TIN213 – Computer Programming

Lecture 1 – Hello World!

Lecture 1 – Hello World!

- Why do I have to learn to code?
- OK, so I have to learn to code, but why Java?
- What is coding?
- Structure of the course
- Your first Java programs

About Me

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The course will be taught in Swedish

...but slides and labs will be in English

# Why should physicists learn to code?
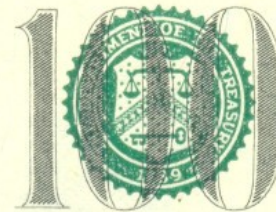
Mathematics
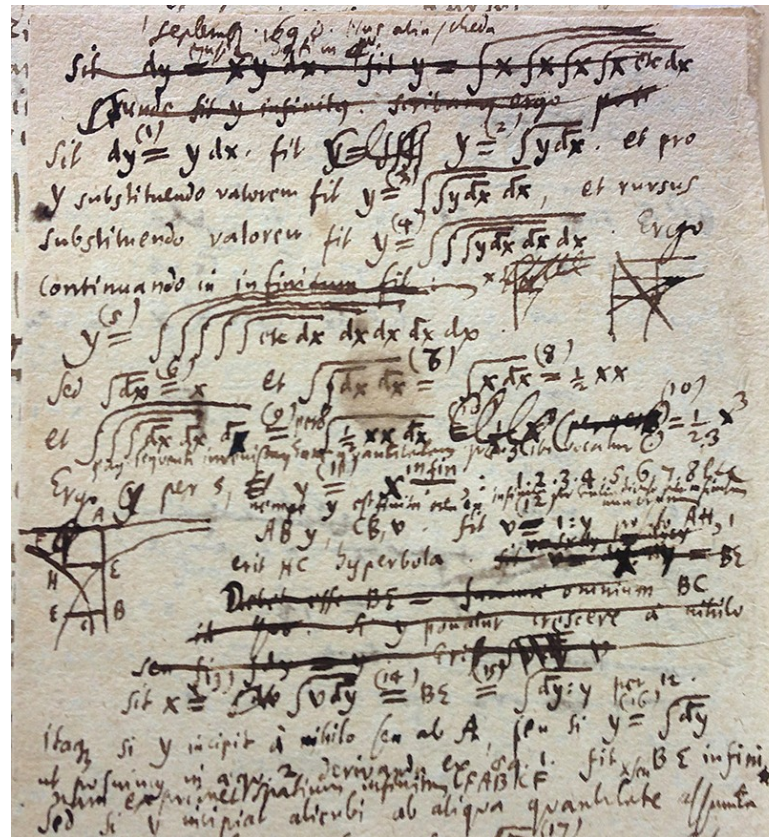
```
soln1 = DSolve[v'[t] + b v[t] - g == 0, v[t], t]
```

Out[2]= $\left\{ \left\{ v[t] \rightarrow \dfrac{g}{b} + e^{-b\,t}\, C[1] \right\} \right\}$

