

Lab 1

Introduction

Aims:

To prepare the set-up for the following assignments. To get familiarised with random numbers generators. To perform and analyze a random search of a solution for a problem.

Points:

- 50 points Task B.
- 50 points Task C.

Time:

Deadline is at the beginning of the second lab.

General hints:

- Determine a representation for the solution of each problem at Task C.
- Some common [probability distributions](#)

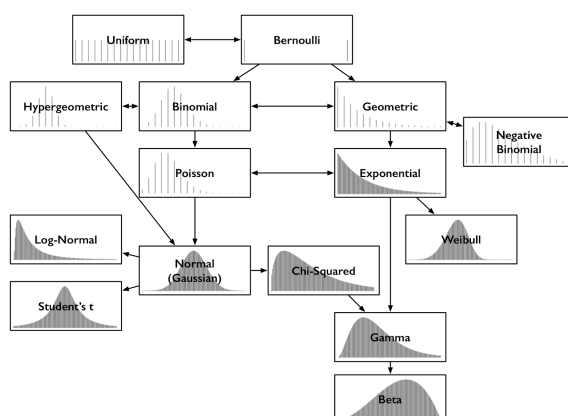
Tasks:

A

1. Install [Anaconda](#) distribution with python 3.7.
2. Create a new environment named 'laboratories' and upload the tensorflow package along with all the other dependent packages.
3. Install Spyder and Jupyter notebook.

B

1. Design and deploy an application in python that generates random numbers. From a menu the user can choose the desired distribution of probability (at least 2 from below), the interval. After generating a set of numbers show a graphic to compare it with the desired output.



C

Develop an application that performs random searches to the following problems. The applications should follow the following conditions:

- a menu to choose the number of the problem
- allows to choose the maximum number of attempts to find a solution
- prints the found solution

Problems:

1. Sudoku game

Consider a Sudoku game - a logic puzzle represented on a $n \times n$ board; some squares contain already a number, others must be completed with other numbers from $\{1, 2, \dots, n\}$ in such a way that each line, column and square with the edge equal with \sqrt{n} must contain only different numbers. Determine one correct solution for the puzzle.

3			2
	1	4	
1	2		4
	3	2	1

	2		6		8			5
5	8				9	7		
		7		4			2	8
3	7		4		1	5		
6				8				5
		8			2		1	3
8		6		2		1		
		9	8				3	6
7			3		6		9	

Figure 3: a) Sudoku game with 4x4 squares; b) Sudoku game with 9x9 squares

2. Cryptarithmic game

Implement an algorithm that solves a crypt-arithmetic problem as the ones presented in Figure 4 knowing that:

- Each letter represent a hexadecimal cipher;
- The result of the arithmetic operation must be correct when the letters are replaced by numbers;
- The numbers can not start with 0;
- Every problem can have only one solution.

$$\begin{array}{r} \text{SEND} + \\ \text{MORE} = \\ \hline \text{MONEY} \end{array}$$

$$\begin{array}{r} \text{TAKE} + \\ \text{A} \\ \text{CAKE} = \\ \hline \text{KATE} \end{array}$$

$$\begin{array}{r} \text{EAT} + \\ \text{THAT} = \\ \hline \text{APPLE} \end{array}$$

$$\begin{array}{r} \text{NEVER} - \\ \text{DRIVE} = \\ \hline \text{RIDE} \end{array}$$

Figure 4: Cryptarithmic problems

3. Geometric forms

Consider the geometric forms from **Figure 5**. Determine an arrangement for this forms on a square board of 5x6 in such a way that the board will be uniform covered and the forms will not overlap.

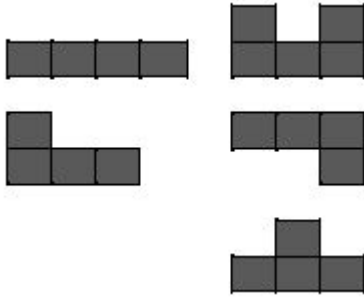
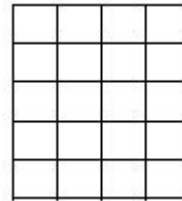


Figure 5: a) the geometric forms.



b) the game board.