

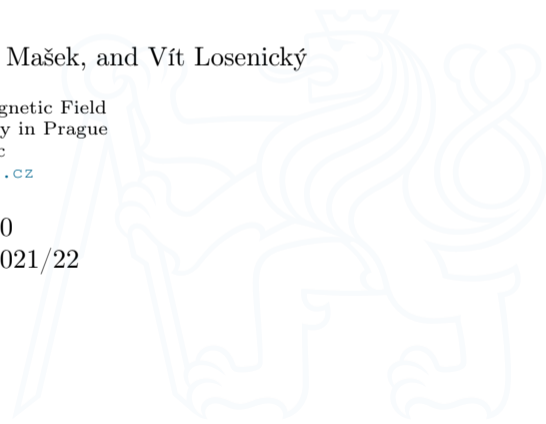
# Lecture 0: Introduction

## B0B17MTB, BE0B17MTB – MATLAB

Miloslav Čapek, Viktor Adler, Michal Mašek, and Vít Losenický

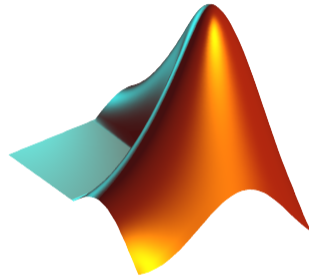
Department of Electromagnetic Field  
Czech Technical University in Prague  
Czech Republic  
[matlab@fel.cvut.cz](mailto:matlab@fel.cvut.cz)

September 20  
Winter semester 2021/22





1. What is MATLAB?
2. Why to Learn MATLAB?
3. Launching and Termination





# MATLAB is...

- ▶ High-level programming language (*4th generation language*).
- ▶ Interpreted language (not compiled, but... JIT).
  - ▶ Intended mainly for numerical computing (nevertheless includes MuPAD symbolic kernel).
- ▶ Philosophy: kernel & tool boxes & user-defined functions → wide application.
  - ▶ Wide possibilities of linking with other tools (Java, C++, Fortran, Python, .NET, Excel, physical- / multi-physical softwares).
- ▶ Speed (of well written) algorithm comes near to that of C++.
- ▶ Excellent “for fast prototyping.”
  - ▶ MATLAB does not require variables declaration (not always the advantage).
- ▶ Multi-licensed for CTU.
  - ▶ Available for students as well!
    - ▶ CTU students: [download.cvut.cz](http://download.cvut.cz)
    - ▶ FEE students: [svti.fel.cvut.cz/cz/services/software/matlab.html](http://svti.fel.cvut.cz/cz/services/software/matlab.html)

# MATLAB's Potential



## Why to learn MATLAB?

- ▶ MATLAB is a worldwide standard.
- ▶ It is used by more than 5000+ universities worldwide.
- ▶ Licenses used by thousands of corporations in aviation, biotechnology, electronics, cybernetics, mechanical engineering, finance, ...
- ▶ Knowledge of MATLAB can be used in other courses at the University as well as in professional life.

# MATLAB's Potential



## Why to learn MATLAB?

- ▶ MATLAB is a worldwide standard.
- ▶ It is used by more than 5000+ universities worldwide.
- ▶ Licenses used by thousands of corporations in aviation, biotechnology, electronics, cybernetics, mechanical engineering, finance, ...
- ▶ Knowledge of MATLAB can be used in other courses at the University as well as in professional life.