Simulation
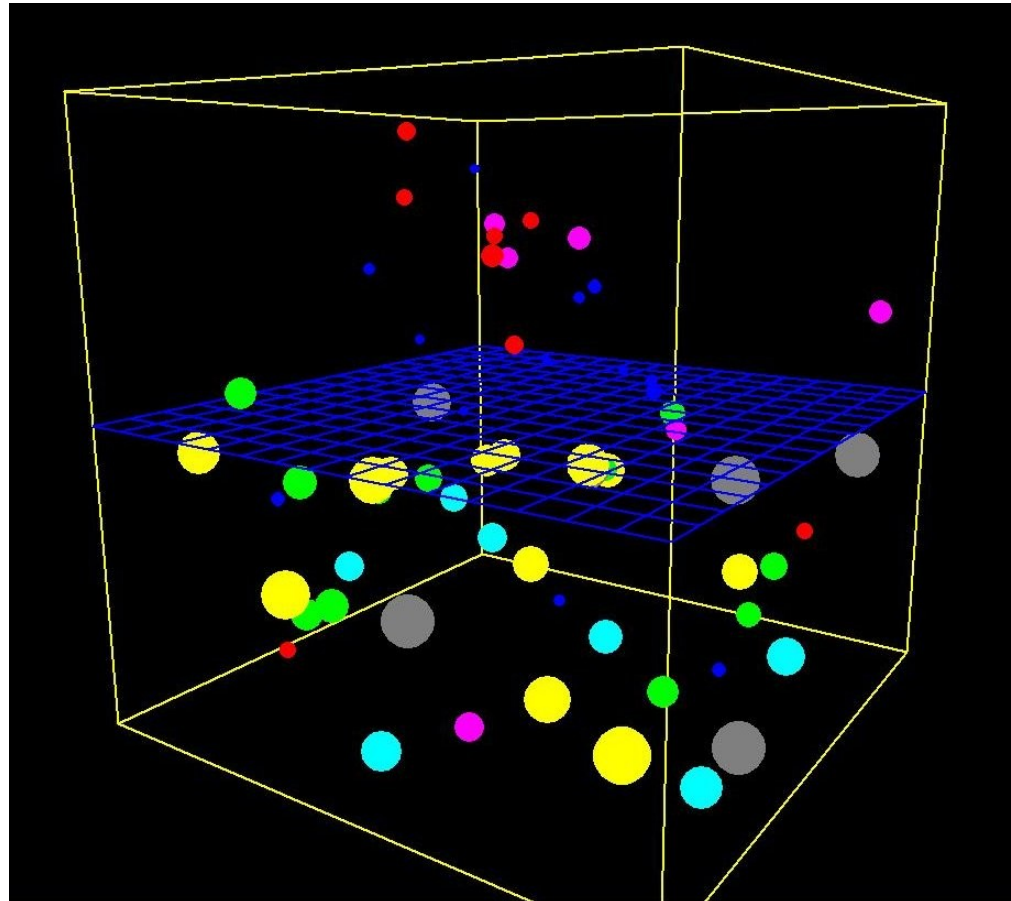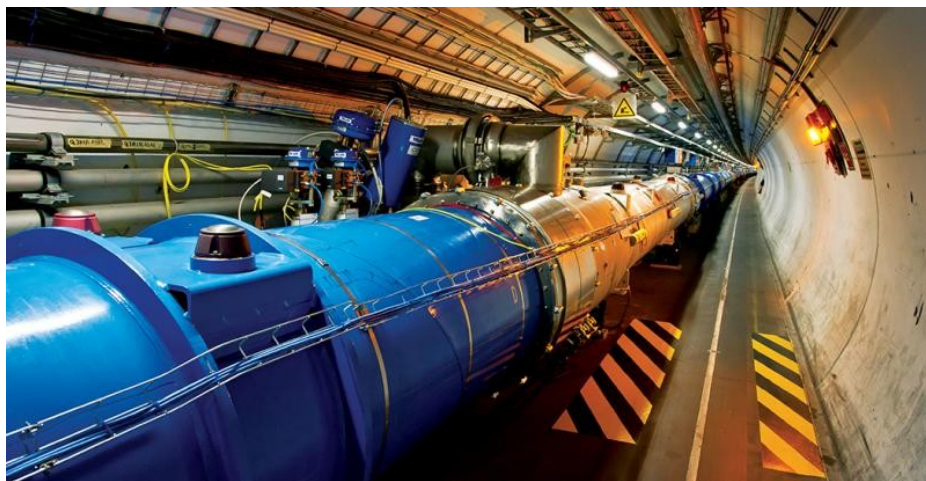
Using Tools

Fun and Creativity

93% of Paint Splatters are Valid Perl Programs
Colin McMillen and Tim Toady
twitter.com/mcmillen & famicol.in/sigbovik
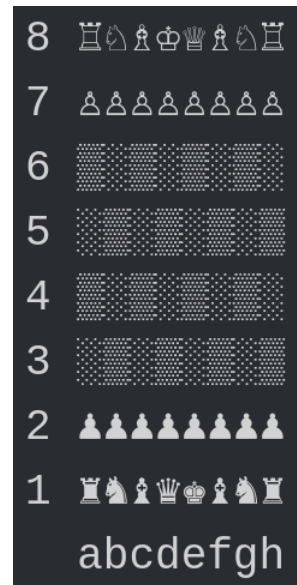
Java

- 1990: "Stealth Project" began at Sun
- 1994-5: Java v1.0
- 2014: Java 8
- (Move to rapid release model)
- Sept 2018: Java 11

https://www.gettyimages.ae/detail/photo/java-and-bali-indonesia-natural-colour-high-res-stock-photography/668758459

Why Java?

