4: Survey for Academics (lecturers) in the field of applied AI:
the state-of-the-art analysis for WP2

Date
19.04.2023

Places of the development of the result
University of Bielsko-Biala, Bielsko-Biala, Poland
University of Library Studies and Information Technologies, Sofia, Bulgaria
University of Nis, Serbia
University of Ss. Cyril and Methodius in Trnava, Slovakia
University of Montenegro, Montenegro

Summary: The questionnaires of 80 teachers from 5 countries were collected and analyzed, concerning artificial intelligence teaching. Among the more interesting results belongs the finding, that most of the teachers are self-educated regarding artificial intelligence, the majority of them never participated in a commercial project regarding artificial intelligence, but most of the teachers would welcome extended participation of experts from industry in teaching of students. From their recommendations can be selected e.g. advices:

Focus more on the free versions.
Select proper computing language and libraries first
Attention on Computer Vision, Explainable AI, Human-AI interaction
Add more doing by examples activities
Solving real AI cases at classes

Most of the answers were analyzed and visualized in a form of graphs.

Keywords: teaching AI, questionnaire results, recommendations

1. Introduction

The questionnaire was a part of the research in connection with the objectives of project 2022-1-PL01-KA220-HED-000088359 "The Future is in Applied Artificial Intelligence" (FAAI) under the Erasmus + program. This project aims to join together Universities, and businesses and provide innovative solutions to develop AI experts. The questions in this study was aimed to research the needs and expectations of academics to propose training specialists in the field of Applied AI. The academics had to fill in the fields about their experience and opinions concerning Applied AI. The most of fields were mandatory, which is shown by an asterisk following the question. Project site: http://faai.ath.edu.pl/

2. Collection and analysis of data

The data was acquired by five partner institutions academics and their colleagues from other institutions.
In total 80 questionnaires were collected.

3. Results

3.1. Place of work

The first question of the survey asks where the academics come from. All five project participants countries were analyzed. The numbers of 80 questionnaires were distributed followingly: Poland11 / 80 (13.75%), Bulgaria 27 / 80 (33.75%), Slovakia 14 / 80 (17.5%), Serbia 16 / 80 (20%), Montenegro 12 / 80 (15%), Other 0 / 80 (0%). The results are presented below.
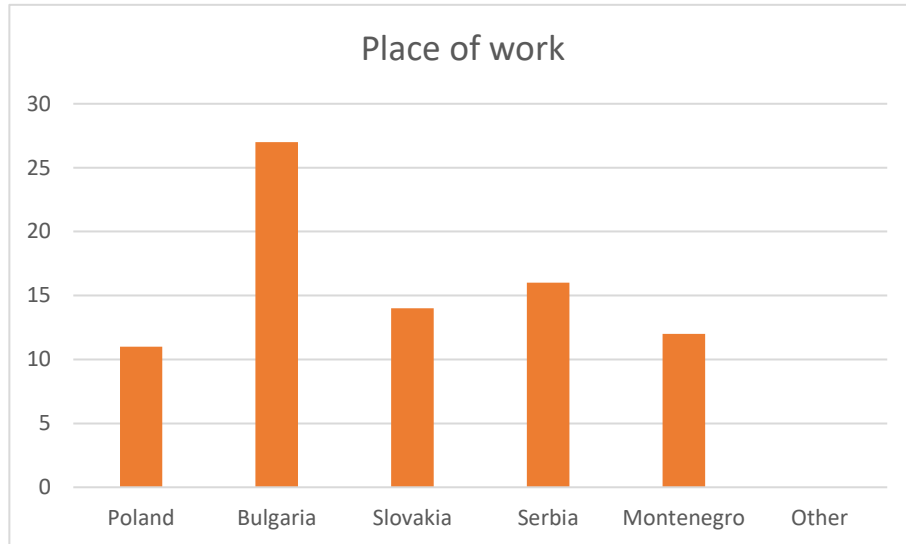
Data description:
According to the research data, academics from Bulgaria filled most of the questionnaires.

