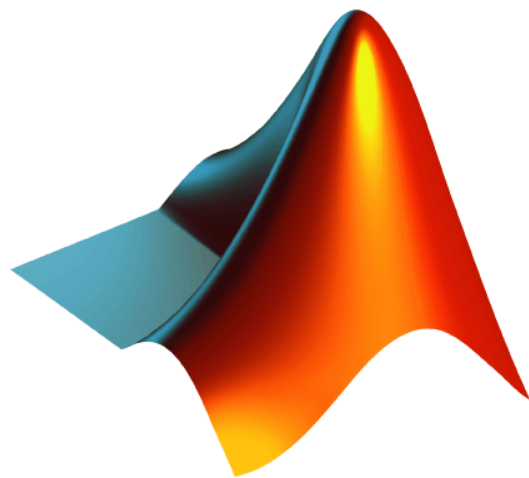


MATLAB



WHAT DO YOU SEE & HEAR IN YOUR UNIVERSITY?

PhD (Dr)

Big Data

Ir

Machine Learning

IR 4.0

Signal Processing

Face Recognition

Engineering Team Project

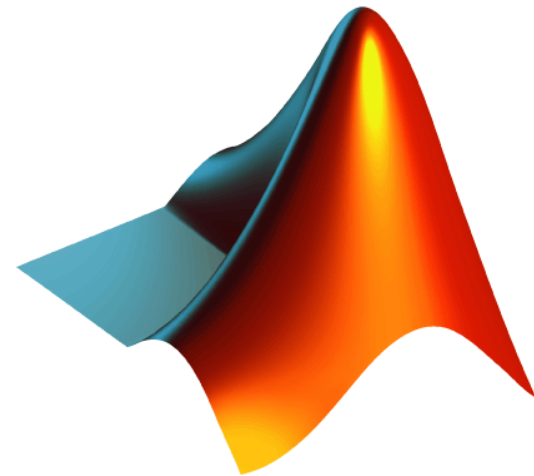
Final Year Project

THE QUESTION IS

Can a student like us, use all
these technologies?

THE ANSWER IS

YES



GOAL FOR TODAY

We will together experience
how all these technologies
looks like in MATLAB

OVERVIEW

- Introduction to MATLAB
- Applications of MATLAB
- Hands-on MATLAB Activities
- Questions and Answer

WHAT IS MATLAB?

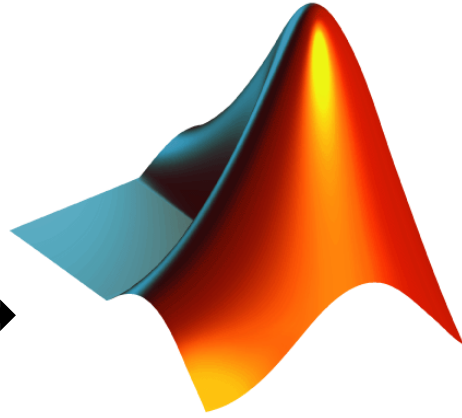
- MATLAB® (**Matrix Laboratory**) is a **programming platform** designed specifically for engineers and scientists.
- Written in Fortran in the late 1970s by **Cleve Moler**, it was a simple interactive matrix calculator.
- In 1983, Jack Little, who was an engineer, visited Moler for MATLAB. He sees the commercial potential in MATLAB, so Jack Little joined hands with Steve Bangert and Moler to **rewrite MATLAB in C Language**.
- This was also accompanied with the **formation of MathWorks** in the year 1984 to further enhance the development of MATLAB.

