DS&AI

Co-funded by the Erasmus+ Programme of the European Union

Curriculum Development in Data Science and Artificial Intelligence

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Online Training Report

July 2020 Training of Academic Staff

July 2020

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WP Lead Beneficiary	AIT
Author and Organization	Manish Taneja, Matthew Dailey, AIT
Dissemination Type	Event
Dissemination Level	All Project Partners
Quality Reviewer 1	Sanae Rujivan, WU
Quality Reviewer 2	Opim Salim Sitompul/USU
First Quality Review Date	26 August 2020
Quality Review Pass Date	31 August 2020

DISCLAIMER

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Abstract

This document reports on the first online training of academic staff in preparation for delivery of the Erasmus+ DS&AI Master's program in the partner countries. In the original project plan, the European project partners were scheduled to take part in study visits to Thailand, Indonesia, and Sri Lanka during the period of leadup to launch of the program, April 2020 to Sept 2020. Due to the COVID-19 pandemic, however, we scheduled a common online training for all partners in all countries. The results are reported upon in this document. Overall, despite the circumstances of COVID-19, the training was a success. Knowledge and practices of the European partners were transferred to Asian instructors, communities of practice for each course were established, plans were made for finalization of the courses, and feedback on the online training modality will be useful to improve future sessions.

Introduction

This document reports on the online training of partner country academic staff by their European counterparts in the Erasmus+ DS&AI Master's program project.

Originally, we had planned study visits to each of the partner countries (Indonesia, Thailand, and Sri Lanka) for the academic training during the period Apr 2020 to Sep 2020 leading up to the launch of the program.

However, the COVID-19 pandemic, with its concomitant restrictions on travel and quarantine on arrival, made that infeasible. We adjusted the plan by running an online training program over Zoom over the period July 13 to July 17. We still hope to organize face to face study visits in 2021 if the COVID-19 situation permits.

The online workshop was organized course by course in the curriculum. In each session, European partners shared instructional material, teaching practices, and their past experience for the courses. Topics covered classroom instruction, laboratory sessions, homework assignments, and projects. The objective was to bridge the gap between the curriculum description and actual pedagogical materials and methodologies so that a common unified approach to teaching DS&AI could be developed, facilitating the imparting of a European-standard educational experience in Asia.

Program

Core course sessions were plenary, whereas elective course sessions ran in parallel sessions. Core courses are highlighted in red, and elective courses are highlighted in yellow in the table below.

Session	Course Abbrev.	Course Title	Leader (European Partner)	Co-Leader (Asian Partner)	Co-Leader (AIT)
1	PDS	Computer Programming for DS&AI	Tiago Gomes (UMI)	Taufik Abidin (UNSYIAH)	Chaklam
2	ML	Machine Learning	(Haralabopoulos) AUEB	Wararat (KKU)	Matthew
3	BIA	Business Intelligence & Analytics	(Safras) AUEB	Paweena (KKU)	Vatcharaporn
4	AI	Artificial Intelligence	Marcello & Jan (LEU)	Sanae (WU)	Dung

5	DMM	Data Modeling & Management	José Machado (UMI)	Prabhath (UOP)	Chutiporn
6	CL	Computational Linguistics	Suzan Verberne (LEU)		Dung
7	CV	Computer Vision	José Machado (UMI)		Matthew
8	DS	Distributed Systems	Marcello (LEU)		
9	HCI	Human Computer Interaction	(Lekakos-Marianna) AUEB	Rahmad Dawood (UNSYIAH)	Chaklam
10	KR	Knowledge Representation	Marcello (LEU)	Ruwan (UOP)	Dung
11	NIC	Nature - Inspired Computing	Paulo Novais (UMI)	Khamron (KKU)	
12	RTML	Recent Trends in Machine Learning	Jan van RIjn (LEU)	Athinan (WU)	Matthew
13	SNA	Social Network Analysis	Katerina (AUEB)		Vatcharaporn
14	SDPM	Software Development and Project Management	(Antonis - Katerina) AUEB	Cat Chitsutha (KKU)	Chutiporn
15	STDA	Spatial - Temporal Data Analysis	Paulo Novais (UMI)	Hemalika (UOP)	
16	MODA	Multicriteria Optimization and Decision Analysis	Marcello (LEU)	Mahyuddin (USU)	Vatcharaporn

The training proceeded in two sessions per day. The five plenary sessions and four parallel sessions were followed by an all-hands project meeting.

Date	Session # 1	Session # 2
Mon 13 July	PDS	ML
Tue 14 July	BIA	AI
Wed 15 July	DMM	CL CV DS
Thu 16 July	HCI	NIC
	KR	RTML
		SNA
Fri 17 July	SDPM	Project Meeting
	STDA	
	MODA	

Session Discussion and Feedback

Informed consent for recording and archiving video of each session was obtained from every participant. Each session began with an overview by the European leader followed by discussion. Attendees of each session were asked to fill out an online version of the questionnaire designed by the Quality Board for evaluation and feedback.

We provide a summary of the evaluations then examples of the detailed discussion in some of the sessions below.

	How satisfied are you with the preparations made to organize the training?	How satisfied are you with the online arrangements?	How satisfied are you with support (training materials) provided during the meeting?
AI	Satisfied	Neutral	Neutral
BIA	Very Satisfied	Satisfied	Satisfied
CL	Very Satisfied	Very Satisfied	Satisfied
CV	Neutral	Neutral	Neutral
DMM	Satisfied	Satisfied	Satisfied
DS	Neutral	Satisfied	Satisfied

HCI	Neutral	Satisfied	Neutral
ML	Neutral	Neutral	Neutral
MODA	Satisfied	Satisfied	Satisfied
NIC	Satisfied	Satisfied	Satisfied
PDS	Satisfied	Satisfied	Neutral
RTML	Satisfied	Satisfied	Satisfied
SNA	Satisfied	Satisfied	Satisfied
STDA	Very Satisfied	Very Satisfied	Satisfied