- Most popular language today

- WORA (Write Once Run Anywhere)

- Simple language(50 keywords)

- Large libraries

Top Programming Languages
Tiobe Index - December 2017

Language	Percentage
Java	13.27%
C	10.16%
C++	4.72%
Python	3.78%
C#	2.82%
JavaScript	2.47%
VB .NET	2.47%
R	1.91%
PHP	1.59%
MATLAB	1.57%
Swift	1.57%
Objective-C	1.50%
Assembly	1.47%
Perl	1.44%
Ruby	1.42%
Delphi	1.40%
Go	1.39%
Scratch	1.37%
PL/SQL	1.37%
Visual Basic	1.35%

https://stackify.com/popular-programming-languages-2018/
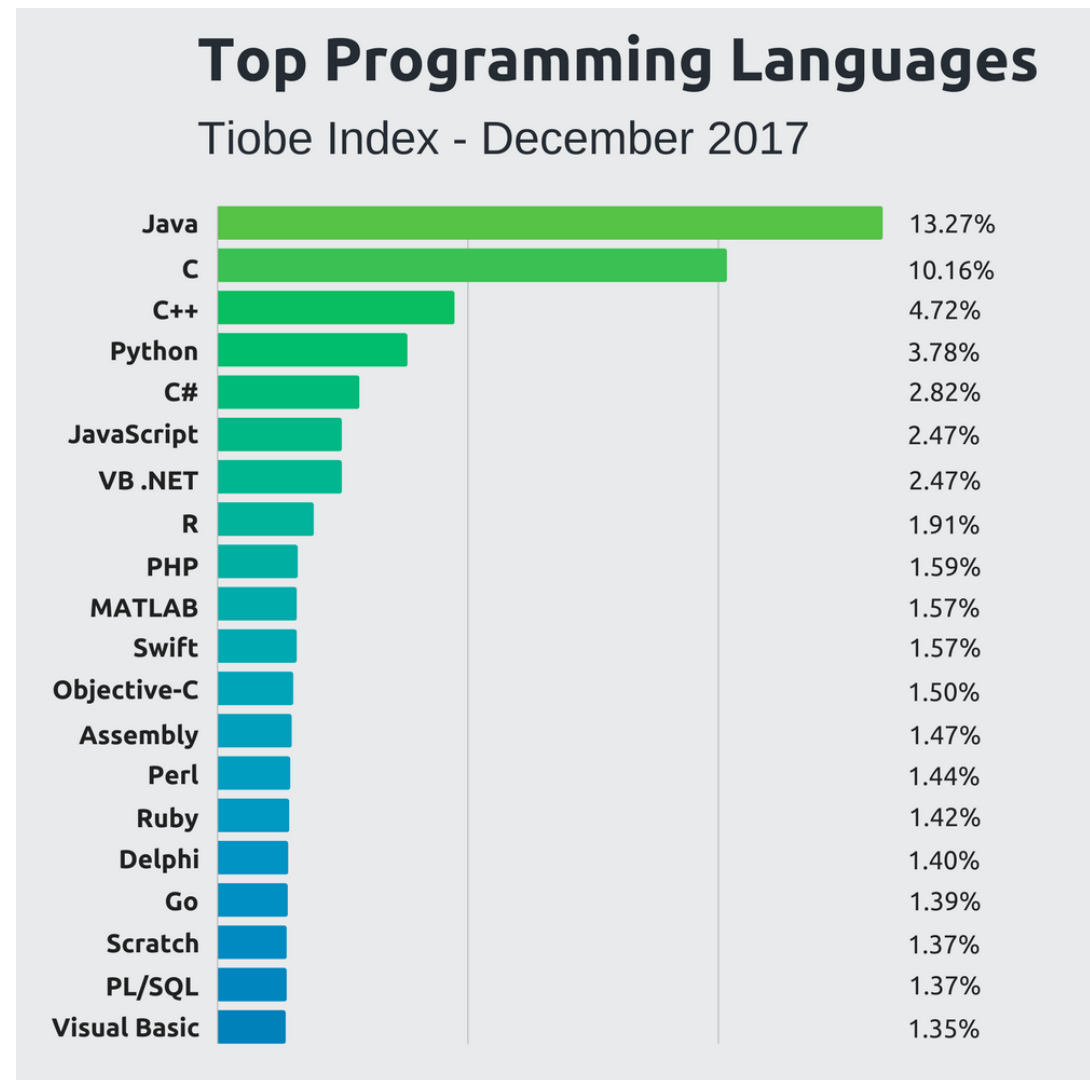
Disadvantages to Java

