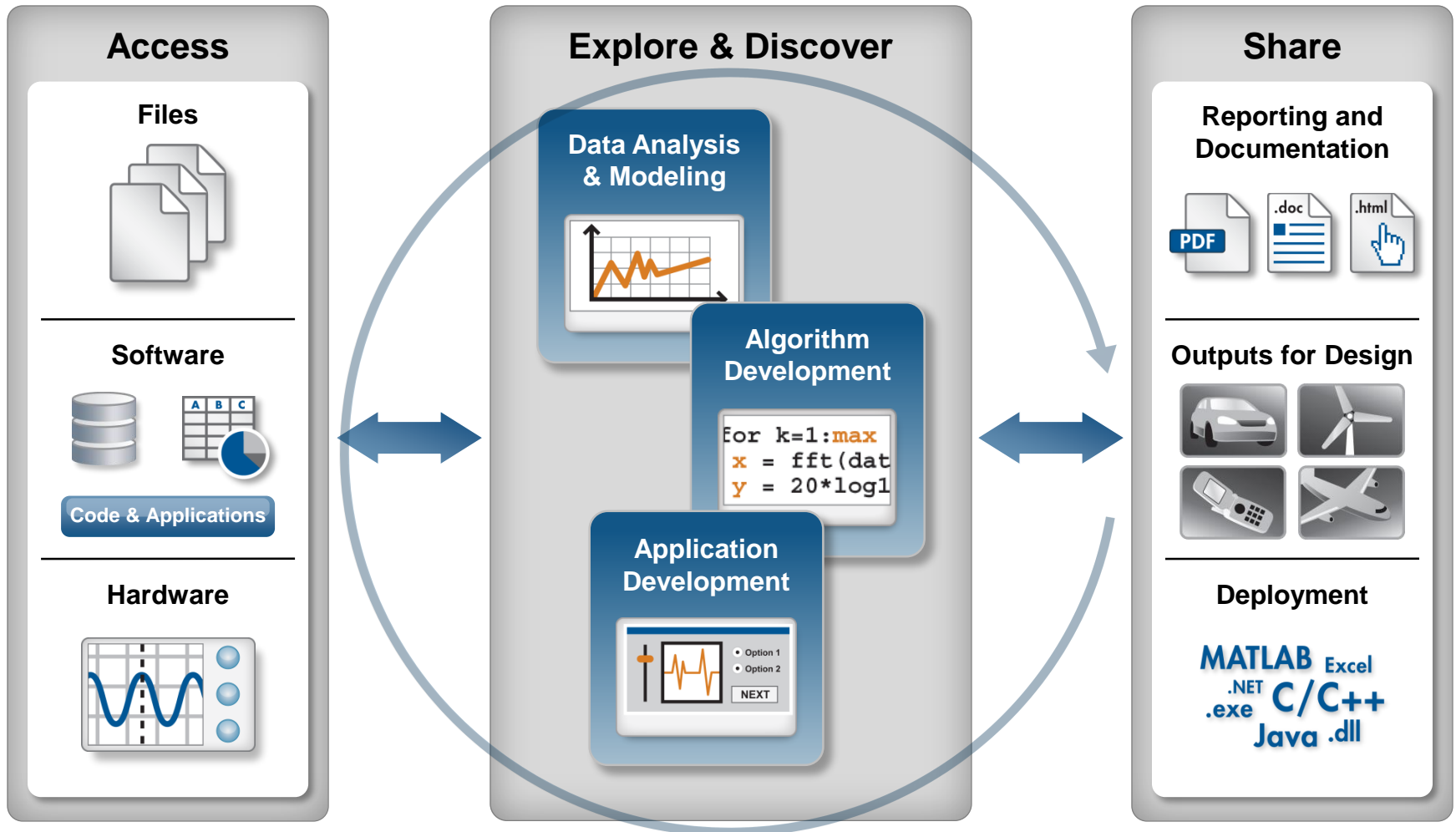


Introduction to Data Analysis in MATLAB

- Bring data into MATLAB from Excel and text files, databases and devices
- Visualize, process and analyze data
- Automate data analysis and create reports

