SMARTSIM

DL SMART-AI

ARTIFICIAL INTELLIGENCE COURSE

DE LORENZO

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.

With this software, students can improve their individual experience on studying artificial intelligence in practice.

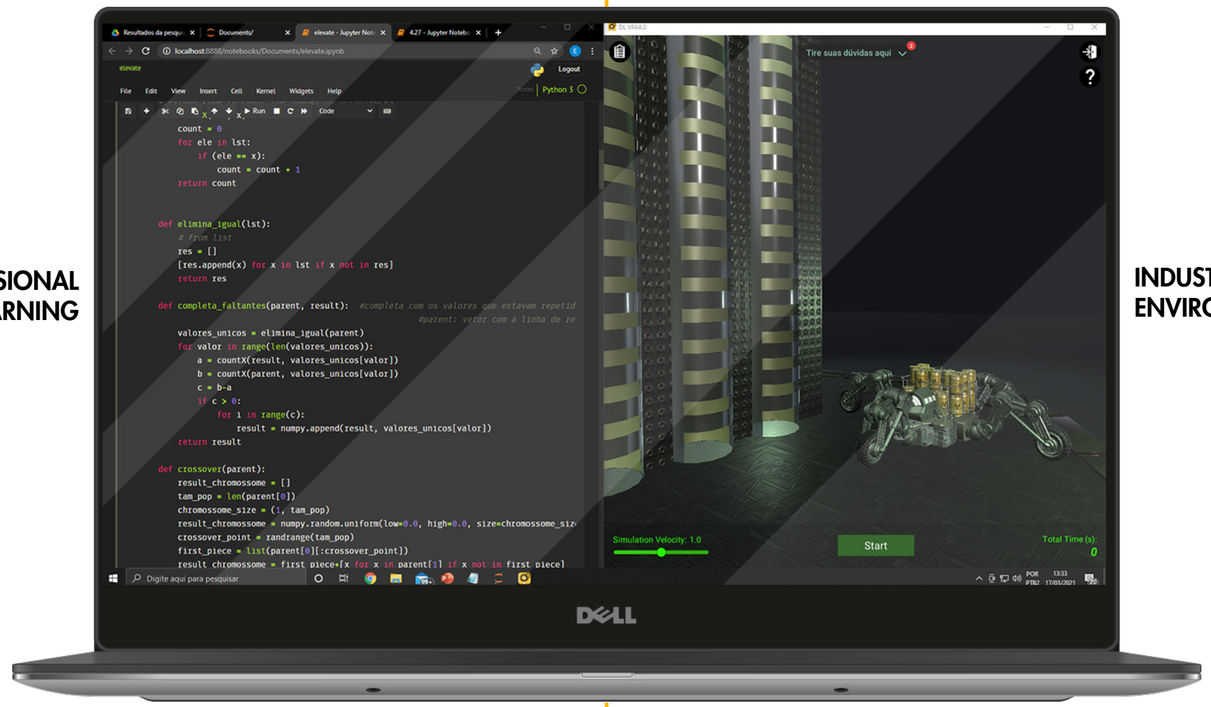
Professors can explore this trainer to provide experiments to students with the following topics:

- **Optimization: Introduction, definition, time and cost problems;**
- **Classification: Neural networks, signal generation, TensorFlow, predictions and failure predicts;**
- **Reinforcement Learning: Introduction and comparative to modern control;**
- **Decision trees: Application on regression.**

This software works integrated to a Python IDE (not included).

