

# SMARTSIM

## DL SMART-A

ARTIFICIAL INTELLIGENCE COURSE

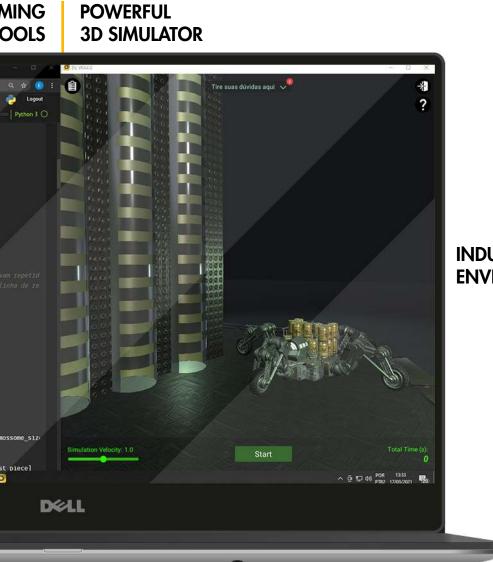




# SMART SIMULATOR FOR LEARNING AI WITH PYTHON

The DL SMART-AI is a software that has been developed to teach artificial intelligence with Python in a unique and effective way.	PYTHON PROGRA	AMMIN TOOI
With this software, students can improve their individual experience on studying artificial intelligence in practice.	▲ Resultados da posqui X C Documenta/ X elevate - Apyter Not: X elevate - Apyter Not: X elevate - Apyter Noteb: X	+
Professors can explore this trainer to provide experiments to students with the following topics:	File Edit View Insert Gell Kernel Widgets Help B + % 2 C x + x > Run ■ C → Gode ∨ mm Count = 0 for ele in 1st: if (ele == x): count = count + 1 return count	Pythor
Optimization: Introduction, definition, time and cost problems;	def elimina_igual(lst): # from list res = [] [res.append(x) for x in lst if x mot in res] return res	
Classification: Neural networks, signal generation, TensorFlow, predictions and failure predicts;	<pre>def completa_faltantes(parent, result): #completa com os valores qu</pre>	
Reinforcement Learning: Introduction and comparative to modern control;	<pre>for 1 in range(c):     result = numpy.append(result, valores_unicos[valor])     return result  def crossover(parent):     result_chromossome = []     tam_pop = len(parent[0])</pre>	
Oecision trees: Application on regression.	chromossome_size = (1, tam_pop)         result_chromossome = numpy.random.uniform(low=8.6, high=8.6, siz         crossover_point = randrange(tam_pop)         first_piece = list(parent[8][:crossover_point])         result_chromossome = first piece+[x for x in parent[1] if x not         P Digite aqui para pesquisar         O 日         ③ □	in first piecel
This software works integrated to a Python IDE (not included).		

