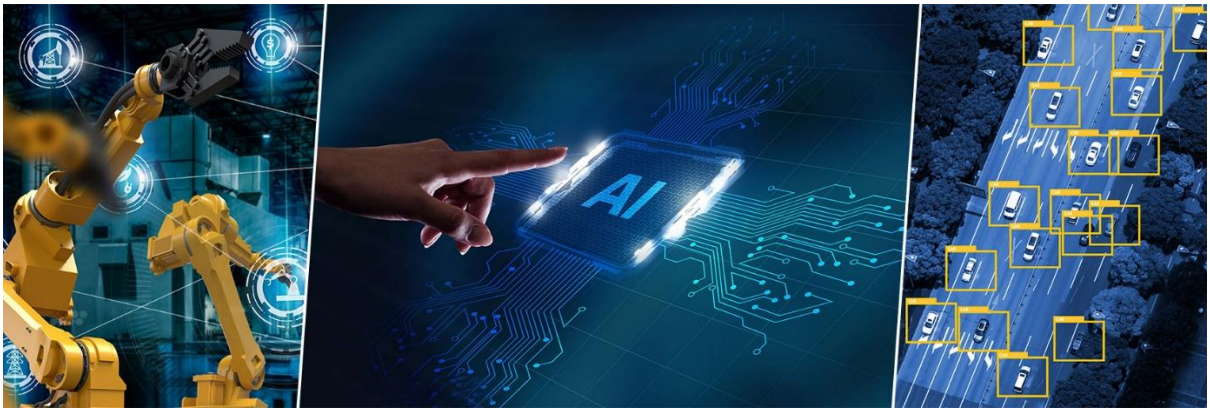

Course Description:

Machine Learning – from Zero to Hero

You've already made the first step - data collection. You've gathered lots of it but don't know how to utilise it in order to predict, optimise and control the future. Infotiv has developed a new hands-on course to get you started on your quest for mining value out of your precious data.

The data doesn't lie, and you know it. Applying machine learning algorithms to analyse your data enables you to extract complex information otherwise not possible to comprehend.

With trained software instead of coded software you can develop truly smart functionality. Let data drive your decisions and you'll be ahead of the curve. Data-driven businesses provide more value to their customers while keeping development costs low.

Course Dates

Day1 2023-03-01. Digitally. Via Teams.
Day2 2023-03-02. Physically. Blue Science Park, Campus Gräsvik, Karlskrona.

Course description

This course aims to give deep knowledge about Machine Learning (ML):

- What it **is.**
- What it is **not.**
- **When** to apply it.
- **How** to apply it.

Upon completion of the course, the user should be comfortable in training and applying ML.

Contact: Tomas Sjögren, +46 73 351 39 66, Tomas.sjogren@infotiv.se

- The course covers every stage of the Data Science Lifecycle, including verification & validation of ML.
- Learn how to put Machine Learning into practice and how to verify your Machine Learning solution.
- Apply ML in practice, both virtually and on embedded target environment.

Prerequisites

To get the most from the course **basic knowledge in Python** as well as in **concepts surrounding software development** is desired.

Course content

- Introduction to AI/ML
- Development environment
- Selection of algorithm and training
- Data management
- Verification & Validation of ML functionality
- Apply ML in practice, both virtually and on embedded target environment
- Risks surrounding the use of ML

Course language

The course will be held in english. It is also possible to have the course in Swedish but course material in English.

Course Schedule

During the course, the participants will be able to **practice on all steps necessary** to train, test (verify), integrate (on HW), and validate a machine learning model.

The exercises will be split over the two days. The first day covers exercise setting up the workflow and training an initial model and the second day handles testing and deployment. After completing the course, **each participant will be allowed to bring home the Raspberry Pi** containing their trained and tested model.