PYTHON PROGRAMMING TOOLS | POWERFUL 3D SIMULATOR

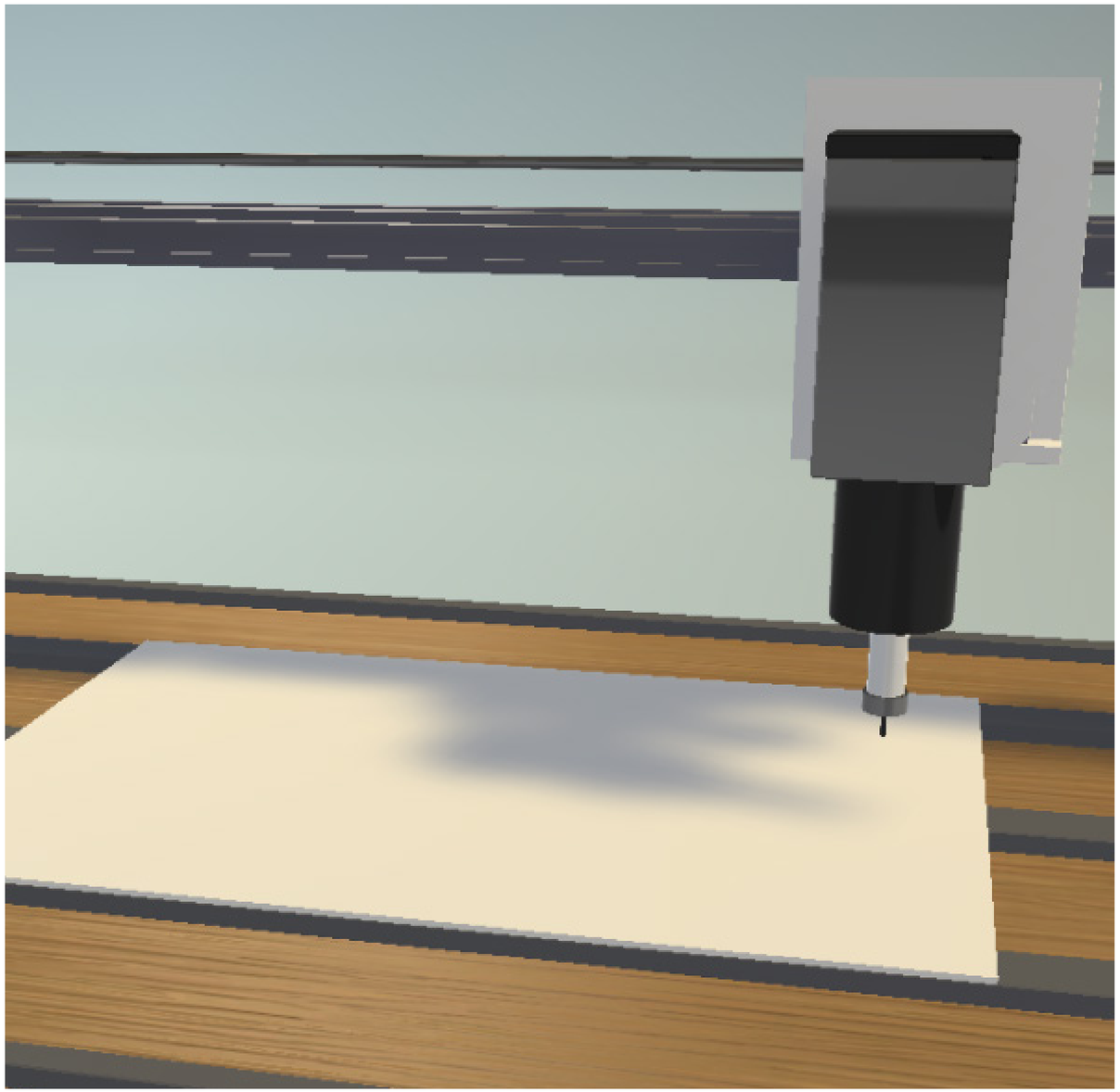
PROFESSIONAL LEARNING

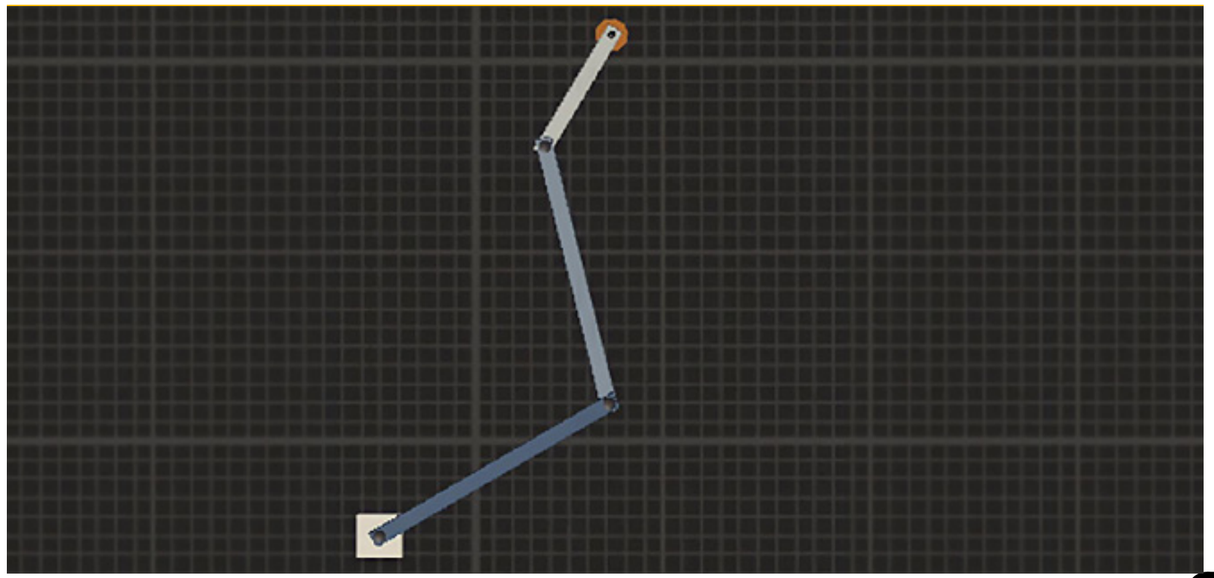


INDUSTRIAL REALISTIC ENVIRONMENTS

PROFESSIONAL EXPERIENCE | REAL-LIFE SITUATIONS

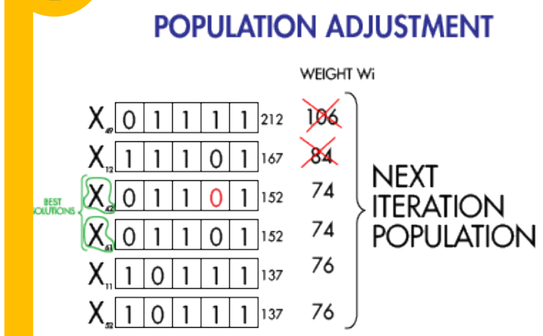
3D INDUSTRIAL ENVIRONMENTS TO PROVIDE REAL PRACTICAL EXPERIENCE TO STUDENTS





