

CS-C1000 – Introduction to Artificial Intelligence

# Computer Assignment A

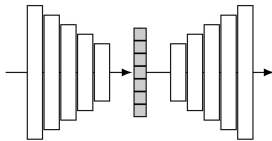
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# Computer Exercise A: Deep Generative Autoencoder Model



Input



512-dimensional  
encoding



Output

# Getting started

- ▶ The exercise does not require programming skills, just an open attitude and curiosity.
- ▶ The computer exercises are implemented in Python.
- ▶ The code can be run by logging into JupyterHub and fetching the course exercise.
- ▶ The student is given compute time on a server and depending on the load things can be faster/slower. If no resources are available (there should be plenty!), try again later.

# Log into JupyterHub

Login to:  
`https://jupyter.cs.aalto.fi`

**Sign in**

**Username:**

**Password:**  
 

**Sign In**

Using your Aalto account.

# Choose the course

The screenshot shows a web browser window with the URL `jupyter.cs.aalto.fi`. The page title is "Spawner Options". It contains a list of courses, each with a radio button. The course "CS-C1000 Introduction to Artificial Intelligence" is selected, indicated by a blue dot and an orange rectangular highlight. Below the list is a large orange button labeled "Spawn".

Course	Selected
Python: General use (JupyterLab) 0.5.9	<input type="radio"/>
Python: General use (classic notebook) 0.5.9	<input type="radio"/>
R: General use (JupyterLab) 0.5.3	<input type="radio"/>
Julia: General use (JupyterLab) 0.5.9	<input type="radio"/>
(testing) Python: General use (JupyterLab) 0.5.10	<input type="radio"/>
30E03000 Data Science for Business 2019 I	<input type="radio"/>
30E03000 Data Science for Business 2019 II	<input type="radio"/>
<b>CS-C1000 Introduction to Artificial Intelligence</b>	<input checked="" type="radio"/>
CS-E3210 Machine Learning: Basic Principles 2018	<input type="radio"/>
CS-E4830 Kernel Methods in Machine Learning	<input type="radio"/>
CS-E4890 Deep Learning 2019	<input type="radio"/>
testcourse	<input type="radio"/>

Spawn

# Fetch the exercise

The screenshot shows the JupyterLab web interface in a browser window. The address bar shows 'jupyter.cs.aalto.fi'. The interface has a top navigation bar with 'Logout' and 'Control Panel' buttons. Below this is a tabbed interface with 'Files', 'Running', 'Clusters', 'Assignments', and 'nbextensions'. The 'Assignments' tab is selected. Below the tabs, there is a dropdown menu for 'Released, downloaded, and submitted assignments for course:' with 'introai2020' selected. The main content area is divided into three sections: 'Released assignments' with a table showing 'Computer-Assignment-A' for 'introai2020' and a 'Fetch' button; 'Downloaded assignments' with the message 'There are no downloaded assignments.'; and 'Submitted assignments' with the message 'There are no submitted assignments.'.

3. Files Running Clusters Assignments nbextensions

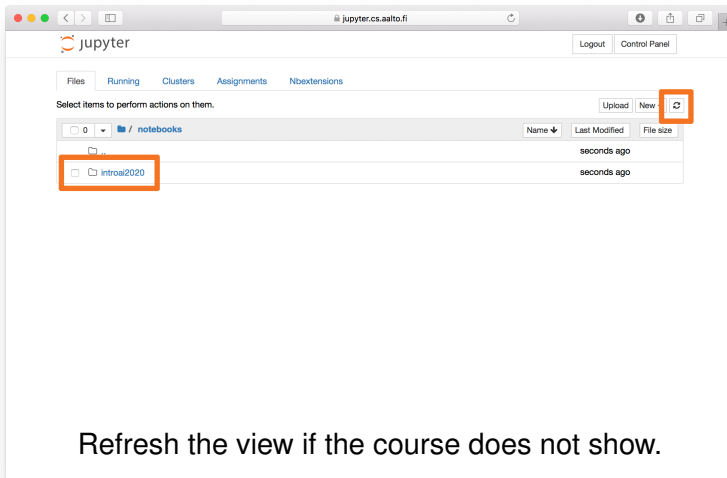
1.

2.