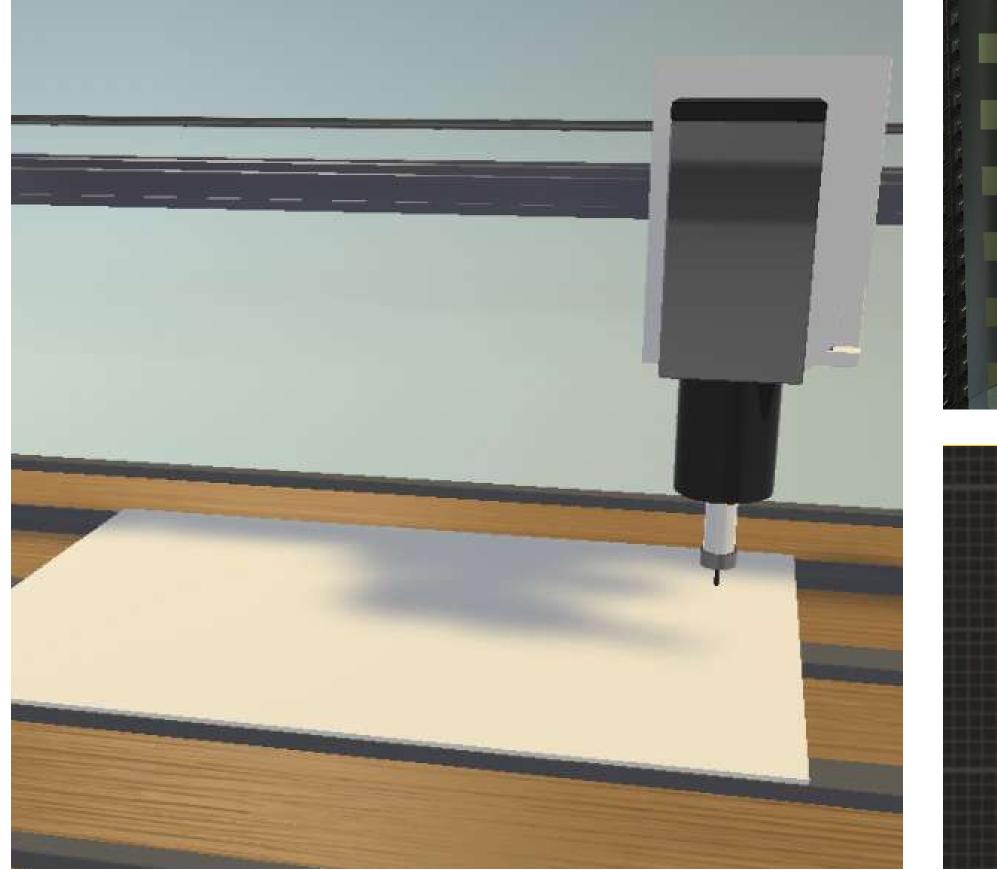
PROFESSIONAL EXPERIENCE



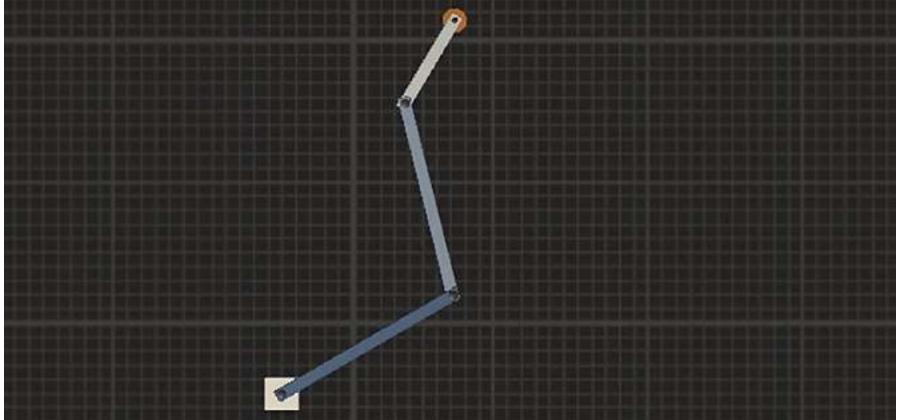
**INDUSTRIAL REALISTIC ENVIRONMENTS** 

**REAL-LIFE SITUATIONS** 

# 3D INDUSTRIAL ENVIRONMENTS TO PROVIDE REAL PRACTICAL EXPERIENCE TO STUDENTS



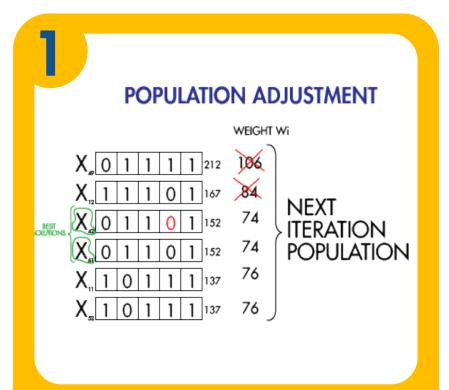




www.delorenzoglobal.com

DE LORENZO

# **EFFECTIVE LEARNING WITH GUIDANCE, REAL-LIFE PROJECTS,** THEORY AND INSTRUCTIONS FROM BASIC TO ADVANCED

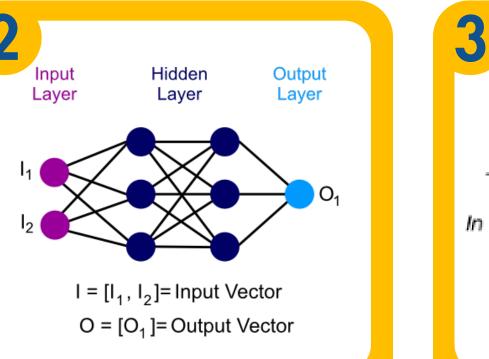


De lorenzo 🥨

### **OPTIMIZATION**

**Goal:** Use genetic algorithm to resolve optimization problems, like the time problem or the cost one.

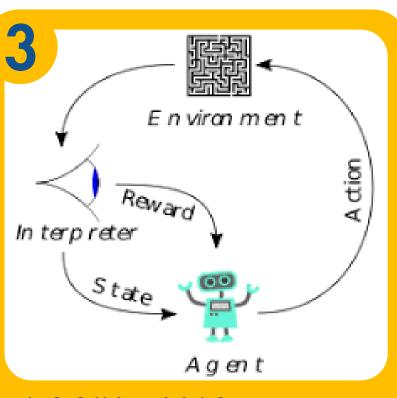
Al concepts: Introduction, genetic algorithm.



### **CLASSIFICATION**

**Goal:** Use neural networks to resolve classification problems.

Al concepts: Neural networks.

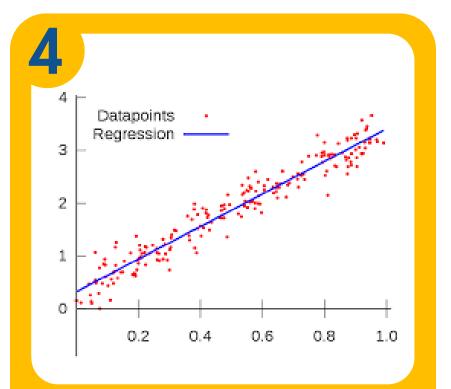


**REINFORCEMENT LEARNING** 

**Goal:** Use reinforcement learning to train a robot and a lead screw to reach a specific position.

Al concepts: Reinforcement learning.





### REGRESSION

Goal: Compare performances of decision tree and neural network algorithms in system modeling and predictions.

Al concepts: Decision trees.

# **STUDENT CAN LEARN AND PRACTICE FROM BASIC TO ADVANCED AI TOPICS**

With the industrial 3D environments and also the built-in projects it's possible to develop solutions that evolve optimization, genetic algorithms, regression, neural networks and a lot more.