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

1

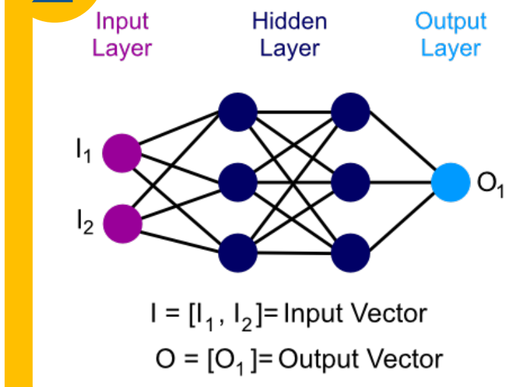


OPTIMIZATION

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

AI concepts: Introduction, genetic algorithm.

2

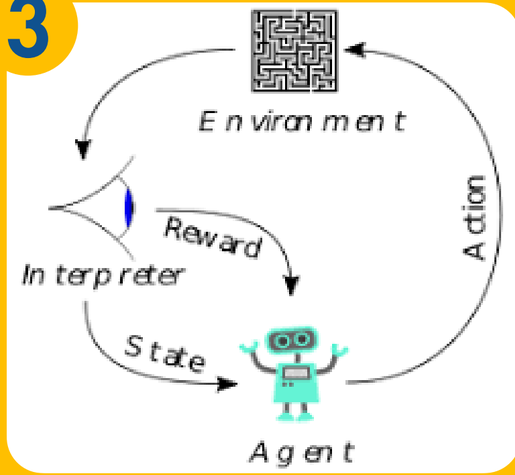


CLASSIFICATION

Goal: Use neural networks to resolve classification problems.

