

AI & Robotics

Course Conspectus



Course Positioning



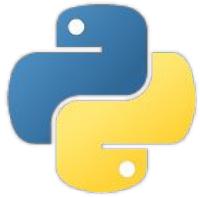
- First AI & Robotics course
- 2nd year
- 9 ECTS (European Credit Transfer and Accumulation System)
- 2nd semester (February - May)
- 13 weeks
- 6h / week (3h Monday, 3h Thursday)

Objectives

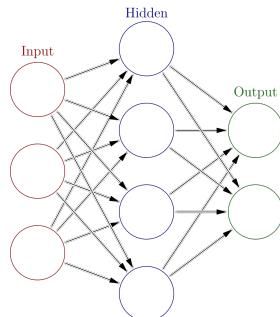
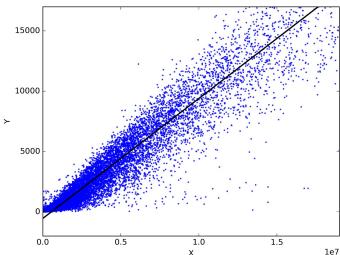
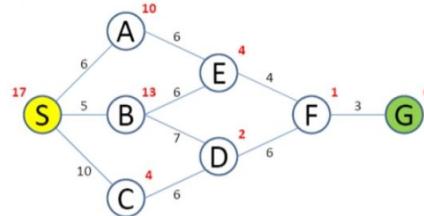


- Apply Artificial Intelligence, Machine Learning and Deep Learning concepts.
- Implement software to control a Robot
(Rapid Robot Prototyping)
- Read, process and visualize data from a variety of input sources
- Understand the mathematical and statistical components used in AI techniques
- Design, implement and evaluate an AI information system

Contents



ROS



- Intro to AI & Robotics
- Ethical aspects of AI & Robotics
- Python
- Trees and Pathfinding
- Robot Operating System (ROS)
- Statistics
- Machine Learning: Supervised Learning
- Machine Learning: Neural Networks
- Machine Learning: Unsupervised Learning

Team

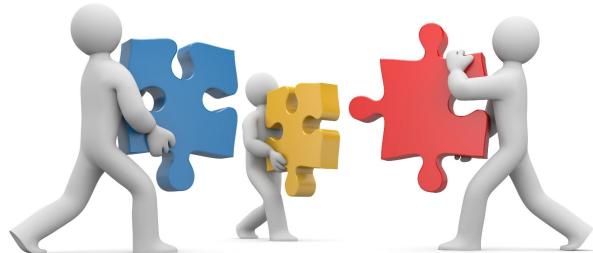


Tim Dupont
Founder & Senior Researcher



Sam Van Rijn
Senior Researcher

Co-Teaching



- Two lecturers, one group
- Complementary partners
- More focus on achieving the goals
- “To serve the junior colleagues”
- Better differentiation (Your responsibility!)

Co-Teaching: Options [Friend&Cook96]



- **One teach, one support**
- **Parallel teaching**
~~(Divided the room in two, one approach.)~~
- **Alternative teaching**
(One group goes to the workstations.)
- **Station teaching**
(Divided the room in two, different approaches.)
- **Team teaching**
(Augment each other, the most)

Evaluation



%	Periode	Type
40	June	Group project (individual assessment)
60	June	Written Exam (closed book)
40	Aug/Sep	Individual assignment
60	Aug/Sep	Written Exam (closed book)

Course materials

The screenshot shows a GitHub repository page for the "PXL AI & Robotics Course".

Repository Overview:

- Name:** PXL AI & Robotics Course
- Description:** The AI & Robotics course of PXL Digital at PXL University of Applied Sciences and Arts
- Owner:** PXL-Digital
- Size:** 3.2 GB
- Last Commit:** 1 day ago by [SamVanderstraeten](#)
- Branch:** main
- Language:** Python

Repository Statistics:

- 3 Repositories
- 3 People
- 0 Teams
- 0 Projects
- Settings

Search and Filters:

- Find a repository...
- Type: All
- Language: All
- Customize pinned repositories
- New

Repositories Listed:

- AnRCourseMaterialsForStudents** [Private]
All the materials for the AI & Robotics course
Updated a minute ago
- researchproject1819**
Updated 4 days ago
- pxl_ai_toolbox**
PXL AI Toolbox
Python Updated 26 days ago

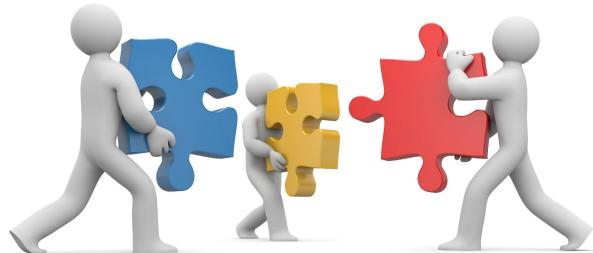
Top Languages:

