

# MATLAB EXPO

## How To Optimize the User Experience of Your MATLAB Apps

*Dr. Gianluca Carnielli, MathWorks*



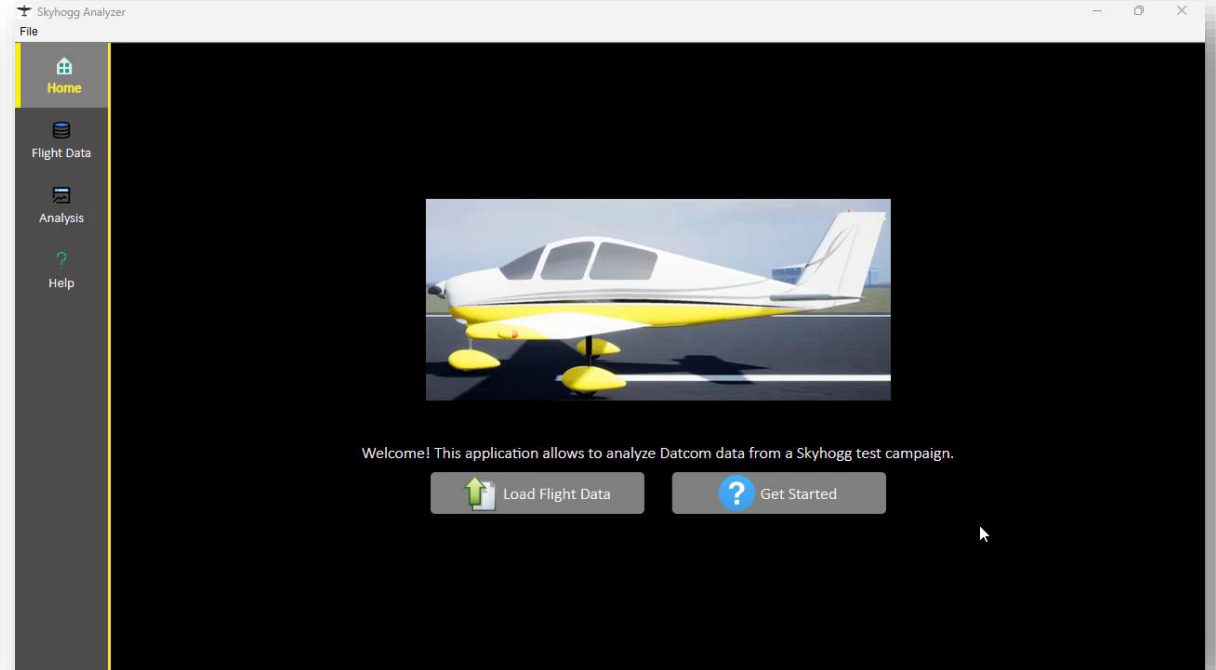
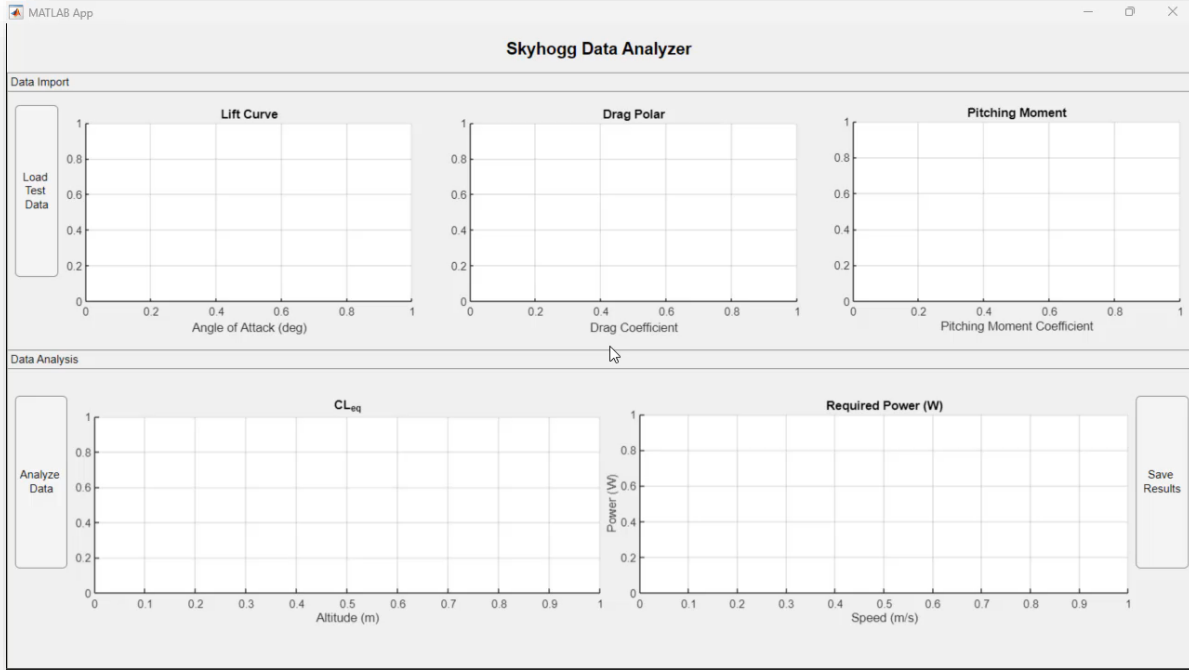


**MathWorks** 

@MathWorks

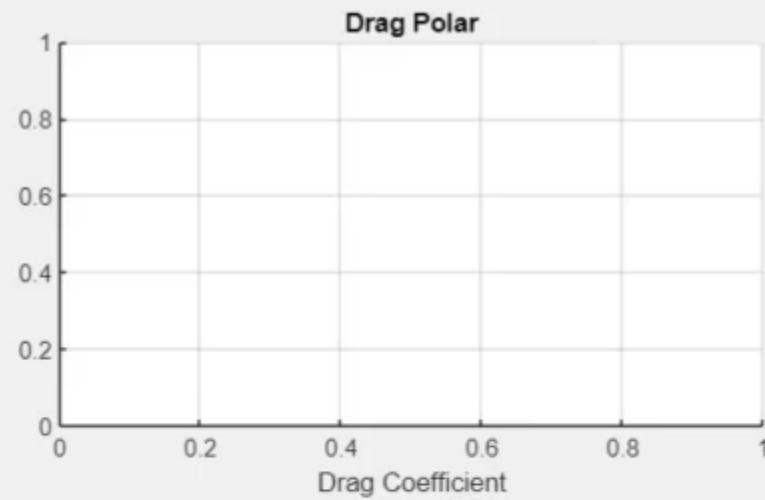
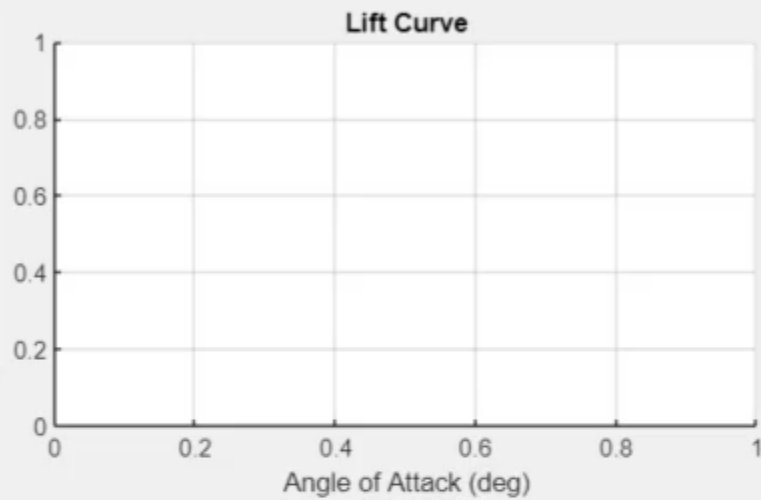
Share the EXPO experience  
**#MATLABEXPO**



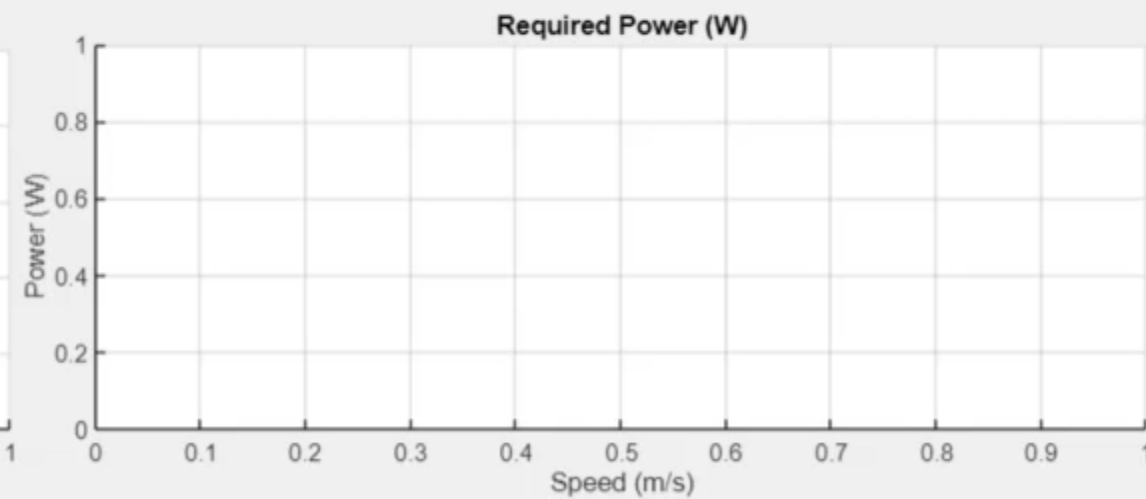
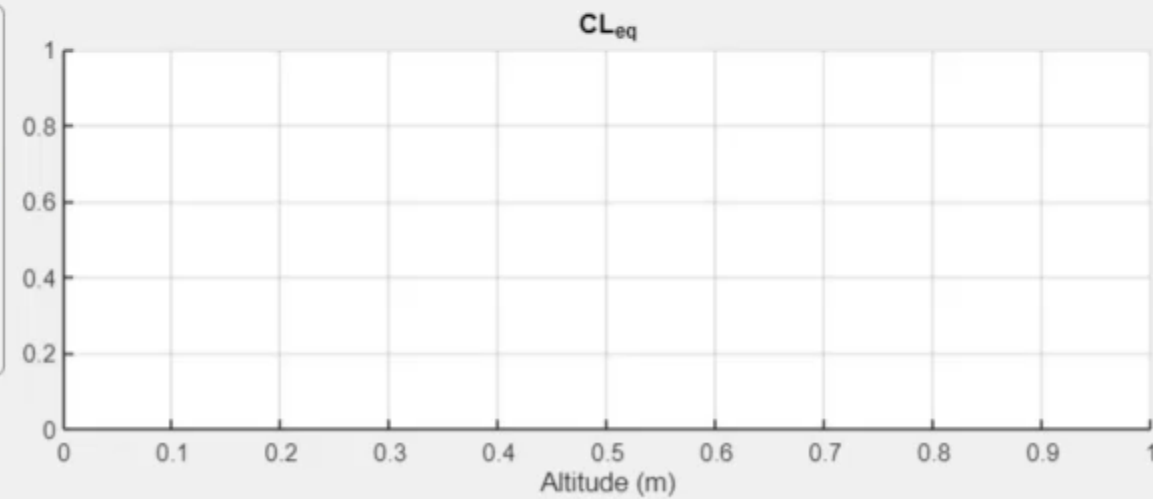


## Skyhogg Data Analyzer

Data Import

Load  
Test  
Data

Data Analysis

Analyze  
DataSave  
Results



Home



Flight Data



Analysis



Help



Welcome! This application allows to analyze Datcom data from a Skyhogg test campaign.

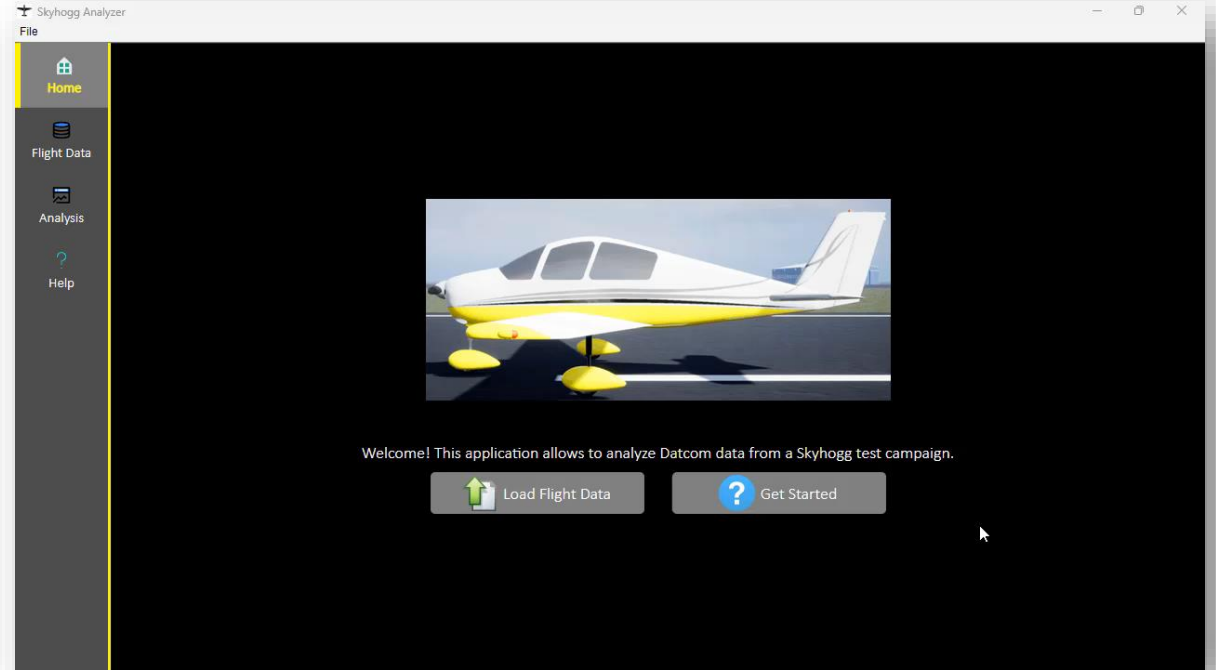
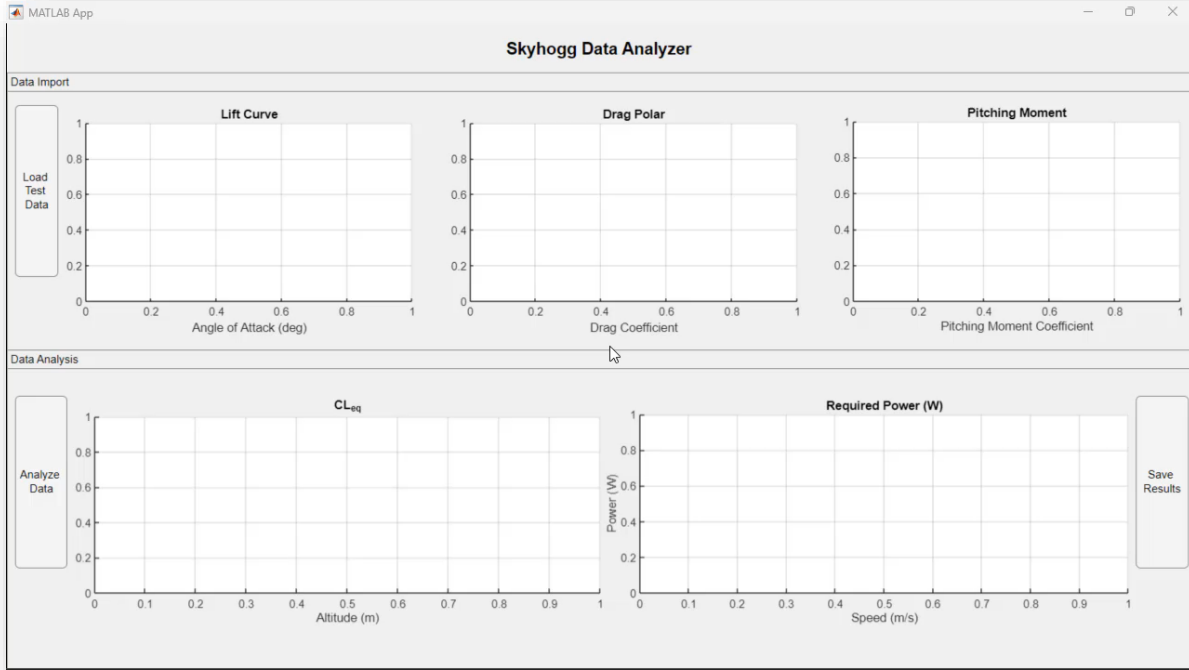