HISTORY OF MATLAB

1970s

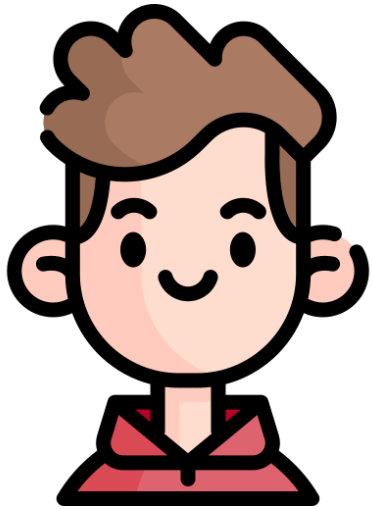


Cleve Moler

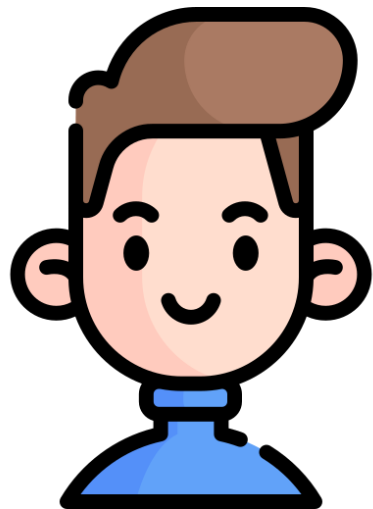


HISTORY OF MATLAB

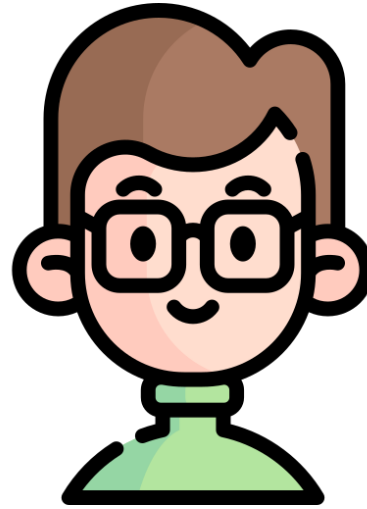
1983 - 1984



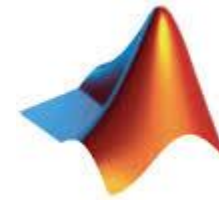
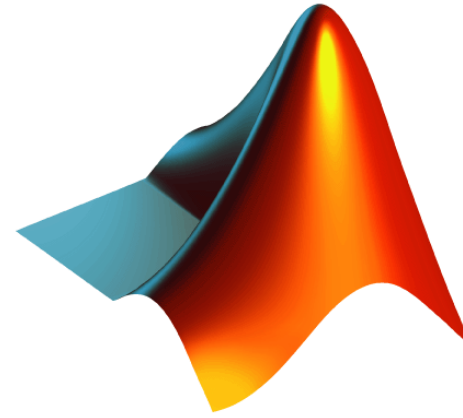
Cleve Moler



