500	700	500	400
COD Concentration	700	300	700	870
TKN Concentration	65	85	65	77
Acetic Acid Concentration	0	2	1	1
metric6	15	65	15	20
metric7	245	290	209	300
metric8	9852	8002	7089	8076
metric9	4	1	3	2

Compare Data


Scientific Design System Tem
strudel.science/strudel-kit/#/monitor-activities/list/detail
16
14
12
10
8
trace 0
trace 1

Project Name

← Experiment Cricket

Event Type	Event Time ↓	Confidence
Chirp	12/17/2023, 9:09:15 PM	97
Chirp	12/17/2023, 8:11:19 PM	98
Chirp	12/17/2023, 7:03:44 PM	99
Hop	12/17/2023, 4:33:53 PM	64
Chirp	12/17/2023, 3:26:42 PM	97
Hop	12/17/2023, 11:09:15 AM	97
Hop	12/17/2023, 11:02:05 AM	99
Hop	12/17/2023, 7:23:32 AM	75
Chirp	12/16/2023, 11:55:21 PM	97
Chirp	12/16/2023, 10:08:10 PM	98
Chirp	12/16/2023, 9:45:10 PM	97

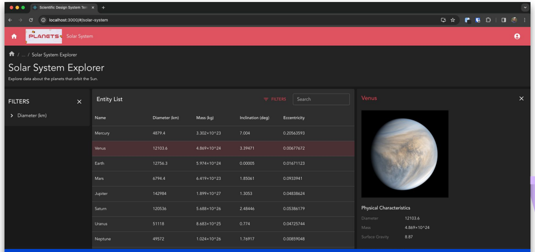
Notes

12/17/2023, 4:00:29 PM	Aute amet aute irure in consectetur enim incididunt aute consectetur.
12/17/2023, 7:00:25 AM	Labore elit cupidatat eiusmod sunt aliquip pariatur quis.
12/16/2023, 11:59:20 PM	Culpa id officia laborum cupidatat dolor mollit.

ADD +

Monitor Activity

Continue Building: Connect Task Flows



/ ... / Solar System Explorer

Solar System Explorer

Explore data about the planets that orbit the Sun.

FILTERS

› Diameter (km)

Entity List

Name	Diameter (km)	Mass (kg)	Inclination (deg)	Eccentricity
Mercury	4879.4	3.302×10^23	7.004	0.20563593
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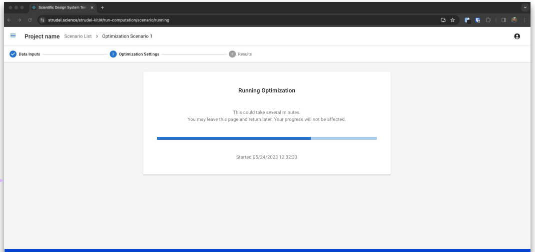
Uranus	51118	8.683×10^25	0.774	0.04725744
Neptune	49572	1.024×10^26	1.76917	0.00859048

Venus

Physical Characteristics

Diameter	12103.6
Mass	4.869×10^24
Surface Gravity	8.87

Explore Data

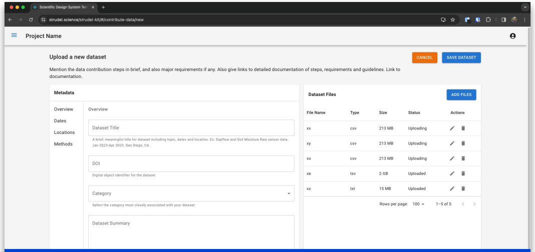

Scientific Design System Tem
strudel.science/strudel-kit/#/run-computation/scenario/running
Project name
Scenario List › Optimization Scenario 1
Data Inputs
2 Optimization Settings
3 Results

Running Optimization

This could take several minutes.
You may leave this page and return later. Your progress will not be affected.

Started 05/24/2023 12:32:33

Run Computation


Scientific Design System Tem
strudel.science/strudel-kit/#/contribute-data/new
Project Name
CANCEL
SAVE DATASET
ADD FILES
Overview
Dates
Locations
Methods

Upload a new dataset

Mention the data contribution steps in brief, and also major requirements if any. Also give links to detailed documentation of steps, requirements and guidelines. Link to documentation.