Load Flight Data



Get Started





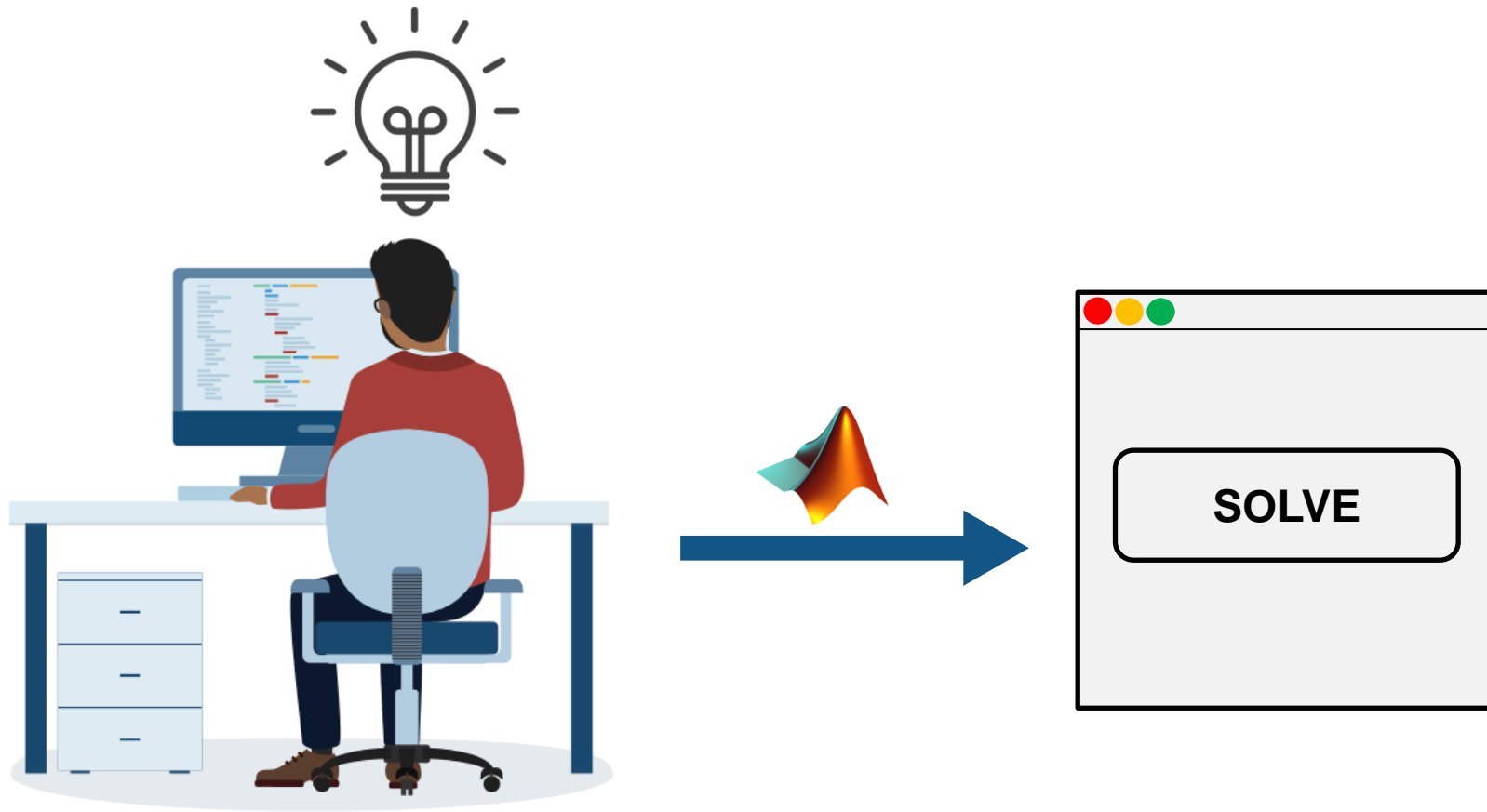
# By the End of This Presentation...

## Learn:

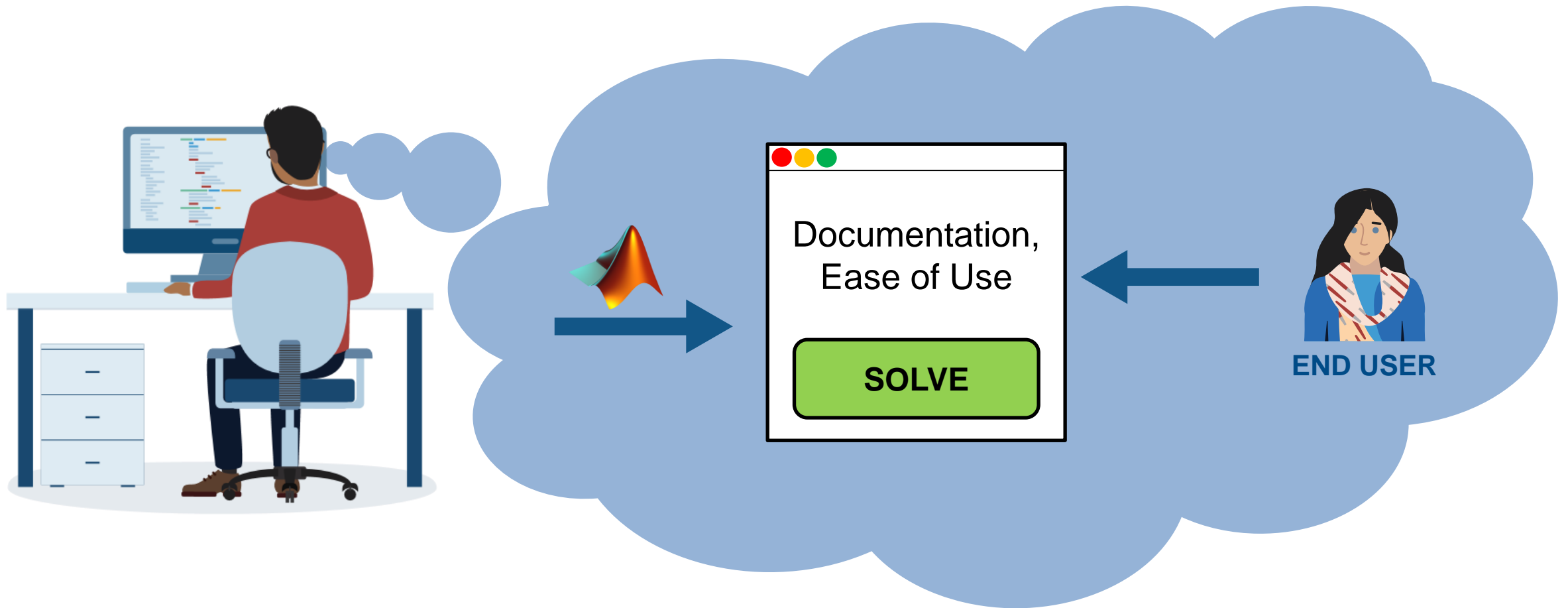
- Tools and techniques to create user friendly apps in MATLAB

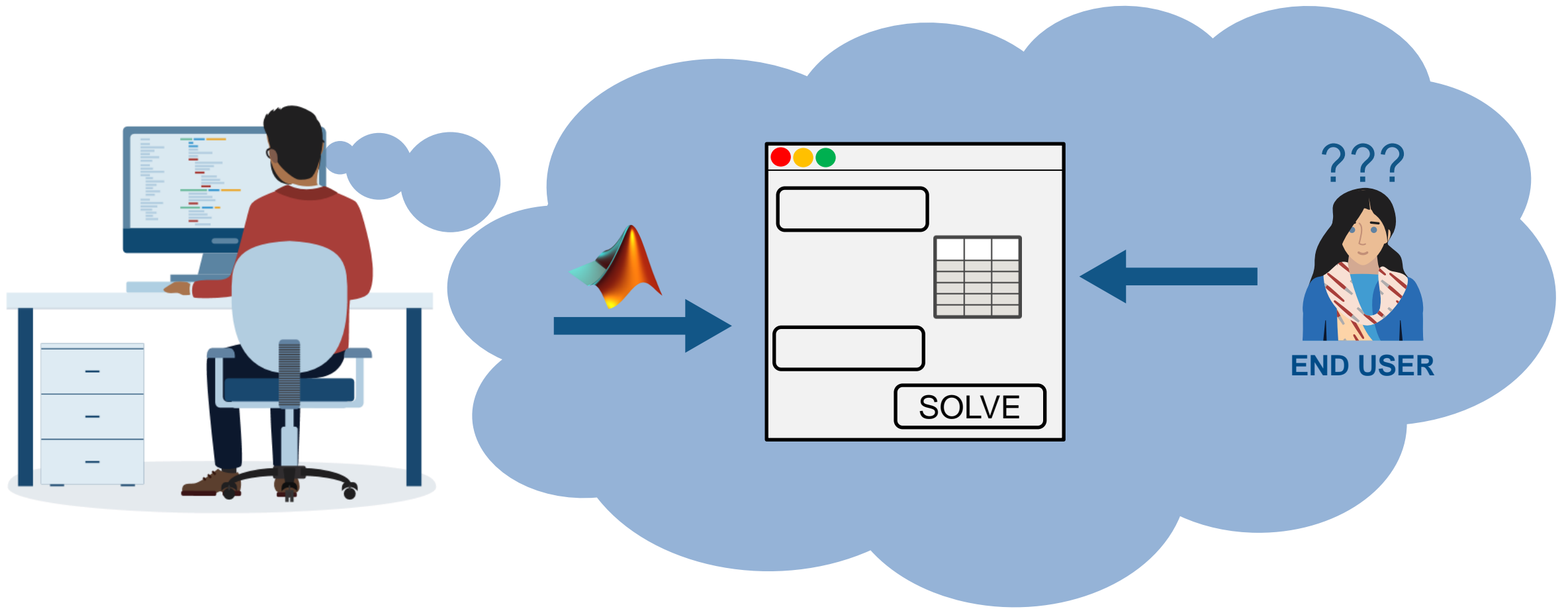
## Remember:

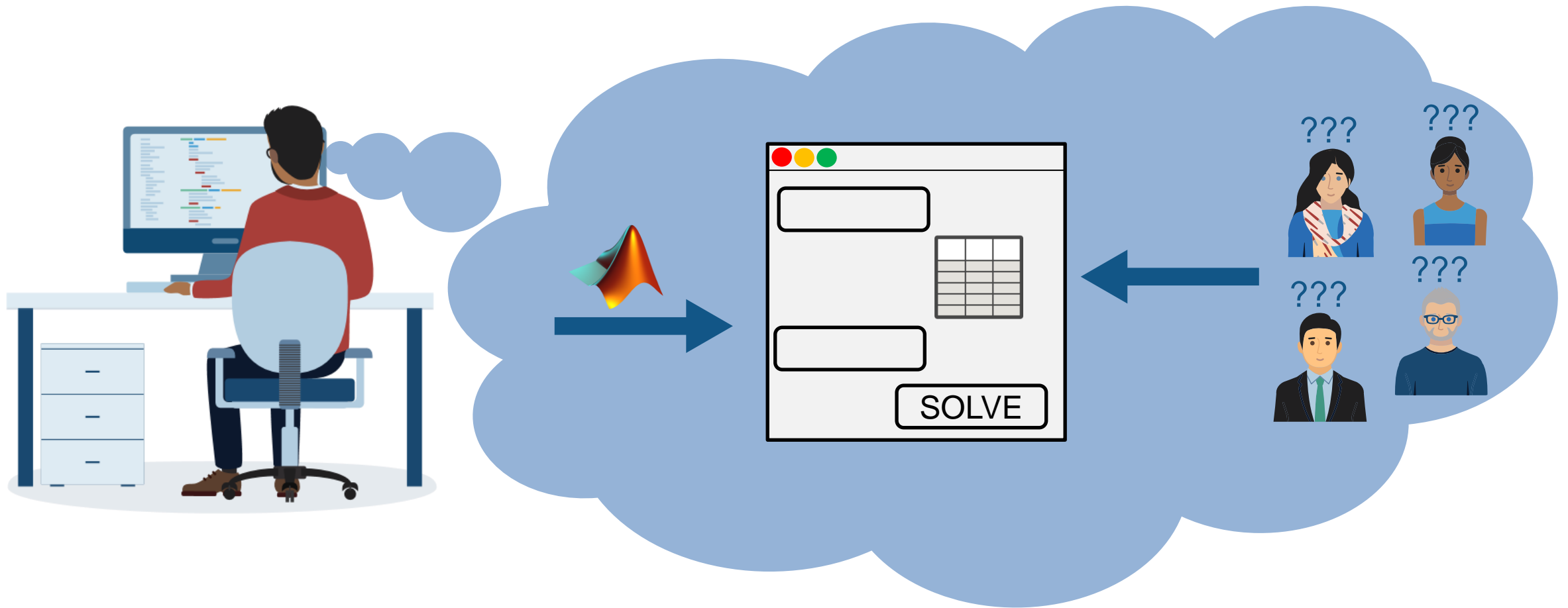
- Great apps come from a great user experience **(BUT NOT ONLY, see handout)**









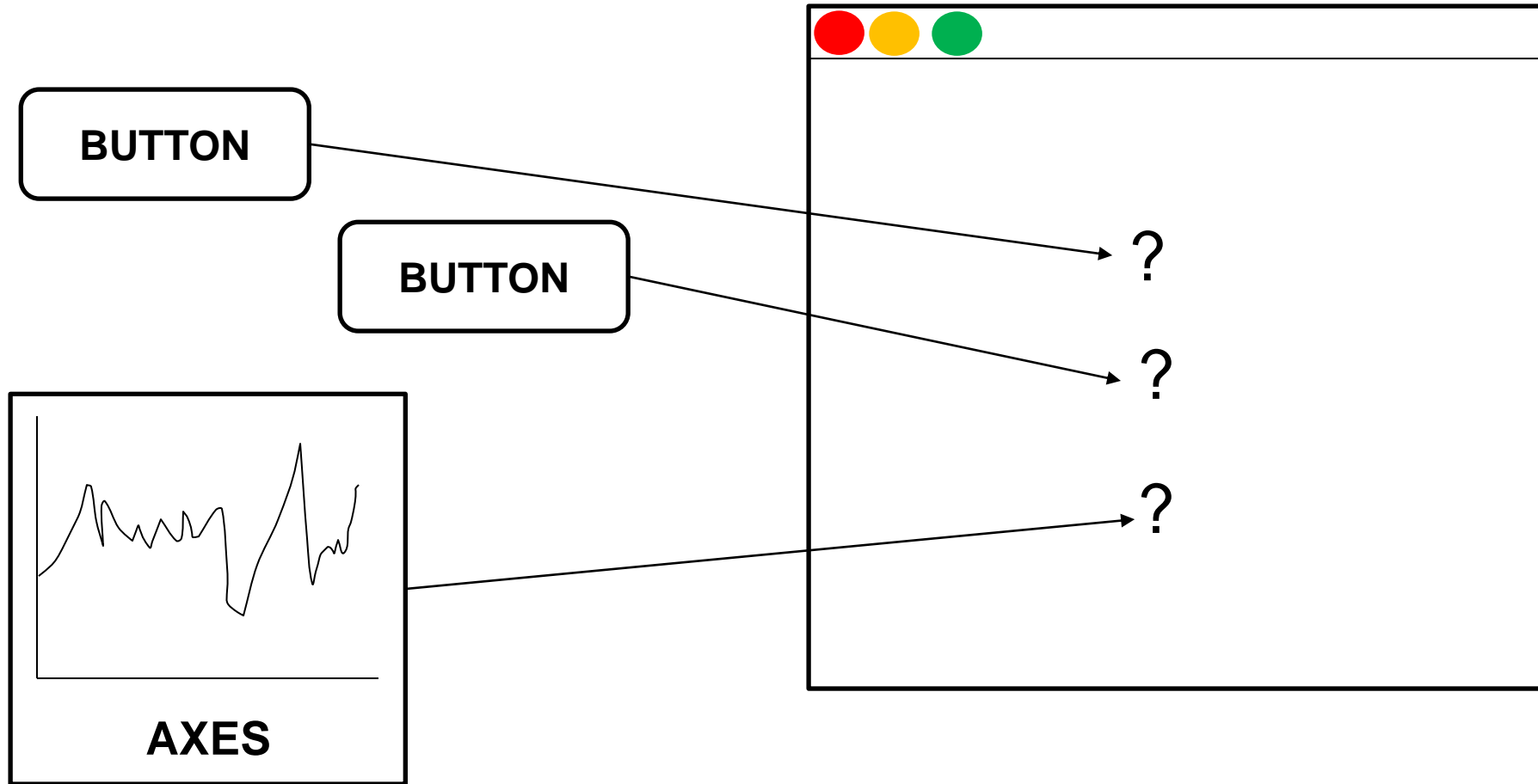


# How Can You Optimize the User Experience of Your MATLAB Apps?

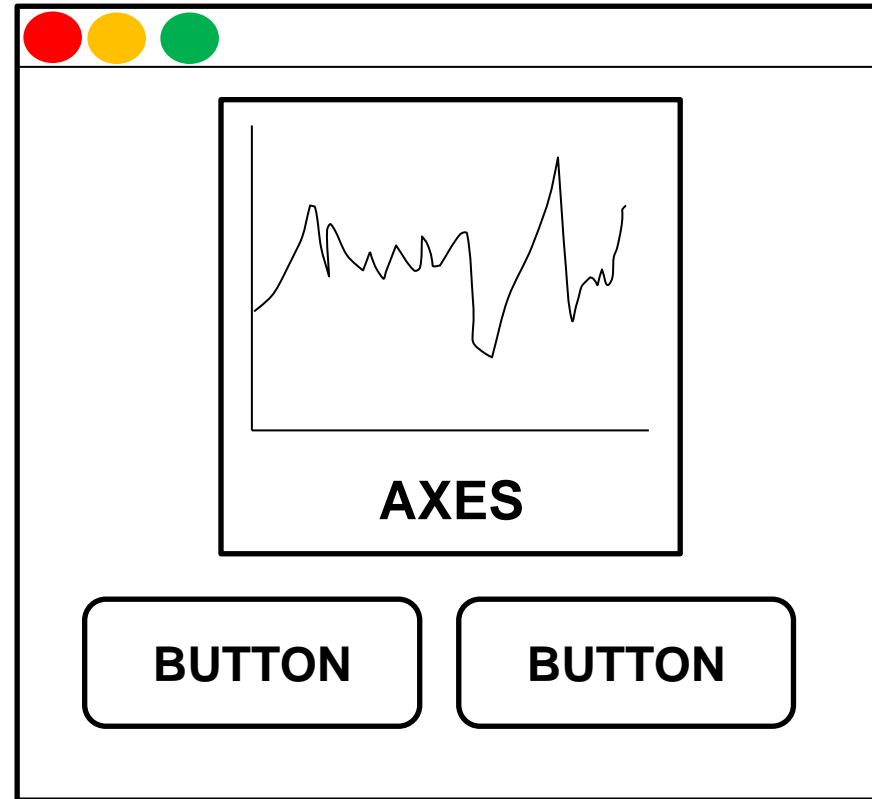
## In a Nutshell...