Kameswarie Nunna, PhD
Academic Technical Specialist
MathWorks

Technical computing workflow



Automate

Flutter = bad



Flutter = really bad



Flutter suppression controller analysis

Challenge:

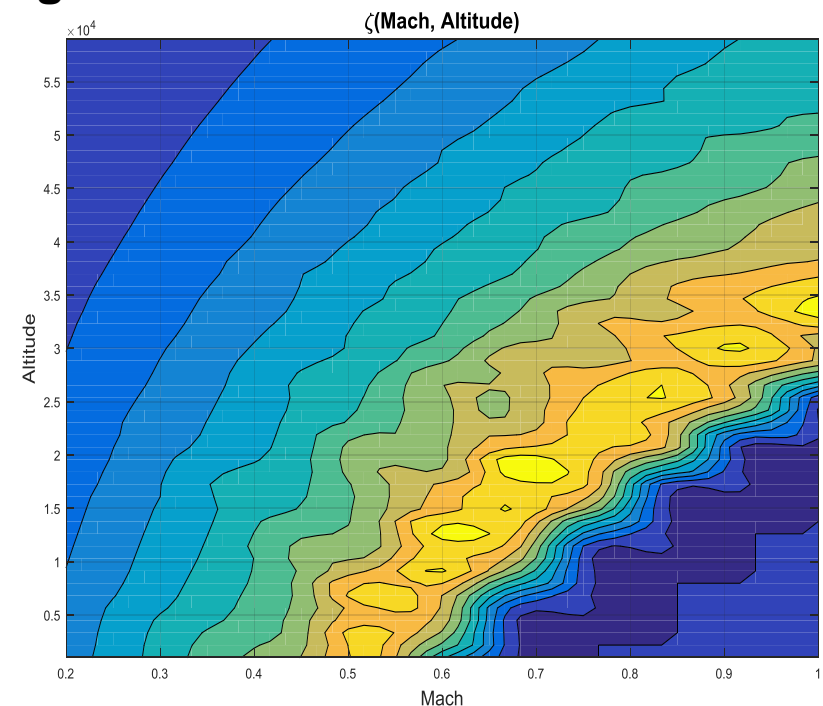
Find stability boundary of flutter suppression controller