## Where to make use of MATLAB?

- ▶ Data processing and visualization during laboratory exercises.
- ▶ When elaborating diploma works.
- ▶ Seminar exercises (signals, algorithm development, ...).
- ▶ Theory verification (mathematics and physics classes, electromagnetic field, electronic circuits, ...).
- ▶ Studying abroad (Erasmus, Sokrates).
- ▶ “everywhere” :)



# Historical Development of MATLAB

- ▶ the 1970's
  - ▶ Cleve Moler<sup>1</sup>, MATLAB used instead of Fortran.
  - ▶ **MAT**rix **LAB**oratory → matrix is the basic data structure.
  - ▶ Fortran-based syntax.
- ▶ 1983
  - ▶ Jack Little rewrote Matlab in C.
  - ▶ New functionality and new mathematical libraries added.
- ▶ 1984 (MATLAB is so far for free!)
  - ▶ MathWorks founded in 1984
- ▶ 2004
  - ▶ Matlab used by more than 1 million of active users.
- ▶ now...
  - ▶ R2021a is the newest version of Matlab.
  - ▶ local distribution: Humusoft s.r.o.

---

<sup>1</sup>see: <http://www.mathworks.com/company/aboutus/founders/clevemoler.html>



# Alternatives to MATLAB

**Fortran:** most of the libraries still in Fortran, used mostly by physicists

**Python:** for free, fast and intuitive; Spyder provides MATLAB-like features

**Mathematica:** symbolic and numerical calculations, excellent symbolic kernel, extensive applicability, mostly for mathematicians and physicists

**Maple:** symbolic and numerical calculations

**MathCad:** used for symbolic and numerical calculations, slightly out-of-date

**Octave:** for free, syntax and functionality similar to Matlab, not so extensive, smartphone executable

**R:** for free, designed particularly for statistical applications

**Scilab:** MATLAB-like, open documentation

**Derive:** small, fast, Casio calculator executable



# Alternatives to MATLAB

- ▶ MATLAB vs. C/C++
  - ▶ Choice between the two strongly depends on application.
  - ▶ C/C++ faster in general, MATLAB, on the other hand, provides implicit parallelism.
  - ▶ General principle: MATLAB is more than suitable for everything except commercial compiled code (especially MATLAB 6.5 and above: JIT + Real-Time Type Analysis).
- ▶ MATLAB vs. Fortran
  - ▶ MATLAB has wider support, more intuitive syntax.
  - ▶ Speed of a well written code is (usually, at least) comparable.
  - ▶ Utilization of Fortran is on the decline.
- ▶ MATLAB vs. Python
  - ▶ MATLAB offers significant support thanks to MathWorks, Matlab File Exchange.
  - ▶ Python entirely for free, it's becoming more and more popular.
- ▶ MATLAB vs. Julia
  - ▶ Comparable speed and syntax for both.
  - ▶ MATLAB has broader community and coverage in industry.





# Launching MATLAB

- ▶ Desktop icon



- ▶ Command line:

- ▶ `matlab`

```

Příkazový řádek
Microsoft Windows [Version 10.0.17134.950]
(c) 2018 Microsoft Corporation. Všechna práva vyhrazena.

C:\>matlab_
  
```

- ▶ MATLAB can be launched with a set of optional parameters.

- ▶ `matlab -r "test(10)"`

- ▶ System requirements<sup>2</sup> for MATLAB R2019a+:
  - ▶ Windows 7+
  - ▶ 4 GB RAM
  - ▶ 3.1 GB of HDD (MATLAB only), 5-8 GB for a typical installation
  - ▶ Any Intel or AMD x86-64 processor
- ▶ Available also for Mac and Linux!

<sup>2</sup><https://www.mathworks.com/support/requirements/matlab-system-requirements.html>



# MATLAB Termination

- ▶ Close button in top right of MATLAB window.



- ▶ Possibility to terminate MATLAB in the command window.

```
>> quit % terminates Matlab (and all windows)
>> exit %   -//-
```

- ▶ More advanced options (see documentation).

```
>> quit cancel
>> exit force
```

# Questions?

B0B17MTB, BE0B17MTB – MATLAB  
matlab@fel.cvut.cz

September 20  
Winter semester 2021/22

---

This document has been created as a part of B0B17MTB course.  
Apart from educational purposes at CTU in Prague, this document may be reproduced, stored, or transmitted only with the prior permission of the authors.

Acknowledgement: Filip Kozák, Pavel Valtr.