

Response
to
Student Feedback
CS-C3230 Machine Learning



Main changes:

- course structured into **fine-grained “topics”** instead of rounds
- demonstrating **Python implementations** of methods
- discussing aspects relevant for **trustworthy AI**
- quizzes replaced by small Python **coding assignments**
- first half dedicated to lectures, **second half to student project**

detailed response to selected feedback
organized as following topics:

- course logistics
- lectures
- assignments
- student project

Course Logistics

“A more structured course would've been nice as a student as well. Some weeks there was a quiz and some weeks there were no quiz and I would've preferred a shorter weekly quiz on the weekly lectures instead.”

We now use a more regular course schedule that includes short fast-paced coding assignments for each lecture topic. These coding assignments will replace the MyCourses quizzes.

“.. found it very hard to produce a topic which kind of left the project to the end of the course. ...encouraging students to start the project earlier would probably lead to better results”

We will introduce the discuss the student project format right from the course start. Reference project reports from the previous course edition will be provided along with some example datasets that students might use for their projects. See Mycourses Section “ML Project”.

“lectures could also be more connected to the project if possible, i.e. "this week we talk about data, model and loss: choose a data model and loss for your project". :)”

We will use the lectures to demonstrate Python implementations of covered topics. These implementations can be used by students in their projects.

"It would've been nice to have a little more guidance on the projects, perhaps ""laskutupa"" type office hours where we could go over our projects individually on zoom with TAs."

We will encourage students to reach out to TAs. (see MyCourses Section "Need Help?")

"As a goal-oriented person I would have appreciated a clearer learning goals. Especially in the beginning of the course."

We have tried to make the learning goals clearer on the MyCourses page. This page now lists the course topics along with keywords for the main concepts for each topic. We also indicate grading scheme in the Section "Grading".

"I did not really like quizzes with time limit, since usually this gave me pressure and then I just tried to rush through the quiz as fast as possible, without properly thinking all of the things."

We replaced timed quizzes with small coding assignments that have to be submitted according to weekly deadlines.

“The assignments were a bit mixed bag, as their type changed in the middle of the course. Especially the later quizzes were a bit too easy as they only covered single lecture per quiz.”

“...the purpose was to learn the theory of machine learning without calculation and practical exercises.”

“A few hands on implications (before the project) to be required would be nice. As to see how the stuff actually functions.”

“..I would like to see some programming exercises.”

The new edition will involve small coding assignments that require students to complete prepared Python code snippets to implement ML methods. The new course edition will include small coding assignments in Python.

“When sharing files (e.g. powerpoints) it would be nice to have them in PDF, always.”

“Some of the materials were given as word documents (docx) or as powerpoints (pptx) such as peer review instructions and some slides. I would prefer pdf so that they are more easily accessible.”

We will provide all materials also in pdf format to the extend possible. For coding assignments and student project reports we use Python notebooks as the main file format.

“Also, it would be better, if exercise rounds were all before the project. It was hard to do both at the same time.”

“...More time for the project.”

We will use a different schedule, having the second half of course period dedicated exclusively to student projects.

“Many courses use slack. The forum we used in this course did not feel as good at all, and it would be nice to have all course forums on the same platform, so I suggest slack if possible.”

“Also more information for project and more time given for project would be helpful (couple weeks without lectures and after that deadline).”

“Student project should have been scheduled a bit later so that all the methods would have been covered before the project started.”

We have changed the schedule so that the students have more time exclusive for the student projects towards the end of the course.

“In my opinion, it is not necessary to send emails about every lecture. This causes the important information to get lost ...One or two messages per week are max IF they are not very important announcements.”

We will reduce the use of email for staff-student communication.

“information...dispersed on multiple pages. simple timetable...would have been...useful.”

"The learning goals for the rounds 1-6 were not stated clearly enough and for the first couple of weeks the MyCourses page was pretty messy."

“the weekly activities should be stated clearly so the students know what is expected of them every week, and the requirements for passing (e.g. quizzes, assignments, project) should be presented along with some guideline about work effort / timing for these.”

“a clearer structure would be beneficial”

“The MyCourses site is cluttered and finding a thing you are looking for can be slow.”