1. **Choose the correct position and size**
2. Set the expectations
3. Provide feedback to the user
4. Anticipate user errors
5. Provide documentation
6. Enhance the appearance

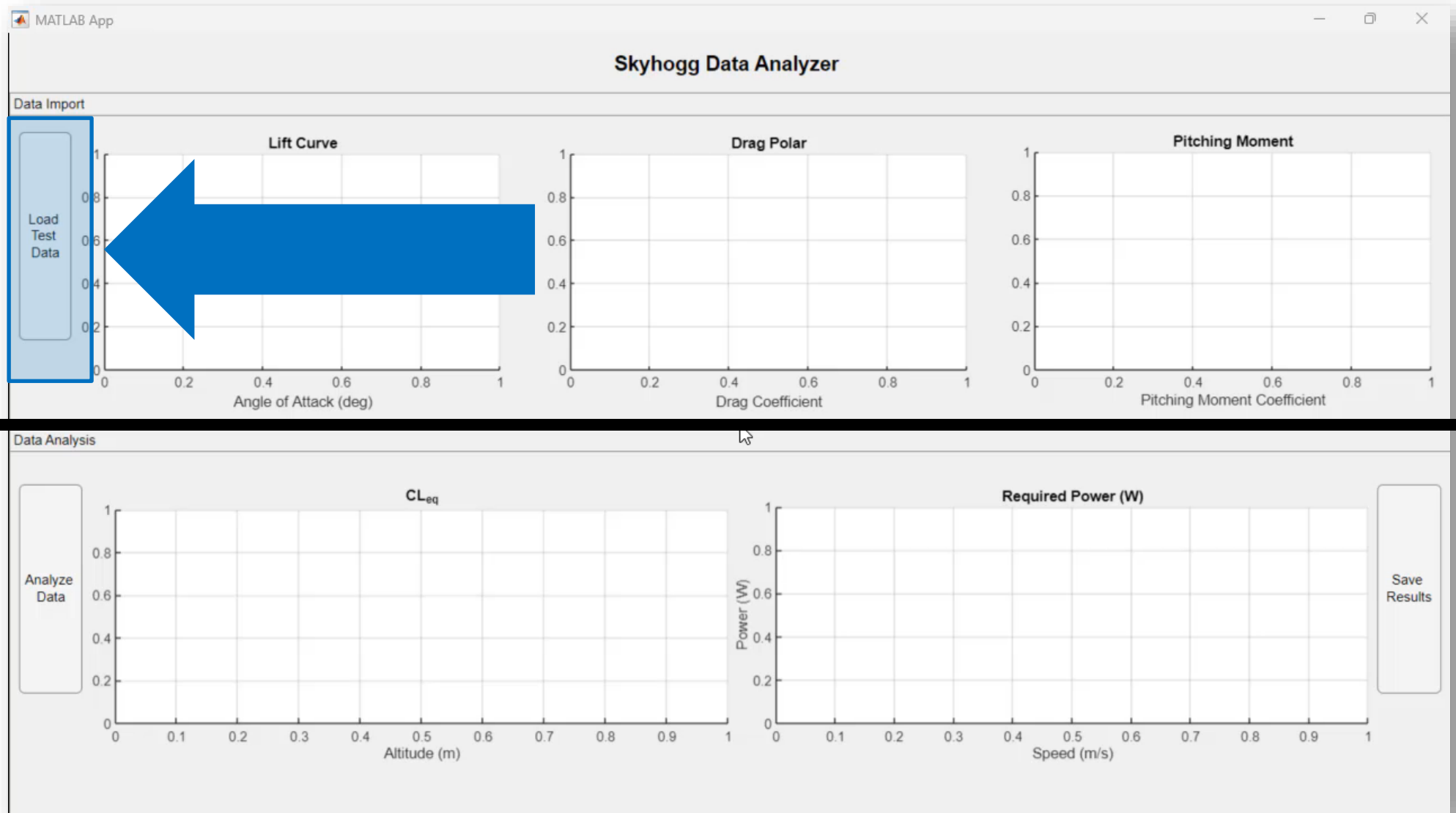
# Choose the Correct Position and Size



# Choose the Correct Position and Size



# Choose the Correct Position and Size





The image shows a MATLAB App window titled "Skyhogg Data Analyzer". The interface is divided into two main sections: "Data Import" and "Data Analysis".

**Data Import Section:**

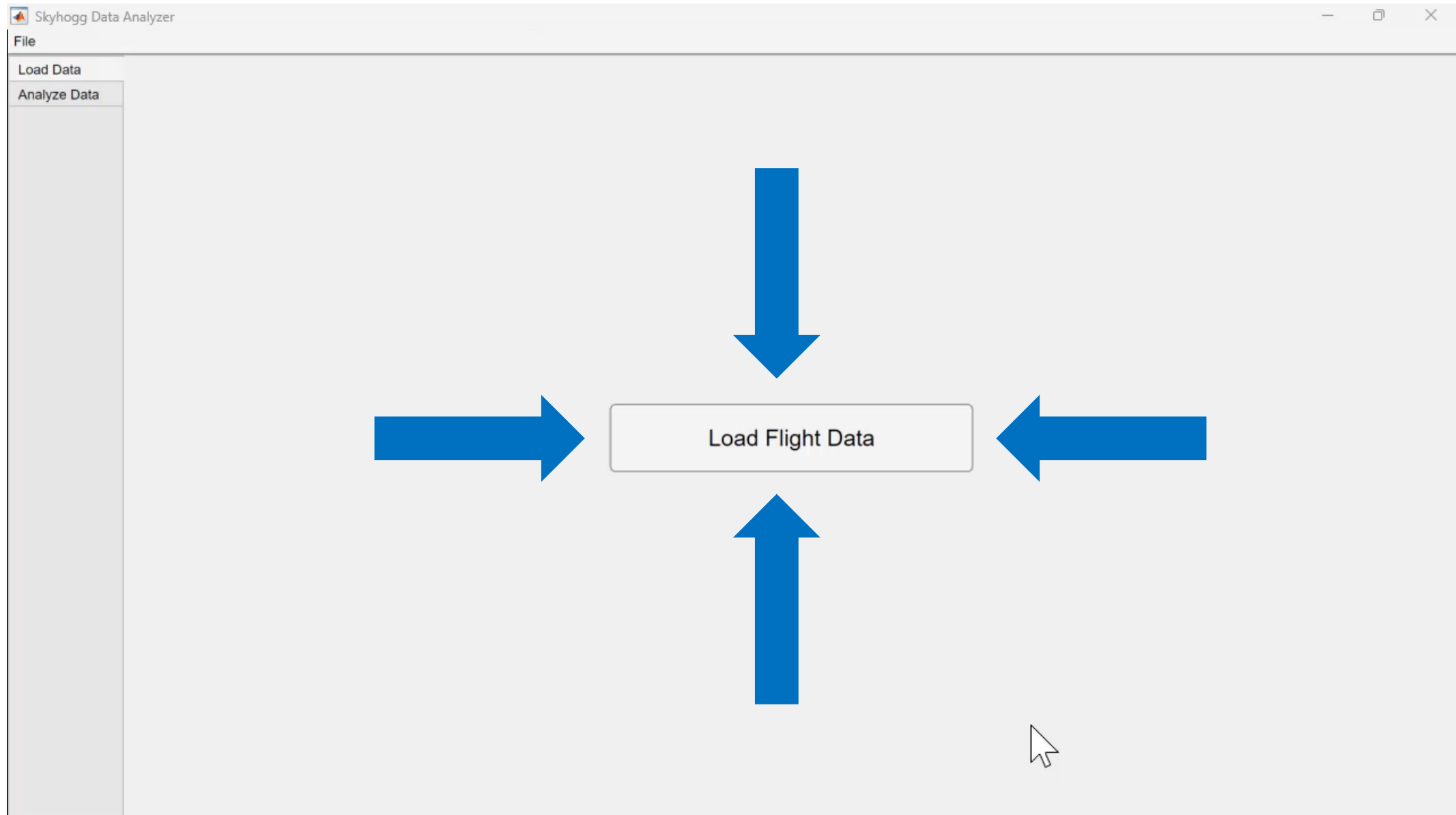
- Contains three empty plots: "Lift Curve", "Dip Polar", and "Pitching Moment".
- The "Lift Curve" plot has a y-axis labeled "Load Test Data" (0 to 1) and an x-axis labeled "Angle of Attack (deg)" (0 to 1).
- The "Dip Polar" plot has a y-axis (0 to 1) and an x-axis (0 to 0.2).
- The "Pitching Moment" plot has a y-axis (0 to 1) and an x-axis (0 to 0.2).

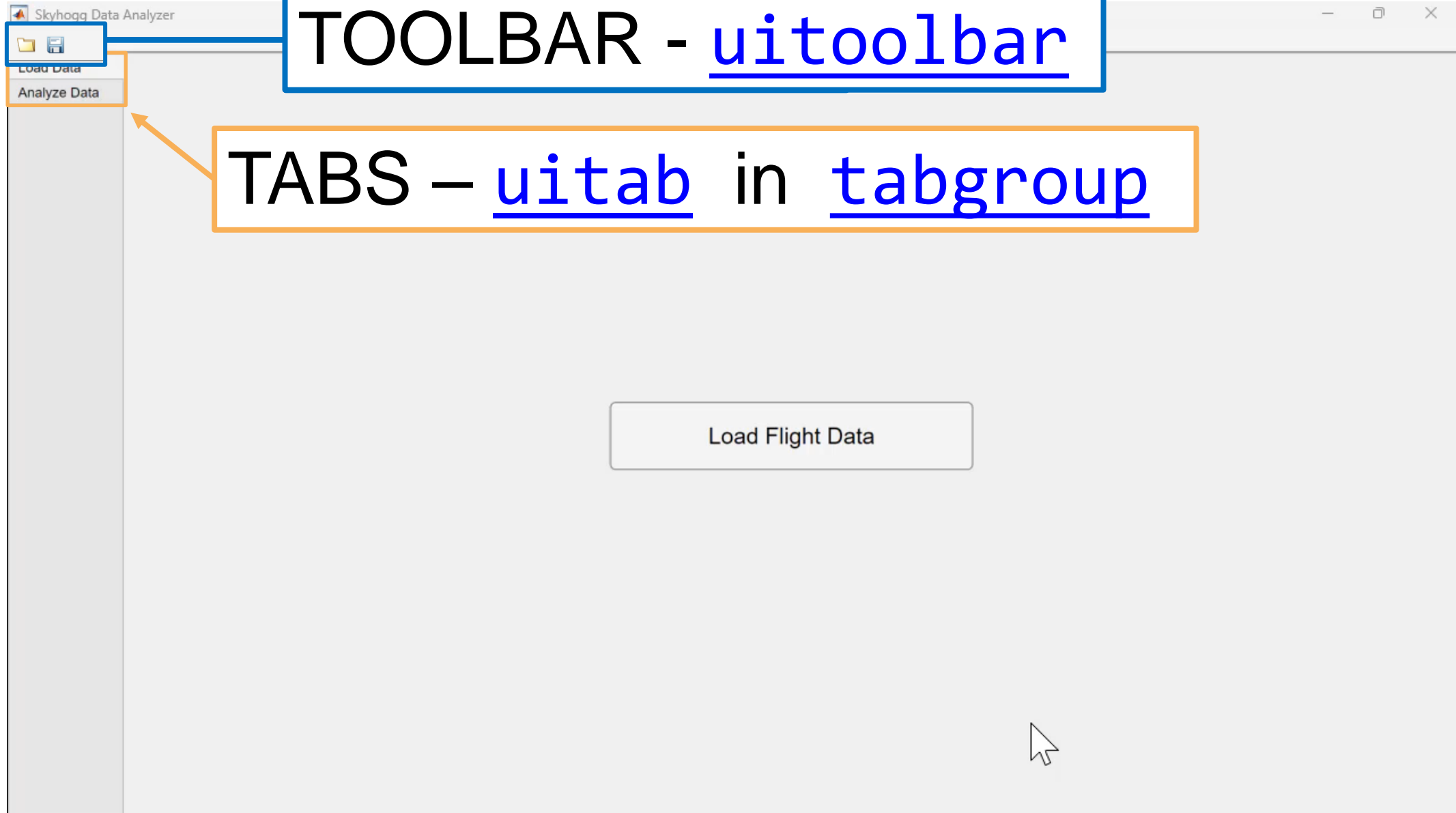
**Data Analysis Section:**

- Contains one empty plot labeled "CL<sub>eq</sub>".
- The plot has a y-axis labeled "Analyze Data" (0 to 1) and an x-axis labeled "Altitude (m)" (0 to 0.9).

**Menu and Interaction:**

- A blue arrow points to the "Skyhogg Data Analyzer" menu item in the application's top bar.
- A context menu is open, showing options: "File", "Load Data", and "Analyze Data".
- A button labeled "Load Flight Data" is located in the lower right area of the application window.
- A mouse cursor is visible at the bottom right of the window.





File

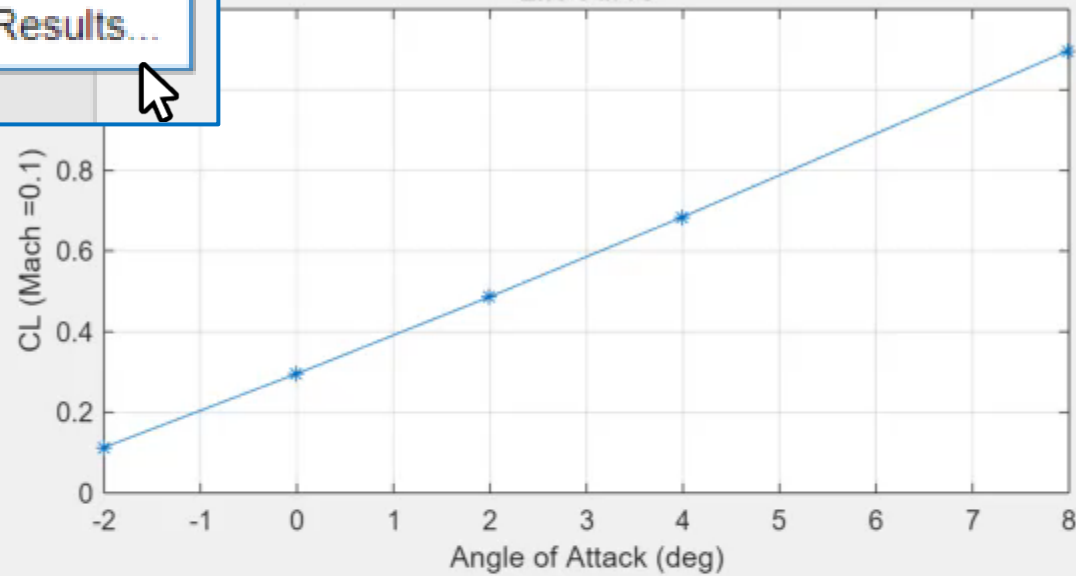
Load Data...

Save Results...