DE LORENZO 🔯

## WHY IS IT A SMARTSIM?

## IT CONNECTS PROFESSOR, STUDENT AND SCHOOL

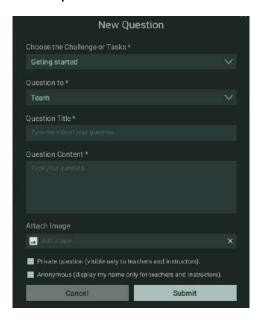
DE LORENZO

## COMPATIBLE WITH THE DL SMART-DASHBOARD (SOLD SEPARETLY)

De Lorenzo's cloud server receives students activities and provides reports and analytics to professors and institutions. Besides, a student can start working at school and continue at home or vice-versa.



The platform includes a query and answer system that enables professors to support the students counting on a team of monitors. That means better support with less effort of the professors. The students can see questions asked by other colleagues too so that way if more than one student have the same doubt the professors answer will attend them all.



### **PROFESSORS CAN FOLLOW STUDENTS PROGRESS**

The professor can do and access everything the student can. Besides, he/she can also access the dashboard's portal. It includes interesting reports and analytics that help the professor to monitor the group in real time, as well as to identify students who are doing very well, as well as those who need help, who are not working at all and who seem to be "cheating".

### Tasks report

This is an important tool since it provides evidence of the activities a student worked on. That means the school has evidence of the practical activities the distance learner has done with detailed information about it.