Discussion:
When the number of inhabitants in the participating countries are taken into account, the number of filled questionnaires per one million of inhabitants in the sequence of the countries is following 0.29, 3.97, 2.54, 2.31, 19.29. This shows, that although the Bulgaria got most of the questionnaires, in relative terms Montenegro is five times better. However, one should also take into account the number of academics in the informatics from the participating institutions.

Main conclusions:
- Even though the Bulgaria got most answers, in relative terms of number of inhabitants, the questionaries from Montenegro will have relatively largest influence.

3.2. If country was "Other" please write the name of the country

One of the questionaries got as country Finland, but it did not correspond neither with the responder's email address nor with the fact, that in the first question the Other possibility was not selected at all, so it is likely a fluke.

3.3 What is your full name?

Data description:
The number of answers was 65 from the total number 80, which means more than 81 percent of respondents provided their full name. This gives the results of questionnaire more credibility, since respondents providing their full name are likely to take more care about the answers.

Place of work of respondents, blue part did non provide names
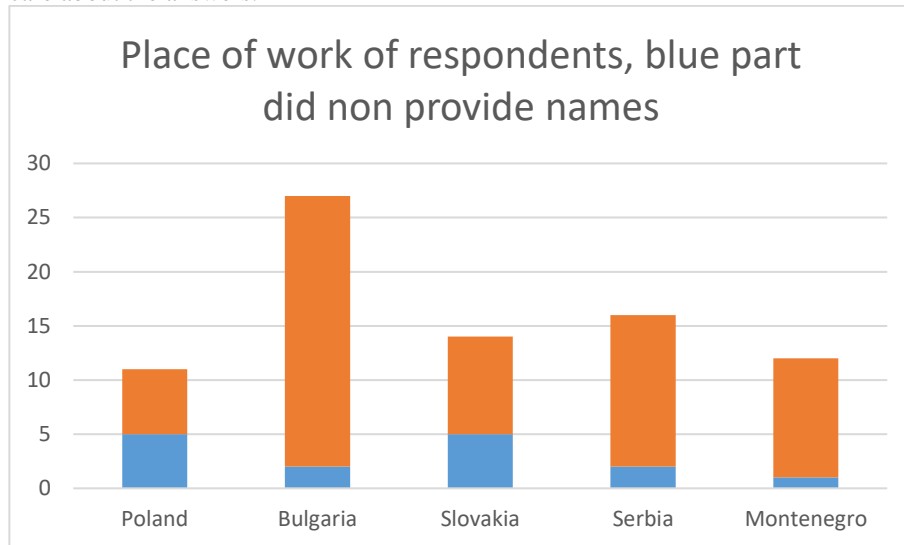
Discussion:
The best ratio of respondents, who gave their name is in Bulgatia and Montenegro.

Main conclusions:
- Bulgaria and Montenegro respondents are likely to provide the most reliable answers.

3.4. What is your e-mail? *

The number of answers was 80 from the total number 80, the answer was compulsory.

3.5. What is your Applied Artificial Intelligence skills level? *

Data description:
Most of responders claimed to be intermediate.