Jack Little



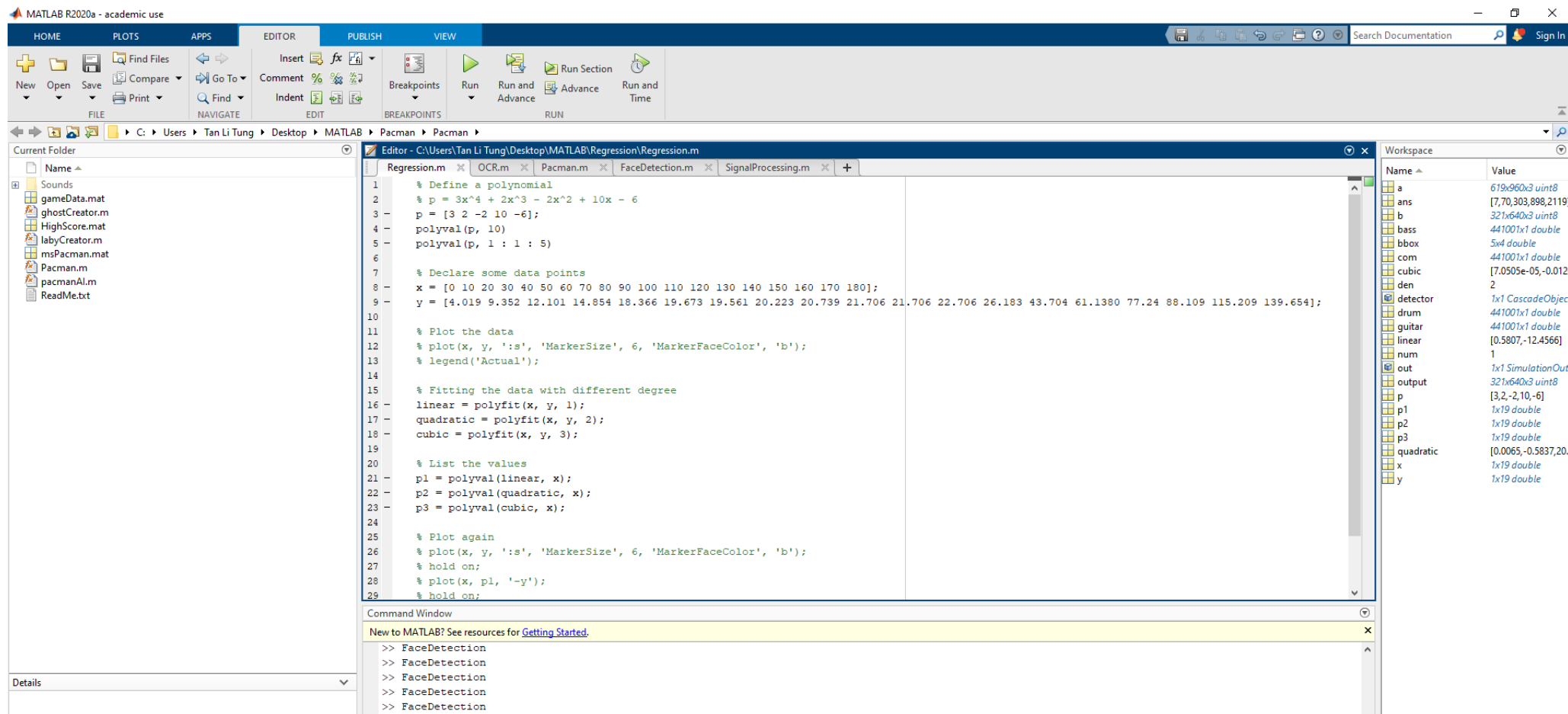
Steve Bangert



MathWorks®

WHY USE MATLAB?

- Easy and intuitive.



WHY USE MATLAB?

- Designed for Engineers and Scientist.



———— *ENGINEER* ————

WHY USE MATLAB?

- Lots of Toolboxes available (Lots of resources).