We have tried to improve the organization and clarity of the MyCourses page.

“would be to have an overview of the rest of the majors and minors courses. Like “‘If you want to learn more about ANN, you can take the 'Deep Learning' course”... Like tying the course into its programs and helping people choose what they want to learn more about.”

We now discuss related courses in the MyCourses page under Section “Related Courses”.

“As a goal-oriented person I would have appreciated a clearer learning goals. Especially in the beginning of the course, I was a bit at a loss as to what to do and to focus on.”

“it would have been nice to know about all these bonus points opportunities at the beginning of the course, ...Now it was sometimes unclear what is expected from the student during this course.”

“More clarified information at the beginning of the course that how the points can be collected.”

We now provide a more detailed list of covered topics on the MyCourses page. Moreover, we discuss the grading scheme in the MyCourses section “Grading”.

“A bit more clear scheduling and correspondence. For example, having the same deadline every week or bi-weekly for assignments rather than the more arbitrary deadlines used now. Similarly, in the further editions could be nice if every deadline was already available at the beginning of the course. Eases up the prioritizing and timing effort for students.”

We now use a more regular schedule for course lectures and assignments. Moreover, the course schedule will be announced more clearly in the beginning of the course.

“The course did not really specify whether it was a technical course or an overall introduction to the topic.”

We now clarify the role of this course as the Bachelor level entry point to ML on the MyCourses page. The Mycourses page also includes a detailed list of topics along with references to the course book mlbook.cs.aalto.fi which should give a good idea about the level of the course.

“Some of the bonus points opportunities were not exactly available for everyone (e.g. short presentations at the end of a Zoom session, possible for only a couple students due to time issues) and I am not sure how I feel about these kinds of bonus points in general.”

The opportunity to earn bonus points by providing a presentation was open for every student. There was no limit on the number of students that can earn bonus points. We will put more effort into indicating how bonus points (if any) can be obtained. There is now a new MyCourses section “Grading” that includes all details of the grading scheme.

“And the Zoom-sessions where you could better your grade were absolutely humiliating because it was recorded”

We make clearer that the private chats will not be recorded by default. There is also a new MyCourses section “Need Help?” that explains how to reach course staff.

Lectures

“The lectures were not coherent, I was unable to get an idea of the big picture.”

“I would suggest using the first lecture to discuss the whole topic of machine learning, explaining the basic ideas of supervised and unsupervised machine learning with concrete examples and use cases. Then it would be easier to delve deeper into how machine learning works, i.e. the three components of ML and the different models.”

“Just would want a clearer introduction of what I'm going to learn during this course: what ML is in general, what kind of things can we do with ML (in different industries, e.g. self-driving cars, material informatics, medical diagnostics, finance), and how it relates to other things, such as AI (which is grouped together with ML in many cases) and data science (which uses similar methodologies).”

“sometimes I didn't understand how these different things and methods connected to each other. Perhaps some clear flow charts would help. Also I think those quizzes were sometimes too difficult since I had trouble to even understand question and answer alternatives.”

We now put more effort to provide the “big picture” at the course start. The first lecture will discuss the plan of the course, i.e., how the individual lectures are related with each other. We now also list the detailed course topics (syllabus) on the MyCourses page (Section “General”).

“too much information and sometimes I didn’t understand how these different things and methods connected to each other. Perhaps some clear flow charts would help”

We revised the course material to include more visualizations of the concepts.

“In the same way, I think it would be motivated to show in python in a jupyter notebook how things behave. Instead of having hand-drawn graphs on presentations, you could show with real(or simulated data) what happens when you change parameters or do the ML.”

The new course edition will involve much more demonstrations and assignments for ML methods in Python.

“the constant answering to student questions (especially during the beginning of the course) disrupted the learning from the lectures and the lecturer was easily led off topic.”

I will collect questions during my lecture and answer them “batch-wise” at regular time intervals

“The lectures contained too much repetition”

“One of my personal favourite courses is ""Statistical inference"" which I completed in 2019. The lecturer jumped between his presentation and R studio to show what the theory meant in practice.”