Discussion:
When the number responders are taken into account, the number of filled questionnaires for single AI skill levels are: Base 18.75%, Beginner 16.25%, Intermediate 31.25%, Advanced 23.75%, Expert 7.50%, Other 2.50%. This shows that the number of experts in the group is relatively low.
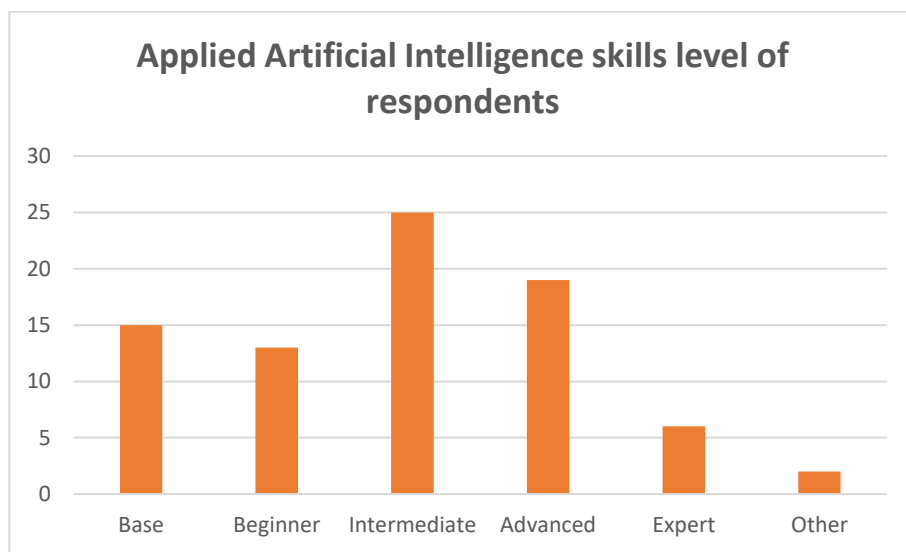
Main conclusions:
- The number of experts is 2.5 times lower than the number of base level skills; the questionaries were therefore evidently sampled across the informatics educators and are not significantly skewed towards experts. The answers should therefore provide a broad overview, not the narrow point of view of experts.

3.6. Where did you get this Applied Artificial Intelligence skills? *
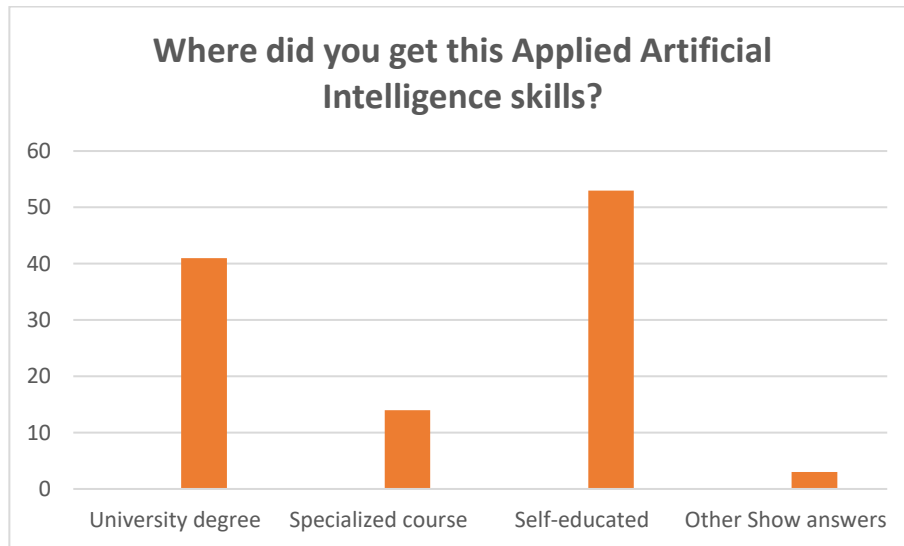
Data description:
The answers were nonexclusive, i. e. more than one choice could be selected.
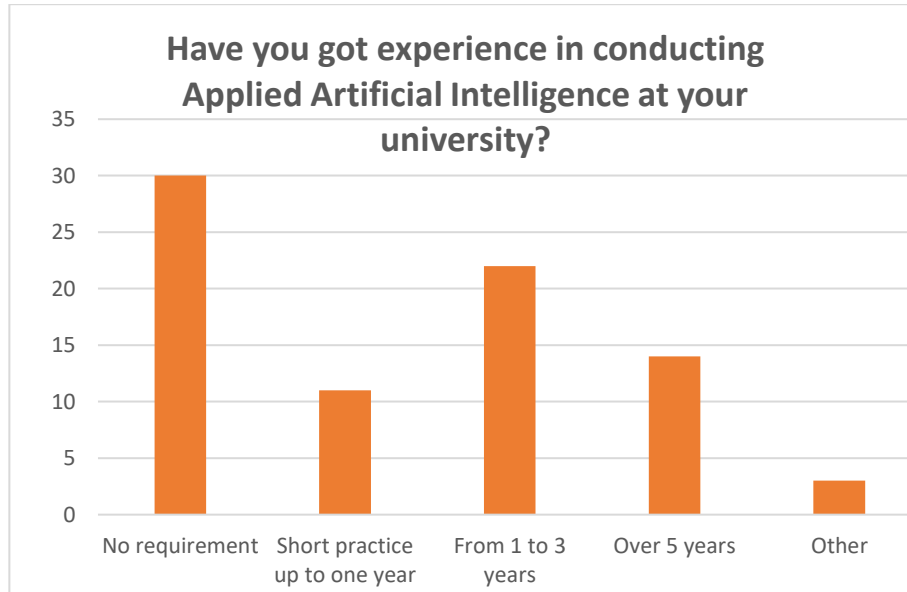
Discussion:
The majority of AI skills of educators comes from self-education, followed by university degree.