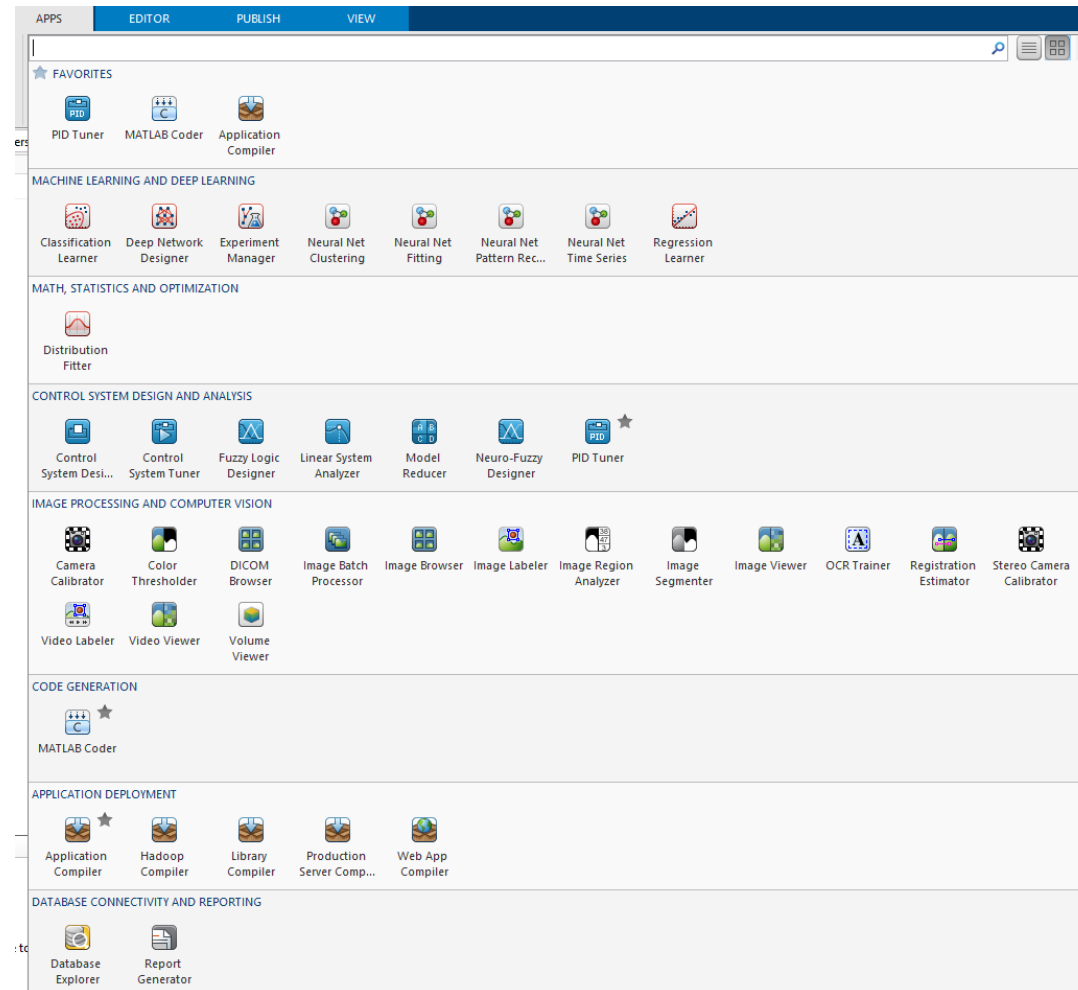
APPLICATIONS		
Signal Processing	RF and Mixed Signal	Automotive
Signal Processing Toolbox	Antenna Toolbox	Model-Based Calibration Toolbox
Phased Array System Toolbox	RF Toolbox	Powertrain Blockset
DSP System Toolbox	RF Blockset	Vehicle Dynamics Blockset
Audio Toolbox	Mixed-Signal Blockset	Automated Driving Toolbox
Wavelet Toolbox	SerDes Toolbox	IEC Certification Kit (for ISO 26262 and IEC 61508)
		Vehicle Network Toolbox
Image Processing and Computer Vision	Wireless Communications	AUTOSAR Blockset
Image Processing Toolbox	Communications Toolbox	RoadRunner
Computer Vision Toolbox	WLAN Toolbox	RoadRunner Asset Library
Lidar Toolbox	LTE Toolbox	RoadRunner Scene Builder
Vision HDL Toolbox	5G Toolbox	
	Wireless HDL Toolbox	Aerospace
Control Systems	Autonomous Systems	Aerospace Blockset
Control System Toolbox	Automated Driving Toolbox	Aerospace Toolbox
System Identification Toolbox	Robotics System Toolbox	UAV Toolbox
Predictive Maintenance Toolbox	UAV Toolbox	DO Qualification Kit (for DO-178)
Robust Control Toolbox	Navigation Toolbox	
Model Predictive Control Toolbox	ROS Toolbox	Computational Finance
Fuzzy Logic Toolbox	Sensor Fusion and Tracking Toolbox	Econometrics Toolbox
Simulink Control Design	RoadRunner	Financial Toolbox
Simulink Design Optimization	RoadRunner Asset Library	Datafeed Toolbox
Reinforcement Learning Toolbox	RoadRunner Scene Builder	Database Toolbox
Motor Control Blockset		Spreadsheet Link (for Microsoft Excel)
	FPGA, ASIC, and SoC Development	Financial Instruments Toolbox
Test and Measurement	HDL Coder	Trading Toolbox
Data Acquisition Toolbox	HDL Verifier	Risk Management Toolbox
Instrument Control Toolbox	Deep Learning HDL Toolbox	
Image Acquisition Toolbox	Wireless HDL Toolbox	Computational Biology
OPC Toolbox	Vision HDL Toolbox	Bioinformatics Toolbox
Vehicle Network Toolbox		SimBiology

More at:

https://www.mathworks.com/products/index.html?s_tid=hp_fp_viewall

WHY USE MATLAB?