“During the lectures i felt pretty lost sometimes when there were so many questions asked and the lecturer stopped in the middle to answer them. The flow of the lecture was disturbed. The questions and the answers also felt like ""over course"" and confused me as a beginner. Maybe in the future answer all questions in one go in the end :) “

We will try to reorganize the lectures according to these comments: We will answer questions only at dedicated breaks during the lecture. We will also put more effort into illustrating the practical implementations of ML methods directly during the lecture.

“I would have liked more concrete examples around the models and mathematical formulas.”

“I know just the basics of python and I couldn't really follow the python lectures because I got a bit confused with the code sometimes. There could have been those kind of ""machine learning in practice"" lectures more in Excel too because those could have been easier to understand.”

“I don't have... background in machine learning and sometimes the lectures were a bit overwhelming because of so many new terms, and therefore I had hard time understanding for example loss functions and how you should use them.”

The lectures will now include demonstrations for how ML methods can be implemented in few lines of Python code. These demonstrations should help students to grasp theoretical concepts such as “models” and “loss functions”.

“In the beginning I experienced some confusion over where some topics fit in in the bigger picture or in a ML project pipeline. Unsure if something was implicit in a model, a design choice or needed to be implemented by a user. An example would be my mistaking ERM and GD as part of some specific model and not more general. Thinking it over, I'm not sure where this confusion stemmed from. In hindsight the course structure seems very logical.”

We put more effort into clarifying the role of ERM and GD as “generic” optimization principle and method that can be used for different combinations of model, data and loss.

“Maybe building on the data+model+loss tree as new things are introduced, to have a visual aid for where everything fits in and what the relationships exist could be helpful? I would appreciate getting still more visual presentations as opposed to mathematical notations.”

Excellent suggestion. We will put more effort into pointing out the specific design choices for data, model and loss used by specific ML methods. These design choices are surveyed in the revised Chapter 3 of the course book <http://mlbook.cs.aalto.fi>

“Interactive trainings of key concepts - I mean visualizing when one changes model/parameters by showing the changes in model outcomes. could be a fixed dataset with just selected model/parameter options.”

We now demonstrate the implementations of ML methods during lectures to better visualize and illustrate the underlying principles.

“coding assignment. let students learn a linear hypothesis for data point whose features and labels are completely unrelated (uncorrelated). see if students find out that there is might not be any good hypothesis.”

The new course edition now includes small coding assignments instead of theory quizzes.

“Although I was familiar with many of the concepts, there were some things which were also new to me as well. On the other hand, it can be that some of the things (e.g. in decisions trees, formulas from Duda book) may be too much for an introductory course.; At least in the beginning of the course materials were very hard to find from mycourses and some of the Rounds did not follow chronological order.”

We now put more effort to provide the “big picture” at the course start. The first lecture will discuss the plan of the course, i.e., how the individual lectures are related with each other. We now also list the detailed course topics (syllabus) on the MyCourses page (Section “General”).

Assignments/Exercises

“I would say that adding more practical exercises would be a huge improvement to this course, as, without it, I have a feeling I learned very little.”

"Would've enjoyed more hands-on exercises about implementing the algorithms etc. instead of the quizzes. Abstraction and ease of use is good but

"""LinearRegression().fit(X, y)""" doesn't really teach the inner workings.”

"The course needs more practical assignments instead of just the quizzes IMO. Some smaller assignments where you need to implement a machine learning task in python or excel would support learning much more than answering a quiz.

“I would have liked to see more coding tasks or some practical exercises, although I understand that there are other courses for these purposes.”

The quizzes will be replaced by small coding assignments that require students to complete prepared Python code snippets.

"I think there needed to be more concrete assignments where students build ML models."

"I think there should have been more practical exercises about machine learning. I think the assignments should have been about implementing some machine learning model in practice. Just theory gets boring quickly."

"Course could have more assignments,...implementing own ML models."

"For example lets say quiz was about k-means, it tested only the little parts of the k-means and it didn't test the understanding of what it really does and what it can do for a certain machine learning model."

"There could have been some more actual assignments like algorithm coding instead of just quizzes. It felt a bit hard to suddenly from just doing quizzes to go to completing an entire project without any kind of intermediate assignments."