Curso	Tarefa	Timestamp	IsDon
Scripts	1.1 - Abrindo uma tela modal	3/9/2020 6:33:37 PM	False
Desenvolvimento de sistemas supervisórios	2.5 - Implementar Gráficos	11/22/2019 7:14:00 PM	False
Desenvolvimento de sistemas supervisórios	2.5 - Montar interface principal	11/18/2019 5:04:15 PM	True
Desenvolvimento de sistemas supervisórios	2.4 - Construindo os objetos da aplicação	11/18/2019 4:28:54 PM	True
Desenvolvimento de sistemas supervisórios	2.3 - Explorando Recursos	11/15/2019 5:35:44 PM	True
Desenvolvimento de sistemas supervisórios	2.2 - Conhecendo o Elipse E3	11/15/2019 5:10:00 PM	True
Desenvolvimento de sistemas supervisórios	2.1 - Comunicação OPC	11/14/2019 12:57:42 PM	True
Desenvolvimento de sistemas supervisórios	1.8 - Comandos pelo supervisório	11/14/2019 11:25:14 AM	True
Desenvolvimento de sistemas supervisórios	1.7 - Implementando alarmes	11/8/2019 7:33:30 PM	True

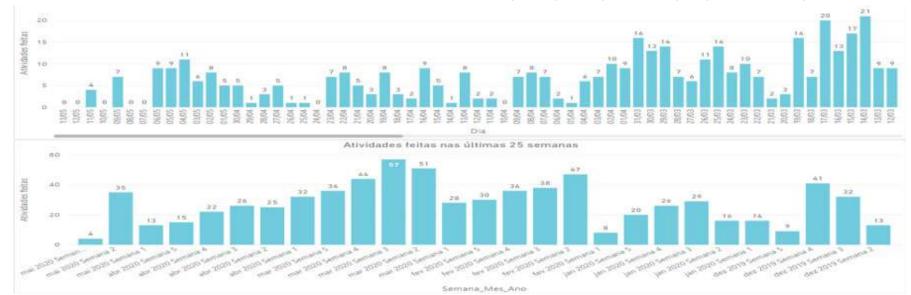
## PROFESSOR CAN SEE WHICH STUDENTS ARE ON SCHEDULE

With this interface, the professor may choose which groups he/she wants to monitor, to verify who is on schedule, who is pending and so on. It is possible to define the expected progress percentage in relation to the tasks available in the course.

Curpo			Grupo		% Aprovação
duitiple selections	~	#0 P 17,18,19 A		v.,	70
					0
Curso	Controle d	e Processos Visão Artificial		Artificial	
AJuno	Atividades feitas	Minimo atividades	Atividades feitas	Minimo atividade	6
anonymized	12	27			
anonymized	39	27	. 7	8	5.
anonymized	30	27	7		5
anonymized	39	27			
anonymized	39	27			5
anonymized	. 1				5
anonymized	30	27	1		5
anonymized	11	27		8	5
anonymized	27	27			
anonymized	12	27			5
anonymized	9	27			
anonymized	39	27	7		5
anonymized	39	27	7		5
anonymized	39	27	7		24
anonymized	33	27			5
anonymized	39	27	7		5
anonymized			7		-
anonymized	39	27			5
anonymized	-	27			9
Total	39	27	7		5

### RHYTHM

This other dashboard shows the number of activities the students did daily and weekly. The professor may decide to verify it regarding a whole group/class or a specific student.



### **EFFORT/TASK DEDICATED TIME**

If the professor selects a student, he/she may verify how much time the student took to develop and deliver each task of the course.

Duracao Total (h)
4.33
4.08
3.14
2.50
2.45
2.35
1.99
1.88
1.63
1.44
1.42
1.29
1.22

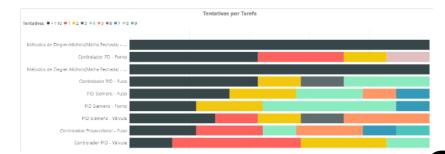
### **PROGRESS VS TIME TAKEN**

It is also possible to verify the distribution of the dedicated time with relation to the number of tasks done by each student at any period of time. That helps to identify who is doing well, who may need help, who is doing nothing and who is trying to cheat.



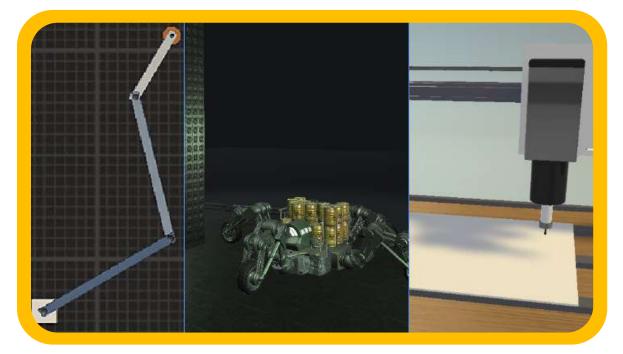
### TRIALS PER TASK

This chart helps the teacher to understand which task may be the most difficult and which one may be the easiest in order to adjust the deadlines.





