Data Science for IoT

A hands-on introductory course exploring the Internet of Things form a Data Science point of view.

Learning Objective

1. Prepare a (Rapid) prototype for an Internet of Things (IoT) data-pipeline scenario
2. Become familiar with Data Science concepts surrounding IoT applications by building them
3. Learn to design and develop simple lightweight IoTprototypes
4. Learn to report on IoT prototypes & data-pipelines

Choosing IoT data-pipeline scenario

The objective is to choose a topic you care deeply about. A subject or theme that's genuinely interesting to you is of essence to succeed and learn the most. Keepin mind that it should be reasonably well scoped →→something small, discrete and easy to implement ←←.
Identify a small solvable problem that illustrate your key idea. Keep it constrained but conceptually interesting. The lectures outline the scope of Data Science for IoT and
relevant literature.

Deliverables:

The course requires the following to be delivered:

- A working prototype that includes software (code), hardware and electronics elements. Code (commented) for the application
- Documentation of the project (contributed to a personal GitHub Repository).
- An online demo (video or IoT Platform implementation) of the completed IoT data-pipeline/project.

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Submitting your work:

You'll submit your work to the HR LMS as follows:

Documentation should be accessible a personal GitHub Repository summited in the format of a text file (.txt) containing the URL to your Repository to the lms.hr.nl INLEVER_MAP_OP3 (CMIDAT01K)

You should document your IoT data-pipeline comprehensively, including:

- ❑ Add/upload code and any supporting documentation and files to your GitHub Repository. Describe the concept and goals (include video or diagrams if needed.)
- ❑ Describe relevant prior projects, approaches or methods you researched that inspired the project. Be thorough and show what informed the project.
- ❑ Process Outline you underwent to reach the outcome (experiments, hacks, tests, refinements, iterations, failures). Describe the realized outcome and how it works.
- ❑ Include supporting images, a video of the working prototype, circuit diagrams, etc. Outline next steps and future directions.

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Grading

Take note:

Main goal is to come up with a compelling IoTdata-pipeline concept.
Provide evidence for a working prototype as proof-of-concept.

A strong grade will result by create interesting, well-crafted and well documented IoT prototype + data-pipeline. As such, each data driven IoT prototype will be graded as follows:

20%	**Approach and Topic** – Merit, creativity, and context for the outcome/proposal
40%	**Proof-of-Concept Documentation** Well illustrated with appropriate use of code, video, diagrams, repeatability, etc.
30%	**Technical Implementation** Quality of data + Executability of Electronics & Code
10%	**Process** Description and Narration of the Process (ideation, iteration, etc.) and personal/critical reflection on the realized learning objectives.

Anote on documentation:

Each Repository has to be accompanied with a written description.
This is a starting point for your exploration.
Everyone is encouraged to use Jupiter Notebooks.

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Grading Rubric (Part1)

Merit - Approach and Topic:

How interesting is the IoT concept? Does it represent a data pipeline approach, or an original perspective, based on Data Science principles? Does it deviate from known or standard approaches? Does it use materials or code in aninnovative way?

0: incomplete: does not satisfy brief and no originality or creativity demonstrated (e.g. direct replication of prior approach without extension)

1: passing: satisfies minimum requirements of the brief and/or a minor increment over existing work (extension/adaptation of a precedent)

2: good: shows engagement, exploration and insight; uses precedents and/or materials in relatively original ways.

3: excellent: shows deep insight, and significant understanding of the problem; goes beyond the brief and demonstrates significant originality in the ideas and their application; uses precedents and/or materials in unexpected ways; surprising and delightful outcome.

Proof-of-Concept - Documentation:

Is the problem space or scenario clearly explained? How clearly are the key principles and goals of the work articulated? How informed is the work? Does it show connections to Data Science, IoT ideas & research, sensor electronics, IoT frameworks or other elements of the domain?

0: incomplete: No mention of problem space, scenario and/or does not include precedents

1: passing: satisfies requirements, provides core-functionality, is basic in operation; requires improvement

2: good: provides a thoughtful and considered introduction to the work with limited references and limited analysis of past work

3: excellent: provides a thoughtful and considered introduction to the work and supports the context with relevant references and critical analysis of past work.

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Grading Rubric (Part2)

Technical implementation - Data & Code + Sensory/Actuator Electronics:

How well implemented is the electronics, data & code? Is it well commented, well formatted, well-structured and functioning? Does it show sophisticated approaches? How well composed is it? Does it show technical skill and mastery of programming?

0: incomplete: does not work – electronics, data or code are not included or not error-free

1: passing: satisfies requirements - provides core functionality only, is basic in operation and requires improvement.

2: good: functional; provides reasonably well-structured approach; well commented; and shows technical competence.

3: excellent: provides a considered well organized, well commented and structured data implementation; and/or has implemented complex functionality beyond the brief and/or demonstrated technical skill

Process – Description & Narration:

How well authored, curated, illustrated is the documentation? Is it sufficiently detailed to repeat the outcome? Does it include a critical reflection? Does it communicate the project and its goals succinctly and effectively?

0: incomplete: documentation is missing or doesn't provide any illustration reasonably poor quality, verbose, unclear or shows other communication issues.

1: passing: satisfies minimum requirements - provides the minimum core functionality, is basic in operation and could be improved.

2: good: functional; provides reasonably well-structured approach; well commented; and shows technical competence.

3: excellent: provides a considered well organized, well commented and structured data implementation; and/or has implemented complex functionality beyond the brief and/or demonstrated technical skill