Main conclusions:
The fact that nor the university courses, nor specialized courses are major skill resource even among educators shows the necessity for improving both university courses as well as specialized ones.

3.7. Have you got experience in conducting Applied Artificial Intelligence at your university? *

Data description:
All 80 questionnaires were filled.

Discussion:
The percentage results are: No requirement 37.50%, Short practice up to one year 13.75%, From 1 to 3 years 27.50%, Over 5 years 17.50%, Other 3.75%. This shows that great many of teachers have no experience in teaching AI, but on the other hand, more than 50 percent of teachers had at least one year experience.

Main conclusions:
- Nearly one fifth of the teachers have more than 5-year experience in teaching AI, which can rank them among the experts.

3.8. Do you think Applied Artificial Intelligence teaching should be supported by external Applied Artificial Intelligence experts (from industry)? *
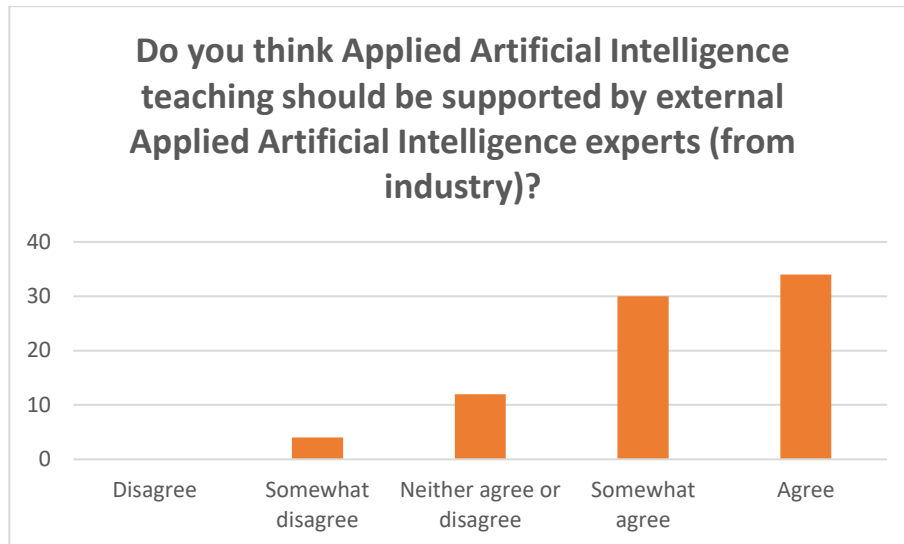
Data description:
All 80 questionnaires were filled.

Discussion:
The percentage results are: Disagree 0%, Somewhat disagree 5%, Neither agree or disagree 15%, Somewhat agree 37.50%, Agree 42.50%. No one would be against the experts from industry, which is a very positive sign.

Main conclusions:
- This shows that the majority of teachers would welcome external artificial intelligence experts from industry.

