

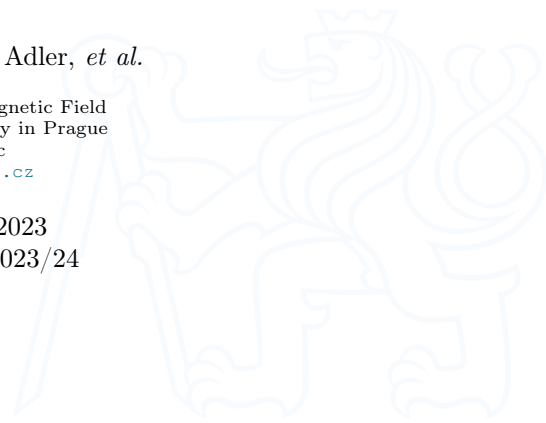
Lecture 0: Introduction

B0B17MTB, BE0B17MTB – MATLAB

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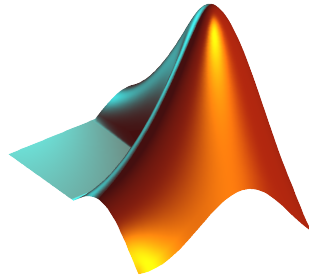
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1. What is MATLAB?
2. Why to Learn MATLAB?
3. Launching and Termination





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
 - ▶ FEE students: 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 6500+ 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.

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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 aboard (Erasmus, Sokrates).
- ▶ “everywhere” :)



Historical Development of MATLAB

- ▶ the 1970's
 - ▶ Cleve Moler¹, 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...
 - ▶ **R2023b** is the newest version of Matlab.
 - ▶ local distribution: Humusoft s.r.o.

¹see: <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

Julia: very fast, still limited community

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 requirements² for MATLAB R2022a+:
 - ▶ Windows 10+
 - ▶ 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!

²<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?

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