- Model **damping ratio** of sensor position as function of **Mach** and **altitude**
- Test data in 330 spreadsheets (for varying **Mach** and **altitude**)
- For each dataset need to compute **damping ratio**

```

res_mach_0.200_alt_1000.csv
res_mach_0.200_alt_3000.csv
res_mach_0.200_alt_5000.csv
res_mach_0.200_alt_7000.csv
res_mach_0.200_alt_9000.csv
res_mach_0.200_alt_11000.csv
res_mach_0.200_alt_13000.csv
res_mach_0.200_alt_15000.csv
res_mach_0.200_alt_17000.csv
res_mach_0.200_alt_19000.csv
res_mach_0.200_alt_21000.csv
res_mach_0.200_alt_23000.csv
res_mach_0.200_alt_25000.csv
res_mach_0.200_alt_27000.csv
res_mach_0.200_alt_29000.csv
res_mach_0.200_alt_31000.csv

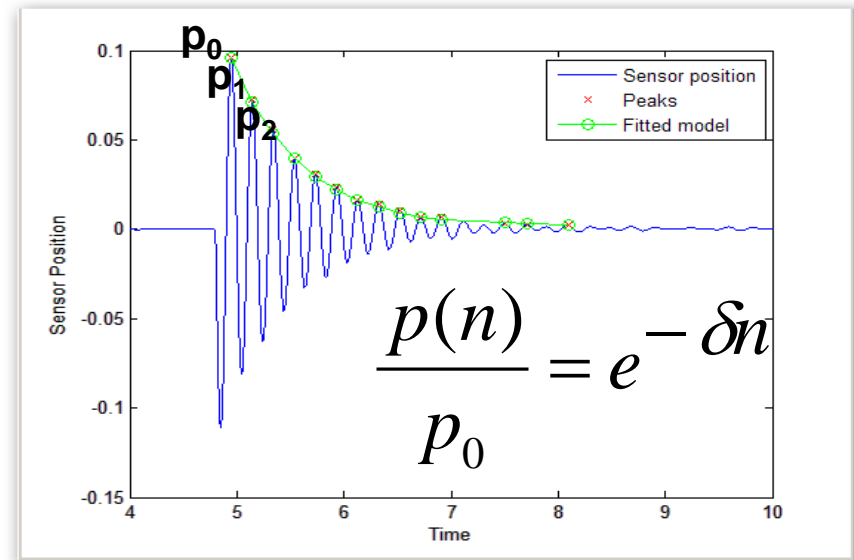
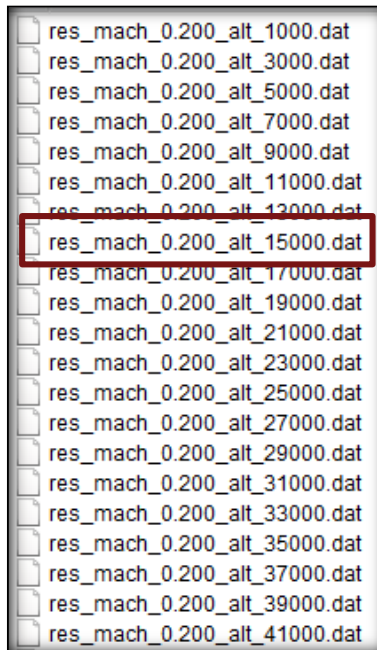
```



Flutter suppression controller analysis

Approach:

- Compute damping ratio for a signal in a single file
- Save the processing routines as a script



$$\text{Damping ratio } \zeta = \frac{\delta}{\sqrt{(2\pi)^2 + \delta^2}}$$

Flutter suppression controller analysis

Approach:

- Compute damping ratio for signal in a single file
- Save the processing routines as a script
- **Compute ratio for each file using batch processing**
- **Model the result**

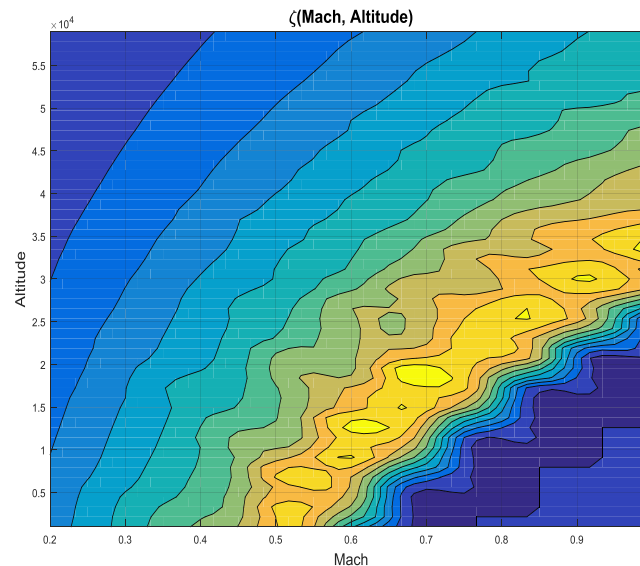
330 data files with varying Mach and Altitude