- MATLAB App (No need to code!).



WHY USE MATLAB?

- MATLAB integrates workflow. Fast. Reliable.

[Documentation](#) [Examples](#) [Functions](#) [Videos](#) [Answers](#)

[Trial Software](#) [Product Updates](#)

Calling MATLAB from Python

R2020b

Write Python® programs that work with MATLAB®

The MATLAB Engine API for Python provides a package for Python to call MATLAB as a computational engine. The engine supports the reference implementation (CPython). MATLAB supports versions 2.7, 3.6, 3.7, and 3.8. For more information, see [Versions of Python Supported by MATLAB Products by Release](#).

- To install and start the engine, see [Get Started with MATLAB Engine API for Python](#).
- To call Python functions from MATLAB, see [Python Libraries in MATLAB](#).

Engine applications require an installed version of MATLAB; you cannot run the MATLAB engine on a machine that only has the MATLAB Runtime.

Call MATLAB Functions from C++

R2020b

Call MATLAB® functions from C++ using the `feval` and `fevalAsync` member functions of the `matlab::engine::MATLABEngine` class. Use these functions when you want to pass function arguments from C++ to MATLAB and to return the result of the function execution to C++. These member functions work like the MATLAB `feval` function.

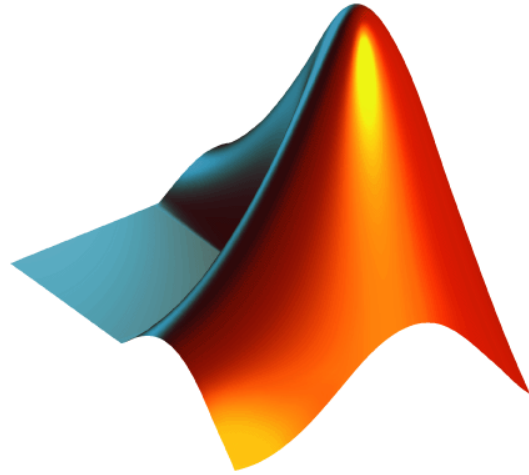
To call a MATLAB function:

- Pass the function name as a `matlab::engine::String`.
- Define the input arguments required by the MATLAB function. You can use either native C++ data types or the MATLAB Data API. For more information, see [MATLAB Data API](#).
- Specify the number of outputs expected from the MATLAB function. One output is the default. For more information, see [Call Function with Multiple Returned Arguments and Control Number of Outputs](#).
- Define the appropriate returned type for the results of the MATLAB function.
- Use stream buffers to redirect standard output and standard error from the MATLAB command window to C++. For more information, see [Redirect MATLAB Command Window Output to C++](#).

APPLICATIONS

- Matrix calculations.
- Plots of graphs.
- Machine learning.
- Signal processing.
- Face recognition.
- Optical Character Recognition (OCR).
- And many more.....