- Python

People:

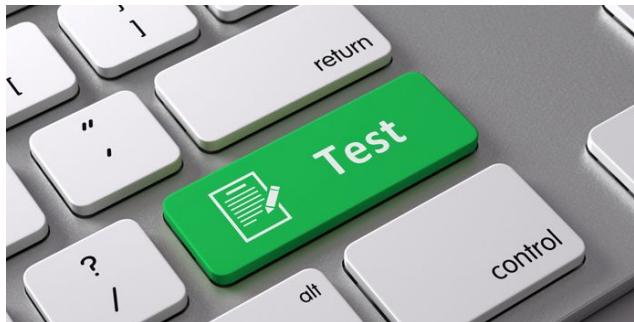
- SamVanderstraeten** (Profile picture)
- samvr-pxl** (Profile picture)
- TimDupontPXL** (Profile picture)
Tim Dupont

Personal Repo @ GitHub



- Backup the solutions of all assignments
- More git experience
- Become fluent with Markdown
- Reassurance for the lecturers

Group project



- Assignment in AnR Week 8 (End of April)
- Same teams as Research Project?
- Starting with data manipulation/cleaning/...
- Focus on AI
- Presentations after the lessons before the exams

Software



- On own Laptop
- MD & git
- Ubuntu 18.04 → ROS
- Docker
- Python3 + libs
- Jupyter Notebooks + Google Colab

Planning



Week 1: Introduction

AI & Robotics, ethical aspects, Python

Week 2: Intro and Classical Machine Learning

Trees & Graphs, Tree Search, ...

Week 3 – Week 5: Robot Operating System

Introduction, installation, nodes, topics, pub/sub, service/client

Rviz, simulations, state machines,

URDF, OpenCV (Computer Vision), QT (GUI)

Week 6: ROS Assignment

Week 7: Supervised Learning: Decision trees

Intro, Decision trees, train/validate/test, underfitting/overfitting, Random Forests

SPRING BREAK: (BIG ASSIGNMENT WITH FLASK)

Week 8 - week 9: Supervised Learning: Data & Optimization

Optimization, data analysis & visualization + project assignment

Week 10: Machine Learning: Supervised Learning (continued)

Boosting (XGBoost), Interpretation

Week 11: Neural Networks (basics)

Introduction, structure, loss function, ...

Week 12: Unsupervised Learning (basics)

K-means clustering, ...

Week 13: What's next?

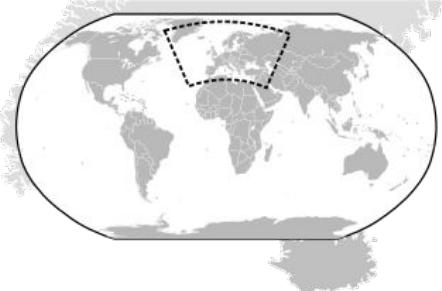
Intro to Deep learning, CNN, RNN, GANs, Reinforcement Learning,...

