인공지능 및 엔터프赖이즈 환경 개발을 위한 빅데이터 개발 프레임워크

성호현
A path for how your team can better work with and utilize data.
Data Science Maturity Levels

- Ad-hoc Individual Analysis
- Generally Useful Tools for Analysis
- Common Infrastructure; Tested and Documented

Ease of scaling to more people
Overhead when asking a new question
Data Science Maturity Levels

- Ad-hoc Individual Analysis
- Generally Useful Tools for Analysis
- Common Infrastructure; Tested and Documented

• Goal is to be fast: reduce time to insight
Getting Started: Exploring a New Dataset
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Getting Started: Exploring a New Dataset

- Missing Data
  - `ismissing`
  - `rmmissing`
  - `fillmissing`

- Outliers
  - `isoutlier`
  - `rmoutliers`
  - `filloutliers`

- Change Points
  - `ischange`

- Noisy Data
  - `smoothdata`

and more...

Getting Started: Exploring a New Dataset

Load 4Hz Data
Load data from same flight that was sampled at 4Hz.

```
Import4HzData
t4hz = table2timetable(flightData4Hz)
```

Synchronize 1Hz and 4Hz Data
Join the 1Hz and 4Hz data using the synchronize command. The synchronize command gives us flexibility in how the synchronize occurs. Here, we use the default synchronize method which synchronizes the
Getting Started: Exploring a New Dataset

Visualizing the Flight Path

```matlab
figure;
inFlight = t.WOW==1;
geoplot(t.LATP(inFlight),t.LONP(inFlight),'LineWidth',3);
```
Data Science Maturity Levels

- Explore and understand data
- Document analysis
- Tools will be re-used in next steps
Data Science Maturity Levels

Ad-hoc
Individual
Analysis

Generally Useful
Tools for
Analysis

Common
Infrastructure; 
Tested and Documented

• Apply to different datasets
  • Functions/Scripts
  • MATLAB Apps

• Trend: Work with BIG DATA
Overview of Flight Data

- 35 unique aircraft
- 180,000 unique flights
- 300 GB of data

Source:
- NASA Dash Link: Sample Flight Data
  - https://c3.nasa.gov/dashlink/projects/85/
Big Data Creates Opportunities

- Find rare events, then dive deeper
- Build and validate test scenarios that match real-world conditions
- Perform fleet-wide calculations
Big Data Requires New Tools

Create a datastore from all CSV files

```matlab
ds = datastore('*.csv')
```

Read a single file of data

```matlab
data = read(ds);
```

Reset the datastore back to the first file

```matlab
reset(ds);
```

Find the maximum value of “Y” in each file

```matlab
X = [];
while hasdata(ds)
    data = read(ds);
    X(end+1) = max(data.Y);
end
```

<table>
<thead>
<tr>
<th>Built-In Datastores</th>
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<tbody>
<tr>
<td>General</td>
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Big Data Requires New Tools

Custom Datastore

- Customize a datastore to work with your dataset
- Gives you control over how data is loaded and formatted
- MATLAB subclass: “fill-in-the-blanks”
- Build a piece of infrastructure, then re-use it in your analyses

```matlab
function [data,info] = read(ds) ...
end

function tf = hasdata(ds) ...
end

function reset(ds) ...
end

function p = progress(ds) ...
end

function data = readall(ds) ...
end
```
A Custom Datastore for Flight Data

```
methods
    function fds = flightDataStore(location)
%
    % Basic datastore implementation
    function [data,info] = read(fds)
    function tf = hasdata(fds)
    function reset(fds)
    function frac = progress(fds)
    function data = readall(fds,iterDisp)
%
    % Custom methods for reading individual flight data
    function data = readFullFlight(fds,flightIdentifier)
```
Find Rare Events, then Dive Deeper

Incident Analysis
The data for tail 666 captures an engine fire that happened shortly after takeoff. This example analyzes data from that tail number to see if there is any interesting information that can be learned about how/when the fire occurred.

Search for Flights where the Engine 2 Fire Sensor Went True
Loop through all flights for this aircraft, and display some information if there is a fire.

```matlab
ds = flightDataStore('/Volumes/Ext/Data/FlightData/666/');
ds.SelectedVariableNames = {'FIRE_2'};
ds.AddFlightIdentifier = true;

results = table('Size',[0 2],'
'VariableTypes',
{categorical','double'},...
'VariableNames',{Flight','Fire_Seconds'});
while hasdata(ds)
t = read(ds);
if any(t.FIRE_2)
results = [results; {t.Flight(1), sum(t.FIRE_2)}];
end
end
results
```
Perform Fleet-Wide Calculations

Calculate fuel efficiency across all of the flights in the dataset.

Tall Arrays

Creating a tall array from the datastore gives us access to many built-in functions.

```matlab
ds = flightDataStore('/Volumes/Ext/Data/FlightData/');

TAS: True Airspeed (knots)
FF_N: Fuel Flow N (lbs/hr)
WOW: Weight On Wheels (logical)
```
Data Science Maturity Levels

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- Make it easy to navigate the data
- Re-use each time you analyze the dataset
Data Science Maturity Levels

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- Collaborate: Work with others on a common code base
- Verify: Write well-tested software
- Share: Build tools for others
MATLAB Projects
## Testing

![MATLAB Source Control Interface]

### Project: FlightDataToolbox

#### Files

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#### Command Window

```matlab
fx >>
```
Creating a Toolbox
Data Science Maturity Levels

- Ad-hoc Individual Analysis
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- Scale-out to larger group of users
- Easier to maintain and share
What’s Next?

Advanced Analytics and Machine Learning

Build and Test Algorithms for Embedded Systems

Deploy Apps and Analytics to Enterprise IT Systems
Takeaways

- MATLAB has many new tools to help you better work with and utilize your data

- Create tools for you / your team / your organization to explore and analyze data

- Increasing maturity with data science is a journey; we’re here to help
MATLAB EXPO 2019

데모 부스와 상담부스로 질문 하시기 바랍니다.

감사합니다