HANDS-ON



MACHINE LEARNING

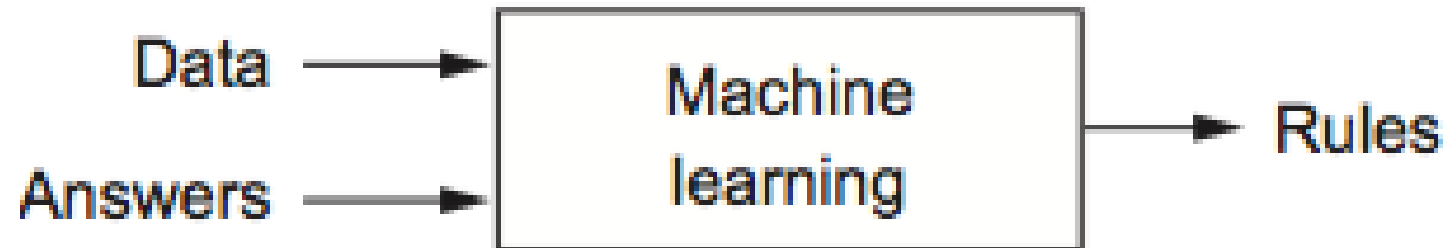
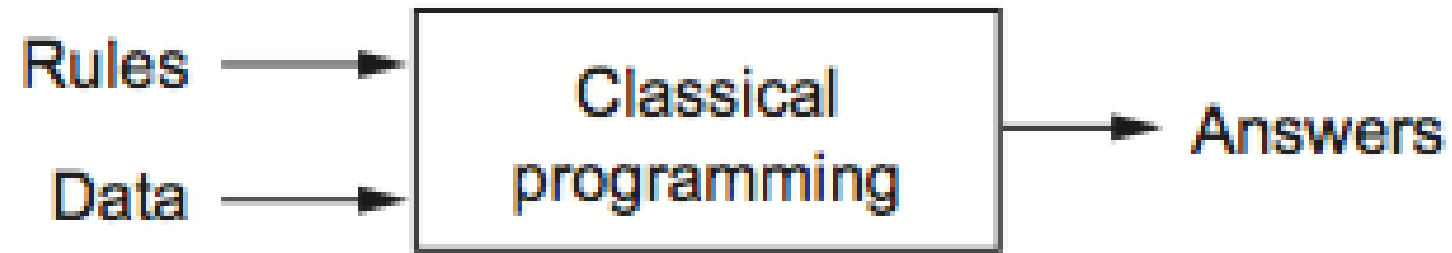
Predict Future Values From Current Trends

1	2	3	4
3	5	7	z

What should z be?