PXL AI & ROBOTICS LAB



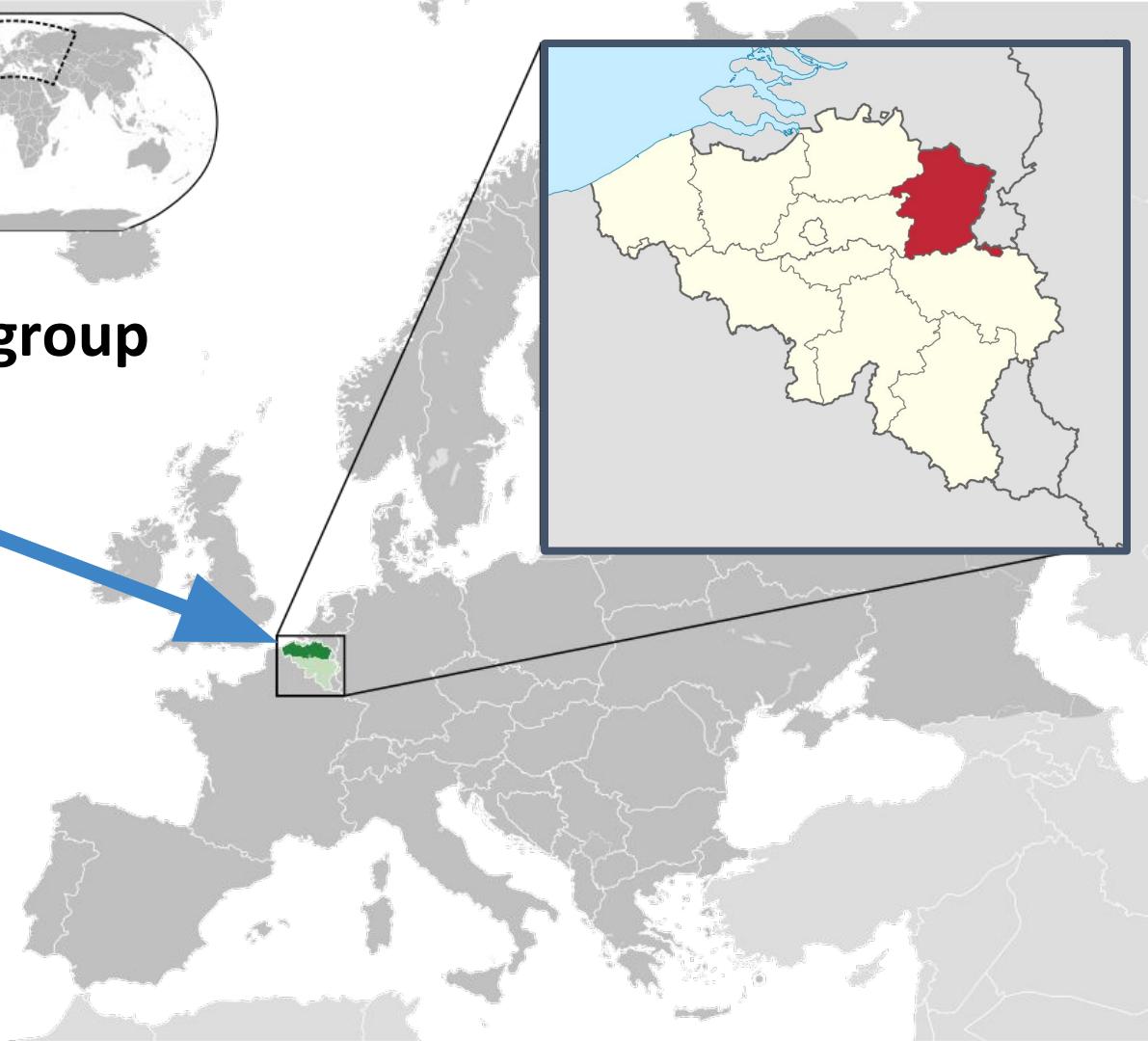
**UNIVERSITY OF APPLIED
SCIENCES AND ARTS**

Who?

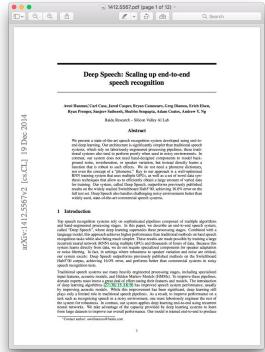


AI & Robotics research group
from Belgium.

8 Senior Researchers
& Fixnum Students



We create practical implementations...

A terminal window showing the execution of the DeepSpeech command-line interface. The user runs the command `deepspeech --help` to see usage information. The terminal also displays the contents of the `README.md` file, which includes the DeepSpeech logo and a brief description of the project.

Implementation

Academic
Results



Projects in cooperation
with companies and/or
other universities.



Example: Emergency UAV PoC



We give back to the community...

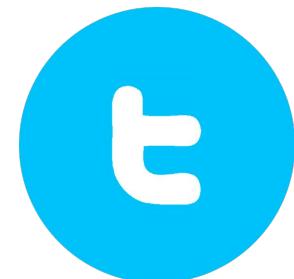
The screenshot shows a GitHub repository page for "PXL AI & Robotics Lab". The page includes the following elements:

- Header:** GitHub logo, search bar ("Search or jump to..."), navigation links ("Pull requests", "Issues", "Marketplace", "Explore"), notifications, and user profile.
- Repository Information:** "PXL AI & Robotics Lab" (AI & ROBOTICS LAB), description ("The AI & Robotics group at PXL University College"), location ("Hasselt, Belgium"), and URL ("http://roboticslab.pxl.be").
- Repository Statistics:** 37 repositories, 5 people, 0 teams, 0 projects, and Settings link.
- Search and Filter:** Search bar ("Search repositories..."), filter dropdowns for "Type: Public" and "Language: All", a "New" button, and a "Customize pinned repositories" link.
- Results:** 16 results for public repositories, a "Clear filter" button, and two repository cards:
 - darknet**: Forked from pjreddie/darknet, Convolutional Neural Networks, C language, 5,194 stars, updated on Jun 30.
 - pepper_cerebrum**: CMake, updated on Jun 30.
- Metrics and Topics:** "Top languages" (Python, CMake, Shell, C++) and "Most used topics" (opensource, python, ros).
- Community:** "People" section showing 5 profiles.

Follow us! #PXLRoboticsLab



Instagram



<https://roboticslab.pxl.be>