

# Introduction to AI, machine learning and neural networks

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<https://utrechtsummerschool.nl/courses/engineering-and-technology/introduction-to-artificial-intelligence-machine-learning-and-neural-networks>

# Agenda

Monday Jul10: Data science	Tue Jul11: machine learning	Wed Jul12: Standard neural networks	Thu Jul13: complicated neural networks	Fri Jul14: other AI algorithms
Data exploration and visualisation	Decision trees and regression	Prediction with neural networks	Image recognition	Evolutionary algorithms
History of AI	AI and ethics (Ethics Inc)	AI validation / medical AI	Neural network types	Business process mining

# Structure of each day

Time	Content	Remarks
8.45-9.05*	Walk-in and coffee	
9.05 – 9.30*	Recap and questions	Discuss previous day. On day 1: check if people have practical questions
9.30 – 10.30	Theory	Presentation by lecturer of key concepts
10.30 - 10.45	Coffee break	
10.30 – 11.45	Practical session	Working on assignments, individual or in groups
11.45 – 12.15	Discuss practice results, conclusion	
12.15 – 13.15	Lunch	
13.15 – 14.30	Theory	Presentation by lecturer of key concepts
14.30 – 14.45	Coffee break	
14.45 – 15.45	Practical session	Working on assignments, individual or in groups
15.45 – 16.15	Discuss practice results, conclusion	
16.15 – 16.30	Time for individual questions	Lecturer is available for individual questions

\* Day one will start later at 9.30

# Monday Jul10: data science

## Programme:

Morning theory

- Your expectations for this week
- Data science basics
- Exploring data sets

Morning practical

- Exploring data sets with python

Afternoon theory

- History of AI
- AI problems
- AI methods

Afternoon practical

- Classifying AI problems

# Tuesday Tue Jul11: machine learning

## Programme:

Morning theory

- Classification and clustering
- Decision trees
- Linear regression

Morning practical

- Predicting prices

Afternoon theory

- Ethics and AI
- AI values

Afternoon practical

- Ethics inc – serious game

# Wednesday Jul12: Standard neural networks

## Programme:

Morning theory

Morning practical

Afternoon theory

Afternoon practical

- Perceptrons
- Neural network structure
- Neural network training
  
- Neural networks in python
  
- AI validation
- AI bias
- Medical AI risks
  
- Measuring and correcting bias

# Thursday Jul13: complicated neural networks

## Programme:

Morning theory

- Collecting and classifying images
- Images as vectors
- Training images

Morning practical

- Image recognition practical

Afternoon theory

- Neural network zoo : different types of neural networks
- Generative AI

Afternoon practical

- Style transfer
- Deepfake recognition

# Friday Jul14: other AI algorithms

## Programme:

Morning theory

- Evolutionary algorithms
- ANT algorithms
- Search algorithms

Morning practical

- Exploring data sets with python

Afternoon theory

- Business process modelling
- Business process mining

Afternoon practical

- Business process mining



# Course preparation

- You must bring a laptop in order to participate. You will use the computer for programming in python
- You must bring paper and pencil for making notes.
- It is useful to install python and jupyter before the course. See instructions on next slide

# Installing python and Jupyter

1. Install python (<https://www.python.org/downloads/>) and the Jupyter toolbox:
2. Download the data set and python notebook at <https://github.com/swzaken/cars-neuralnetwork>
3. Install python packages. You can use the following commands

Library	Description	Command to install
Updated version of Pip	Installing packages	<code>python -m pip install --upgrade pip</code>
Numpy	Arrays and numbers	<code>pip install numpy</code>
Matplotlib	Data visualization	<code>pip install matplotlib</code>
Pillow	Image processing	<code>pip install pillow</code>
Jupyter Notebooks	Running the code	<code>pip install jupyterlab</code>
Tensorflow	Machine learning algorithms	<code>pip install tensorflow</code>