# Master’s thesis project pitch

*Please fill out and return the following template to us.*

*If you do not already have contact with a potential supervisor at NTNU, let us know as soon as possible.*

## Thesis information

### (Working) Title of the project:

**Time frame of the thesis:** *(Usually 6 or 12 months, 1 or 2 semesters)*

**(Potential) NTNU supervisor:**

### Company intro

*Please give a brief introduction of the company and/or unit in which the thesis will be carried out.*

### In-house contact person

*This person will follow up the student(s) from the company’s side. They should have knowledge about the target problem but does not need to have advanced competences in AI.*

**Name:**

**Email:**

## Presentation of data and problem

### Problem description

*Please provide a high-level description of your target problem (and if relevant, how it’s handled**today)****.*** *Give a brief presentation of the project that you would like the student to carry out****.*** *Say something about the expected outcome of the thesis****.*** *A suitable master thesis project should have a scientific and practical challenge. In your description, please ensure both aspects are addressed.*

### Data

*The availability of the proper data set is vital for the projects. Keep in mind that the more open the data is, the better. For all of these projects, the expectation is that all (or most) data will be available to the student at the start of the project. If this is not the case at your company, that needs to be explained in your proposal.*

*Please describe: Which data will be used and how will the data be made available to the student? Size of the data / will the provided data be raw or pre-processed / de-identified/anonymized? / Which level of data security is needed? Will there be a need for an NDA or delayed publication of the thesis?*

### Risks / Challenges

*Let us know if you foresee any potential business challenges or scientific challenges using the data set.*

### Additional information (optional)

*Include photos/figures if relevant*

## Example 1:

*Data Analytics for HUNT: Recognition of Physical Activity on Sensor Data Streams*

Data captured by body worn sensors provides an excellent opportunity for assessing the physical activity of patients and hence creating behavioral profiles over time. Particularly patients with chronic disease can receive tailored advice on how to increase their activity and hence improve their overall life quality.

The focus and challenge for this project and master thesis is the selection, implementation and improvement of pattern recognition and data mining, techniques to identify different types of activities such as sitting, standing, walking, running, biking, etc within sensor data. The data will be provided by NTNUs medical faculty (DMF), while this thesis should focus on the data analysis. The captured data sets will be streaming data from six acceleration sensors recorded at 100 Hz. The sensor system also includes recording of heart rate.

During this work, the state of the art for algorithms should be described, the most fitting algorithms selected and implemented. The implementation will be evaluated in collaboration with DMF, who is also providing background information on the data.

Once the experimental set up is created, different existing algorithms should be evaluated, and their strength and weaknesses pointed out. Based on this analysis, a follow-up master thesis can be defined focusing on improving existing algorithms and validated in a real-world setting.

**Sketch for the project thesis:**

* Literature review on existing pattern recognition and data mining techniques
* Selection of framework
* Implementation of selected algorithms
* Evaluation of accuracy for detections in real data

**Sketch for a follow-up master thesis:**

* Strength and weaknesses of existing approaches
* Further development of existing algorithms to increase the accuracy
* Evaluation using real data sets

## Example 2:

*Smart Image Segmentation*

**Background:**

Brain injury in new-borns accounts for more than 9 million years lived with disability worldwide. The functional consequences of early brain injury in new-borns are commonly seen months or even years after birth, delaying therapeutic interventions and leaving families with uncertainty about their child’s health status for months and years.

Classification of movement characteristics and movement patterns in spontaneous movements in young infants has in recent years been presented as the most accurate method for early identification of infants who will later develop serious motor problems and reduced motor function (like cerebral palsy). Today, characteristic of such normal and abnormal infant spontaneous movement could be objectively captured and processed by computer software from video recordings, but the procedures are so far too imprecise, cumbersome and time consuming for clinical use.

Based on a database of 900 standardized video recordings at St. Olav’s University Hospital of infants at risk of neurological dysfunctions from Norway, USA and India, this project aims at solving the following tasks:

1. To assess the movement (x and y coordinates) of infant body segments (legs, arms, trunk and head) from the database of video recordings
2. Make this procedure time effective, feasible and available for researchers within the medical field without any technical or computer vision expertise.

**Task**

To achieve the above goals, this project is divided into the following sub-projects:

1. Investigate the possibility of applying existing state-of-the-art deep learning methods to solve the above tasks. As part of this, the candidate is expected to perform a state-of-the-art literature review and implement the most relevant method(s) that can solve the problem.
2. Using results from I., an important task is to extend the developed method to make it as effective and feasible as possible. This includes evaluating the method with respect to applicability.