Trend: $2x + 1$

$$Z = 2(4) + 1 = 9$$



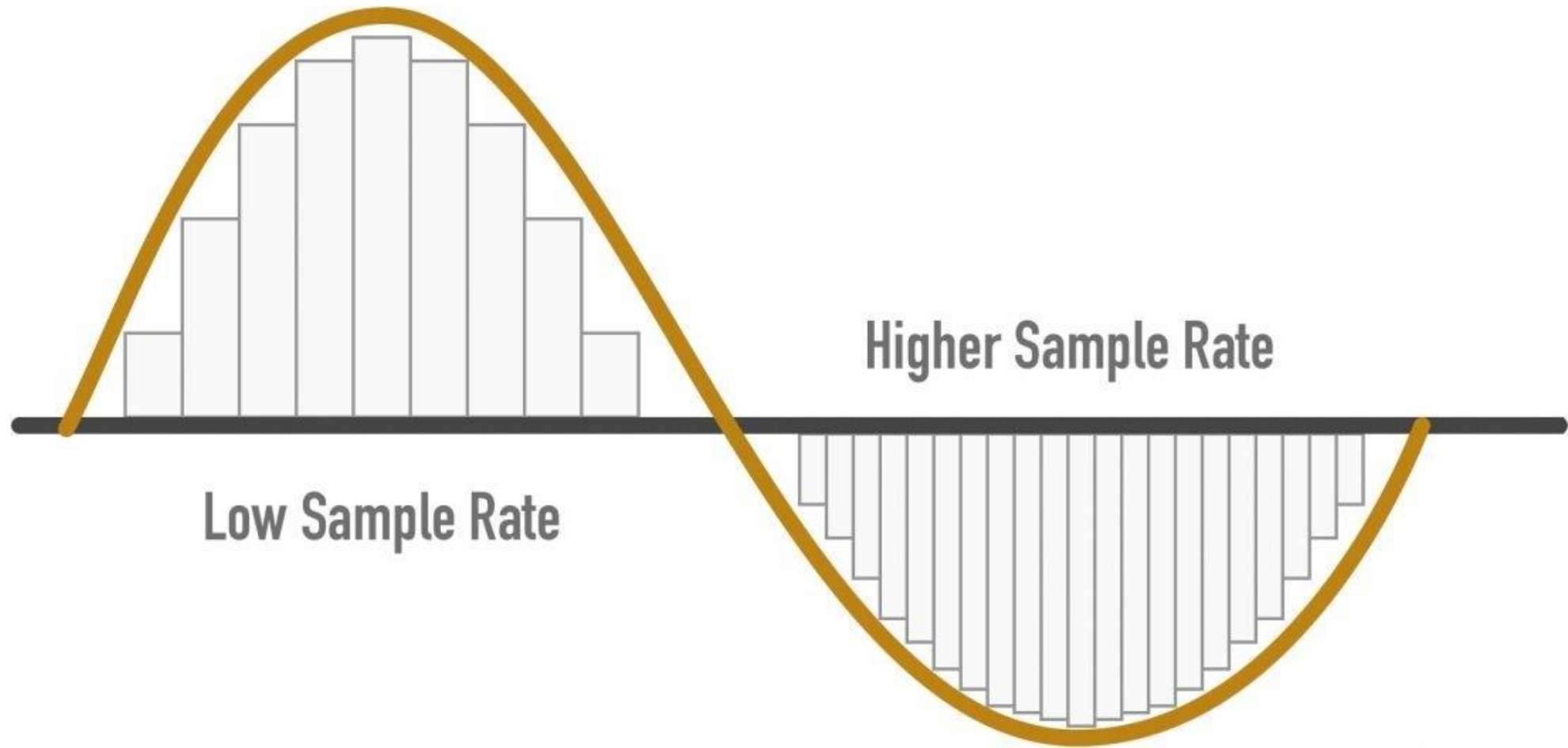
id	name	host_id	host_name	neighbourhood_group	neighbourhood	latitude	longitude	room_type	price	minimum_nights	number_of_reviews	last_review	reviews_per_month	calculated_host_listings_count	availability_365
2539	Clean & quiet apt home by the park	2787	John	Brooklyn	Kensington	40.64749	-73.9724	Private room	149	1	9	19/10/2018	0.21	6	365
2595	Skylit Midtown Castle	2845	Jennifer	Manhattan	Midtown	40.75362	-73.9838	Entire home/apt	225	1	45	21/5/2019	0.38	2	355
3647	THE VILLAGE OF HARLEM.....NEW YORK !	4632	Elisabeth	Manhattan	Harlem	40.80902	-73.9419	Private room	150	3	0			1	365
3831	Cozy Entire Floor of Brownstone	4869	LisaRoxanne	Brooklyn	Clinton Hill	40.68514	-73.9598	Entire home/apt	89	1	270	5/7/2019	4.64	1	194
5022	Entire Apt: Spacious Studio/Loft by central park	7192	Laura	Manhattan	East Harlem	40.79851	-73.944	Entire home/apt	80	10	9	19/11/2018	0.1	1	0
5099	Large Cozy 1 BR Apartment In Midtown East	7322	Chris	Manhattan	Murray Hill	40.74767	-73.975	Entire home/apt	200	3	74	22/6/2019	0.59	1	129
5121	BlissArtsSpace!	7356	Garon	Brooklyn	Bedford-Stuyvesant	40.68688	-73.956	Private room	60	45	49	5/10/2017	0.4	1	0
5178	Large Furnished Room Near B'way	8967	Shunichi	Manhattan	Hell's Kitchen	40.76489	-73.9849	Private room	79	2	430	24/6/2019	3.47	1	220
5203	Cozy Clean Guest Room - Family Apt	7490	MaryEllen	Manhattan	Upper West Side	40.80178	-73.9672	Private room	79	2	118	21/7/2017	0.99	1	0
5238	Cute & Cozy Lower East Side 1 bdrm	7549	Ben	Manhattan	Chinatown	40.71344	-73.9904	Entire home/apt	150	1	160	9/6/2019	1.33	4	188
5295	Beautiful 1br on Upper West Side	7702	Lena	Manhattan	Upper West Side	40.80316	-73.9655	Entire home/apt	135	5	53	22/6/2019	0.43	1	6

Optical Character Recognition (OCR)

MATLAB GRAPHIC USER INTERFACE (GUI)

FACE DETECTION

SIGNAL PROCESSING



USEFUL LINKS

MATLAB Academy (Certification)

<https://matlabacademy.mathworks.com>

MATLAB for Beginners

https://www.youtube.com/watch?v=T_ekAD7U-wU

MATLAB Drive

<https://www.mathworks.com/products/matlab-drive.html>

Solving ODEs in MATLAB

<https://www.mathworks.com/help/symbolic/solve-a-single-differential-equation.html>

THANK YOU