Damping ratio as a function of Mach and Altitude

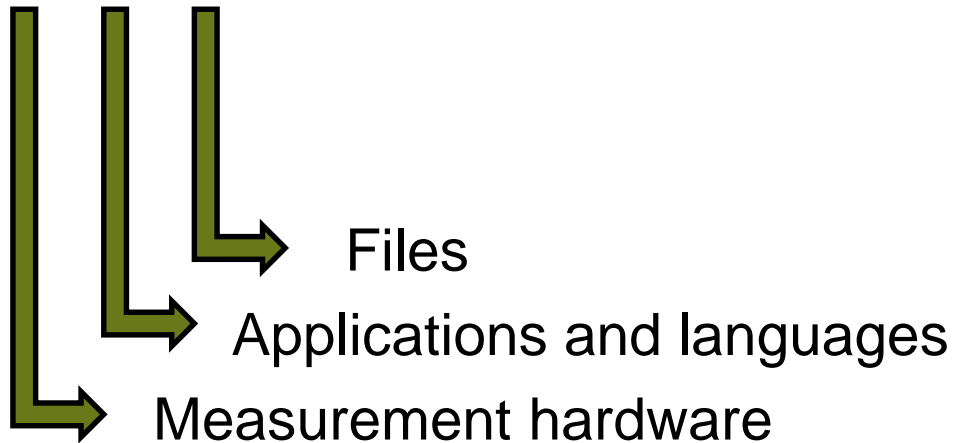
Report to share

```

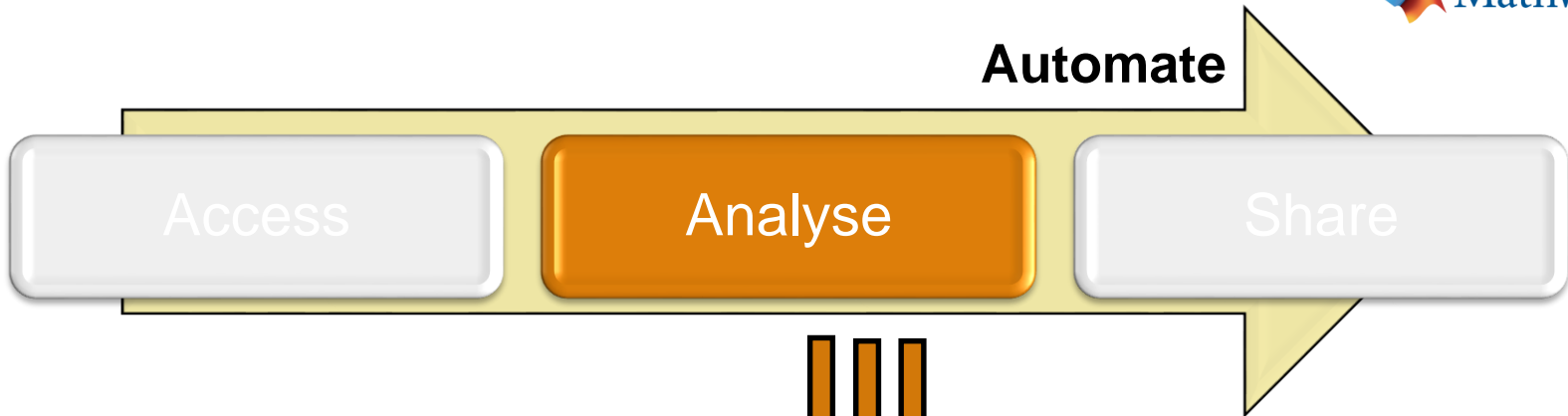
res_mach_0.200_alt_1000.dat
res_mach_0.200_alt_3000.dat
res_mach_0.200_alt_5000.dat
res_mach_0.200_alt_7000.dat
res_mach_0.200_alt_9000.dat
res_mach_0.200_alt_11000.dat
res_mach_0.200_alt_13000.dat
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res_mach_0.200_alt_33000.dat
res_mach_0.200_alt_35000.dat
res_mach_0.200_alt_37000.dat
res_mach_0.200_alt_39000.dat
res_mach_0.200_alt_41000.dat
    
```