Metadata

Overview

Dataset Title

A brief, meaningful title for dataset including topic, dates and location. Ex: Sapflow and Soil Moisture Raw sensor data. Jan 2023-Apr 2023. San Diego, CA.

DOI

Digital object identifier for the dataset

Category

Select the category most closely associeted with your dataset.

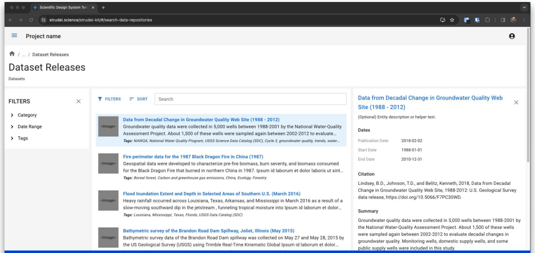
Dataset Summary

Dataset Files

File Name	Type	Size	Status	Actions
xx	csv	213 MB	Uploading	
xy	csv	213 MB	Uploading	
xs	csv	213 MB	Uploading	
xe	tsv	2 GB	Uploaded	
xz	txt	15 MB	Uploaded	

Rows per page: 100 1–5 of 5

Contribute Data


Scientific Design System Tem
strudel.science/strudel-kit/#/search-data-repositories
Project name
FILTERS
SORT
Search
<image>
<image>
<image>
<image>

/ ... / Dataset Releases

Dataset Releases

Datasets

FILTERS

› Category
› Date Range
› Tags

Data from Decadal Change in Groundwater Quality Web Site (1988 - 2012)
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(Optional) Entity description or helper text.

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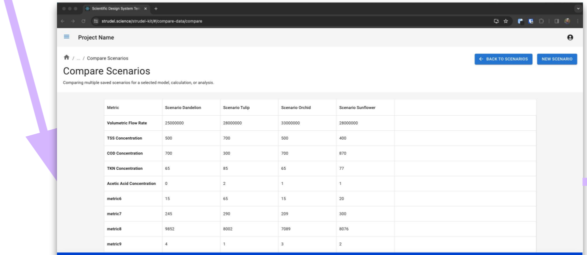
Scientific Design System Tem
strudel.science/strudel-kit/#/compare-data/compare
Project Name
BACK TO SCENARIOS
NEW SCENARIO

/ ... / Compare Scenarios

Compare Scenarios

Comparing multiple saved scenarios for a selected model, calculation, or analysis.

Metric	Scenario Dandelion	Scenario Tulip	Scenario Orchid	Scenario Sunflower
Volumetric Flow Rate	25000000	28000000	33000000	28000000
TSS Concentration	500	700	500	400
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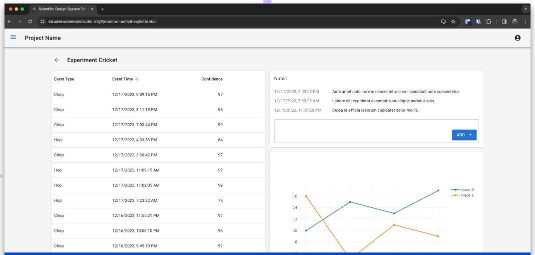
Compare Data


Scientific Design System Tem
strudel.science/strudel-kit/#/monitor-activities/list/detail
Project Name
ADD +
16
14
12
10
8
trace 0
trace 1

Experiment Cricket

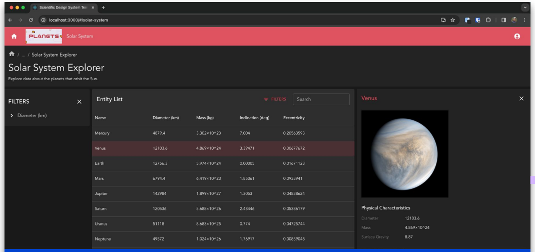
Event Type	Event Time	Confidence
Chirp	12/17/2023, 9:09:15 PM	97
Chirp	12/17/2023, 8:11:19 PM	98
Chirp	12/17/2023, 7:03:44 PM	99
Hop	12/17/2023, 4:33:53 PM	64
Chirp	12/17/2023, 3:26:42 PM	97
Hop	12/17/2023, 11:09:15 AM	97
Hop	12/17/2023, 11:02:05 AM	99
Hop	12/17/2023, 7:23:32 AM	75
Chirp	12/16/2023, 11:55:21 PM	97
Chirp	12/16/2023, 10:08:10 PM	98
Chirp	12/16/2023, 9:45:10 PM	97