"...have expected to have more hands-on programming exercises"

“It would be beneficial to teach implementing all of the models as well. This would certainly support the learning process.”

“More practical assignments would have been appreciated (e.g. `"""fit model H on the dataset X, what is the weight vector?"""` or `"""fit these models and compare their training and validation errors, which model performs best?"""`)”

“Making the students create, for example, a linear regression model themselves would serve as a good practice.”

“quizzes could be split better, for example after every lecture ...a quiz”

“I think it would be better if there were more weekly assignments than the quizzes. That would motivate the students to do more than bare minimum.”

The quizzes will be replaced by small coding assignments that require students to complete prepared Python code snippets. We will have one such fast paced coding assignment for each lecture topic.

“Material was hard to understand, maybe some kind of web material with code examples good be better. Also the grading points are confusing: seems that there were a lot more points than 60 from assignments.”

“There could have been more exercises like the machine learning problem formulation on the first round. I think that those kind of exercises would have taught me more than quizzes”

We will now have two peer grading rounds for the student projects. The first round involves only the ML problem formulation of the student project. The second peer grading round involves the full project report.

“Also, since we did not get to apply most of the ML methods we were taught, my understanding of them was left to rudimentary at best”

“it is good to do something hands on (project). However, being new to machine learning, it felt hard at first.”

“... wish there had been at least some practical tasks, because doing the project and implementing the functions I had learned the theory about really helped me understand the subject better. ”

The quizzes will be replaced by small coding assignments that require students to complete prepared Python code snippets. We will have one such fast paced coding assignment for each lecture topic. The lectures will now also include demonstrations of how to implement ML methods using few lines of Python code.

“I would have preferred more traditional PDF assignments with math proofs or hands-on computation with Python. I understand that this is not the hands on course but something more involving than quizzes would be better.”

“The assignments could be more hands-on style. Less emphasis on the pure maths side and more on the implemented algorithms.”

“The course was very theoretical and while the project was trying to fill that gap between theory and reality, the distance between them was daunting. I think it would be very beneficial to have easy assignments every week that shows in practice most of the theoretical ideas taught during lectures. The quizzes didn't support my learning that much, too much grade weight on them considering how tricky some of the questions were.”

The quizzes will be replaced by small coding assignments that require students to complete prepared Python code snippets. Moreover, the lectures will now also include demonstrations of how to implement ML methods using few lines of Python code.

“....lack of interaction and hands-on practice.”

“I get that this is not so much a hands-on course, but still personally I learned most doing some tutorials from tensorflow website.”

“The exercises didn't really reflect how to do machine learning.”

“If it is expected to create a project at the end of the course students should also have some hands on exercises where you would implement some of the theory in practice.”

“no hands-on learning and therefore learning to apply methods was not part of the course. Maybe in the future combine theory and hands on learning..”

See our response on the previous slide.

Student Projects

“It took me awfully long to form the project's algorithms in Python. It was emphasised that one doesn't need to code but it still was necessary if the method used would differ from linear regression implementable in Excel for example. Guidelines for what kind of a project receives full marks without coding ought to be provided.”

The new course edition will focus more on the implementation of ML methods using Python. Lectures will include live coding demonstrations for how to implement ML methods using few lines of Python code. Theory quizzes have been replaced by small coding assignments that requires students to complete short Python code snippets that implement ML methods. We will provide examples for ML projects that received top grades in the previous course edition. Moreover, we will publish the peer grading questions at the course start and let students comment and suggest modifications.

“Peer grading with the first exercise was a good idea. But it's not a good idea with this big project. Because some students haven't learn anything during the course and that means they can't grade the project correctly. They just can give all points because they don't see any mistakes. In contrast, some students are very exact and they see all mistakes. So they can give less points. So, this peer grading is unfair and unequal.”

“The project instructions and the peer-grading instructions could have been clearer. I also think that some of the peer-grading scoring metrics should have been more flexible than just e.g. 0, 1 or 4.”

The new course edition will focus more on the implementation of ML methods using Python. Using the same tool (Python) for the student projects should make the peer grading process easier. Moreover, we will publish the peer grading questions at the course start and let students comment and suggest modifications.