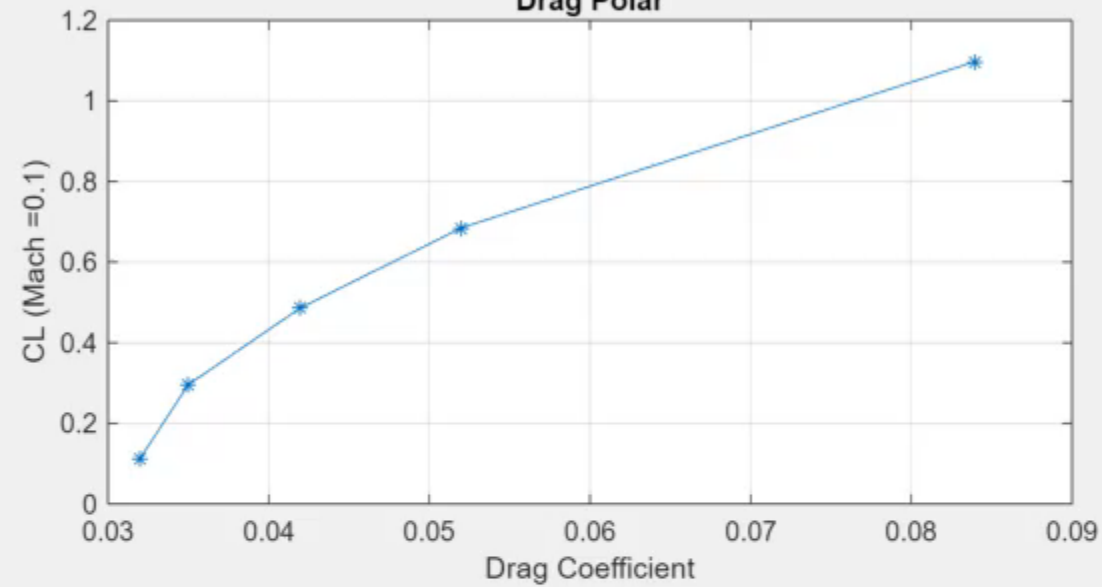
Clear All

 Lift Curve Drag Polar Pitching Moment

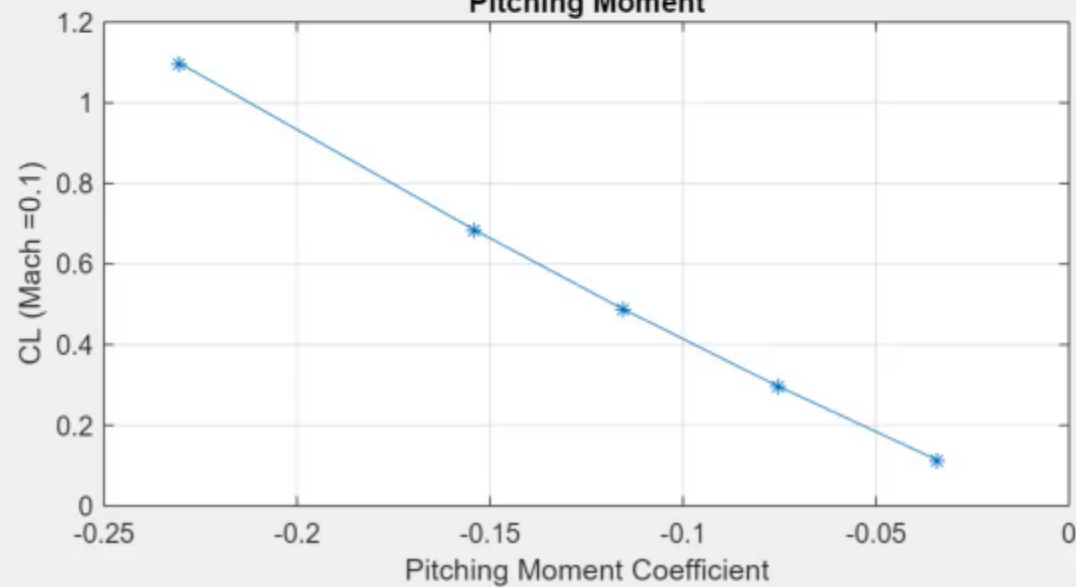
Lift Curve



Drag Polar



Pitching Moment

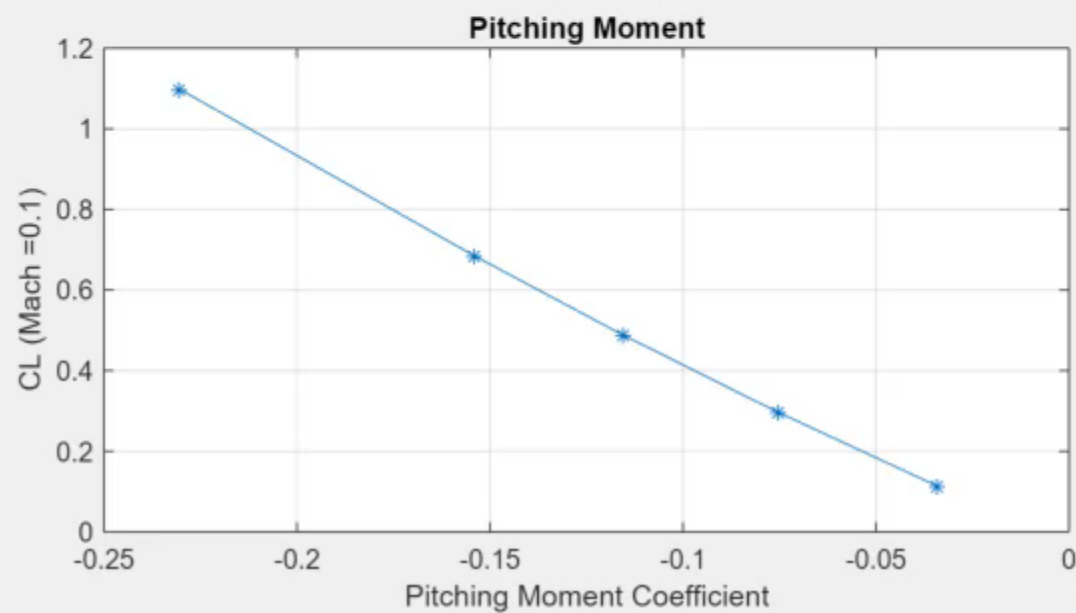
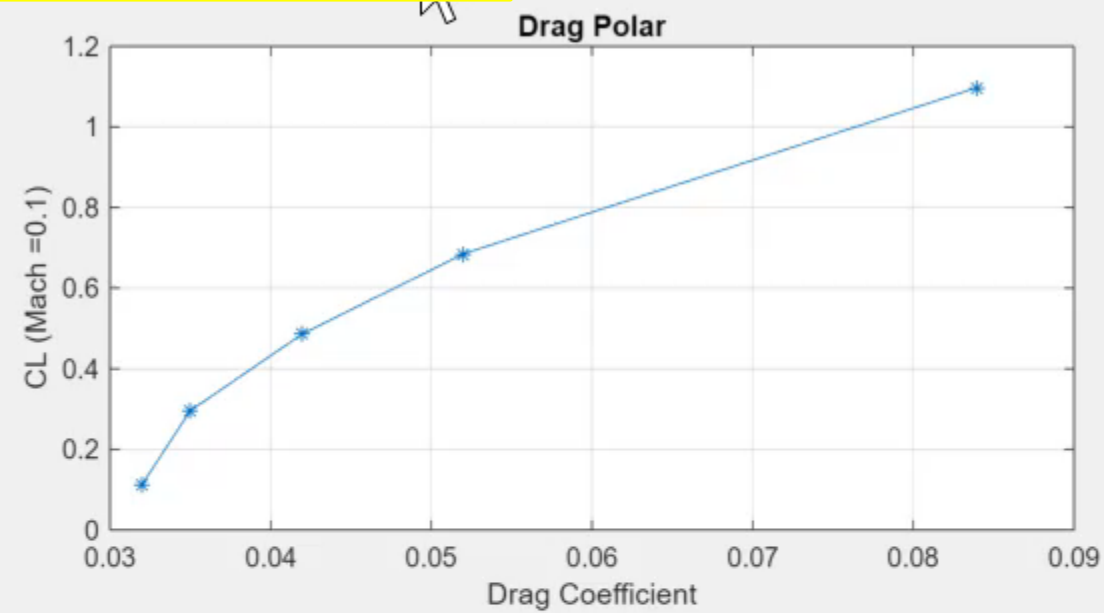
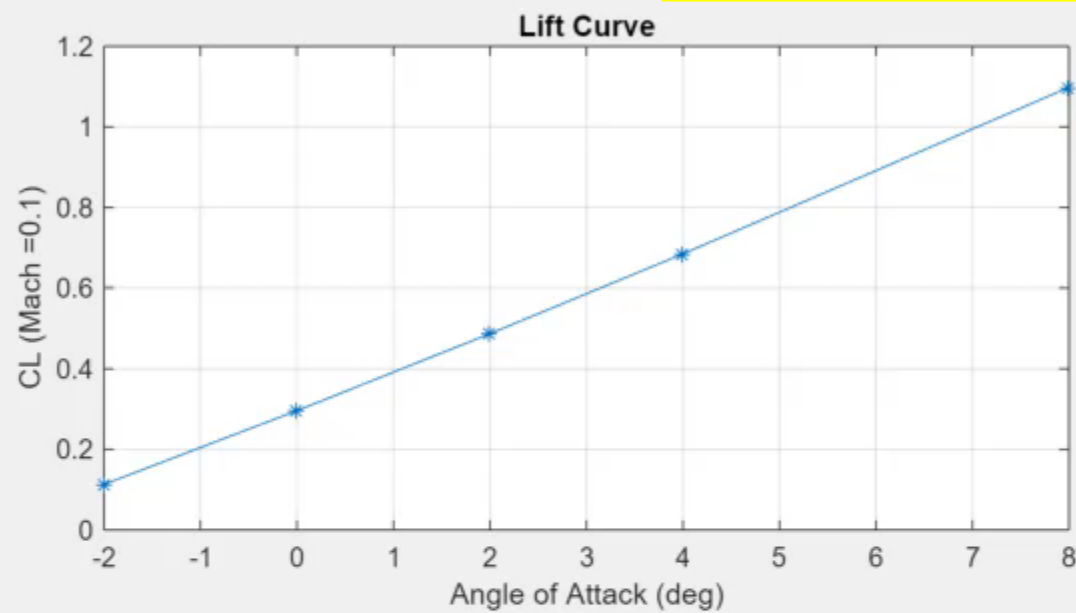


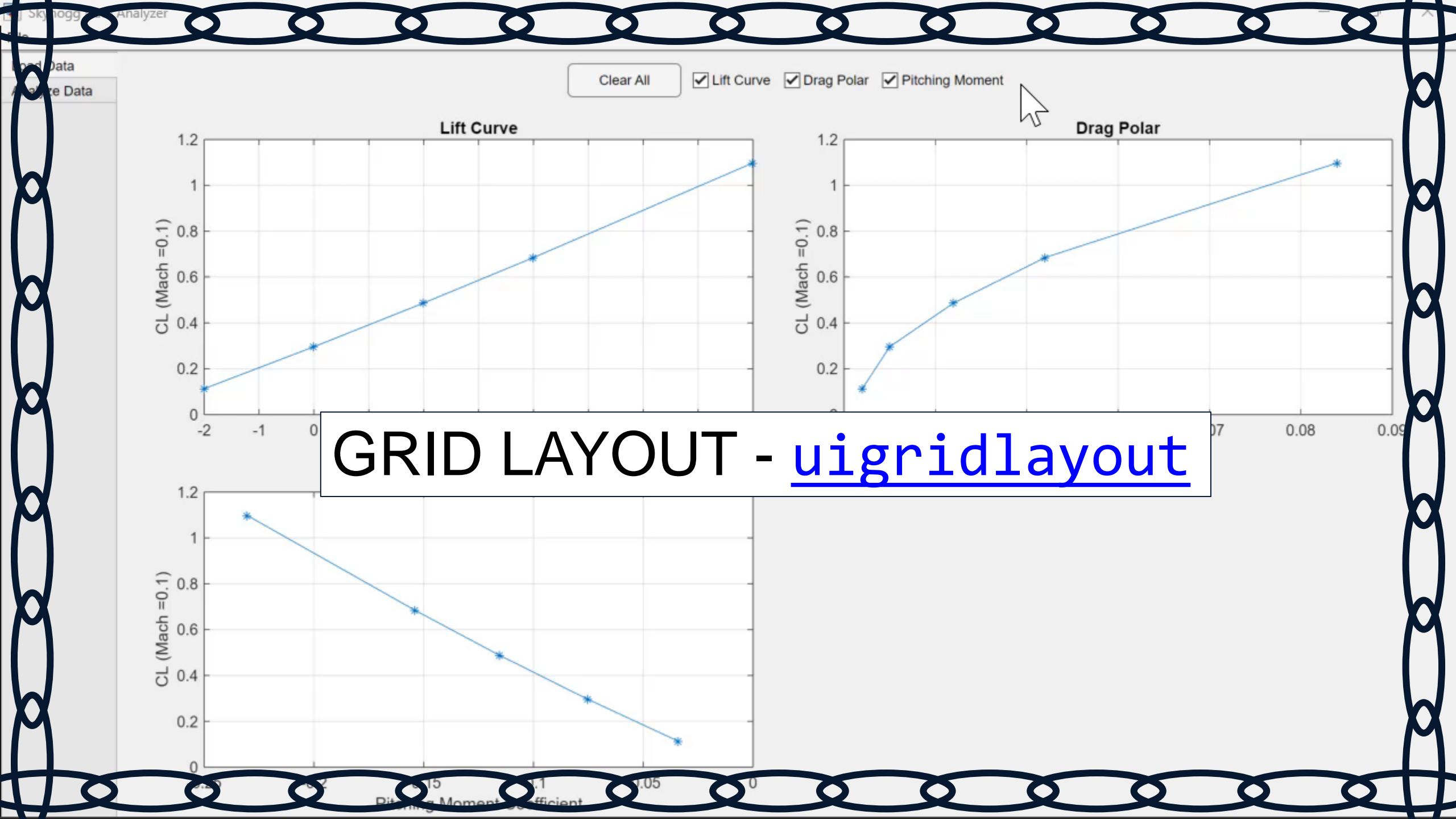
File

Load Data

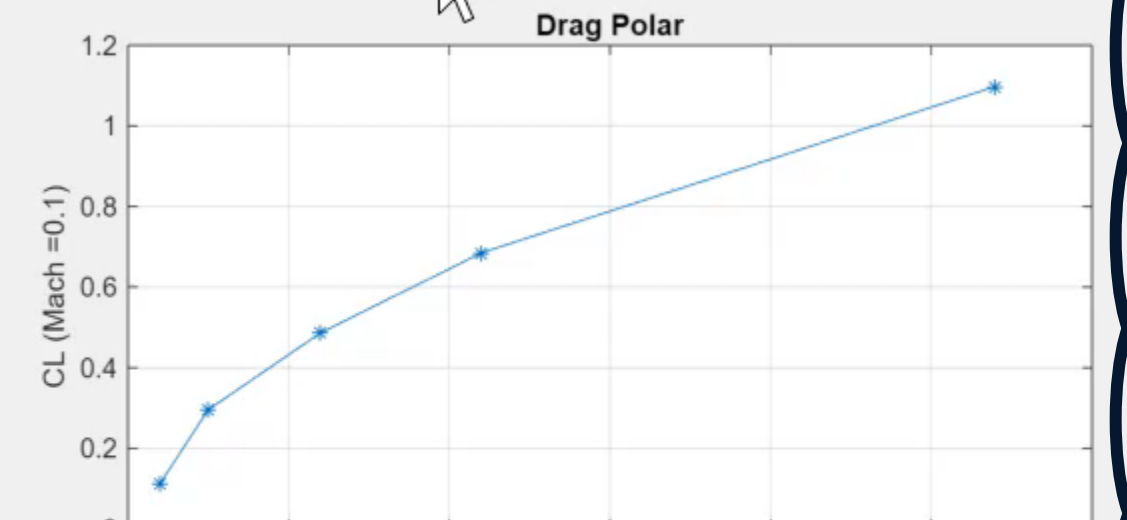
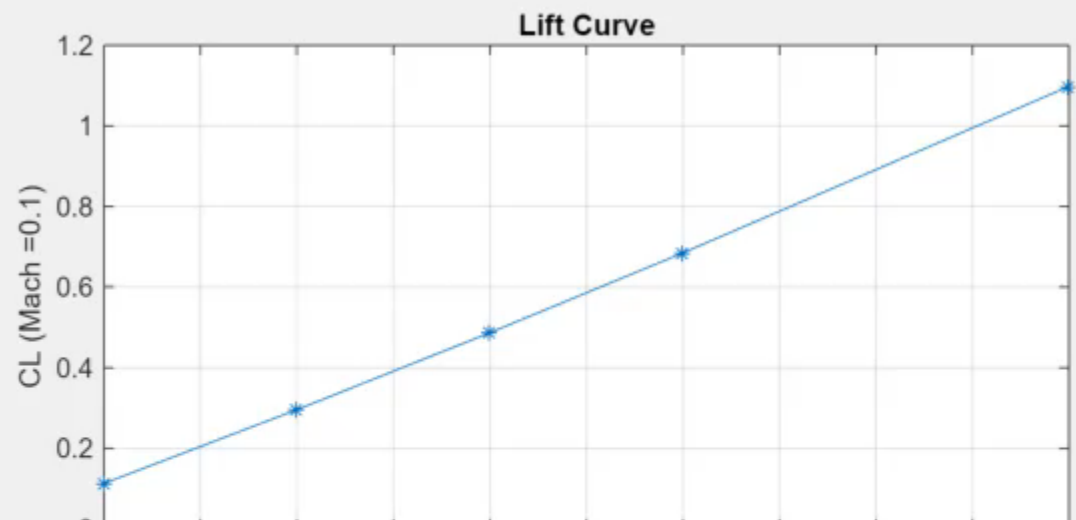
Analyze Data

Clear All

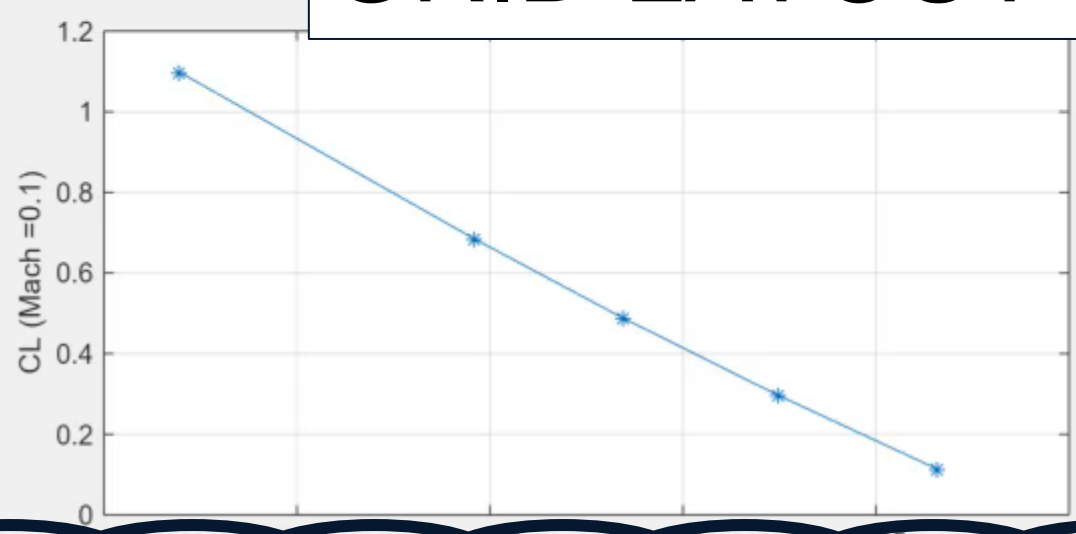
 Lift Curve Drag Polar Pitching MomentTILED LAYOUT - [tiledlayout](#)