- Verbose language
  ```
  public static void main(String[] args)
  ```
- First steps are slower than Python
  (Second steps are faster)
- Not the most widely used language for scientific applications (Matlab, Python)

Principles > Languages

Object-oriented
languages

Java   PHP

Python   C#
         C++
JavaScript   Lua

Haskell
                Lisp
Erlang
       fl   Agda

Functional
languages

Procedural
languages

???

Assembly
         SQL
Promela
      VHDL

Bash   C
         Visual Basic
QuickBasic
         ASP

What is Coding?

Exercise

Write down the instructions to make an egg sandwich

Assume I know nothing about neither eggs nor sandwiches!

Things to Notice

- Expect to get it wrong first time (and second, third, ...)

- Iterative process: write code, test code, debug

- Computer has no common sense.

- You will need to think very carefully about the process and understand it deeply.

- Just because you know how to do it doesn't mean you know how to tell a stupid machine to do it!

About the Course

Typical week:

- One lecture

- One 4-hour lab session

- One 2-hour exercise session

- Readings

- Exercises to complete

The timetable will vary – please check TimeEdit!

Teaching Team

- Anton Ekblad (antonek@chalmers.se)
  - Lectures and exercise sessions

- Teaching Assistants
  - Labs and exercise sessions
    - Andreas Andersson
    - Axel Forsman
    - Rakel Hellberg
    - Tore Levenstam
    - Ruben Seyer
    - Daniel Weber Fors

Learning Objective

By the end of the course, you can design and write small (< 100 lines) programs in Java.

Course Literature

- J. Skansholm. *Java Direkt med Swing*
- S. McConnell. *Code Complete*

Assessment

- Four compulsory laboratory assignments
  - Two deadlines in LP2, two in LP3
- Two written exams
  - Part A in LP2 (16 December)
  - Part B in LP3 (13 March)
  - Registrations *not* handled through Studieportalen!

    You may bring *Java Direkt med Swing* lightly annotated into the exam. You will also be provided with a help sheet

    You must pass all four labs to complete the course. Grade is based on exam results.

Laboratory Groups

- You have been divided into groups
  - Same groups as TMA970
  - Labs and exercises scheduled based on these
- Please work in pairs
- Choose a partner in your group with about the same level of experience in coding

Course website

http://tiny.cc/tin213

- General course info, news
- Labs, old exams, lecture slides
- Course discussion board
- Useful links

Volunteers wanted for Student Representatives!
Talk to me or email `antonek@chalmers.se`

Your First Java Program

Programming Language Types

- Machine code (executable)
  - Humans don't write this nowadays
- Interpreted language
  - JavaScript, Python, Ruby, PHP
- Compiled language
  - Java, C, C++, C#

Programming Language Types

- "Weak" dynamic
  - JavaScript, PHP
  - "500 monkeys" + 1 = 501

- "Strong" dynamic
  - Python, Ruby
  - "500 monkeys" + 1 = runtime error!

- Static
  - Java, C, C++, C#
  - "500 monkeys" + 1 = compile time error!

The Structure of a Java Program

- A Java program is divided into *classes*
- A class has *fields* (data) and *methods* (operations that can be performed on the data)
- There must be a class that has a method called `main`
  - This tells what to do first when the program is run
- The simplest possible Java program has one class with one method called `main`

Program 1: Hello World!

Program 2: Hello name!

Program 3: Monthly cost of mobile phone

This Week

- In the labs: Parts 1-3 of Laboratory 1

- Reading: Sections 1.1-1.8 of *Java Direkt med Swing*

- Optional Reading: Chapters 1-2 of *Code Complete*