“Since I do not have programming or strong mathematical background, I felt that completing the assignments and especially the student project was really hard. I did not understand how you would be able to create a student project without coding anything, and finding a topic was a struggle for me since I felt I am not capable of assessing suitable topics for ML (I chose a dataset that was not good eventually, which led to re-doing the whole project at the end of the course).”

The new course edition will focus more on the implementation of ML methods using Python.

“The guidelines for the project were very limited and the true contents it required were found on the review questions sheet. Also the review questions were vague and maximum points could be obtained even if the whole method (polynomial regression for example) was understood completely wrong. The questions also had very few options (for example training error was told, or it wasn’t), there were no middle ground. We had no examples of data sources, very few examples of project ideas (very few applications of machine learning on the course itself) and this made it really hard to even come up with a project idea.”

We provide detailed information about student project format right at the course start. This information includes example project reports from previous course edition and example datasets that might be used for student projects. Moreover, we will publish the peer grading questions at the course start and let students comment and suggest modifications

“I hope that we could have had only the mycourses assignments, and maybe more questions in those starting from a more basic level, since it is a first course in ML (at least for me). Also the examples of previous student projects conflicted with the overall message that we would not need to implement highly advanced methods or programming to create our project - I would have wished easier examples to compare with. I felt like this should be described as a more advanced course on ML based on the graded elements, rather than a basic course for everyone to follow regardless of their background. Because I felt underqualified from the beginning of the course, it also affected my motivation a lot”

We provide more detailed prerequisites on the Mycourses page which now also includes a detailed list of topics. The revised Mycourses page should help students to decide if this course is suitable for them. A new focus of the course is on the implementation of basic ML methods using few lines of Python code. These implementations will be demonstrated during lectures and practiced during small coding assignments (which replace the theory quizzes). We also provide a new list of reference projects that are aligned with the expected level of approaches.

“final project info came too late”

“The project was ridiculous as some just copied the idea of the example project and others came up with a deep neural network.”

“The project topic was in my opinion too wide. I would need some more guidelines for picking up a topic for my project. Some example topics or websites where to get suitable dataset would have been really helpful.”

“more complete examples of machine learning projects/use cases”

We will introduce the discuss the student projects right at the course start. Reference project reports from the previous course edition will be provided along with some example datasets that students might use for their projects. See MyCourses Section “ML Project”. The course will now have a stronger focus on the Implementation of ML methods in simple Python code which should support students for their project work.

“but as the focus was on trying out different models and less on producing cool ideas, as I repeat myself, a pool of problem ideas would have been nice.”

“The scope of the project was not limited in any way and students were able to use machine learning models which were not even part of the course. This is kind of problematic for the peer review”

We will introduce the discuss the student projects right at the course start. Reference project reports from the previous course edition will be provided along with some example datasets that students might use for their projects. See MyCourses Section “ML Project”. The course will now have a stronger focus on the Implementation of ML methods in simple Python code which should offer more guidance for students in their project work and during the peer grading.

“all of the exercises returned have been peer-graded, including the course's Machine Learning Project, worth 40% of the course's grade. Given that the course is a ""beginner"" course to ML, it seems absurd to have people with flimsy knowledge on the subject to grade these quite complex projects...”

We provide detailed information about student project format right at the course start. This information includes example project reports from previous course edition and example datasets that might be used in student projects. The new course edition will also have a stronger focus on the implementation of ML methods using few lines of Python code. Lectures will include live coding demonstrations and theory quizzes have been replaced by small coding assignments. Overall, the new course edition will provide more guidance for students for their ML projects. Moreover, we will publish the peer grading questions at the course start and let students comment and suggest modifications

"It would've been nice to have a little more guidance on the projects, perhaps ""laskutupa"" type office hours where we could go over our projects individually on zoom with the teaching assistants. Understandably the course might be too large for that. Overall I enjoyed the course!"

We will encourage students more explicitly to contact course staff in case of questions that cannot be solved via the discussion forum.

"The tools for the course project were a bit unclear."

The new course edition makes consistent use of Python notebooks which can be edited and run via the Jupyterhub server <https://jupyter.cs.aalto.fi/hub/login>

"Project was bad idea if you not need to program. There wasn't exercises in course which means no one does nothing."