3.9. What activities do you prefer to extend your knowledge in Applied Artificial Intelligence ? *
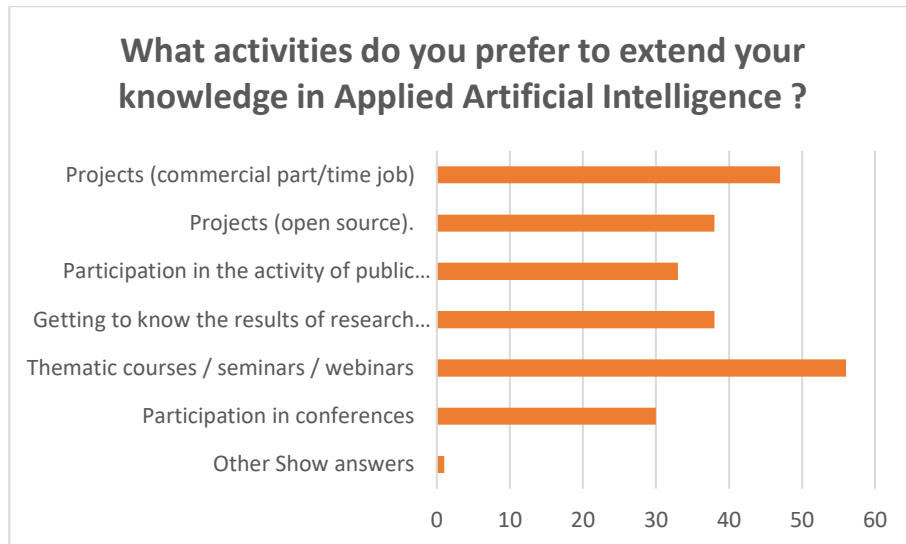
Data description:
All 80 questionnaires were filled.

Discussion:
The percentage results are: Projects (commercial part/time job) 58.75%, Projects (open source) 47.50%, Participation in the activity of public scientific groups 41.25%, Getting to know the results of research conducted at the universities 47.50%, Thematic courses / seminars / webinars 70%, Participation in conferences 37.50%, Other Show answers 1.25%. The data show that all the methods of gaining more AI knowledge are welcome.

Main conclusions:
- While thematic courses are most preferred, conferences are the least popular.

3.10. What Applied Artificial Intelligence competencies do you think are important to include in the programme? *

	1	2	3	4	5 (high importance)
Describe major areas of AI as well as contexts in which AI methods may be applied.	0/80 (0%)	6/80 (7.5%)	17/80 (21.3%)	22/80 (27.5%)	35/80 (43.8%)
Represent information in a logic formalism and apply relevant reasoning methods.	1/80 (1.3%)	10/80 (12.5%)	26/80 (32.5%)	30/80 (37.5%)	13/80 (16.3%)
Represent information in a probabilistic formalism and apply relevant reasoning methods.	0/80 (0%)	9/80 (11.3%)	27/80 (33.8%)	29/80 (36.3%)	15/80 (18.8%)
Be aware of the wide range of ethical considerations around AI systems, as well as mechanisms to mitigate problems.	1/80 (1.3%)	12/80 (15%)	30/80 (37.5%)	22/80 (27.5%)	15/80 (18.8%)
Recognize the breadth and utility of machine learning methods	0/80 (0%)	4/80 (5%)	14/80 (17.5%)	28/80 (35%)	34/80 (42.5%)

	1	2	3	4	5 (high importance)
Compare and contrast machine learning methods	0/80 (0%)	4/80 (5%)	15/80 (18.8%)	22/80 (27.5%)	39/80 (48.8%)
Select appropriate (classes of) machine learning methods for specific problems.	0/80 (0%)	3/80 (3.8%)	16/80 (20%)	20/80 (25%)	41/80 (51.2%)
Use appropriate training and testing methodologies when deploying machine learning algorithms.	0/80 (0%)	2/80 (2.5%)	16/80 (20%)	26/80 (32.5%)	36/80 (45%)
Explain methods to mitigate the effects of overfitting and curse of dimensionality in the context of machine learning algorithms.	0/80 (0%)	4/80 (5%)	23/80 (28.7%)	31/80 (38.8%)	22/80 (27.5%)
Identify an appropriate performance metric for evaluating machine learning algorithms/tools for a given problem.	0/80 (0%)	3/80 (3.8%)	19/80 (23.8%)	33/80 (41.3%)	25/80 (31.3%)