Notes

12/17/2023, 4:00:29 PM	Aute amet aute irure in consectetur enim incididunt aute consectetur.
12/17/2023, 7:00:25 AM	Labore elit cupidatat eiusmod sunt aliquip pariatur quis.
12/16/2023, 11:59:20 PM	Culpa id officia laborum cupidatat dolor mollit.

Monitor Activity

Continue Building: Integrate an Existing App


Scientific Design System Tem
localhost:3000/#/solar-system
PLANETS
Solar System
/ ... / Solar System Explorer
FILTERS
Diameter (km)
Entity List
FILTERS
Search
Venus

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Physical Characteristics

Diameter	12103.6
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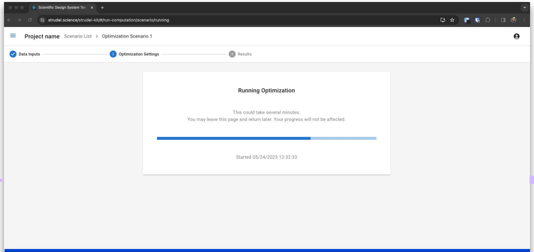
Explore Data



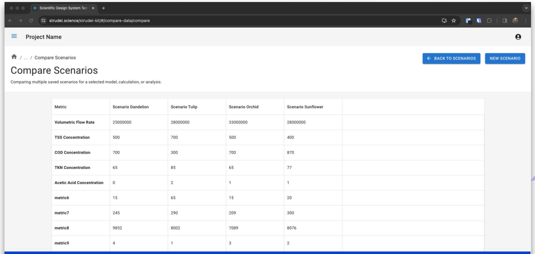
Running Optimization

This could take several minutes.
You may leave this page and return later. Your progress will not be affected.

Started 05/24/2023 12:32:33

Run Computation

Your app


Scientific Design System Tem
strudel.science/strudel-kit/#/compare-data/compare
Project Name
/ ... / Compare Scenarios
BACK TO SCENARIOS
NEW SCENARIO

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Acetic Acid Concentration	0	2	1	1
metric6	15	65	15	20
metric7	245	290	209	300
metric8	9852	8002	7089	8076
metric9	4	1	3	2

Compare Data

STRUDEL Design System Hackathon

Tuesday, March 19

9:00 AM to 4:00 PM PDT

In-person at the **Berkeley Lab**

Register now: https://www.surveymonkey.com/r/1ststrudelhackathon

Join the STRUDEL team and other members of the scientific community for an interactive day of building user interfaces with the STRUDEL Design System.

Attendance is completely free and lunch will be included. Registration required.

Funding to assist travel is not available for this event.

