# Data Science for IoT

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



## LearningObjective & Design Brief

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 IoT-prototypes
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.

Keep in mind that it should be reasonably well scoped:

➔➔***something small, discrete and easy to implement***➔➔

Identify a 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 (narrated video)*** of the completed IoT data-pipeline/project + evidence of a working prototype. ➔[video + IoT Platform implementation]➔

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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_OP2 (vakcode CMIDAT01K | 2021-2022)

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

- ❑ Add/upload code and any supporting documentation and files to your GitHub Repository.
  That is: describe the concept and goals in the readme ***(include video + diagrams)***

- ❑ Describe relevant prior projects, approaches or methods you researched that inspired the project. Be thorough and show explicitly on which recourses your project is based (add a reference list).

- ❑ Process Outline you underwent to reach the outcome (experiments, hacks, tests, refinements, iterations, failures). Describe the realized outcome and how it works.

- ❑ Provide compelling evidence of a working prototype by producing a narrated video. This should include a clear demonstration and evaluation of how the prototype works and highlighting key IoT features.

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

**Git-Hub documentation:**

Each Repository has to be accompanied with a written description (README file).
Everyone is encouraged to use Jupiter Notebooks + Python as the main coding language.

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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:** No originality or creativity demonstrated (e.g. direct replication of prior approach without extension)

**1: passing:** satisfies minimum requirements. Includes only a minor increment over existing work (extension/adaptation of a precedent)

**2: good:** shows engagement, exploration and insight; uses precedents and/or materials in a original way.

**3: excellent:** shows deep insight, and significant understanding of the IoT problem; demonstrates significant originality in the ideas and their IoT-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:** Does not provide compelling evidence of a working proptotype (No video material is provided).

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

**2: good:** provides a thoughtful and considered introduction to the work with limited references to excisting IoT-projects and/or 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 minimum 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 well organized, well commented and structured prototype + IoT data pipeline. Has implemented complex IoT functionality and/or demonstrated in-depth technical skills.

### 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 only 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 well organized, well commented and structured prototype + IoT data pipeline. Has implemented complex IoT functionality and/or demonstrated in-depth technical skills.