	1	2	3	4	5 (high importance)
Recognize problems related to algorithmic and data bias, as well as privacy and integrity of data.	1/80 (1.3%)	4/80 (5%)	17/80 (21.3%)	34/80 (42.5%)	24/80 (30%)
Debate the possible effects -- both positive and negative -- of decisions arising from machine learning conclusions.	1/80 (1.3%)	8/80 (10%)	25/80 (31.3%)	22/80 (27.5%)	24/80 (30%)

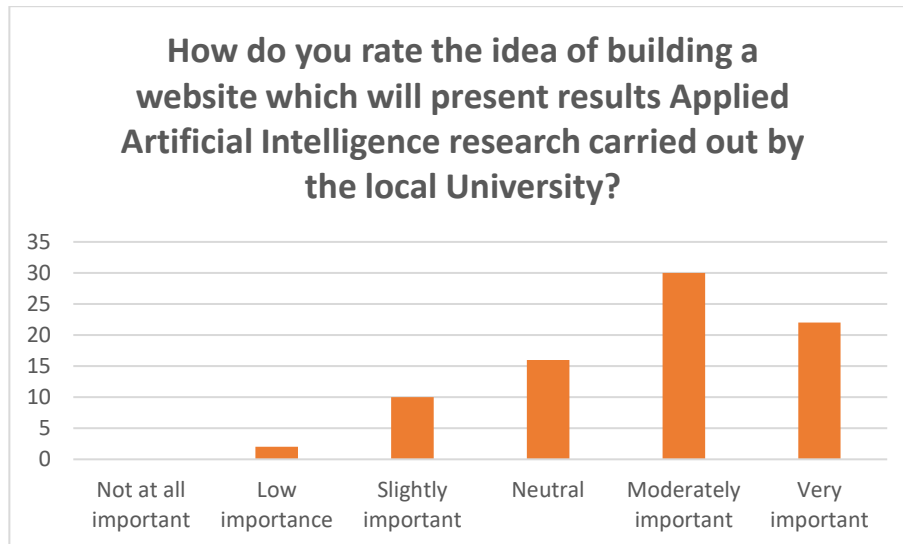**Data description:**
All 80 questionnaires were filled.

Discussion:
While description of major AI areas is very preferred, logical formalism and probabilistic methods are not in the forefront of interest, unlike the issues connected with machine learning.

Main conclusions:
- The most important parts are general description of AI methods, followed by overview and comparison of machine learning methods, selecting appropriate one for the problem and using correct training and testing.

14

3.11. How do you rate the idea of building a website which will present results Applied Artificial Intelligence research carried out by the local University? *

How do you rate the idea of building a website which will present results Applied Artificial Intelligence research carried out by the local University?