	How satisfied are you with the participation of project partners in discussions and decision making?	How satisfied are you with the structure of the agenda (subjects issues covered)?	How satisfied are you with the time assigned to the discussion of important issues?
AI	Neutral	Neutral	Satisfied
BIA	Satisfied	Satisfied	Very Satisfied
CL	Satisfied	Satisfied	Very Satisfied
CV	Neutral	Neutral	Neutral
DMM	Satisfied	Satisfied	Satisfied
DS	Satisfied	Satisfied	Satisfied
HCI	Neutral	Neutral	Neutral
ML	Satisfied	Neutral	Neutral
MODA	Satisfied	Satisfied	Satisfied
NIC	Satisfied	Satisfied	Satisfied
PDS	Satisfied	Satisfied	Satisfied
RTML	Neutral	Satisfied	Satisfied
SNA	Satisfied	Satisfied	Satisfied
STDA	Satisfied	Very Satisfied	Satisfied

	How satisfied are you with the scope of information presented	How satisfied are you with the training's overall value in helping you achieve project goals?	How satisfied are you with the quality of the overall training
AI	Neutral	Neutral	Neutral
BIA	Very Satisfied	Very Satisfied	Satisfied
CL	Satisfied	Very Satisfied	Satisfied
CV	Neutral	Neutral	Neutral
DMM	Satisfied	Satisfied	Satisfied
DS	Satisfied	Satisfied	Satisfied
HCI	Neutral	Neutral	Neutral
ML	Neutral	Neutral	Neutral
MODA	Satisfied	Satisfied	Satisfied
NIC	Satisfied	Satisfied	Satisfied
PDS	Satisfied	Satisfied	Satisfied
RTML	Satisfied	Satisfied	Satisfied
SNA	Satisfied	Satisfied	Satisfied

STDA	Very Satisfied	Satisfied	Satisfied

Computer Programming for DS&AI

Introduction

On July 13, 15:00 – 18:00 GMT+7, we held an online training session topic on "Computer Programming for Data Science and Artificial Intelligence" with Tiago Gomes (UMI), Taufik Abidin (UNSYIAH), and Chaklam Silpasuwanchai (AIT) leading the session. Around 45 participants have participated. Two consensuses were reached. First, it is essential to provide a quick introduction of Mathematics and Statistics given that students may not come from engineering/science backgrounds. Second, it is more effective to focus on the fundamentals of Python for Data Science and AI such as Python data structures, scientific libraries, and a gentle introduction of deep learning libraries. Going too deep into deep learning mechanics, NLP, signal processing are not encouraged, given that these topics can be covered in other courses such as Machine Learning, Recent Trends in Machine Learning, Artificial Intelligence, etc.

Comments

Here is the summary of participants' comments:

- Lecturers may not restrict the environment to any particular operating systems. This should increase the accessibility of the course to a more wider student group.
- Lecturers should include basic Python scientific libraries including NumPy, Pandas, Scikit-Learn, Matplotlib, SciPy as the basis
- PyGal was introduced as a promising alternative to Matplotlib and Visdom.
- PyTorch vs. TensorFlow was discussed and the consensus was that it depends on different university because both libraries are very competent
- CNN, RNN, Signal Processing, NLP can be way too deep.
- Encourage more introductory stuffs - Math and Stats and less machine learning
- Some participants have mentioned that knowledge in Math and Stats should be assumed for students. This view was seemingly split among participants. Anyhow, finally, it was viewed that it may be appropriate to provide students a quick and brief introduction of Math (Linear Algebra, Calculus) and Stats in the beginning of the course. Perhaps first one or two classes can be devoted to these topics.

Conclusion

Specific action plan was proposed:

- Merge course materials from Tiago and Chaklam. Then allow participants to freely pick, mix and match, revise according to their preferences
- Chaklam will include introductory course materials including Math and Stats
- Since most university shall start on November, Tiago and Chaklam should expect their course materials to be ready by then.

Evaluators:

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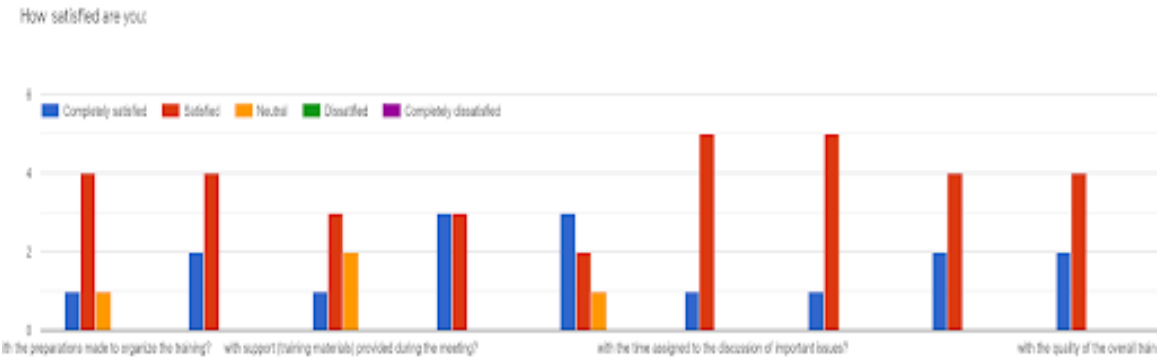

Strengths of this training?

- Motivate future lecturer to prepare the complete material for the course.
- This training is very interesting since having many topics are up to date.
- Discussions about teaching techniques
- We finally got into the detailed evaluation of the training material.

What were the weaknesses of this training?

- The training material has not completed before the training.
- Foundation knowledge about mathematics and statistics that is the background should be introduced.
- It was clear that Tiago and Chaklam haven't started working together yet. That's understandable, as Chaklam only joined the team from Jan.

Ideas for improving project training.

- Please give a complete material.

- Due to the presenters have many topics, I think the essential topics should be selected according to foundation of DSI/AI knowledge and further to be a basic to study in the high levels.
- Tiago and Chaklam should now start working together and get the rest of the partners on board in cooperating on material production/review/improvement.

Other comments.

- Still wait for the complete material.

Machine Learning

Session held on 13/7/2020.