Clear All  Lift Curve  Drag Polar  Pitching Moment



GRID LAYOUT - [uigridlayout](#)



File

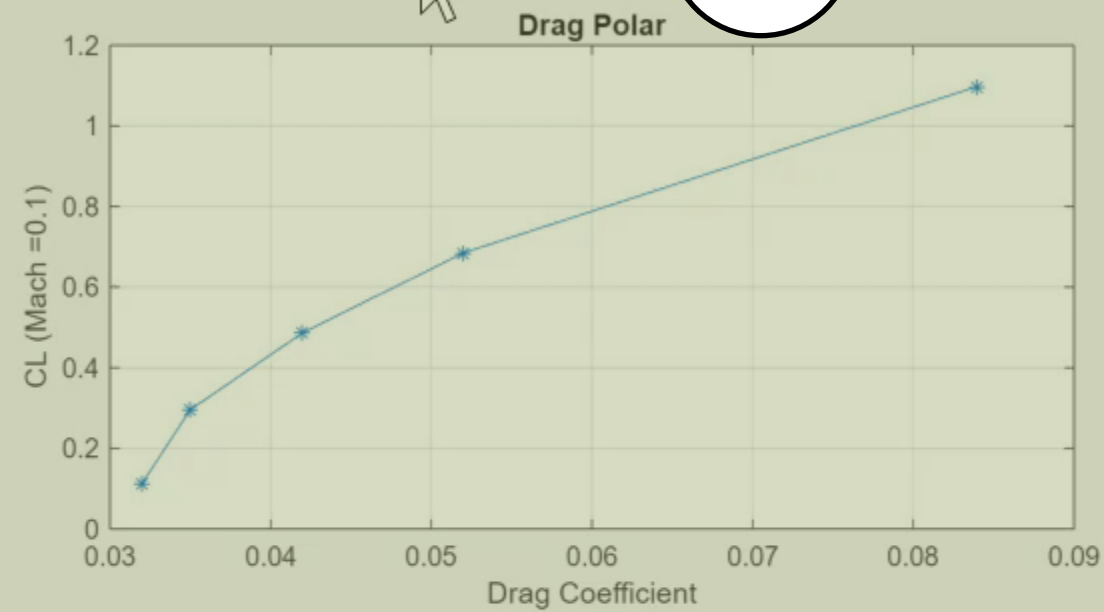
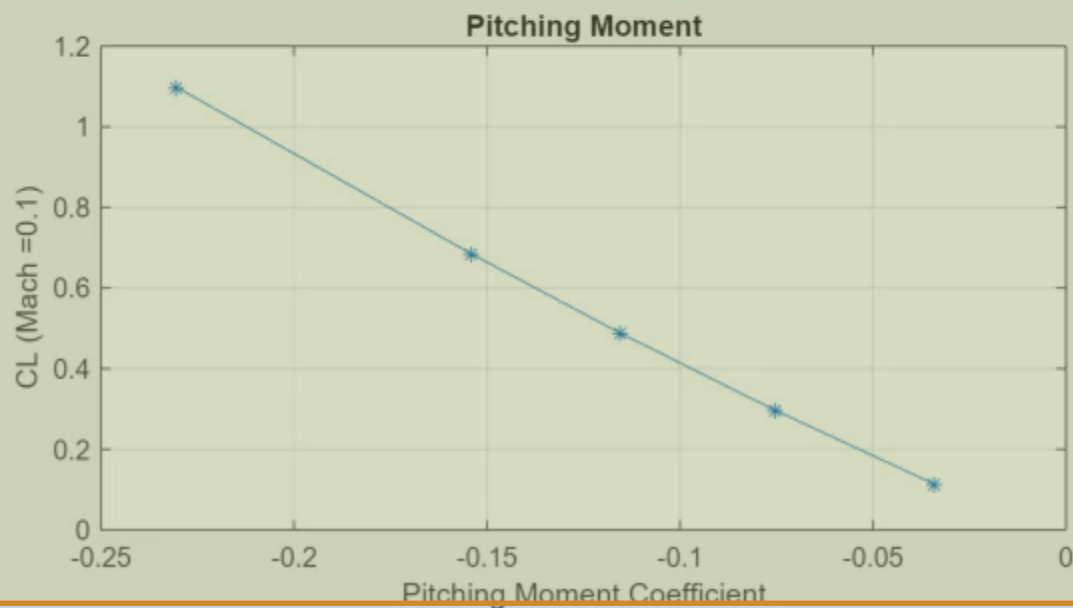
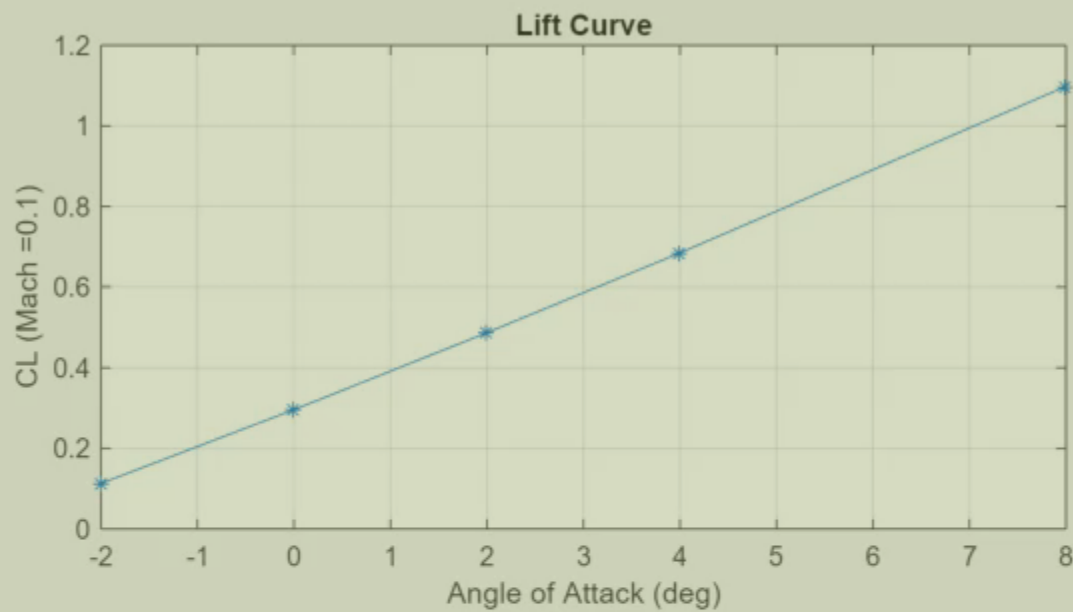
Load Data

Analyze Data

Clear All

 Lift Curve Drag Polar Pitching Moment

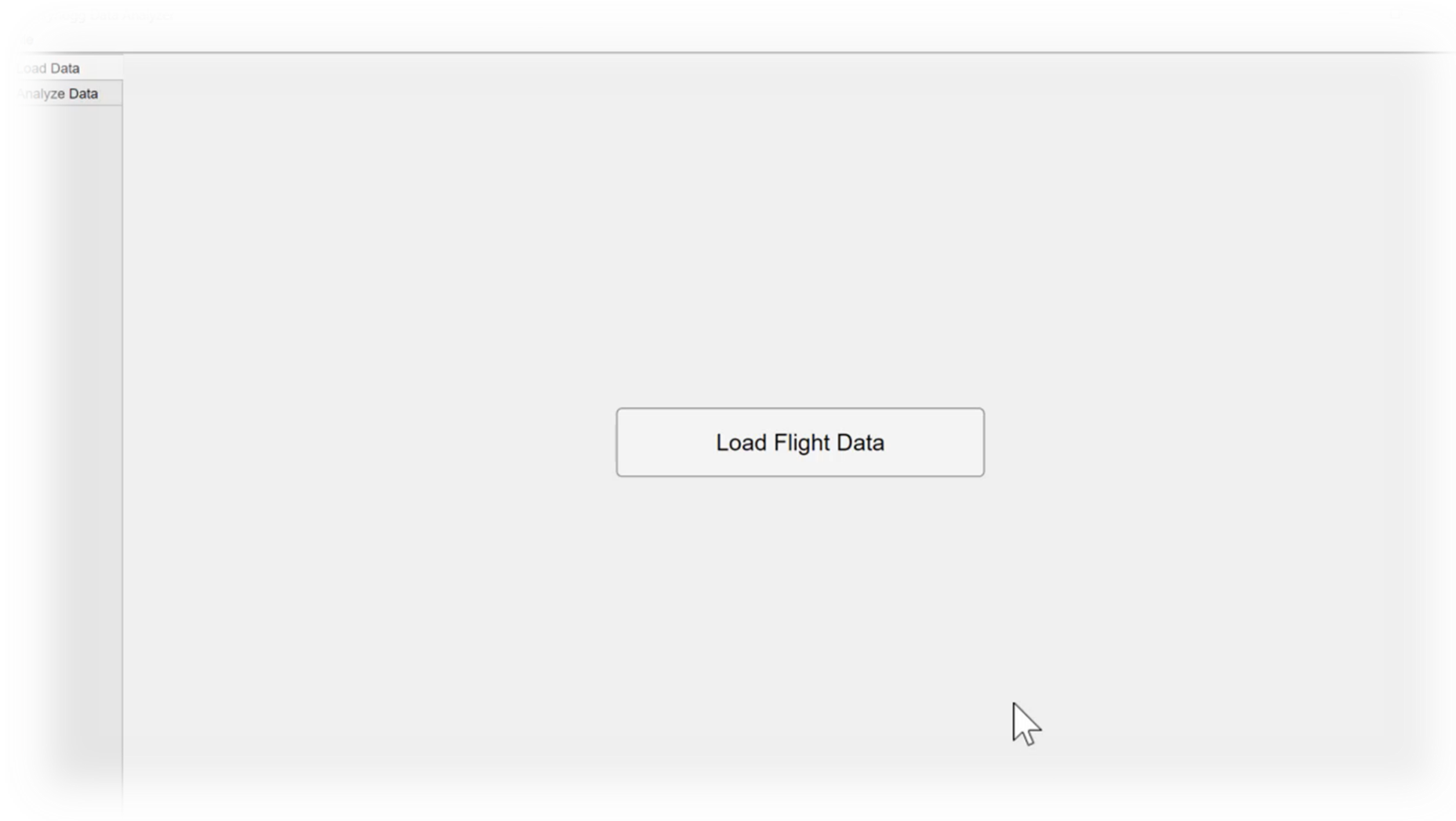
1



2

3

# Use Grid Layout to Enable Dynamic Positioning



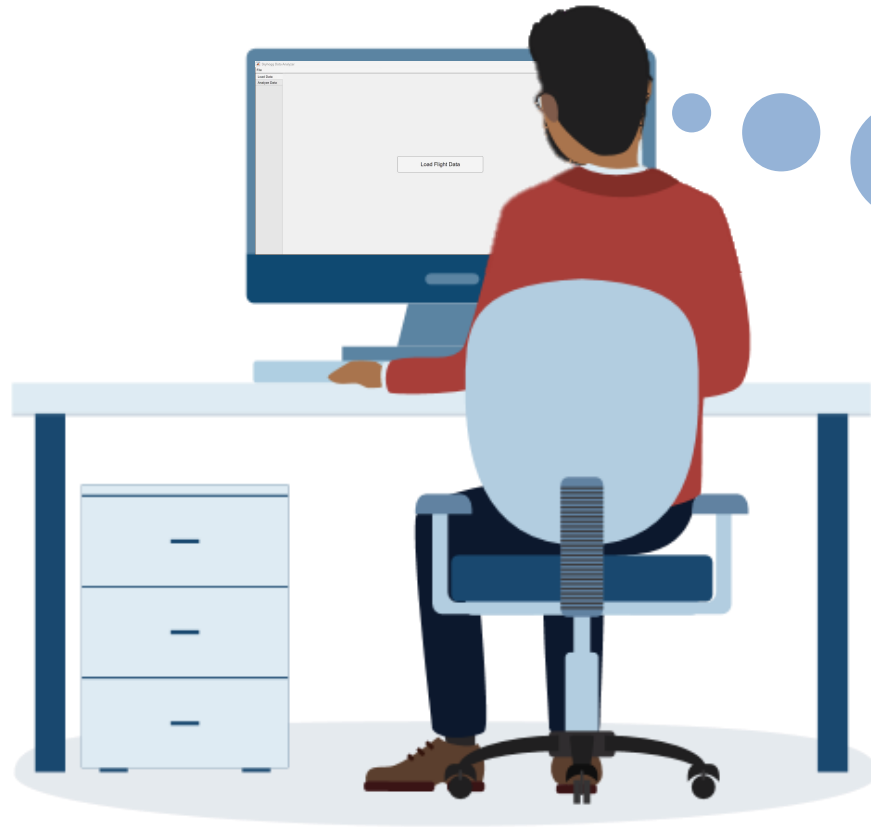
More details in the handout.



# How To Optimize the User Experience of Your MATLAB Apps

1. Choose the correct position and size
2. **Set the expectations**
3. Provide feedback to the user
4. Anticipate user errors
5. Provide documentation
6. Enhance the appearance

# Set the Expectations

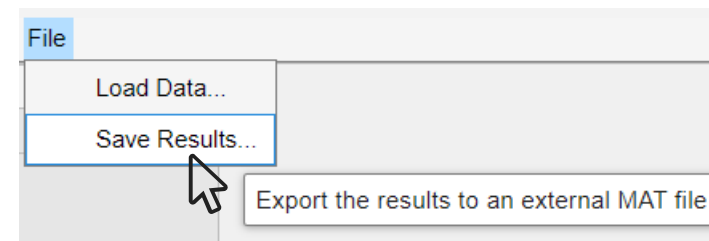
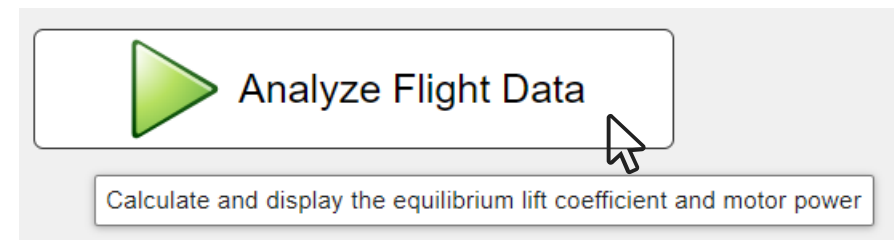
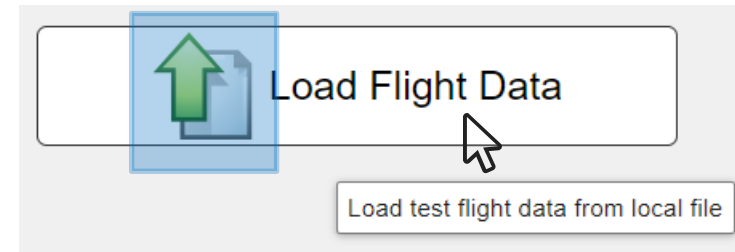
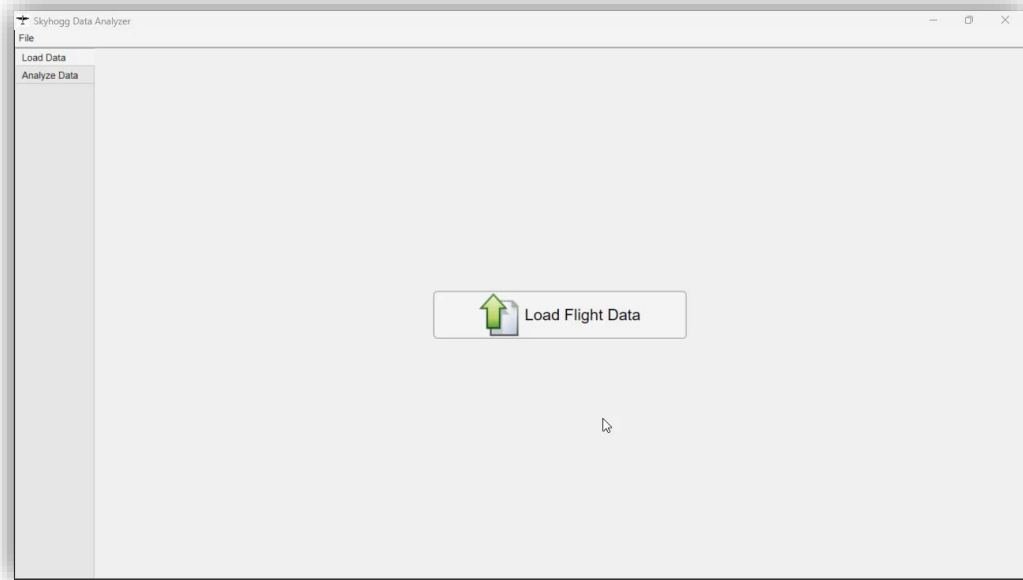


...What data do I need to provide?

...What is this app going to calculate?

...Can I shut this down safely?