Data description:
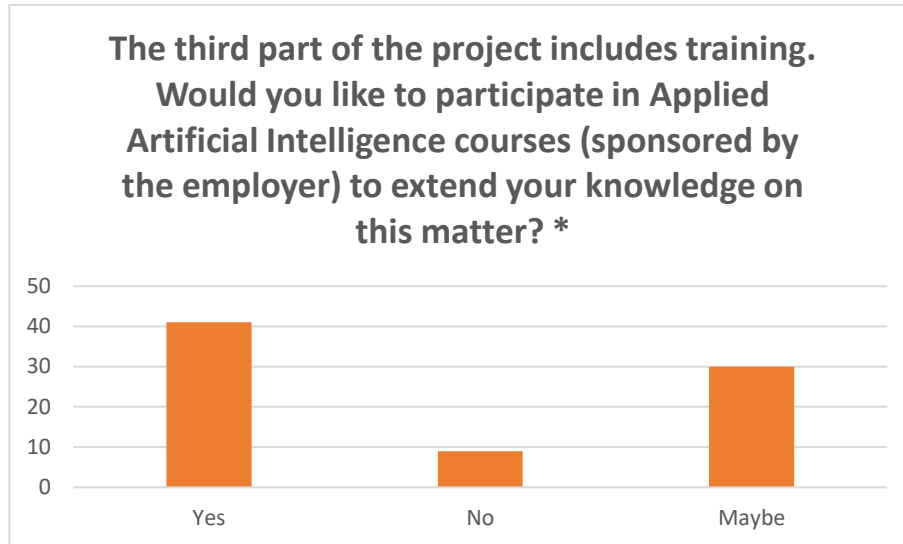All 80 questionnaires were filled.

Discussion:
The percentage results are Not at all important 0%, Low importance 2.50%, Slightly important 12.50%, Neutral 20%, Moderately important 37.50%, Very important 27.50%.

Main conclusions:
- A website presenting AI results in university is quite important for promotion of AI research and teaching.

3.12. The third part of the project includes training. Would you like to participate in Applied Artificial Intelligence courses (sponsored by the employer) to extend your knowledge on this matter? *

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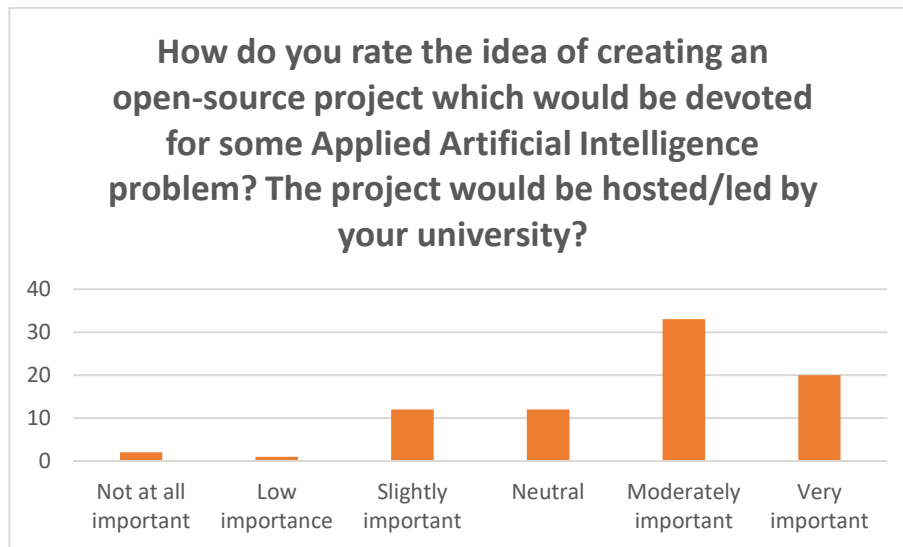**Data description:**
All 80 questionnaires were filled.

Discussion:
The percentage results are Yes 51.25%, No 11.25%, Maybe 37.50%. Only one tenth of the teachers would not like to participate in the course, which shows a positive attitude towards AI in general.

Main conclusions:
- More than half of the teachers would like to participate in the training, and nearly forty percent would consider it.

3.13. How do you rate the idea of creating an open-source project which would be devoted for some Applied Artificial Intelligence problem? The project would be hosted/led by your university? *