Facilitator: AUEB

Recommendations and suggestions by European facilitator :

- ML course should follow middle ground (combination of)
  - Computer Science/Research oriented – covers the basis and concepts in mathematical detail.
  - Business oriented – covers concepts with focus on implementation using available tools, libraries, frameworks.
- Students form a homogenous cohort and have different academic and work backgrounds.
  - Statistics from the UK reflect that most (97%) students choose to work in Industry and only 3% continue in the academic field.
  - The middle ground can lead to different learning experiences based on previous backgrounds. Preparatory classes as prerequisites 2 months before the PG classes begin.
  - The interests and expectations of the students from the course is different. If the students understand machine learning concepts, then the underlying technical details of the algorithm are trivial.
- There are two courses, data science and machine learning. The two courses have 30 to 40% overlap.
  - Data science-based projects apply to many disciplines like economics, mathematics, physics.
  - Computer science/mathematics/scientific-based approach is abstract learning and is technology independent. The challenge is how deep the mathematics and statistics should be delved into.
- Machine learning is data agnostic.
  - The level of details of data/mathematics the labs should delve into is immaterial as long as the students can apply the models using available tools.

- Use Jupyter notebook for classroom teaching as it can integrate text, mathematics formulae, codes with visualization. The blend depends on the previous knowledge of students and should be customized to maintain optimal learning pace.
- The institute does not have assignments but does have labs and project work. The labs are sequential with each lab augmented on the previous one. The size of a dataset is not important as long as the data processing and concepts can be addressed.
- Multiple choice exams are preferred.
- The slides highlighting the differences have been in the syllabus should be integrated.

Questions, suggestions and concerns raised by faculty in Asia:

- Machine learning teaching has a scientific approach and is more mathematics and computer science oriented.
- Machine learning is different from data science. Data science is applied machine learning. Machine learning is more algorithm design, parameters fine tuning based. Both approaches can work and contribute to industry. By not focusing on internal details of algorithms and just learning a technique can make the course more of a training than learning.
- Two types of assignments are necessary, take home and lab reports.
- We should provide a middle ground level learning program and let students choose academic vs industry pursuance of machine learning knowledge.
- They should though be able to answer the fundamental questions when approaching a problem such as
    - What is the objective function?
    - What does the data look like and which potential model can I apply?
    - What tools can be applied?
- What is the syllabus/models should be taught, share slides and course materials?
- Necessity of assignments requiring coding and implementation. Should assignments have small or big data size.
- How to integrate mathematics concepts with machine learning concepts?

Evaluators:

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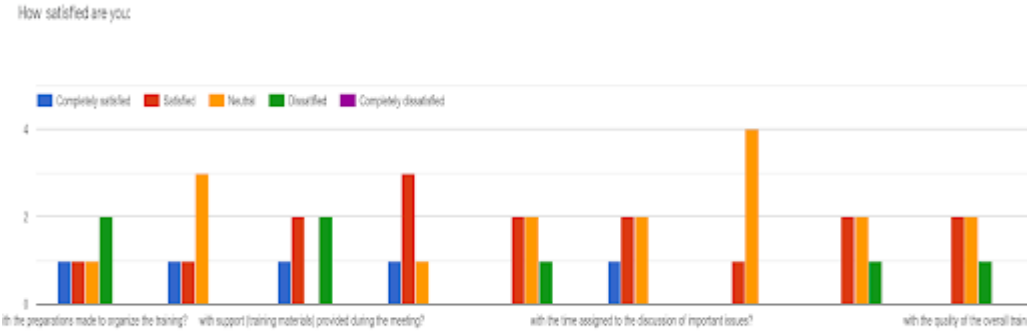

What were the strengths of this training?

- The presenter seems to have a good knowledge on the field and answered all questions.
- Discussion of course structure, especially notebook for lab works.
- The speaker mastered in material and his tips that are useful in carrying out teaching this course.
- Good speaker.

What were the weaknesses of this training?

- Unfortunately, there are no materials on the shared platform, and the presenter didn't show any update on the materials creation. I don't know if the slides provided by Matt will replace the materials that should have been prepared.
- No presentation.
- internet connecting sometimes not stable.
- The discussion on the course content had already taken place. It is not clear how the material will integrate the material from AIT with that of AUEB.

Ideas for improving project training.
Need presentation to show scope of this course.

Business Intelligence and Analytics

Evaluators:

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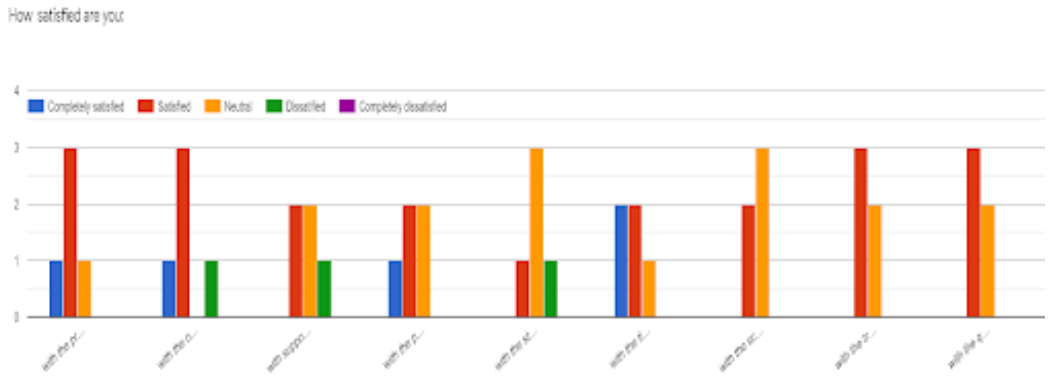

What were the strengths of this training?

- the explanation is detail.

What were the weaknesses of this training?

- Too much concentrated on the content of the AUEB course lecture notes, and less on the material as part of the DSAI master programme.
- it should be business intelligence, not data engineering.

Ideas for improving project training.

- discussing on business intelligence.