Fetch

1. Choose 'Assignments', 2. Fetch, 3. Choose 'Files'

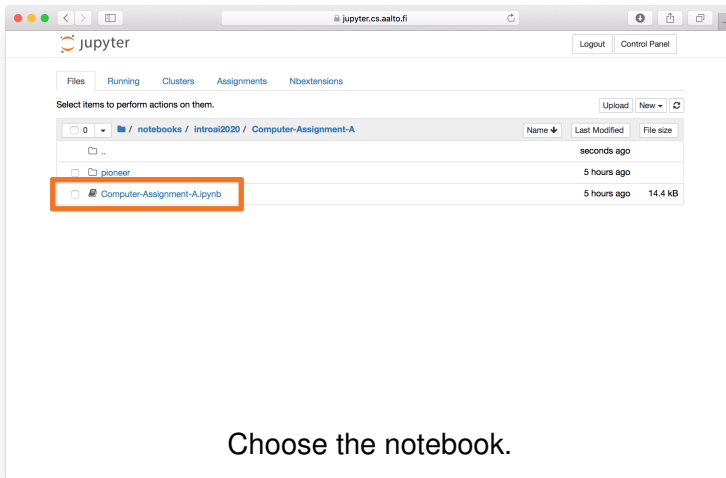
# Find the notebook



The screenshot shows the JupyterLab web interface in a browser window. The address bar displays 'jupyter.cs.aalto.fi'. The interface includes a top navigation bar with 'Files', 'Running', 'Clusters', 'Assignments', and 'Nbextensions' tabs. Below this, there are buttons for 'Logout' and 'Control Panel'. A message 'Select items to perform actions on them.' is followed by 'Upload', 'New', and a refresh icon (circular arrow). The file browser shows the current directory as '/ notebooks'. A table lists files with columns for 'Name', 'Last Modified', and 'File size'. The file 'introai2020' is listed and highlighted with an orange box. The refresh icon in the top right of the file browser is also highlighted with an orange box.

Refresh the view if the course does not show.

# Fire it up



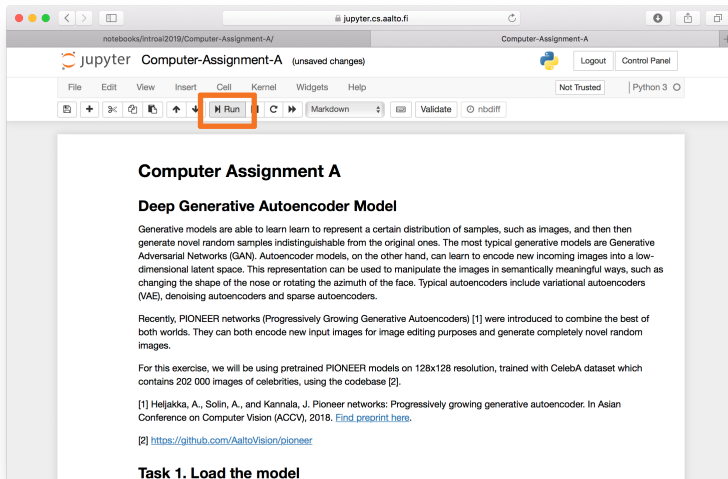
The screenshot shows the JupyterLab web interface in a browser window. The address bar shows `jupyter.cs.aalto.fi`. The interface includes a top bar with the Jupyter logo, a "Logout" button, and a "Control Panel" button. Below this is a navigation bar with tabs for "Files", "Running", "Clusters", "Assignments", and "Nbextensions". The "Files" tab is active, displaying a file browser. The breadcrumb path is `/ notebooks / introai2020 / Computer-Assignment-A`. The file list shows three items: `..` (parent directory), `pioneer` (directory), and `Computer-Assignment-A.ipynb` (notebook). The `Computer-Assignment-A.ipynb` file is highlighted with an orange rectangle. The file list also shows the last modified time and file size for each item.

	Name	Last Modified	File size
<input type="checkbox"/>	..	seconds ago	
<input type="checkbox"/>	pioneer	5 hours ago	
<input type="checkbox"/>	Computer-Assignment-A.ipynb	5 hours ago	14.4 kB

Choose the notebook.



# Ready to run (a cell at a time)



## Task 1: Load the model

- ▶ Read the cells and run them one after another by pressing 'Run'.
- ▶ A small asterisk (\*) will indicate that the cell is still running.
- ▶ You are not going to train the model (the learning already happened), but rather load an already trained model.

## Task 2: Fake people

- ▶ The autoencoder model is quite handy for many things, you can for example directly create a random vector with 512 numbers and convert that into a face.
- ▶ Put in your student number as the **random seed** in order to have a unique set of faces (you can experiment with other seeds as well).
- ▶ Run the cell to get your set of fake people.

## Task 3: Reconstruct

- ▶ Here you first encode an image to the 512-dimensional representation, and then you reconstruct it.
- ▶ You should notice that the original and reconstruction do not completely match, but they should have the same kind of attributes (hair color, etc.)
- ▶ **Note the potential bias in the training data:** the model is trained on a dataset of Hollywood actors, in which female white actors are over-represented. The ethical implications of this is a current topic of discussion in the AI community. We will have more discussion on these issues in Lecture 6.

## Task 4: Interpolation

- ▶ Given two encoded images, it is easy to calculate intermediate in-between variations of two faces.

## Task 5: Manipulation

- ▶ If you know which attributes in the latent representation correspond to specific features, you can manipulate existing images.

## Task 6 & 7: Optional

- ▶ For those who are familiar with Python and coding, there are two additional tasks.

# How to get points?

- ▶ To get the points for this week's exercise, answer the questions in MyCourses related to this Computer Exercise A.