AI concepts: Neural networks.

3

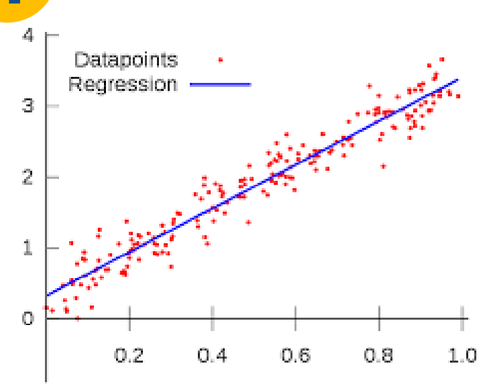


REINFORCEMENT LEARNING

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

AI concepts: Reinforcement learning.

4



REGRESSION

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

AI concepts: Decision trees.

STUDENT CAN LEARN AND PRACTICE FROM BASIC TO ADVANCED
AI TOPICS

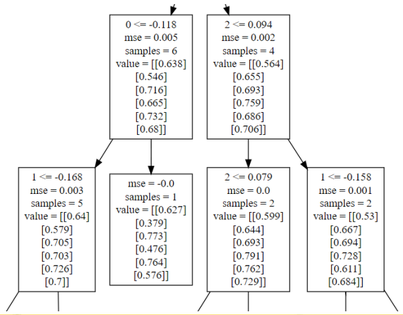
With the industrial 3D environments and also the built-in projects it´s possible to develop solutions that evolve optimization, genetic algorithms, regression, neural networks and a lot more.

PYTHON INSTRUCTIONS

```
def crossover(parent):
    result_chromossome = []
    tam_pop = len(parent[0])
    chromossome_size = (1, tam_pop)
    result_chromossome = numpy.random.uniform(low=0.0, high=0.0, size=chromossome_size)
    crossover_point = randrange(tam_pop)
    first_piece = list(parent[0][:crossover_point])
    result_chromossome = first_piece+[x for x in parent[1] if x not in first_piece]
    result_chromossome = numpy.asarray(result_chromossome)
    result_chromossome = completa_faltantes(parent[0], result_chromossome)
    return result_chromossome

def mutate(chromossome):
    chromossome = chromossome.astype(int) #transform a float array into a integer array
    lista = chromossome.tolist() # transform into list to use the function "sample"
    i, j = numpy.random.randint(low=0, high=len(chromossome), size=2) # choose two samples of the list (chromossome)
    lista[i], lista[j] = lista[j], lista[i]
    lista_saida = numpy.asarray(lista)
    return lista_saida
```

DECISION TREE



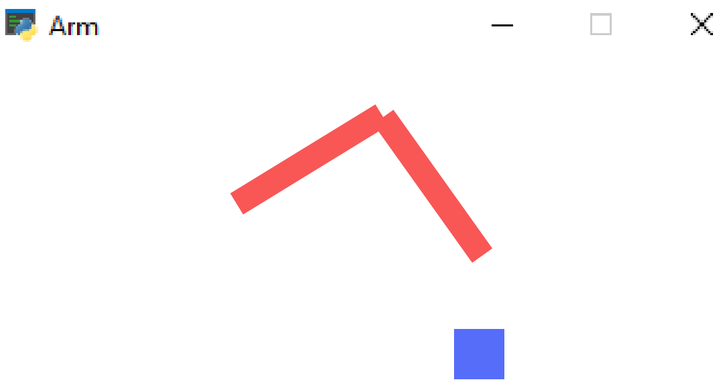
PREDICTIONS

```
predictions = model.predict(testX)
```

```
predictions[10]
predictions[80]
predictions[50]
predictions[90]
```

```
array([9.9999940e-01, 1.9931608e-07, 1.7625602e-07, 2.5123788e-07],
      dtype=float32)
```

VIRTUAL TRAINING ROBOT



TRAINING

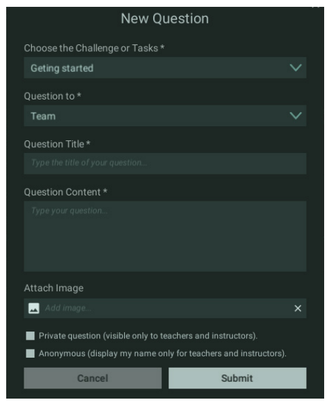
```
Epoch 2245/4000
1280/1280 [==============================] - 1s 998us/step - loss: 0.1307 - accuracy: 0.9531 - val_loss: 0.1074 - val_accurac
y: 0.9719
Epoch 02245: early stopping
Train: 0.972, Test: 0.972
```

WHY IS IT A SMARTSIM?