SCHEDULE – DAY 1: INTRODUCTION OF AI AND MACHINE LEARNING
During the first day of the course we will be taking an in-depth look at AI and machine learning from an advanced, professional perspective. We will learn how AI/ML can be used in practice, about its limitations and when one should avoid such approaches. During the day, the course participants will set up a working machine learning environment and train a neural network. ***Introduction***

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- *Definition of AI/ML*
- *Comparison to conventional approaches*
- *Common practices*
- *Application areas*

Traditional ML approaches

- *Supervised, Unsupervised, Reinforcement*

Workflow

- *Setting up the work environment (development environment)*
- *Identifying and categorizing the problem*
- *Choosing appropriate algorithms & metrics*
- *Data processing*
- *Gathering, cleaning, preprocessing, augmentation*
- *Model training*
- *General workflow/pipeline*

EXERCISES DAY 1

Connect the theoretical concepts to actual implementations.

Setting up the workflow

- *Set up the environment & pipeline*

First steps to ML deployment

- *Import and verify the data*
- *Train the neural network*

SCHEDULE – DAY 2: DATA + V&V

The second day will focus more on verification and validation of machine learning. Since the data used to train a ML model is essential (garbage in, garbage out), some time will be spent focusing on the data itself. In addition, we will discuss how to ensure that a ML-function actually accomplishes the task it is assigned to do.

The course will end with a discussion of potential risks of machine learning. During the day, the course participants will be able to test their trained model from the day prior, as well as transfer it to a hardware platform in order to deploy the model.

Data

- *Dataset (Real-world vs Synthetic)*

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- ***Data quality***

Bias

- ***Data gathering***
- ***Training***
- ***In development and testing***

Verification and validation

- ***Quality assurance using test levels***
- ***Choosing a metric***
- ***Simulators***

Risks

- ***Potential problems with OpenSource***
- ***Ethical AI***
- ***Safety critical applications***

EXERCISES DAY 2

Connect the theoretical concepts to actual implementations.

Testing the model

- ***Test the model locally (on computer)***

Deploying on HW & testing

- ***Deploy the model on the Raspberry Pi***
- ***Test the model on the Raspberry Pi***

Course completion

The Infotiv Machine Learning course gives the student the theoretical and practical knowledge in training models. The student will also get basic understanding on the challenges in testing functionality based on ML.

Estimated completion time: 2 days

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Add-on – Code Jam (this part is not mandatory)

Dates for Code Jam:
2023-03-09 at 1300-1700.
2023-03-16 at 1300-1700.

- After introduction, we intend to conduct a Code Jam for developers. The task for the developers will be to test what has been learned in different ways. Through the Code jam, the developers can develop their knowledge of techniques in machine learning which can enable new businesses in new areas.
- During this Code Jam, an Infotiv consultant will serve you as mentor when coding machine learning.
- The Code Jam is a group exercise.
- The Code Jam is led by a consultant from Infotiv.
- The consultant lead digitally via Teams Meeting.
- The content of the Code Jam is prepared by Infotiv consultants in consultation with the participants of the Code Jam.

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Course leaders

Martin Karsberg:

Competence Leader for Test Methodologies at Infotiv. Working with testing of IT in a variety of fields, from the defence industry to municipalities. Martin also teaches methodology.

Martin knows his way around both traditional and new testing methods. He is currently Infotiv's project leader for two research projects focused on the task of V&V on Machine Learning.

During weekends Martin listens to his broad collection of LP:s, grill burgers and lets his mind wander back to his punk days in Ireland.

Elias Sonnsjö: v

Competence Leader for Machine Learning/AI at Infotiv. Elias has a genuin interest and wide knowledge within the field of Machine Learning. This started during the work with his master thesis, focusing on modeling of virtual sensors and sensor fusion using ML.

Over the last two years Elias has been a part of Infotivs´ research group with focus on V&V of safety critical functionality based in ML Technologies.

Outside Machine Learning Elias have done guest lectures at Chalmers along with crushing it on stage with his metal band.

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