### **IT'S A 3D SIMULATOR**



### **IT HAS BUILT-IN PROJECTS**



As we already know how to use a neural network in Tensorflow, we will comment only on the changes that need to be made to solve a regression problem.

Open the program "Neural Network - State Machine"

Artificial Intelligence

We will use the same network that we use, but with some modifications, we modify the number of neurons in the input, which must be equal to the number of input variables of our problem, which are 4, and the number of output neurons, for the number of engines that we want to control, which are 2.

We also changed the function of activating the output to sigmoid, as our output must be between 0 and 1. Note that the output will not be exact, but a poorly trained network will give for example 0.4 whenever it is 0 and 0.6 whenever either 1. Now a better trained network, it will give for example 0.1 whenever it is 0 and 0.9 whenever it is 1. As we already have our truth table with all possible known states, we will not need a test group, because we will never it will be possible to find values different from these.

Another thing we need to change is the metric for Mean Squared Error (MSE) and Mean Absolute Error (MAE), which are good metrics for regression.

It is very important that you identify and understand the changes that we have made! See how our model looks:

### + CONTENTS AND SUPPORT MATERIALS, SO THEY CAN LEARN BY THEMSELVES

Let's study a little bit about GA before we continue. For that, you can take a look at the video below and, if you want to complement, see also the links:

Video 1: https://www.youtube.com/watch?v=FYF6IS\_BHKA

🚺 DELORENZO 🔯

Link 8: https://conteudo.icmc.usp.br/pessoas/andre/research/genetic/

Link 9: https://www.nce.ufrj.br/GINAPE/VIDA/alggenet.htm

### IT AUTOMATICALLY CHECKS STUDENT ACTIVITIES TO LET THEY MOVE ON, LIKE IN GAME



### THE PROJECTS INCLUDE GUIDANCE

Change the activation function of the output layer to the linear function. Because we want our output to be an integer that will tell the position of the joint.

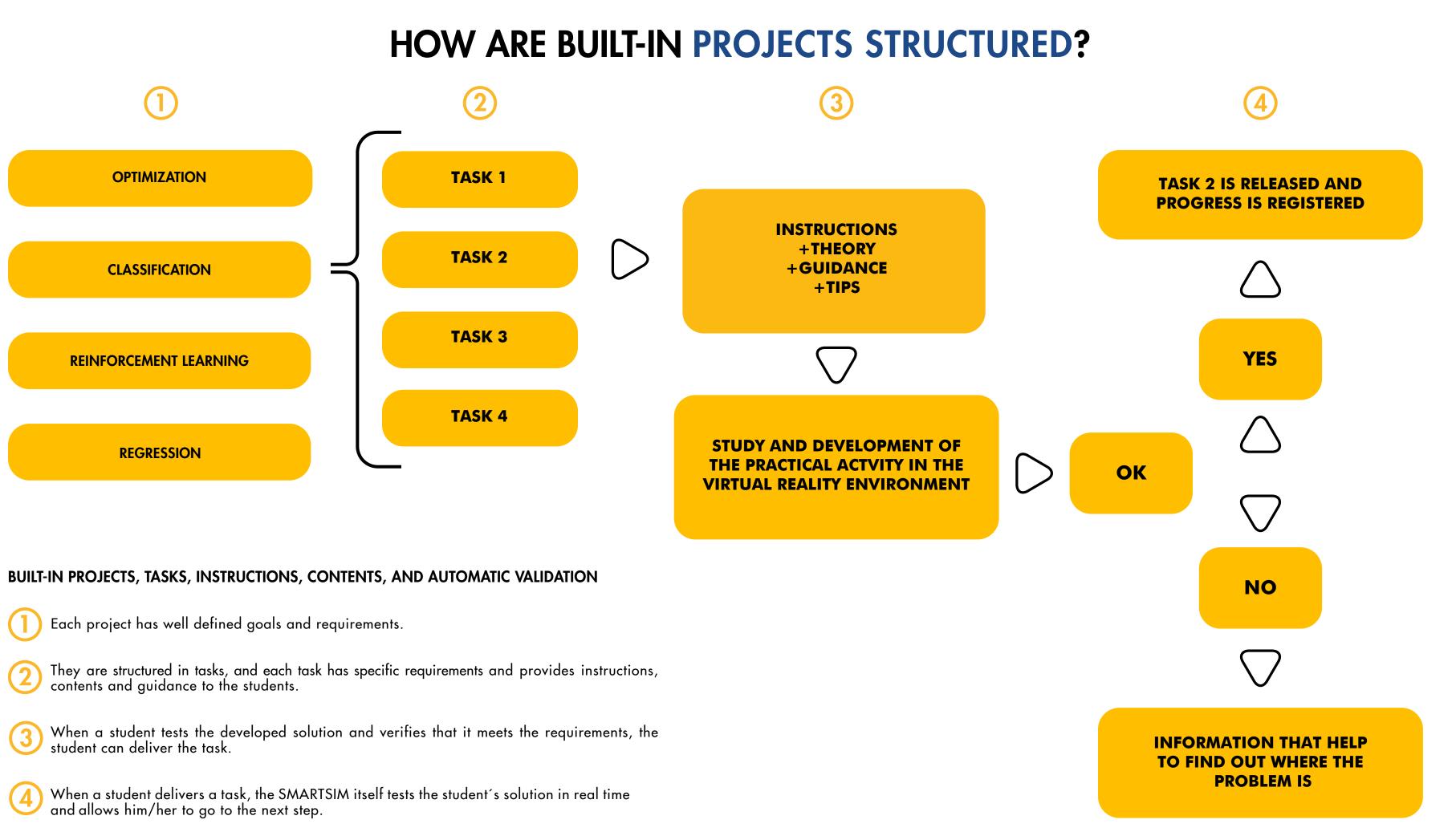
Train the network and see the output errors, if it doesn't look good, change the hyperparameters.