IT CONNECTS PROFESSOR, STUDENT AND SCHOOL

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.



COMPATIBLE WITH THE DL SMART-DASHBOARD (SOLD SEPARETLY)

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".

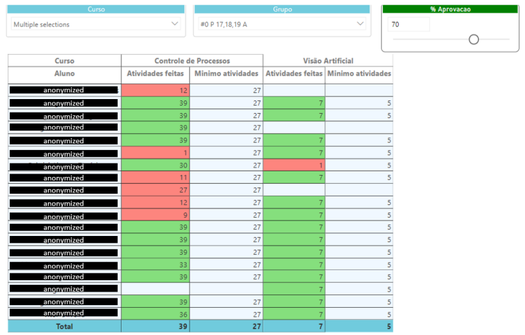
Tasks report

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	2.6 - 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

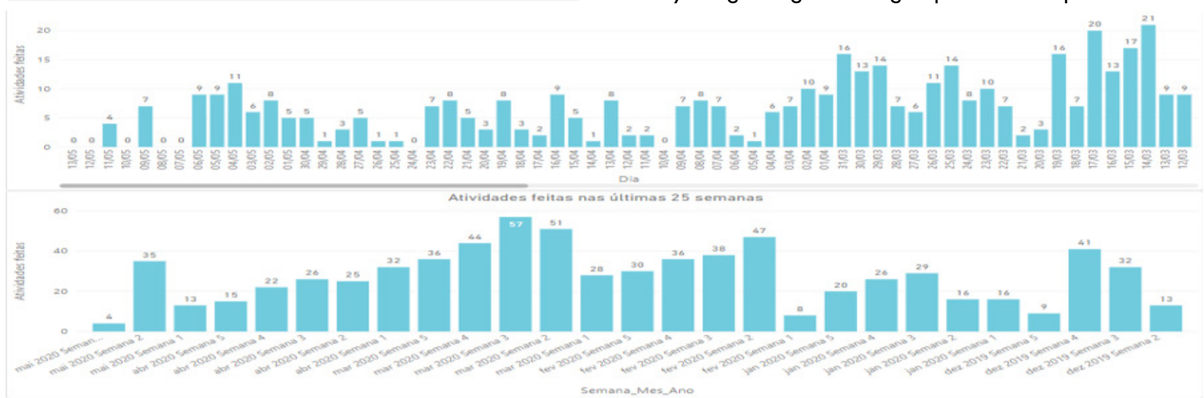
With this interface, the professor may choose which groups he/she wants to monitor, to verify who is on schedule, who is pending and so on. It is possible to define the expected progress percentage in relation to the tasks available in the course.



Curso	Controle de Processos		Visão Artificial	
Aluno	Atividades feitas	Mínimo atividades	Atividades feitas	Mínimo atividades
anonymized	12	27		
anonymized	39	27	7	5
anonymized	39	27	7	5
anonymized	39	27		
anonymized	39	27	7	5
anonymized	1	27	7	5
anonymized	30	27	1	5
anonymized	11	27	7	5
anonymized	27	27		
anonymized	12	27	7	5
anonymized	9	27	7	5
anonymized	39	27	7	5
anonymized	39	27	7	5
anonymized	39	27	7	5
anonymized	33	27	7	5
anonymized	39	27	7	5
anonymized			7	5
anonymized	39	27	7	5
anonymized	36	27	7	5
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

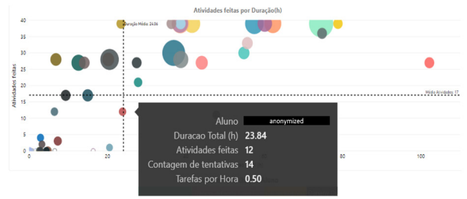
If the professor selects a student, he/she may verify how much time the student took to develop and deliver each task of the course.