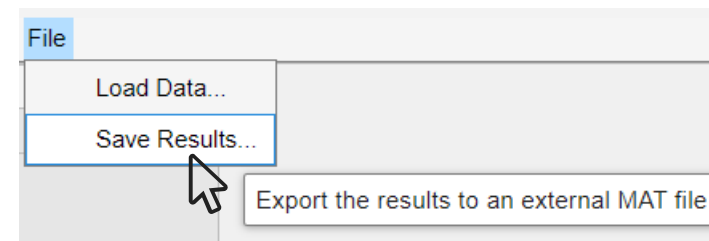
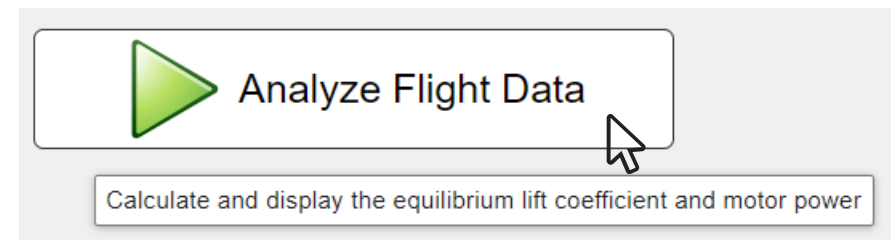
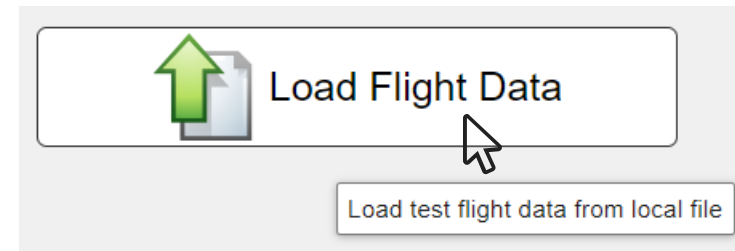
# Set the Expectations – Tooltips and Icons



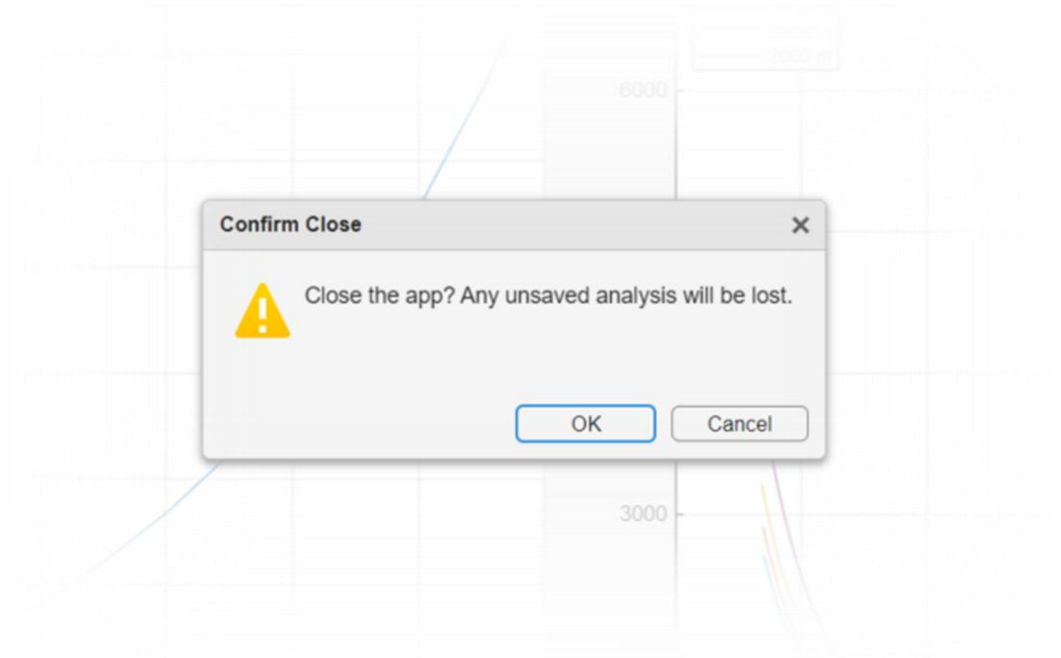
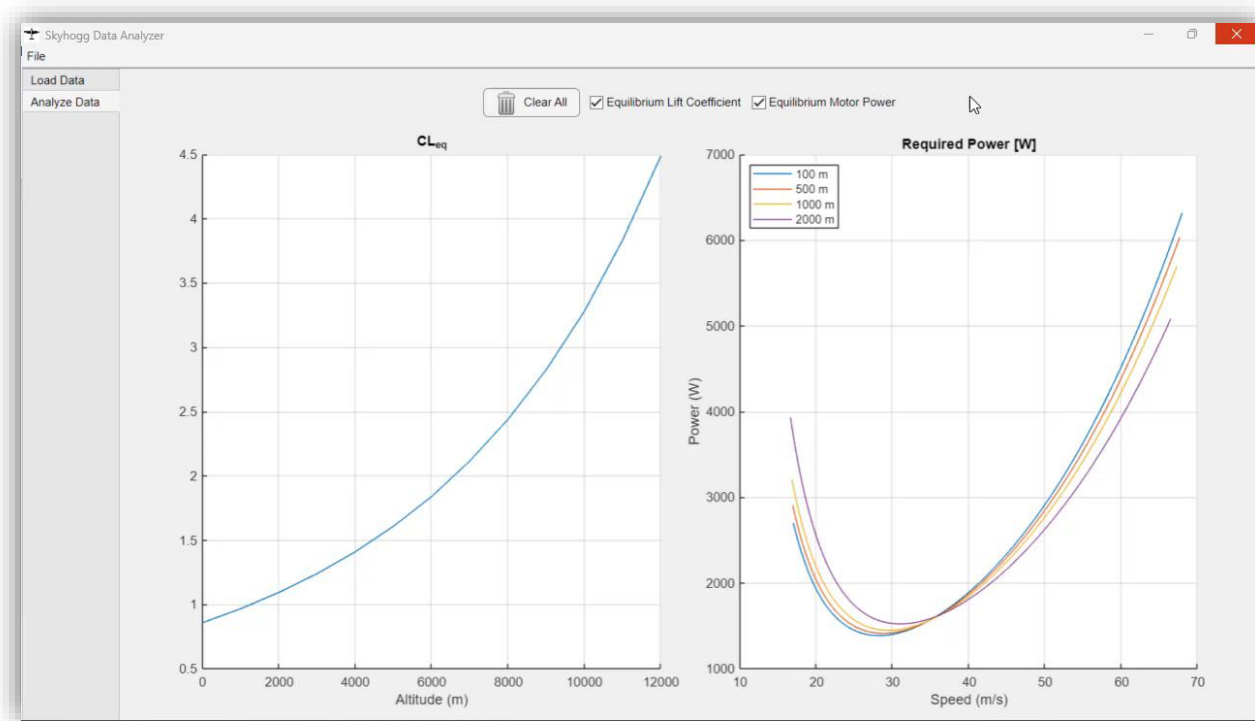
# Set the Expectations – Tooltips and Icons

“Icon” and “Tooltip” are properties of the UI component; set these using «dot» notation, e.g.:

```
obj = uibutton;  
obj.Icon = "myIcon.png";  
obj.Tooltip = "Description";
```



# Set the Expectations – Dialog Windows



Set expectations with dialog windows using:

- [uiaalert](#)
- [uiconfirm](#)

# How To Optimize the User Experience of Your MATLAB Apps

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# We Need Feedback



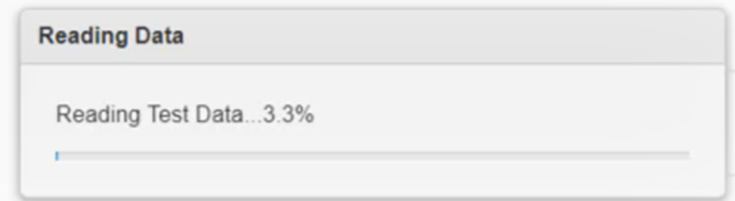
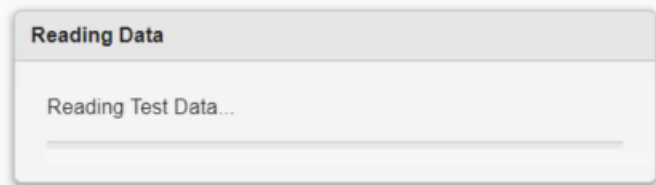
# Feedback Is Needed Also in Software



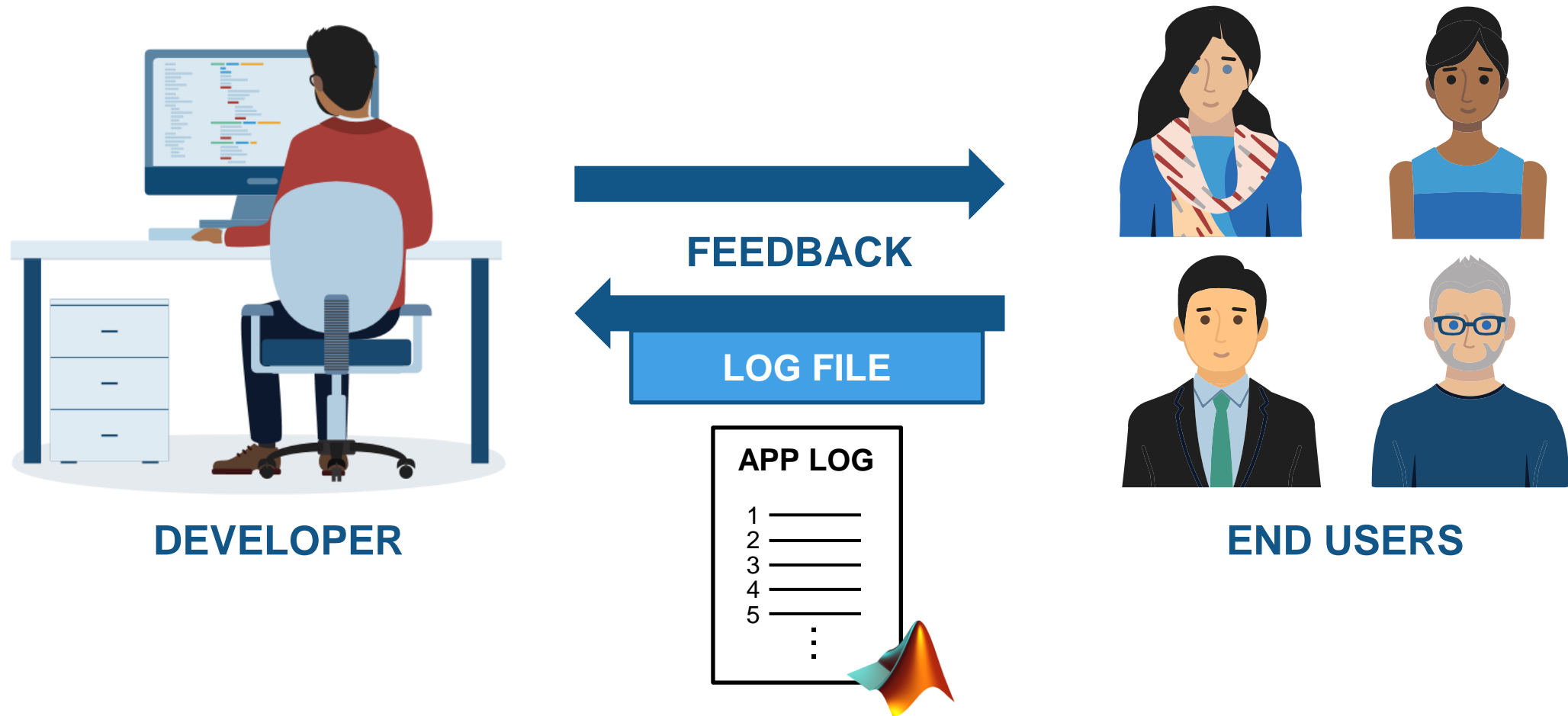


# Provide Feedback to the User – Progress Bar

uiprogressdlg

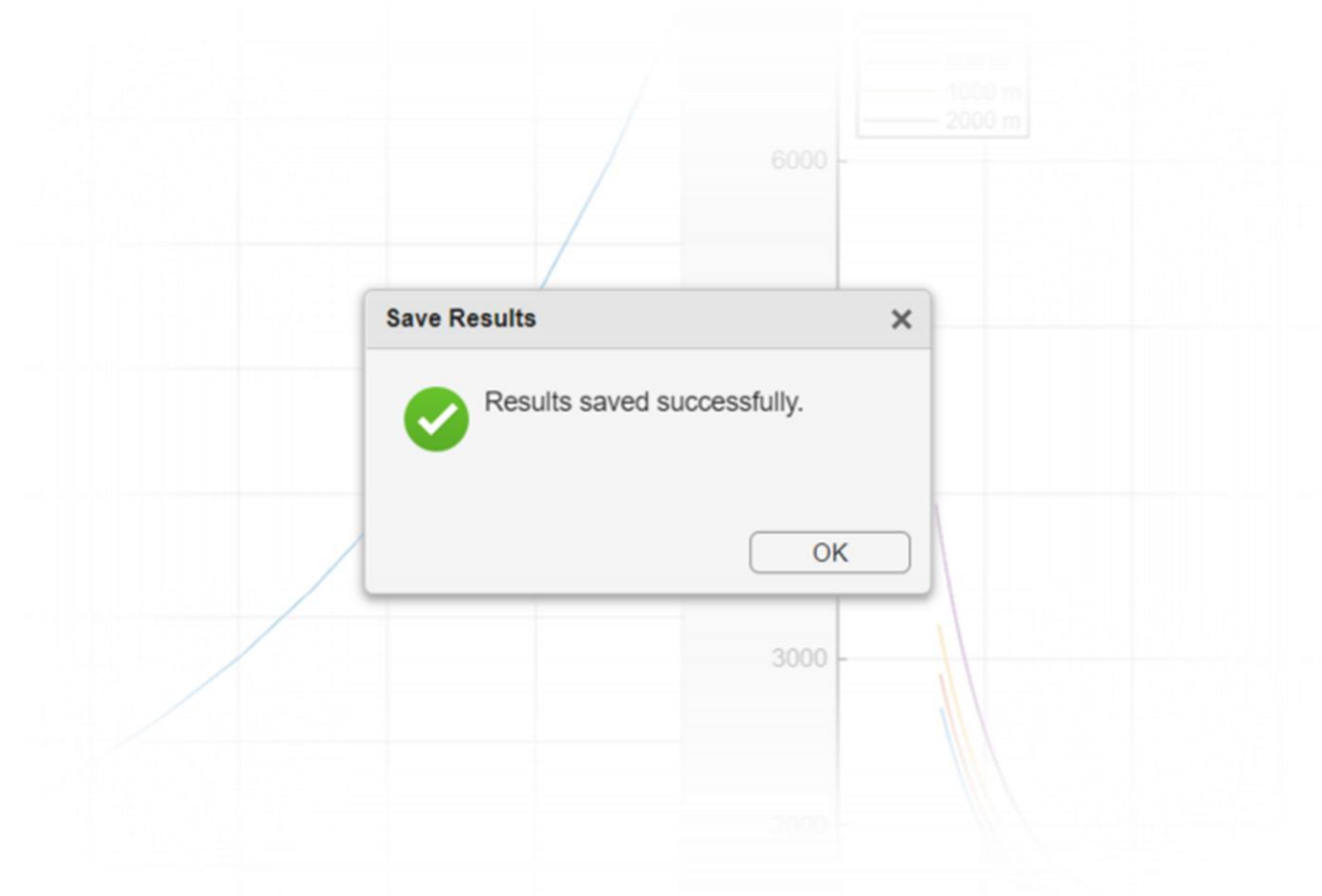


# Feedback Should Be Mutual

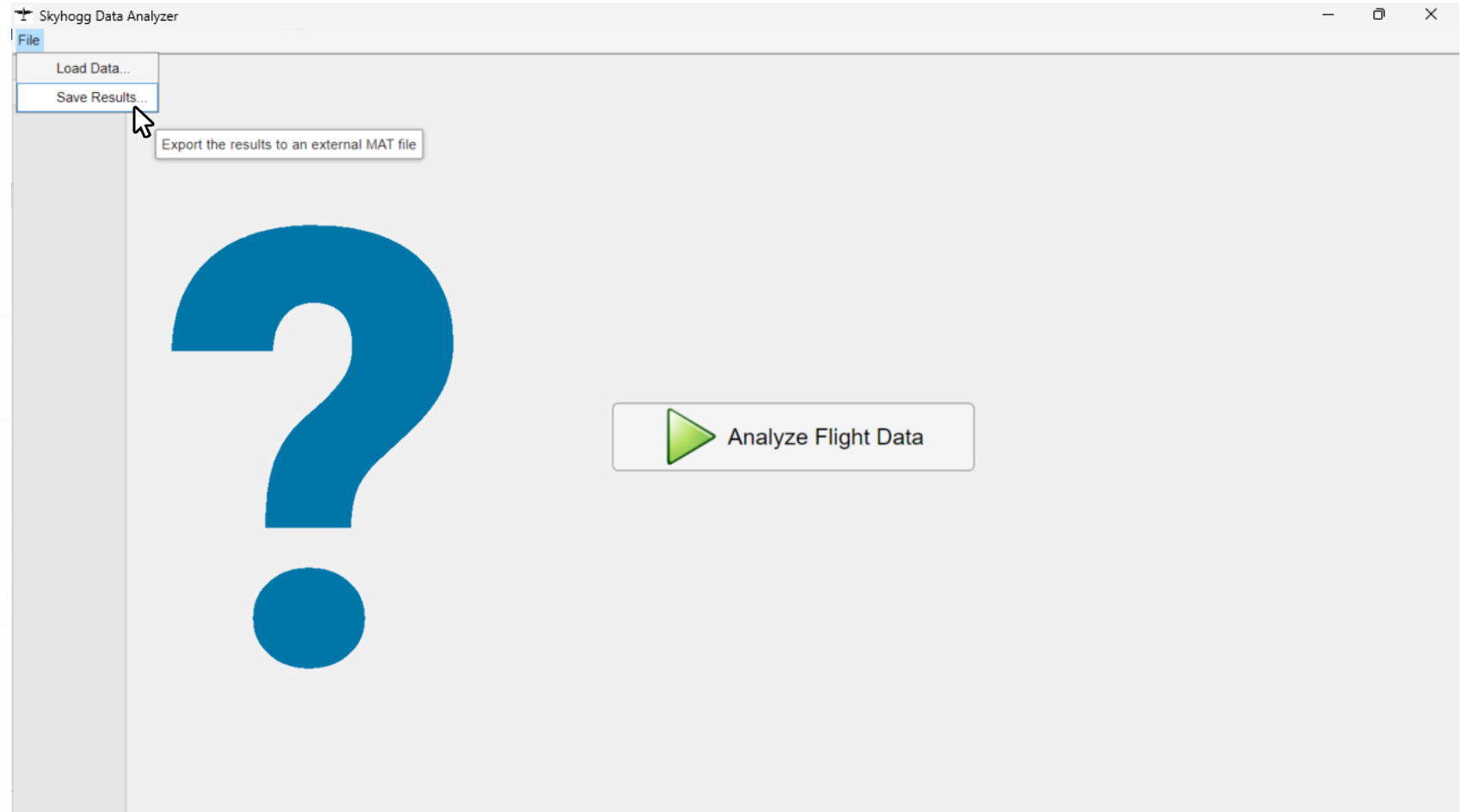


[Advanced Logger for MATLAB – File Exchange](#)