Did it look good? Use the predict function to predict some values.

### PROFESSORS CAN MONITOR STUDENTS, AND VERIFY WHICH POINT THEY NEED HELP (Option available with Dashboard)

Defense Contractor			
Group 1 × Course Machine Automation with Codesys	× Student 1 ×		
User Progress (POLI)		User Activities	
Student 1		Timestamp	■ Tasks → Task Description
Student 2		Aug 26, 2019	1.1-Breaking the inertia
		Aug 26, 2019	12-Interlocking with endswite
Student 3		Aug 26, 2019	13-Retentive command
Student 4		Aug 26, 2019	14-Adding other interlocks
Student 5		Aug 26, 2019	15-Using the remote button
Student 6		Aug 26, 2019	2.1 - Manual operation
		Aug 27, 2019	22-Simultaneous commands
Student 7		Aug 27, 2019	2.3 - Adding water
Student 8		Aug 27, 2019	24-Adjusting the conveyors
Student 9		Aug 27, 2019	31-Dosing station
		Aug 30, 2019	32-Mixing station







## **SYSTEM REQUIREMENTS**

ORDER CODES

DL SMART-AI

ARTIFICIAL INTELLIGENCE COURSE

DL SMART-DASHBOARD

CLASSROOM MANAGEMENT DASHBOARD FOR SMARTSIMS

IMPORTANT NOTE:

THIS PRODUTS DOES NOT INCLUDE ANY THIRD PARTY SOFTWARES. TO OUR KNOWLEDGE, ANACONDA PYTHON CAN BE FREE DOWNLOADED AT ANACONDA WEBSITE. MINIMUM REQUIREMENTS

OPERATIONAL SYSTEM

64-BIT WINDOWNS 10

DIRECTX VERSION

DIRECTX 11

PROCESSOR

INTEL i5 9400F OR AMD RYZEN 5 3600

MEMORY

8GB

GHRAPHIC CARD

STORAGE

HDD (1GB)

RECOMMENDED REQUIREMENTS

OPERATIONAL SYSTEM

64-BIT WINDOWNS 10 PRO

DIRECTX VERSION

DIRECTX 12

PROCESSOR

INTEL i7 9700 OR AMD RYZEN 7 3700X

MEMORY

16 GB

GHRAPHIC CARD

NVIDIA GTX 1050 TI 4GB OR RX 550 4GB

STORAGE

HDD (1GB)