Tempo por tarefa

Tarefa	Duracao Total (h)
Controlador ON-OFF - Forno	4.33
Estudando a Planta - Forno	4.08
Controlador PI - Forno	3.14
Resposta transiente e estacionária - Forno	2.50
Estudando a planta - Fuso	2.45
Métodos de Ziegler-Nichols(Malha Fechada) - Forno	2.35
Controlador PD - Forno	1.99
Controlador ON-OFF - Válvula	1.88
PID Siemens - Forno	1.63
Controlador Proporcional - Forno	1.44
Controlador PI - Válvula	1.42
Métodos de Ziegler-Nichols(Malha Aberta) - Forno	1.29
Estudando a planta - Válvula	1.22

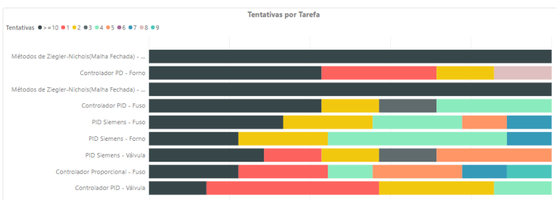
PROGRESS VS TIME TAKEN

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.



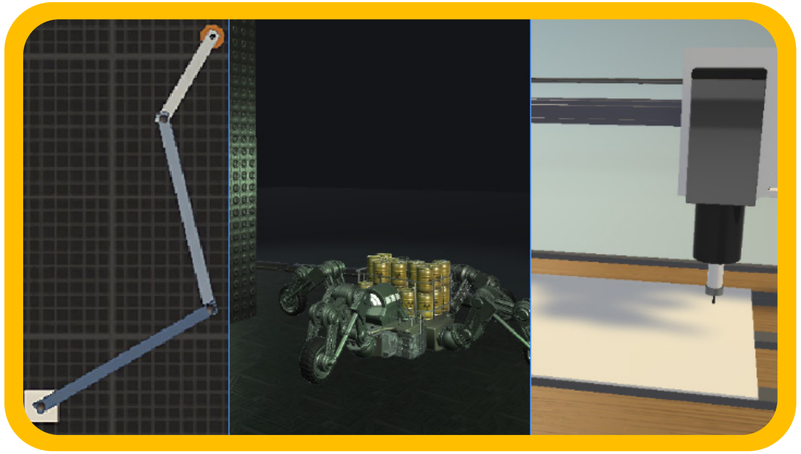
TRIALS PER TASK

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.

