Teaching in the Classroom: Then and Now
Workplace: Then

The term “computer”, in use from early 17th century, meant “one who computes”: a person performing mathematical calculations, before electronic computers became commercially available. Teams of people were frequently used to undertake long and often tedious calculations.

(Source: Wikipedia)
Workplace: Now
Technology Trends
Data Everywhere – Algorithms in Everything
Medical Devices

Aeronautics

Railway Systems

Automotive

Retail

Aeronautics

Off-highway vehicles

Industrial Automation

Oil & Gas

Clean Energy

Medical Devices

Fleet Analytics

Process Analytics

Health Monitoring

Prognostics

Retail Analytics

Condition Monitoring

Operational Analytics

Risk Analysis

Supply Chain

Mfg Process Analytics

Healthcare Analytics

Healthcare Management

Internet

Finance

Logistics

MATLAB EXPO 2017
Companies using MathWorks products
Why MATLAB?

The One App You Need On Your Résumé If You Want A Job At Google

JIM EDWARDS
OCT. 17, 2014, 7:16 AM
141,772 43

Google has more than 50,000 employees right now, and they earn great salaries.

Average pay at Google is $141,000.
It's relatively easy to get a job at Google, too.

The company is so large and has such a massive need for talent that hiring for Google is something of a headache, so if you have the right skills, Google is really enthusiastic to hear from you.

Especially if you know how to use MatLab, a code and data analysis and management tool.

We had never heard of MatLab, so we asked Rosenberg what it was.

For the uninitiated, MatLab lets developers code and arrange data and algorithms so that results are visual. (Yes, it’s complicated). The key here is that data is produced visually or graphically, rather than in a spreadsheet. Here is an example:

This is a Matlab surface 3-D plot of a two-dimensional unnormalized sinc function (obviously!). We got it from Wikipedia.
What is Data Analytics?

*Turn large volumes of complex data into actionable information*

- **Descriptive**
  - What happened?

- **Diagnostics**
  - Why did it happen?

- **Predictive**
  - What will happen?

- **Prescriptive**
  - What should be done?

Data → Decisions
Data Analytics Workflow

Access and Explore Data
- Files
- Databases
- Sensors

Preprocess Data
- Working with Messy Data
- Data Reduction/Transformation
- Feature Extraction

Develop Predictive Models
- Model Creation e.g. Machine Learning
- Parameter Optimization
- Model Validation

Integrate Analytics with Systems
- Desktop Apps
- Enterprise Scale Systems
- Embedded Devices and Hardware
Demo: Diagnosing Arrhythmia
Classification Learner App

% Train using fitglm.
GeneralizedLinearModel = fitglm(...
    concatenatedPredictorsAndResponse,
    'Distribution', 'binomial', ...'
    'link', 'logit');

% Convert predicted probabilities to pr
convertSuccessProbsToPredictions = @(p)
Demo: Deployed Analytics – Energy Load Forecasting

Predictive Data Analytics

This website tightly integrates MATLAB analytics with web technologies for demonstrating predictive data analytics models in production with live data.

Get started »

Demand Forecasting
Forecast electricity demand for US power grids with live data from ISOs and weather stations using Neural Network models. Forecasts can be compared to past data as well as normal weather. Prediction bands at different confidence intervals also quantify uncertainty in forecast.

Start »

Web Service Information
Documentation on end points and query parameters for demand forecast web services

Read more

App Document
Documentation of the en components

Coming soon

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Demo: Deployed Analytics – Energy Load Forecasting

MATLAB Production Server

Web Application Server
- Apache Tomcat
- Web Server/Webservice

MATLAB Production Server
- Request Broker
- MATLAB Production Server

MATLAB Desktop
- Train in MATLAB
- Predictive Models
- Weather Data
- Energy Data
Demo: Object Detection with Deep Learning

<table>
<thead>
<tr>
<th>Training</th>
<th>Millions of images from 1000 different categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prediction</td>
<td>Real-time object recognition using a webcam connected to a laptop</td>
</tr>
</tbody>
</table>
How Many Lines of Code Did We Use for Object Detection with Deep Learning?

```matlab
camera = webcam;  % Connect to the camera
nnet = alexnet;  % Load the neural net

while true
    picture = camera.snapshot;  % Take a picture.
    picture = imresize(picture, [227, 227]);  % Resize the picture.
    label = classify(nnet, picture);  % Classify the picture.

    image(picture);  % Show the picture.
    title(char(label));  % Show the label.
    drawnow;
end
```
Demo: Human Activity Analysis and Classification


Dataset available at: http://archive.ics.uci.edu/ml/datasets/Human+Activity+Recognition+Using+Smartphones
Internet of Things
Internet of Things
University College London Improves Computational Literacy with Online and Onsite MATLAB Training

Challenge
Enrich student coursework with project-based learning while enabling instructors to focus on teaching core concepts

Solution
Acquire a MathWorks Total Academic Headcount license and use MathWorks onsite training and online courses to accelerate student adoption of MATLAB campus-wide

Results
- Program scalability enabled
- Faculty and students focused on addressing real-world problems
- Students equipped with required tools and skills

“One advantage of teaching with MATLAB is that our students are exposed to a tool that is used in the commercial world. The quality of the learning materials delivered online and onsite was excellent, enabling me to focus on teaching analytics and working with students.”

Daniel Hulme
University College London

First-year students using MATLAB for mathematical modeling
Industry Links

“On one project, students used MATLAB to develop a solution that helped an energy company reduce costs by £59 million.”
MATLAB Enabled Campus for Everyone, Anywhere

MATLAB Courseware
Cody Coursework Autograding
MATLAB Academy
MATLAB Online
MATLAB Central

Student Competitions

Big Data Support
Dedicated Engineers

Low-Cost Hardware Support
Project-Based Learning

On-Campus Events
Integration with Production Systems

HPC
Ambassadors
Technical Support

MATLAB ENPC 2017
Key Takeaways

- MATLAB is a learning tool for Data Analytics
- MATLAB is an Integrated Curriculum Platform
- MATLAB is a state-of-the-art industry software