Artificial Intelligence

Evaluators:

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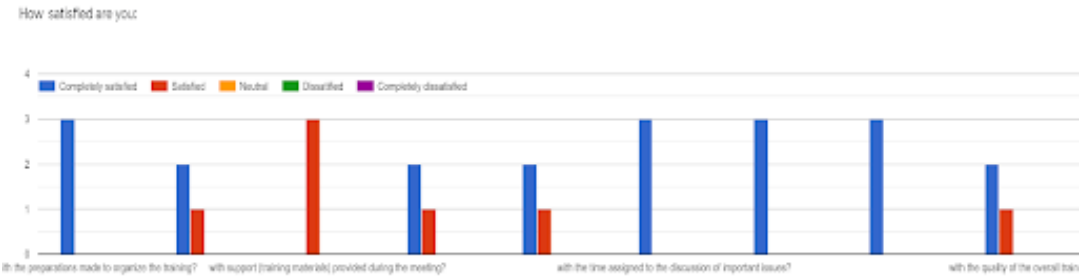

What were the strengths of this training?

Mature content/materials. It seems well organized.

What were the weaknesses of this training?

Some practical materials seems to be missing but Its ok because they will be uploaded soon.

Data Modeling and Management

Evaluators:

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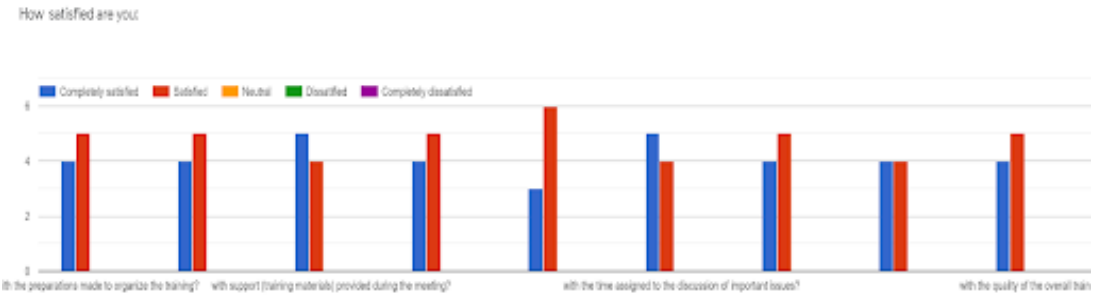

What were the strengths of this training?

- This training for summary to introduce curricula and materials learning for DS&AI.
- Nice presentation.
- welcome to any suggestions from the participant.
- Slides are complete and in a very mature version.
- Strengthen our knowledge on the material.
- Well prepared and good material!

What were the weaknesses of this training?

- I can't communicate all participants in a room meeting.
- The context or prerequisite for the course and how the course relate itself to the other courses were not clearly stated.
- Maybe some examples/materials for assignments are still missing in the shared space. Prof. Machado will provide them.
- The only thing is the online matter, we could not interact directly.

Ideas for improving project training.

- Maybe we have presentations to enhance it at next time.
- Discussing more on the Practical material that will be given to the students in the Laboratory.
- Have another session where we can do face-to-face interaction.

Other comments.

- Ok. all good.
- Others are good. Today's discussion gives me more information.
- This is a very good session.

Computational Linguistics

Session held on 15/7/2020.

Evaluators:

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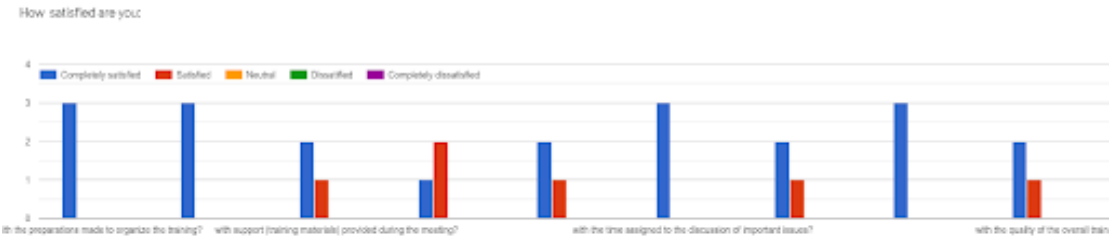

What were the strengths of this training?

- Could cover few unseen places for our existing curriculum.
- The speaker combines fluently both an overall presentation of the course structure with concrete cases to illustrate the problems.
- the detailed materials and the explanation.

Ideas for improving project training.

Presentation like this one could be viewed as a very effective way to "train the trainers".

Other comments.

- Thank you Suzan for a very impressive lecture.
- it was great

Computer Vision

Session held on 15/7/2020.

Facilitator: Victor Alves.

Recommendations and suggestions by European facilitator.

- Deep learning has boosted research in Computer Vision.
- Computer vision research involves a combination of big data, artificial intelligence, and machine learning.
- Students in this course should understand the implementation of deep learning models to solve real world problems. They model enable classification and segmentation.
- Big real-world problems are broken down into smaller problems. The breakdown helps in understanding the logic behind the models being chosen and implemented.

- The lab setting comprises an Nvidia 24 GB GPU server to which the students can connect using the Nvidia docker application, Portainer and Jyupter lab. Students also use Google Colab for coursework.
- Students are assisted in lab
- to understand the Neural Network diagrams.
- to understand existing kernels and improve them.
- to be able to use existing data from websites such as Kaggle and improving the models.
- Students follow a well-defined image processing life cycle consisting of data preprocessing, objective function definition, model selection, model testing, model augmentation, model deployment and results summary.

Questions and concerns raised by faculty in Asia:

- The course RTML overlaps with the course structure as laid down by the faculty.
- In Athens, the syllabus agreed upon for Computer Vision focuses more on camera intrinsic, epi-polar geometry, projection, robotic implementation of computer vision etc.
- A tutorial session on lab setup as described by faculty would be preferred.

Evaluators:

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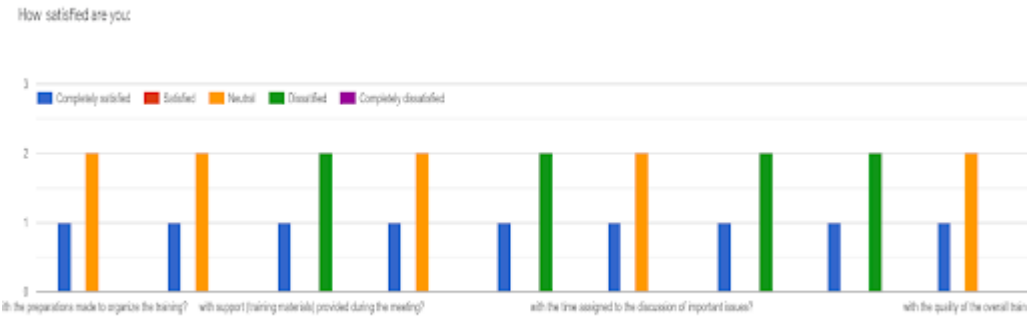

What were the strengths of this training?