# Provide Positive/Negative Feedback



# Provide Positive/Negative Feedback



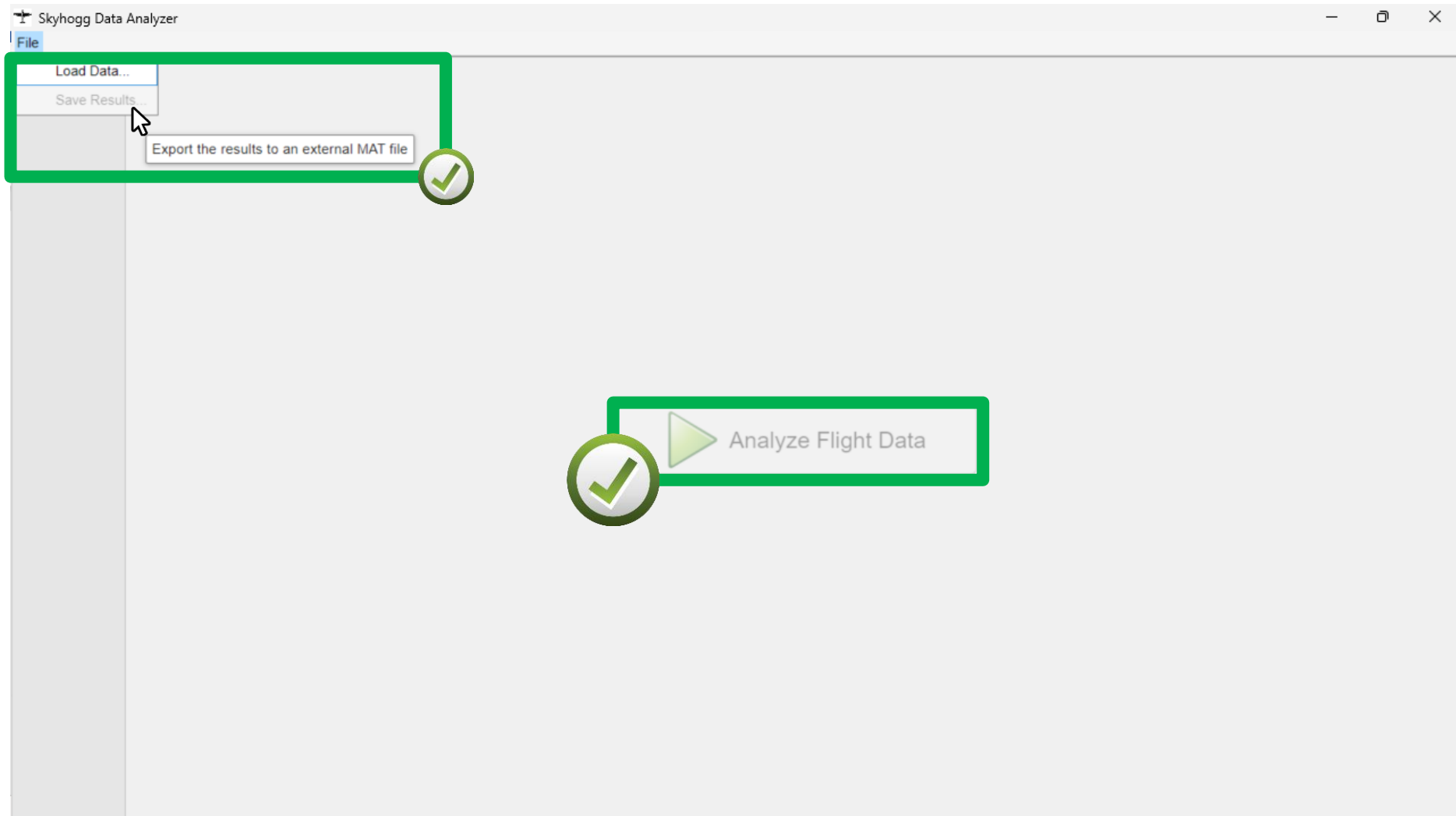
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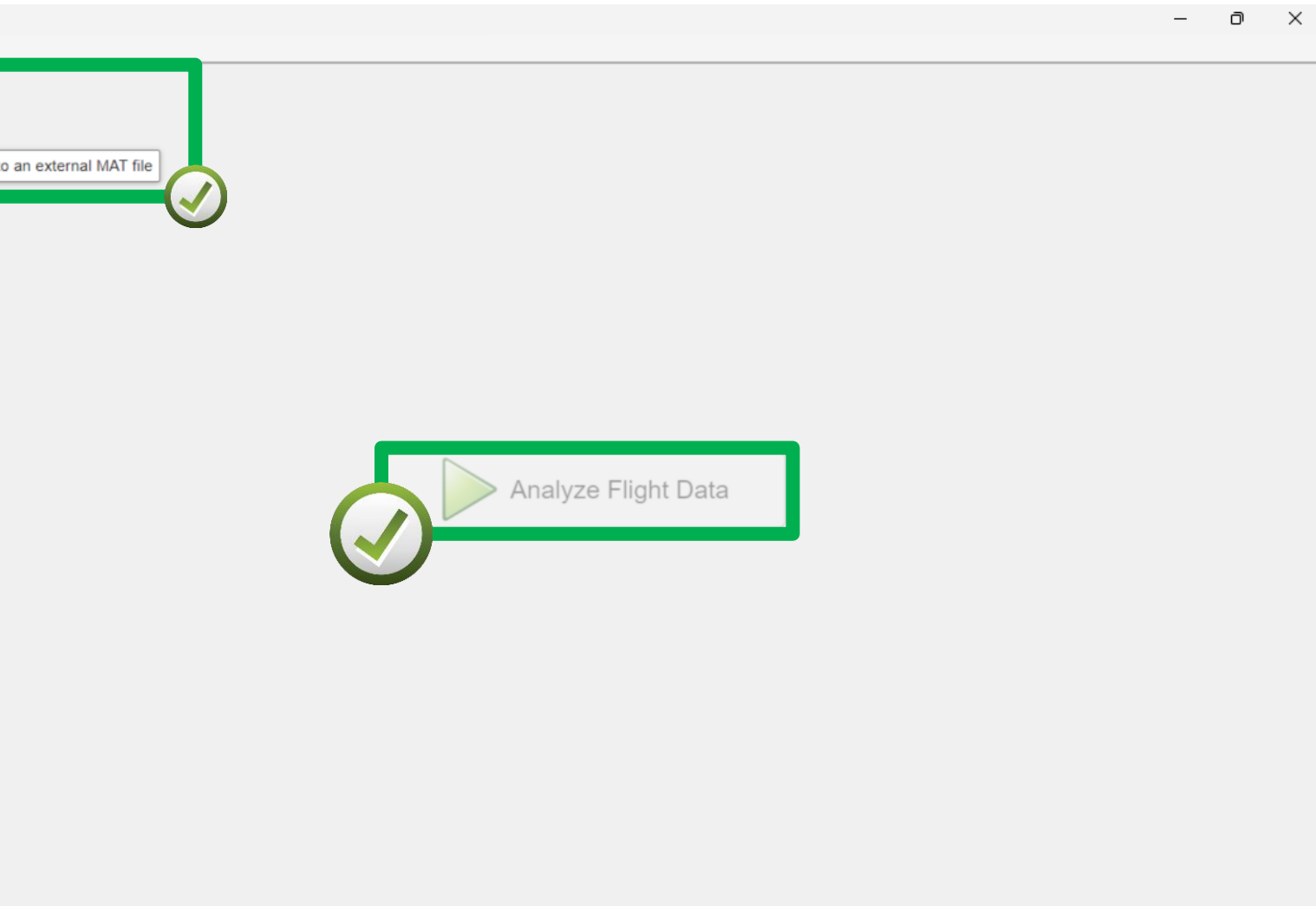
# Anticipate User Errors



# Anticipate User Errors



# Anticipate User Errors



## STARTUP:

```
button.Enable = "off";  
menu.Enable = "off";
```

## LOAD DATA...

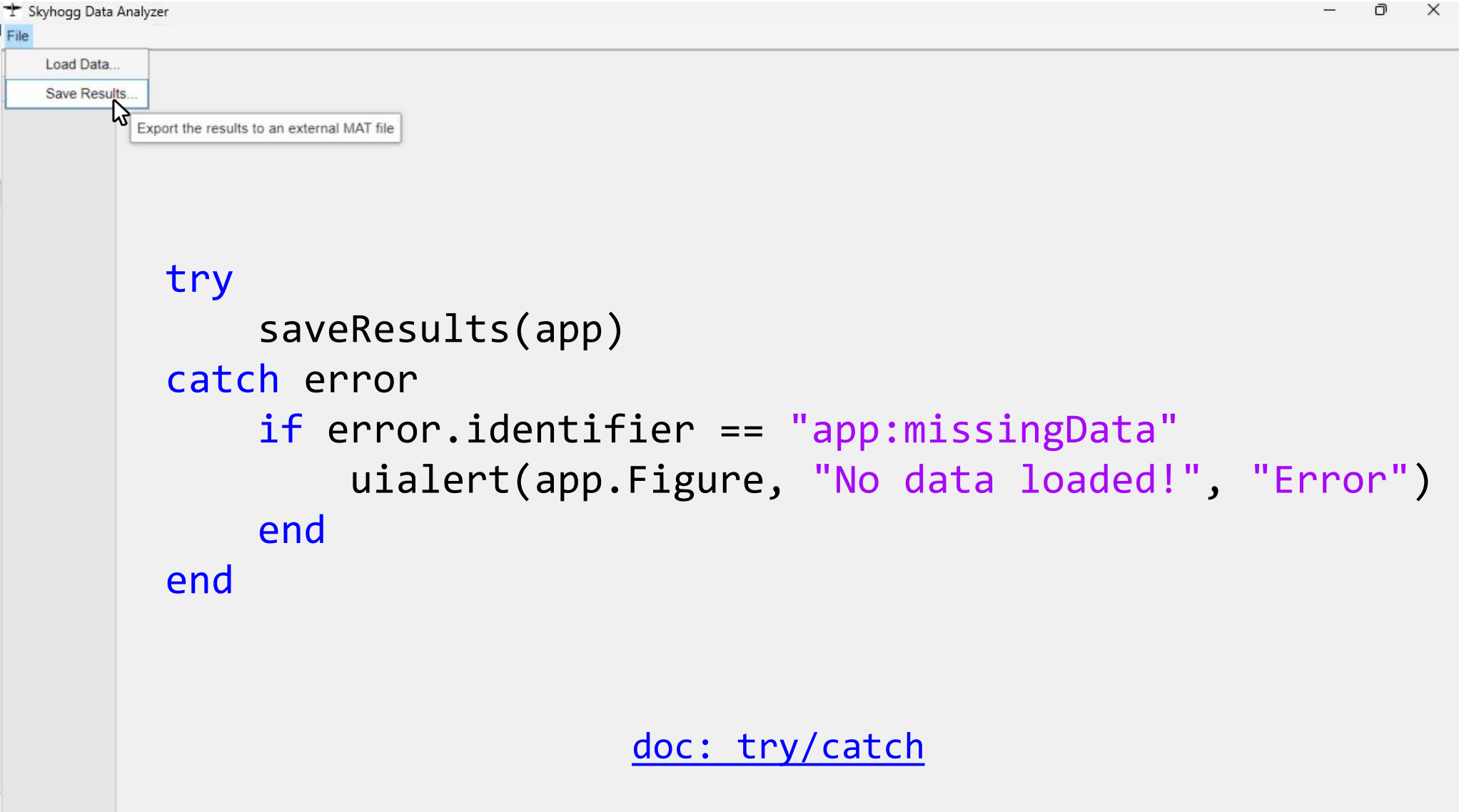
```
button.Enable = "on";
```

## ANALYZE DATA...

```
menu.Enable = "on";
```



# Anticipate User Errors – Try/Catch Block



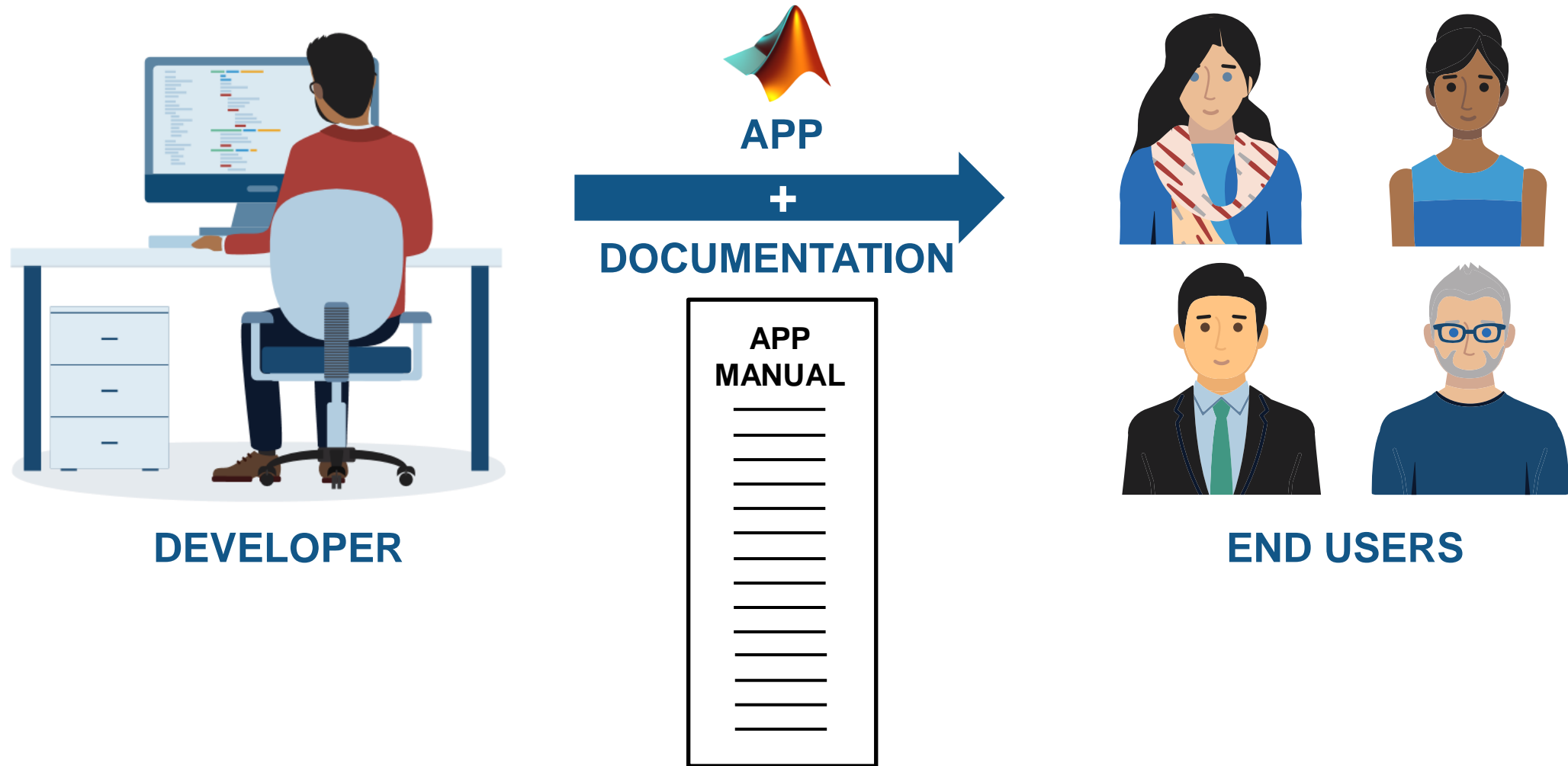
```
try
    saveResults(app)
catch error
    if error.identifier == "app:missingData"
        uialert(app.Figure, "No data loaded!", "Error")
    end
end
```