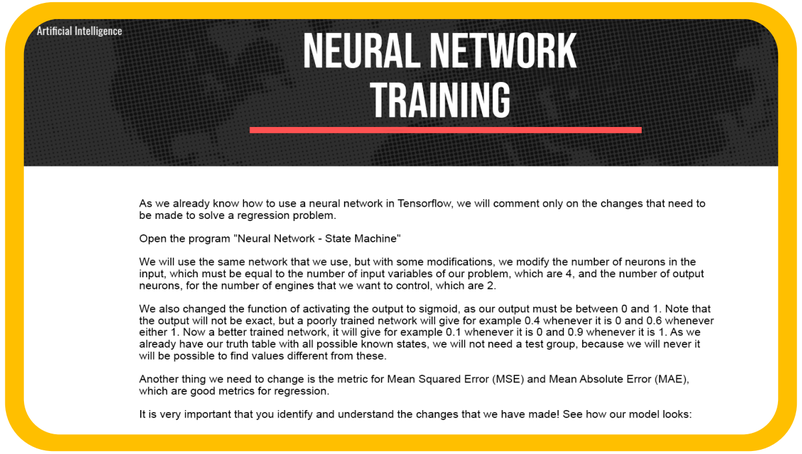


SUMMARY OF FEATURES

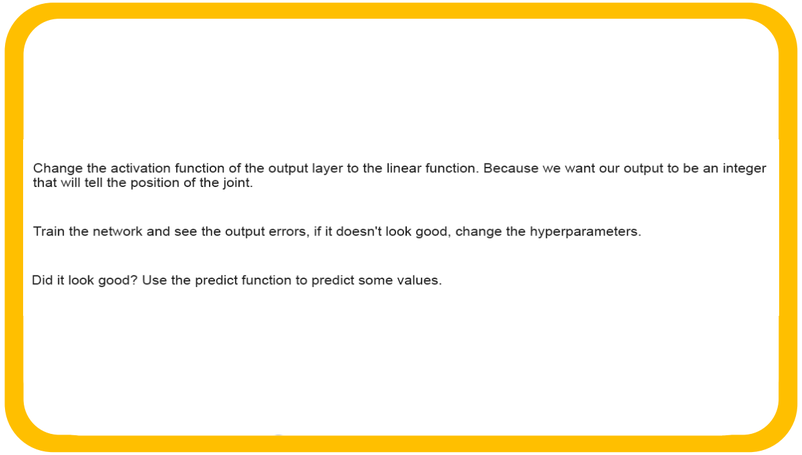
IT'S A 3D SIMULATOR



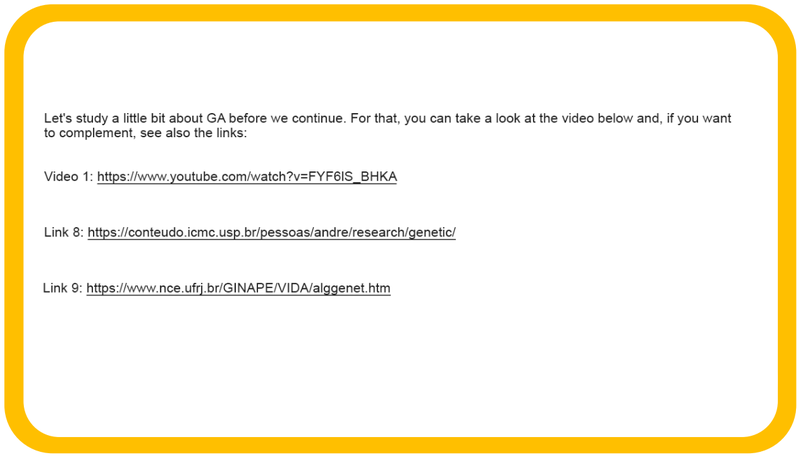
IT HAS BUILT-IN PROJECTS



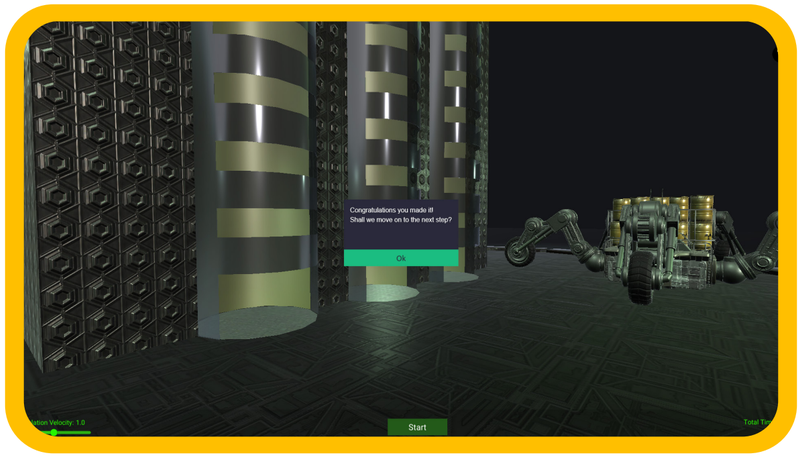
THE PROJECTS INCLUDE GUIDANCE



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

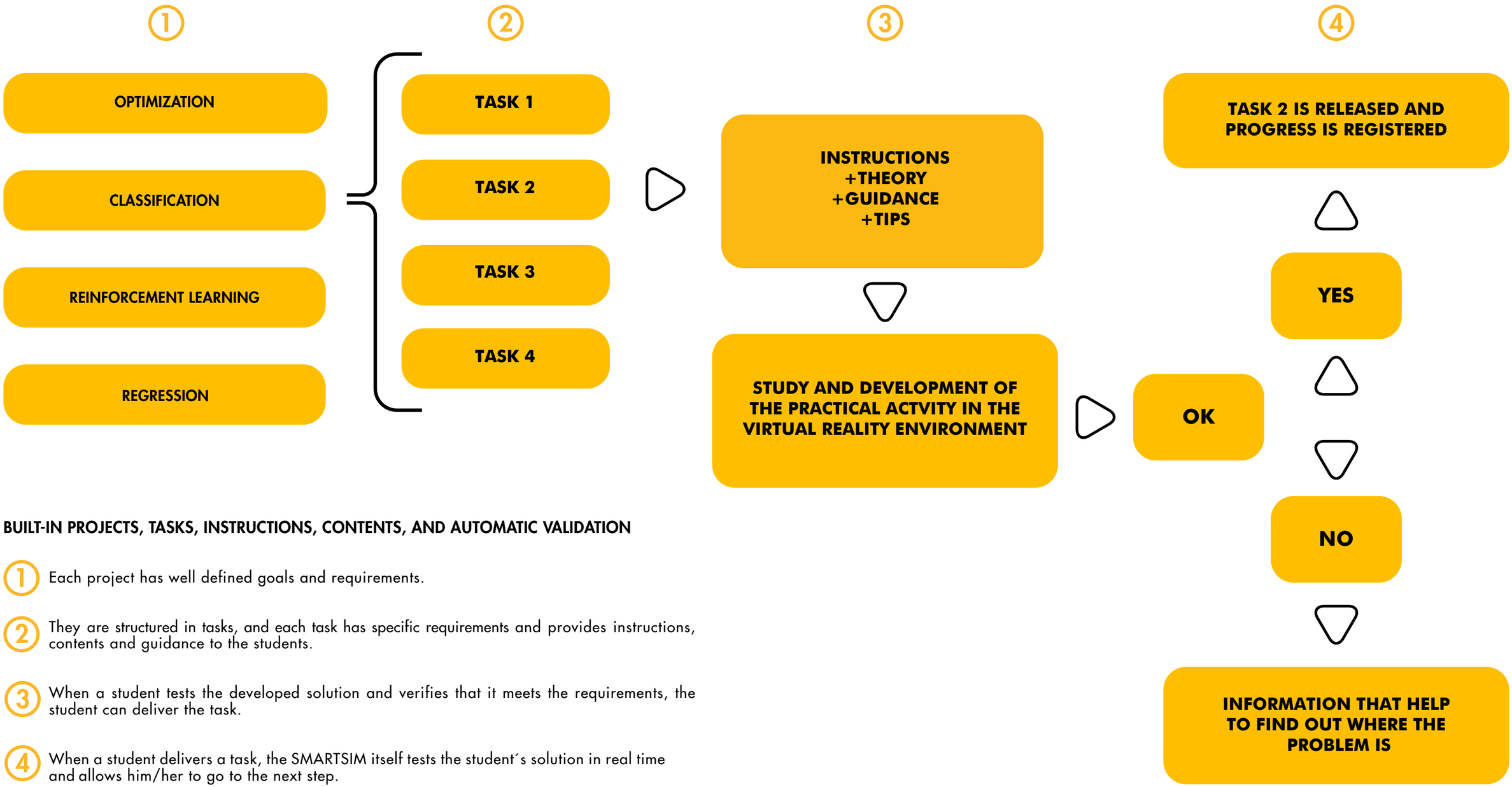


IT AUTOMATICALLY CHECKS STUDENT ACTIVITIES TO LET THEY MOVE ON, LIKE IN GAME



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

HOW ARE BUILT-IN PROJECTS STRUCTURED?



BUILT-IN PROJECTS, TASKS, INSTRUCTIONS, CONTENTS, AND AUTOMATIC VALIDATION

① Each project has well defined goals and requirements.

② They are structured in tasks, and each task has specific requirements and provides instructions, contents and guidance to the students.

③ When a student tests the developed solution and verifies that it meets the requirements, the student can deliver the task.

④ When a student delivers a task, the SMARTSIM itself tests the student´s solution in real time and allows him/her to go to the next step.

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)