- The good part from CV training is information in regards with setting up the laboratory.
- Victor provided a great presentation and materials.

What were the weaknesses of this training?

- In CV, the material was quite different from the syllabus, and it had many overlapping with other courses, will be hard to be implemented as it is.
- Maybe more practical materials/assignments should be provided.

Ideas for improving project training.

stay stick with the syllabus.

Distributed Systems

Evaluators:

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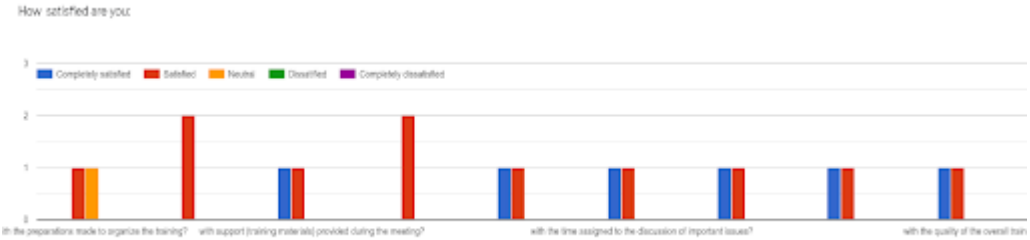

What were the strengths of this training?

sharing materials

What were the weaknesses of this training?

online meet/zoom organization, rather unstructured and not on time.

Human Computer Interaction

Evaluators:

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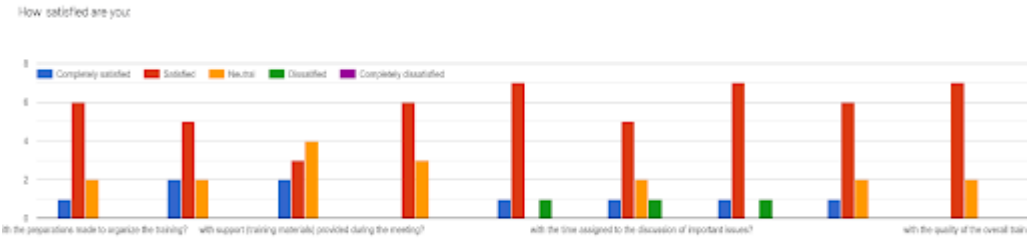

What were the strengths of this training?

- A possible structure for the course and teaching approaches.
- There is relation between source of big data (people, machine, organization) and HCI (for interaction of combination of source of big data).
- sharing the most important things that hci must be,, like sharing tools for prototyping, hand books that used for reference and others.
- Many practical supports of tools that could be used in class.
- Presenter's experience in subject.
- Good presenter, good presentation.
- I don't think this is considered a training.
- Quite prepeared, adequate resource.

What were the weaknesses of this training?

- More focus on a DS&AI aspect would have been more interesting.
- I really did not recognize what is implication of the material learning of HCI.
- Need more time to dig deeper on the materials none.
- Its a little bit off with less focus on data visualization and more on application UI/UX.
- Too fast. Not get into detail.
- Time arrangement.

Ideas for improving project training.

- I will study it next for enhancing my learning in other material.
- Better if could be done face to face.

- Need more topic on data/information visualization, designing Data/BI Dashboard, best practice in designing data representation.

Other comments.

- Thanks to everyone who organised this.
- OK. all is good.
- Good presentation.
- I like when others try to answer my question. Share resources and share textbook names.

Nature-Inspired Computing

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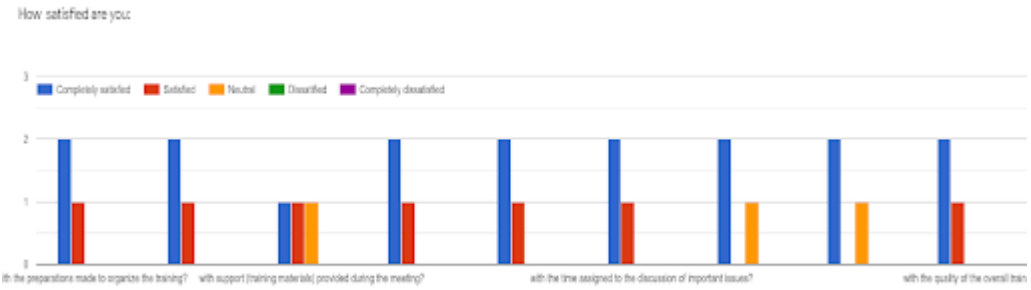


What were the strengths of this training?

planning of the materials

What were the weaknesses of this training?

No responses yet for this question.