[doc: try/catch](#)

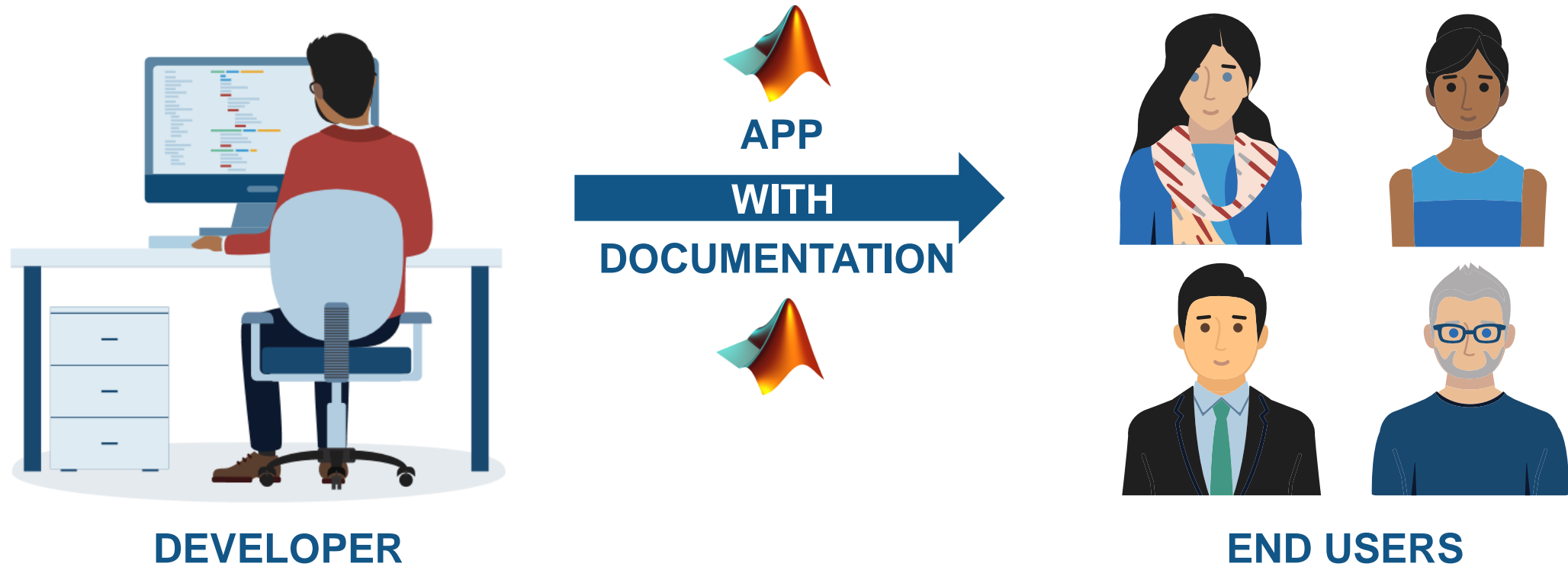
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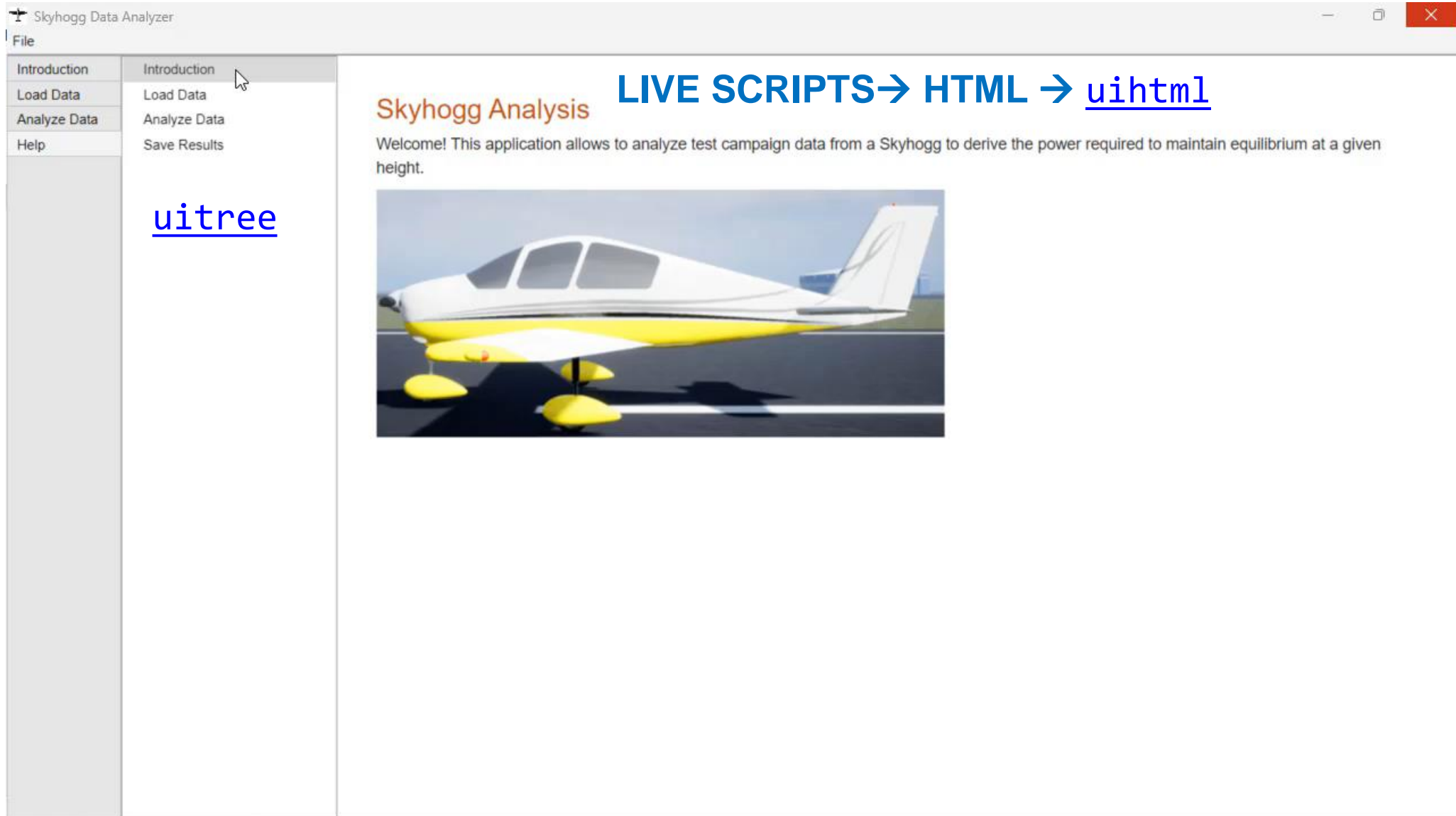
# Provide Documentation



# Provide Documentation



# Provide Documentation



The screenshot shows a MATLAB application window titled "Skyhogg Data Analyzer". The window has a menu bar with "File" and a toolbar with standard window controls. The main content area is divided into two panes. The left pane contains a menu with the following items: "Introduction", "Load Data", "Analyze Data", and "Help". The right pane displays the "Introduction" page, which includes the text "Skyhogg Analysis" in orange, followed by "LIVE SCRIPTS → HTML → [uihtml](#)" in blue. Below this is a welcome message: "Welcome! This application allows to analyze test campaign data from a Skyhogg to derive the power required to maintain equilibrium at a given height." and a 3D rendering of a white and yellow aircraft on a runway. The word "uitree" is written in blue in the left pane.

File

- Introduction
- Load Data
- Analyze Data
- Help

Introduction

Load Data

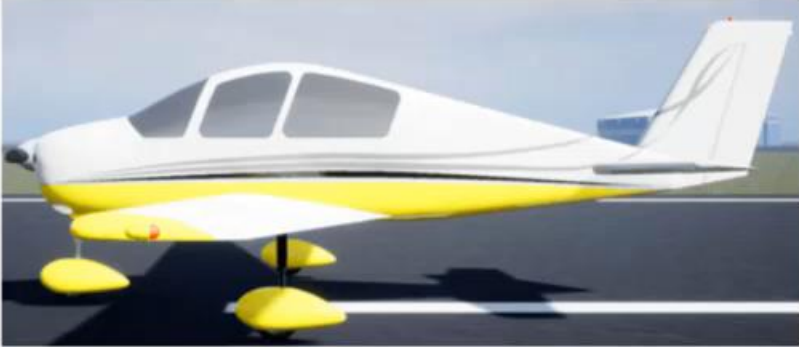
Analyze Data

Save Results

[uitree](#)

**Skyhogg Analysis** LIVE SCRIPTS → HTML → [uihtml](#)

Welcome! This application allows to analyze test campaign data from a Skyhogg to derive the power required to maintain equilibrium at a given height.

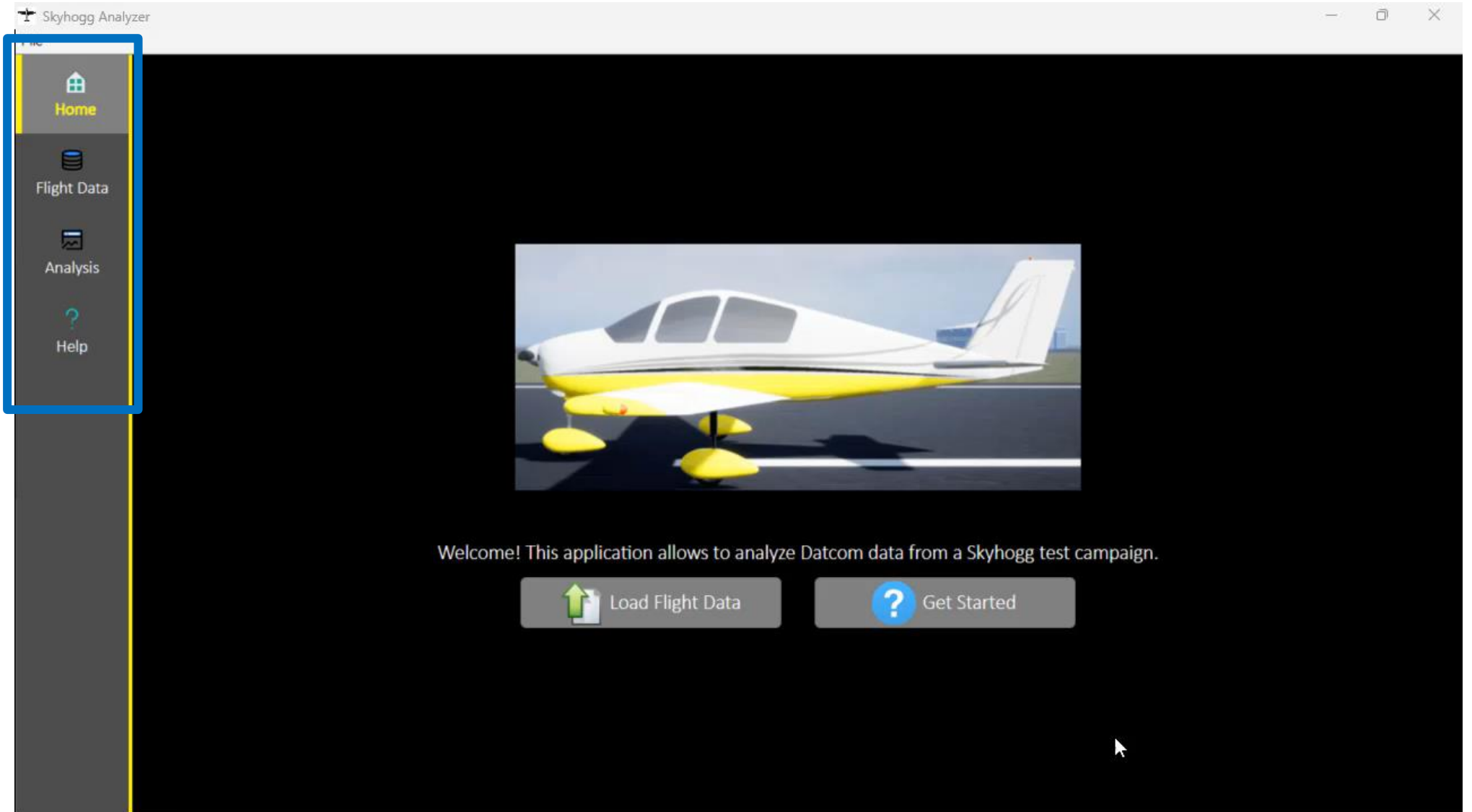


# How To Optimize the User Experience of Your MATLAB Apps

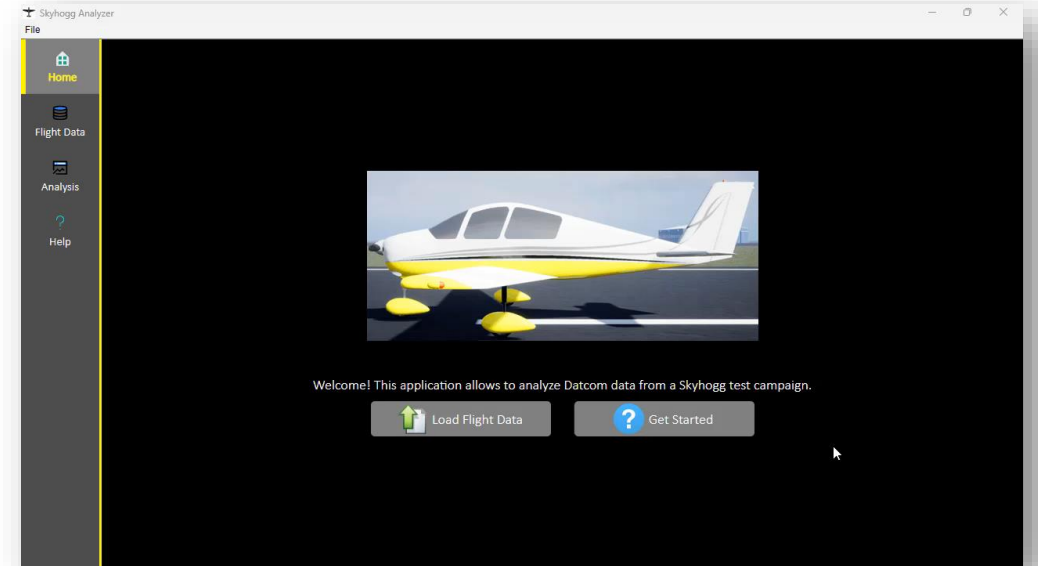
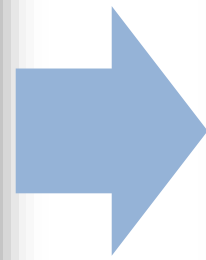
1. Choose the correct position and size
2. Set the expectations
3. Provide feedback to the user
4. Anticipate user errors
5. Provide documentation
6. **Enhance the appearance**

# Enhance the Appearance

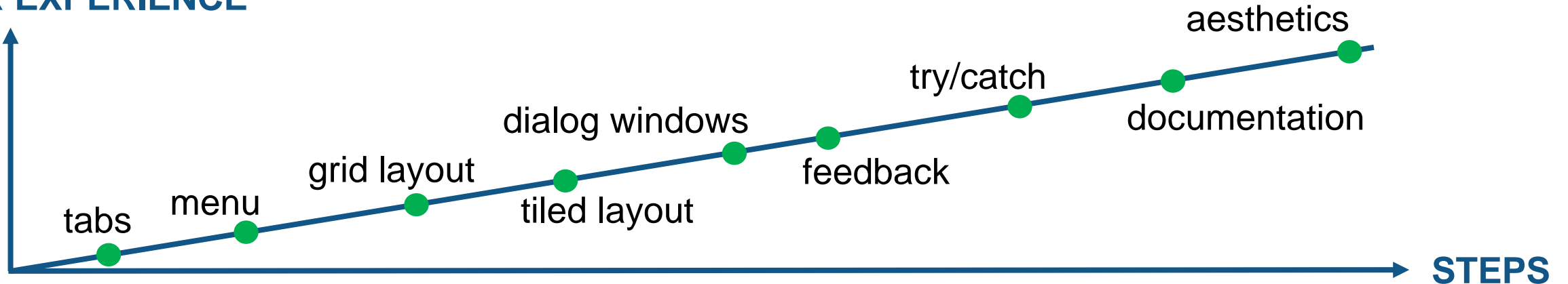
HTML  
+  
CSS  
+  
JavaScript  
+  
uihtml



# In Summary



## USER EXPERIENCE






# Conclusion

- **Key takeaways:**
  - Develop professional-grade apps with a great user experience in MATLAB
  - A user-friendly app will result increased productivity
- **Call to action:**
  - Use the tools and techniques learned in this presentation to optimize the user experience of your MATLAB apps

# Learn More

- Download the handout



## How To Optimize the User Experience of Your MATLAB Apps

This document provides some recommendations to improve the user experience of applications developed with MATLAB. Note: The content of this document should not be intended as an exhaustive list of actions to take to create an app with an optimal user experience.

### 1. Choose The Correct Position and Size

- ✓ [uimenu](#) – use as an API for loading and saving data, and to provide access to unfrequently-used app functionalities.
- ✓ [uitab](#), [uitabgroup](#) – separate different parts of the workflow, convert multi-window apps to single-window apps, avoid concentrating all the UI components into a single panel.
- ✓ [uitoolbar](#) – alternative for menu, use as an API for functionalities that always need to be readily accessible.

# MATLAB EXPO

Thank you



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