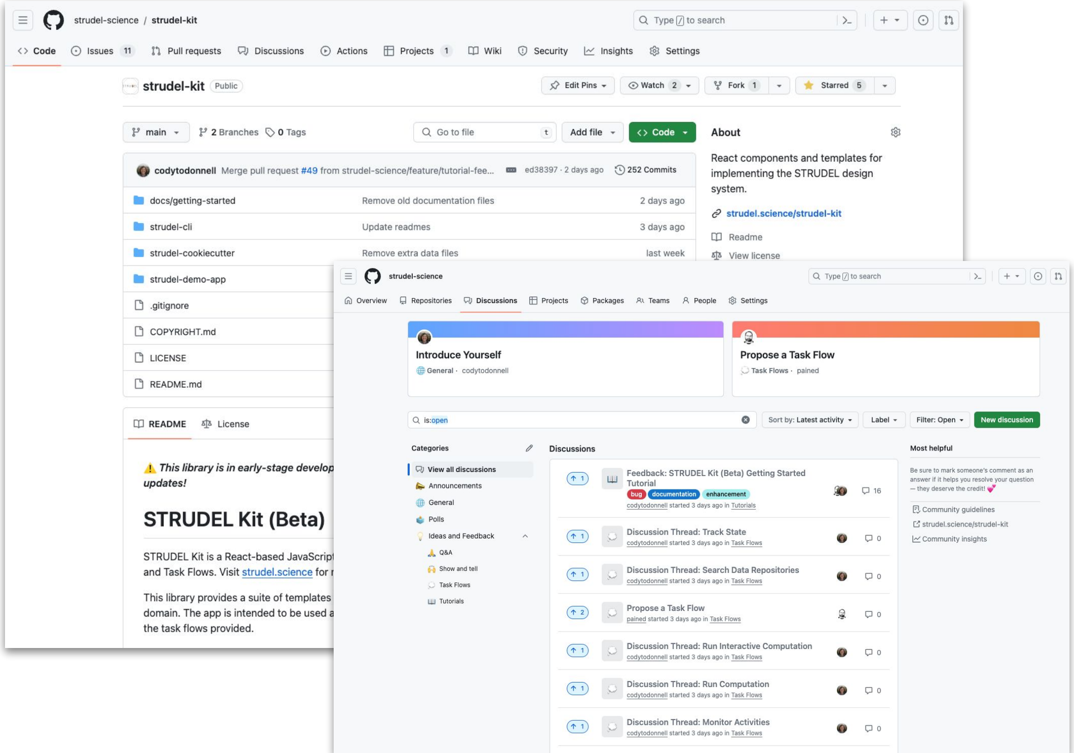
How STRUDEL can Grow

STRUDEL Kit and the STRUDEL Design System are still early beta-stage projects.

Expanding the Task Flows and Implementation Process

- Advanced UI features and variants
- Advanced custom components
- Community-driven Task Flows
- Expanded suite of tutorials
- Smarter automation
- More complex configuration
- Graphical configuration UI
- Backend integrations

[*strudel-kit repository on GitHub*]



codytodonnell Merge pull request #49 from strudel-science/feature/tutorial-fee... ed38397 · 2 days ago 252 Commits

docs/getting-started	Remove old documentation files	2 days ago
strudel-cli	Update readmes	3 days ago
strudel-cookiecutter	Remove extra data files	last week
strudel-demo-app		
.gitignore		
COPYRIGHT.md		
LICENSE		
README.md		

About

React components and templates for implementing the STRUDEL design system.

strudel.science/strudel-kit

Readme

View license

⚠️ *This library is in early-stage develop*
updates!

STRUDEL Kit (Beta)

STRUDEL Kit is a React-based JavaScrip
and Task Flows. Visit strudel.science for r

This library provides a suite of templates
domain. The app is intended to be used a
the task flows provided.

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General · codytodonnell

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Discussions

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1	Feedback: STRUDEL Kit (Beta) Getting Started Tutorial bug documentation enhancement codytodonnell started 3 days ago in Tutorials	16
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1	Discussion Thread: Run Interactive Computation codytodonnell started 3 days ago in Task Flows	0
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Most helpful

Be sure to mark someone's comment as an answer if it helps you resolve your question — they deserve the credit! 💕

Community guidelines

strudel.science/strudel-kit

Community insights

[*Join the discussion on our GitHub Discussions page.*]

Get Involved!
Join the STRUDEL Community

Visit our website to learn more & use our products!

https://strudel.science

Join the US-RSE User Experience working group to connect with the larger community of practice!

#wg-ux on the **US-RSE Slack**
https://go.lbl.gov/usrse-uxwg

Join our mailing list to keep up to date & contribute to the community!

strudel-community+subscribe@lbl.gov

Have comments?
Start a conversation on our
GitHub Discussions Page
https://go.lbl.gov/strudel-discussion

STRUDEL Design System Hackathon

- In person @ Berkeley Lab
- Tuesday March 19, All Day
- *Space is limited! Please express your interest by this coming Monday March 11, 2024*
- *Register for the event*

Interested in co-hosting a local hackathon? Reach out to chat!

Thank you for joining us!

Questions?