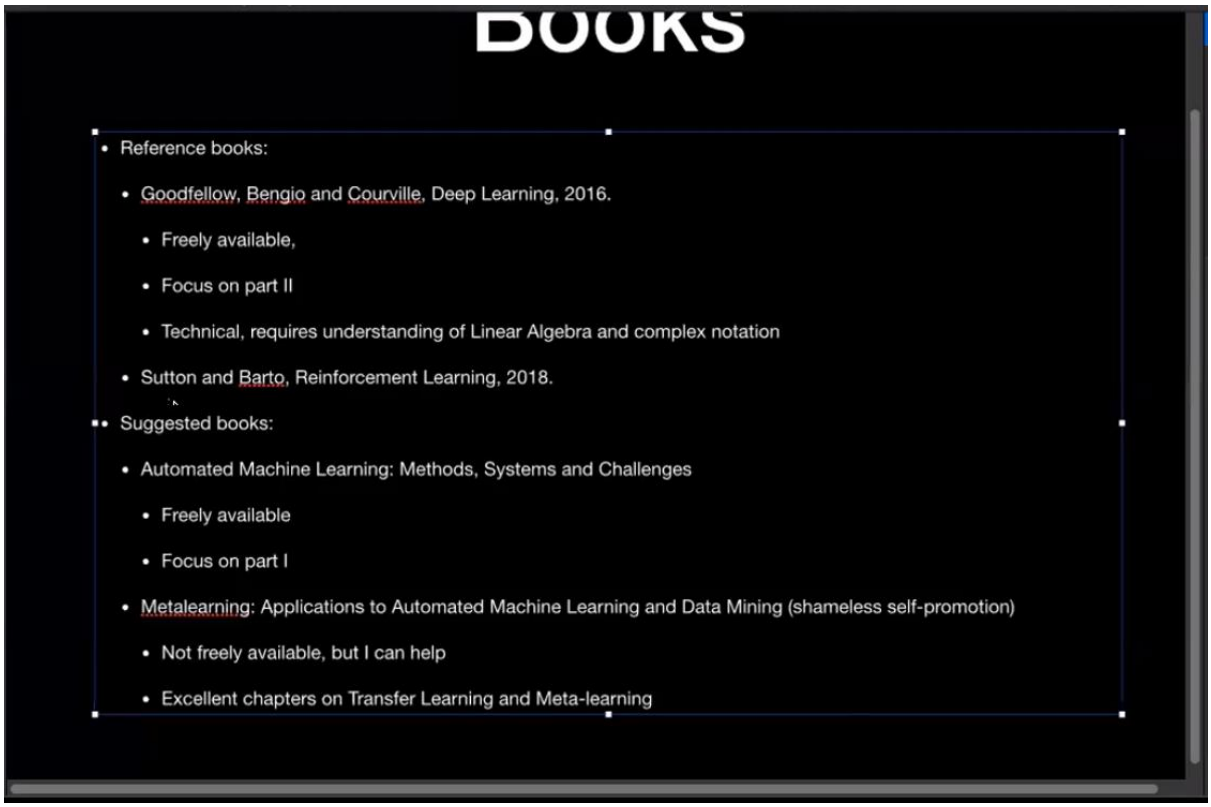
Recent trends in Machine learning

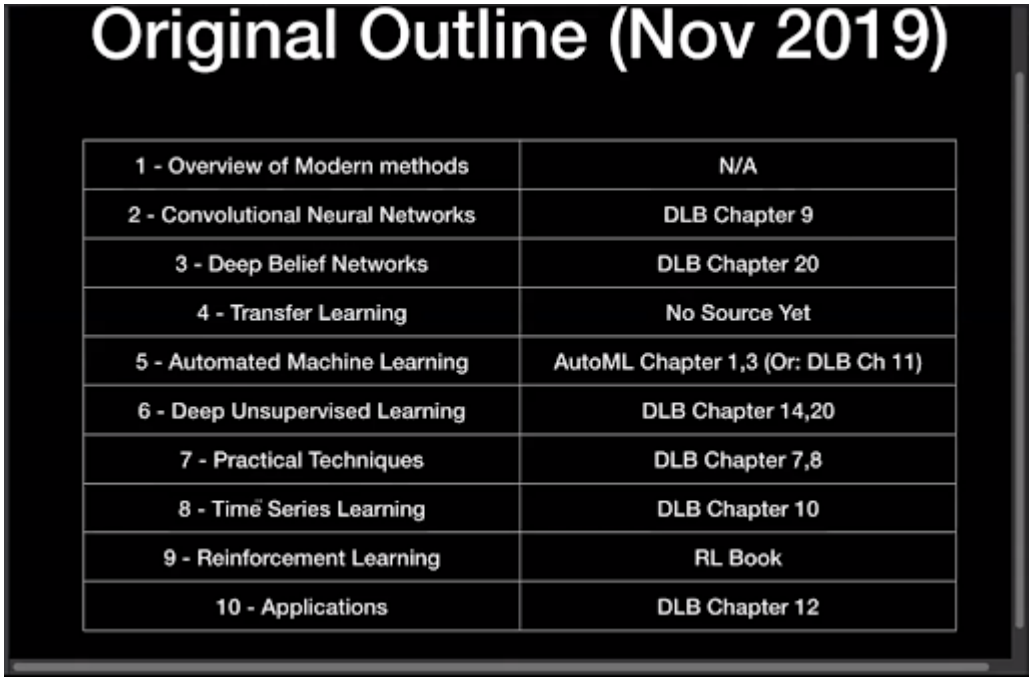
Session held on 16/7/2020.

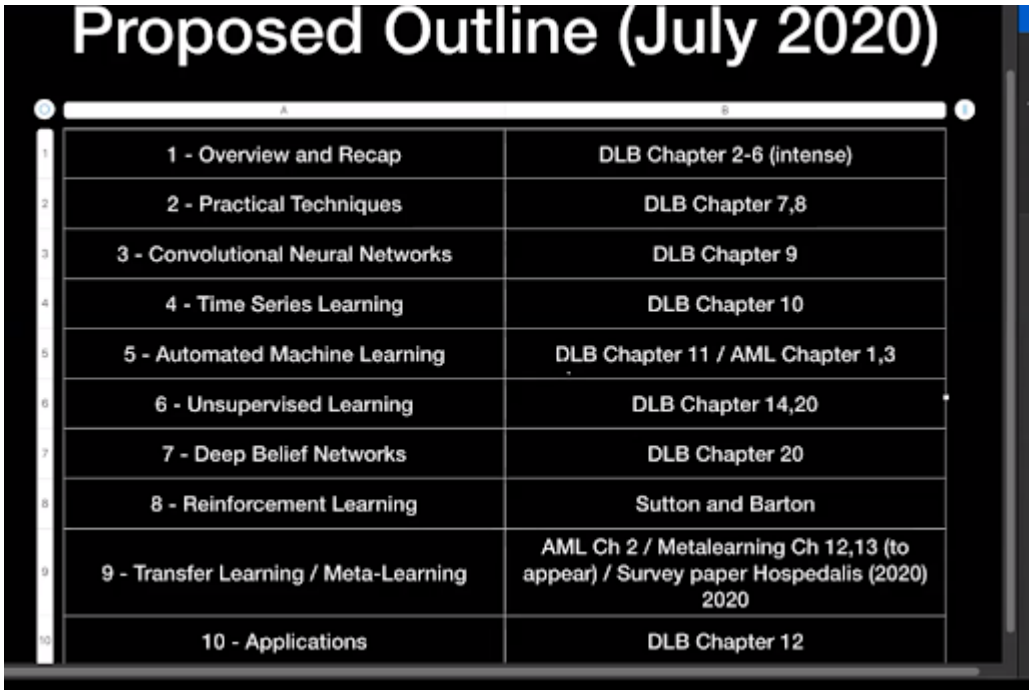
Facilitator: Jan Van Rlin.

