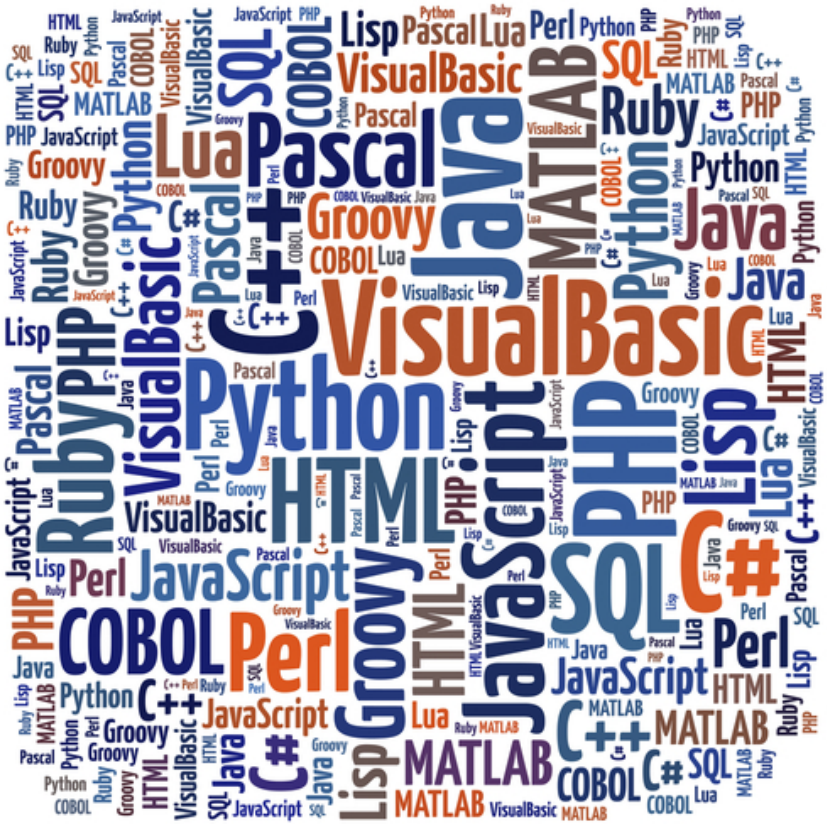
CLACINDIA Workshop
Lab Session
Part 1: Programming, why we need it?

Nikolay Koldunov

JNU
2014

Programming languages

A **Programming language** is an artificial language designed to express computations that can be performed by a machine, particularly a computer. Programming languages can be used to create programs that control the behavior of a machine.



“Hello world!” program

MATLAB

```
disp('hello world')
```

“Hello world!” program

MATLAB

```
disp('hello world')
```

FORTRAN 90

```
PROGRAM HelloWorld
   WRITE(*,*)  "Hello World!"
END PROGRAM
```

“Hello world!” program

MATLAB

```
disp('hello world')
```

FORTRAN 90

```
PROGRAM HelloWorld
   WRITE(*,*)  "Hello World!"
END PROGRAM
```

C++

```
#include <iostream.h>
main()
{
    cout << "Hello World!" << endl;
    return 0;
}
```

“Hello world!” program

BrainF**k

```
++++++++++[>+++++++>++++++++++>+++<<<-]>++.>+.+++++++
..+++.>++.<<+++++++++++++++.>.+++.------.--------.>+.
```

“Hello world!” program

BrainF**k

```
++++++++++[>+++++++>++++++++++>+++<<<-]>++.>+.+++++++
..+++.>++.<<+++++++++++++++.>.+++.------.--------.>+.
```

Bit

```
LINENUMBERZEROCODEPRINTZEROGOTOONELINENUMBERONECODEPRINTONEGOTOONEZEROLINENUMBE↩
RONEZEROCODEPRINTZEROGOTOONEONELINENUMBERONEONECODEPRINTZEROGOTOONEZEROZEROLINE↩
NUMBERONEZEROZEROCODEPRINTONEGOTOONEZEROONELINENUMBERONEZEROONECODEPRINTZEROGOT↩
OONEONEZEROLINENUMBERONEONEZEROCODEPRINTZEROGOTOONEONEONELINENUMBERONEONEONECOD↩
EPRINTZEROGOTOONEZEROZEROZEROLINENUMBERONEZEROZEROZEROCODEPRINTZEROGOTOONEZEROZ↩
EROONELINENUMBERONEZEROZEROONECODEPRINTONEGOTOONEZEROONEZEROLINENUMBERONEZEROON↩
```

Popular programming languages for the Earth Sciences

- Fortran (Mathematical **For**mula **Tran**slating System)

Popular programming languages for the Earth Sciences

- Fortran (Mathematical **For**mula **Tran**slating System)
- MATLAB (**Mat**rix **Lab**oratory)

Popular programming languages for the Earth Sciences

- Fortran (Mathematical **For**mula **Tran**slating System)
- MATLAB (**Mat**rix **Lab**oratory)
- Python

Popular programming languages for the Earth Sciences

- Fortran (Mathematical **For**mula **Tran**slating System)
- MATLAB (**Mat**rix **Lab**oratory)
- Python
- IDL (Interactive Data Language)

Popular programming languages for the Earth Sciences

- Fortran (Mathematical **For**mula **Tran**slating System)
- MATLAB (**Mat**rix **Lab**oratory)
- Python
- IDL (Interactive Data Language)
- bash, csh

Popular programming languages for the Earth Sciences

- Fortran (Mathematical **For**mula **Tran**slating System)
- MATLAB (**Mat**rix **Lab**oratory)
- Python
- IDL (Interactive Data Language)
- bash, csh
- NCL (NCAR Command Language)