We now use Python as the main tool for practical course activities.

“The project was a little unclear even though there were lectures and exercise sessions about it.”

“Maybe there could be more info about project”

“More definitive project instructions in general.”

"The project would have benefitted from a ""checkpoint"". Finding a good project topic is hard.

“make clear that there is no need to use deep learning. Stick more to scikit-learn methods”

We provide more detailed information about the student projects right from the start of the course. The new course edition will also put more emphasis on the practical implementation of basic ML methods using Python libraries such as scikit-learn. These Python implementations will be discussed along with the corresponding theory during the lectures. We will also highlight the possible use cases of these Python implementations for student projects.

“The ML-project felt overwhelmingly big and complicated as we hadn't done anything practical before - I would suggest that this course should be more about coding/practical exercises, as the project feels like way too much when you haven't really done anything before i.e., your very unsure about if you're doing it right and which sorts of methods would be the best.”

The new course edition puts more emphasis on the implementation of ML methods using few lines of Python code. Lectures will include live coding demonstrations and theory quizzes have been replaced by small coding assignments. Overall, the new course edition will provide more guidance for students for their ML projects.

“Grading of the student project was somewhat clunky in that sense that it generally penalized making difficult and more challenging project in favour of doing very simple and unimaginative projects.”

The main purpose of the student projects is to practice the appropriate use of ML methods. A main focus is on the validation of and selection between different ML methods. Nevertheless, the peer grading questions include also an assessment of the originality of the proposed ML application. We will publish the peer grading questions at the course start and give students the opportunity to review these questions and proposed modifications/improvements.

“There could have been some more actual assignments like algorithm coding instead of just quizzes. It felt a bit hard to suddenly from just doing quizzes to go to completing an entire project without any kind of intermediate assignments.”

The new course edition includes small coding assignments that prepare students for the project work.

“I also feel like I'd have needed more support in the making of the student project.”

We will put more effort in encouraging students to ask questions in discussion forum and reach out to TAs. There is also a new MyCourses section “Need Help?” where students can reach out to course staff.

“Project was very confusing at first. It was hard to know what will I be capable of implementing by the end of the course, and thus wasted time on thinking about wrong kind of subjects for the project. I also would have liked to do more problem solving during the course.”

We will provide reference projects and example datasets right at the start of the course. One such example is the prediction of weather characteristics (3 day ahead temperature) using FMI data. We will now also demonstrate the implementation of ML methods in Python right from the start of the course during lectures. Moreover, Python skills that might be useful for the student projects will be practiced during small coding assignments. These coding assignments replace the quizzes used in the previous course edition.

“The project assignment was obviously great.; More support and guidelines for project ideas could have been provided. I like the freedom given to students to decide what to work on, but I think I could have focused more on the methods and work, if coming up with the project idea would not have taken as much time.”

“Also regarding the project I found it very hard to come up with a topic...encouraging students to start the project earlier would probably lead to better projects.”

“More definitive project instructions in general. I suggest providing a fixed amount of topics and corresponding datasets for the students to choose from.”

“The only improvement that I can think is that maybe you could provide few project topics for student's who struggle to come up with their own topic.”

We provide more detailed information about student projects right from course start. Moreover, we provide reference projects from last year and also present some example datasets (e.g., FMI weather data) that might be used for the student projects.

“we were required to do practical project without really any teaching about practical stuff”

“I think it would be nice if we were maybe a couple more programming lectures because sometimes the theory alone was hard to understand. However, I understand that there is maybe no time for more programming and there is the course exclusively for Python in machine learning.”

The new course edition teaches how to implement ML methods in Python. These implementations will be discussed during the lectures and practiced during small coding assignments.

“i also don't think that peer-reviewing is a good thing in this class as some students don't know how to apply the rules and just because they disagree with your work they wont give you your points even tho it might not be incorrect.”

“Peer review/grading is in my opinion less reliable than course assistant review/grading.”

Students can report reviews that they consider flawed for some reason. TAs will look into these cases. Moreover, TAs will also participate during the peer-grading process. In particular, TAs will provide peer-reviews (grading) for reports that received mixed peer grades.