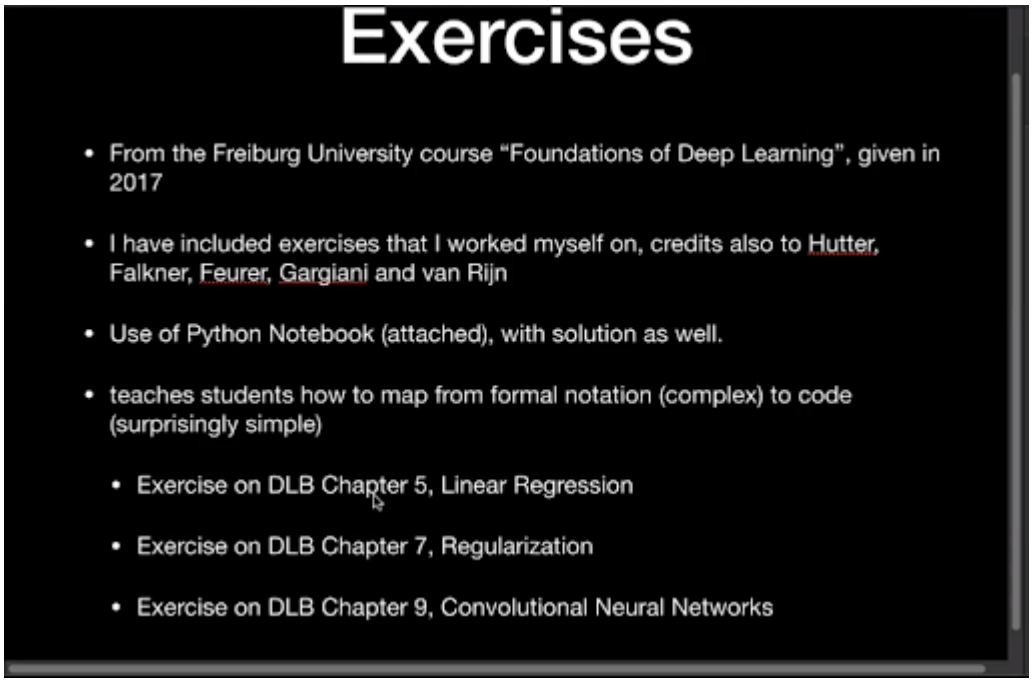
Recommendations and suggestions by European facilitator.

Among others, the following slides were shared by the facilitator.


BOOKS
Reference books:
Goodfellow, Bengio and Courville, Deep Learning, 2016.
Freely available,
Focus on part II
Technical, requires understanding of Linear Algebra and complex notation
Sutton and Barto, Reinforcement Learning, 2018.
Suggested books:
Automated Machine Learning: Methods, Systems and Challenges
Freely available
Focus on part I
Metalearning: Applications to Automated Machine Learning and Data Mining (shameless self-promotion)
Not freely available, but I can help
Excellent chapters on Transfer Learning and Meta-learning


Original Outline (Nov 2019)
1 - Overview of Modern methods
N/A
2 - Convolutional Neural Networks
DLB Chapter 9
3 - Deep Belief Networks
DLB Chapter 20
4 - Transfer Learning
No Source Yet
5 - Automated Machine Learning
AutoML Chapter 1,3 (Or: DLB Ch 11)
6 - Deep Unsupervised Learning
DLB Chapter 14,20
7 - Practical Techniques
DLB Chapter 7,8
8 - Time Series Learning
DLB Chapter 10
9 - Reinforcement Learning
RL Book
10 - Applications
DLB Chapter 12





The course mainly covers deep learning and reinforcement learning.

There are a total of 9 chapters.

- 6 chapters cover deep learning.
- 1 chapter on reinforcement learning.
- 1 chapter on optimization of hyper parameters.
- 1 chapter on transfer learning.

The course could be renamed to “Deep learning” as deep learning techniques are taught every week through weekly exercises.

The course has student projects at the end.

The assignments can be completed on a personal computer using freely available data. The goal of the assignments is to enhance conceptual learning, understanding of algorithms and not on research.

The grading is flexible wherein the emphasis is on the overall approach the student has taken, algorithm used and less on accuracy of results achieved. Visual inspection is done to check for plagiarism.

Questions and concerns raised by faculty in Asia:

Recent trends in machine vision use deep learning, so adding a relevant keyword would be helpful.

In the proposal the name of the course submitted is “Recent trends in machine learning”.

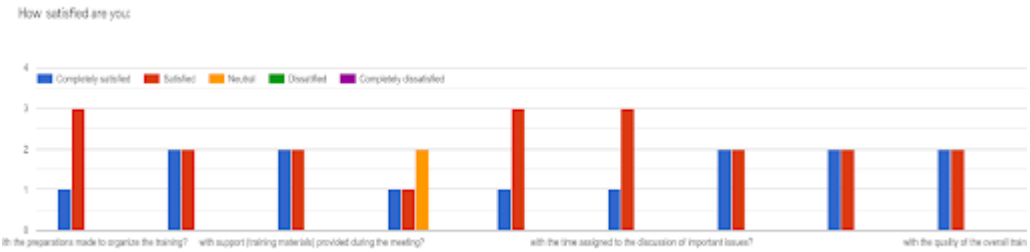
The course should focus on adding more case studies from Kaggle.

The RTML course being piloted at AIT has a project in which students submit a project proposal at the beginning of semester, refine the project requirements and present project progress at the middle of semester. At the end of the semester the students present and submit the project.

Can the assignments be completed on a personal computer?

Evaluators:

Name	Email	University/Organization
Ayu Purwarianti	ayu@informatika.org	ITB
Marcello Bonsangue	m.m.bonsangue@liacs.leidenuniv.nl	LEU
Opim Salim Sitompul	opim@usu.ac.id	USU
Erna Budhiarti Nababan	ernabrn@usu.ac.id	USU



What were the strengths of this training?