Automate



- res_mach_0.200_alt_1000.dat
- res_mach_0.200_alt_3000.dat
- res_mach_0.200_alt_5000.dat
- res_mach_0.200_alt_7000.dat
- res_mach_0.200_alt_9000.dat
- res_mach_0.200_alt_11000.dat
- res_mach_0.200_alt_13000.dat**
- res_mach_0.200_alt_15000.dat
- res_mach_0.200_alt_17000.dat
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- res_mach_0.200_alt_37000.dat
- res_mach_0.200_alt_39000.dat
- res_mach_0.200_alt_41000.dat



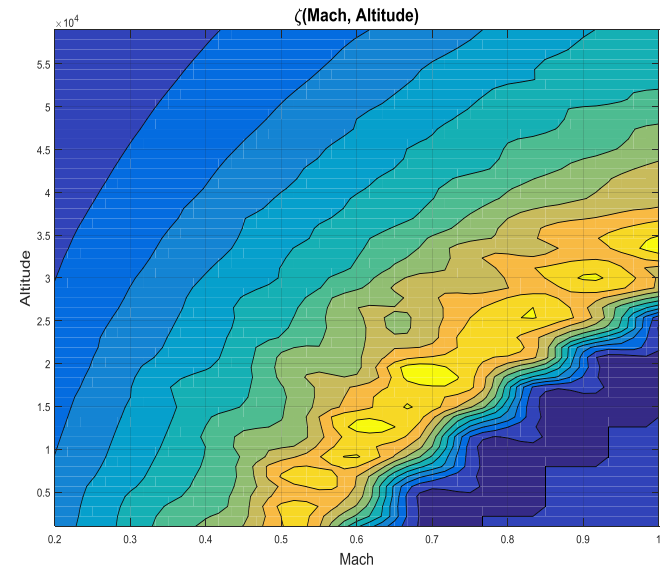
- Data analysis

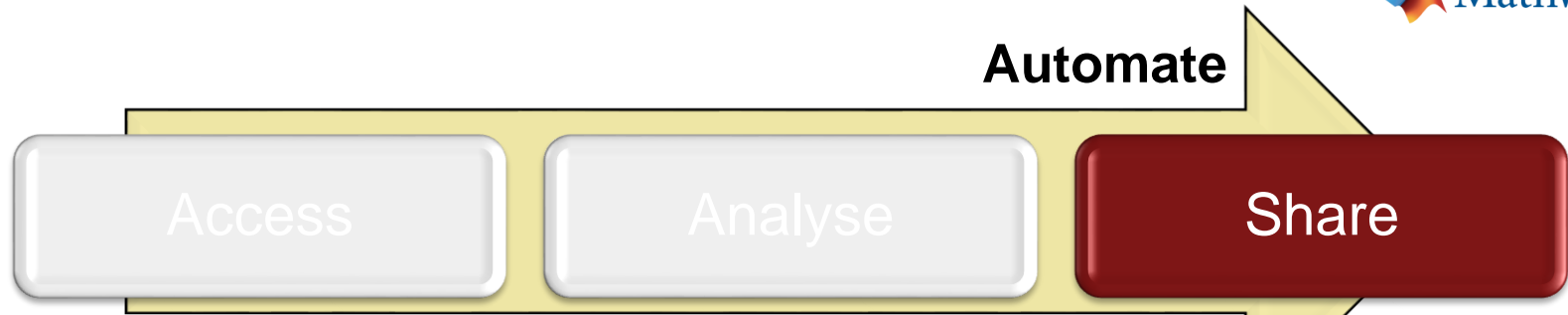
- Manipulate, preprocess, and manage data
- Fast, accurate analysis with pre-built math and engineering functions

Visualize data
 Compute ζ for single file
 Run over all files batch processing

- Visualization

- Built in graphics functions for engineering and science (2D, 3D)
- Interactive tools to annotate and customize graphics





- Automatically generate structured reports
 - Published MATLAB files
 - MATLAB® Live Editor
- Create apps and toolboxes
 - App designer
 - Package Toolbox
- Deploy applications to other environments



Benefits of MATLAB for data analysis applications

- Easy to prototype and find solutions
- Automatic code generation accelerates process
- Single software for the entire workflow