- Syllabus & experience.
- This lecture is very interesting, talking around recent trend in ML.
- Get more information on the materials and very helpful experience in managing the class shared by speakers.

What were the weaknesses of this training?

- The Internet connection is troublesome today.
- Internet connection is not stable.

Ideas for improving project training.

- Good to be followed face to face.
- Should be done offline.

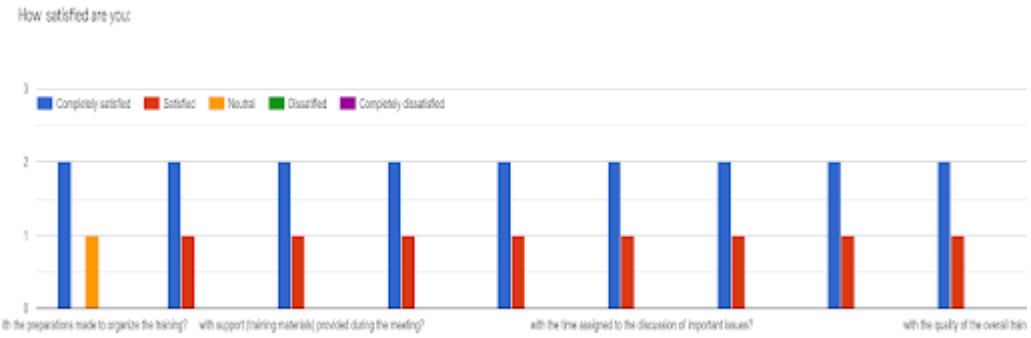
Other comments.

Overall very good.

Social Network Analysis

Evaluators:

Name	Email	University/Organization
Thanaphon	thanaphon@kku.ac.th	KKU
Mahyuddin K. M. Nasution	mahyuddin@usu.ac.id	USU
Maya Silvi Lydia	maya.silvi@usu.ac.id	USU



What were the strengths of this training?

- I found that some material can enhance studies in SNA.
- The trainers were very generous and helpful casual form.

What were the weaknesses of this training?

I did not get a clear confirmation of the structure of the related teaching material.

Ideas for improving project training.

- May need ongoing discussion through other media or dissemination of related studies.
- elaborate more on the example of the assignment.

Other comments.

- All is ok and good.
- Very Good Sharing Session.

Software Development and Project Management

Session held on 17/7/2020.

No Evaluations Submitted.

Spatio-Temporal Data Analysis

Evaluators:

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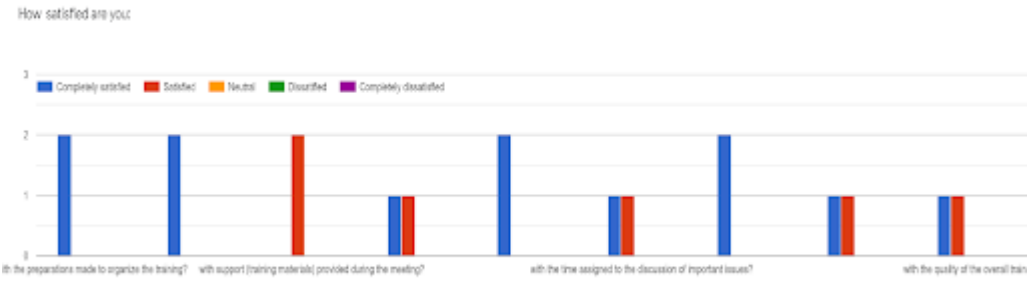
Ade Candra	saiful@informatika.org	ITB
Saiful Akbar	ade_candra@usu.ac.id	USU



What were the strengths of this training?

Clear description and explanation of the course

Ideas for improving project training.

Please share all the materials before the training.

Multicriteria Optimization and Decision Analysis

Session held on 17/7/2020.

Evaluators:

Name	Email	University/Organization
Yudistira Asnar	yudis@std.stei.itb.ac.id	ITB
Marcello Bonsangue	m.m.bonsangue@liacs.leidenuniv.nl	LEU
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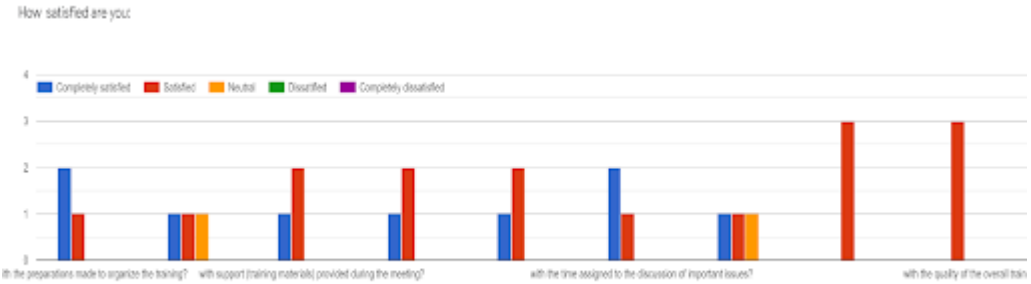

What were the strengths of this training?

- sharing experience and practices on delivering a course on SW Dev and PM.
- I have sent via Opim to Matt course materials about MODA, it has contributed to this.

What were the weaknesses of this training?

- The topics are not closely related to DSAI
- I can't access the curricula from the site of DSAI (space).

Ideas for improving project training.

- SW Dev and PM need to be more related to practices in Data Science and Artificial Intelligence.
- To improve team performance, may the curricula be shared to all members.

Other comments.

All is OK. Good.

Conclusion

Overall, given the circumstances of COVID-19, the online session was a success. All courses in the DS&AI curriculum were discussed. Communities of teachers were formed around each course. European academics were able to transmit many of their perspectives and techniques to the Asian partners, and all benefited from the discussion. Plans were made for finalization of materials for each course.

Specific issues included instability of the Zoom meeting platform, lack of complete materials for some courses, and discussion of material not directly relevant to the course at hand. The learning from this series of sessions will be used to improve future trainings within the project and beyond.