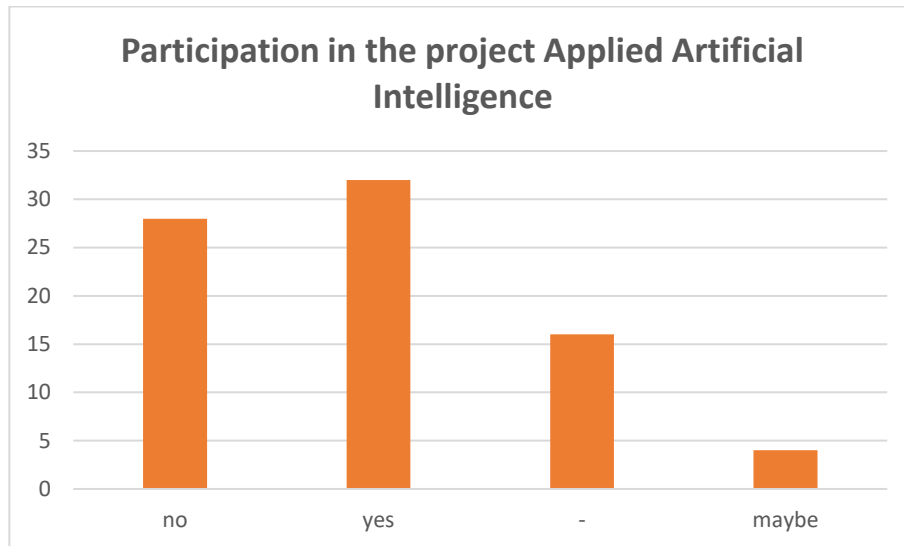**Data description:**
All 80 questionnaires were filled.

Discussion:
The percentage results are Not at all important 2.50%, Low importance 1.25%, Slightly important 15%, Neutral 15%, Moderately important 41.25%, Very important 25%. Unlike a website, there are a few participants who do not consider the open-source project important.

Main conclusions:
- Similarly to a dedicated university website, open source projects are considered important for promotion of AI.

3.14. Participation in the project Applied Artificial Intelligence *

Data description:
All 80 questionnaires were filled. Here a verbal field response was required, the data therefore had to be processed before making a graph.
In the part – were counted answers like I do not understand the question, N/A or similar, in the part yes were counted answers specifying project or "DataEngineer".
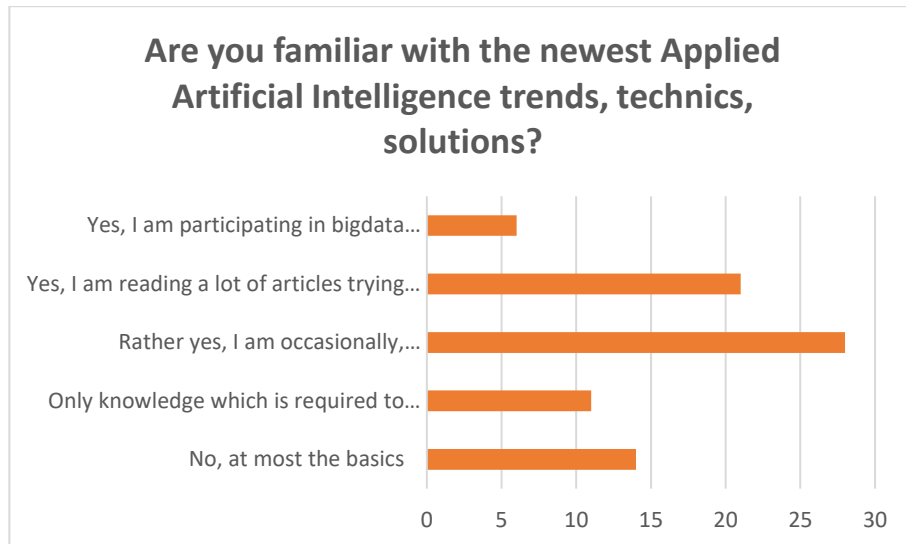
Discussion:
There was a potential problem with understanding the question, which could be specified as Have you participated..., or Would you like to participate… or Do you consider participation as important? This led to many blank answers.

Main conclusions:
- While many teachers have positive attitude towards participation in applied AI, the questions in future must be more specific to avoid confusion in the understanding of the question.

3.15. Are you familiar with the newest Applied Artificial Intelligence trends, technics, solutions? *

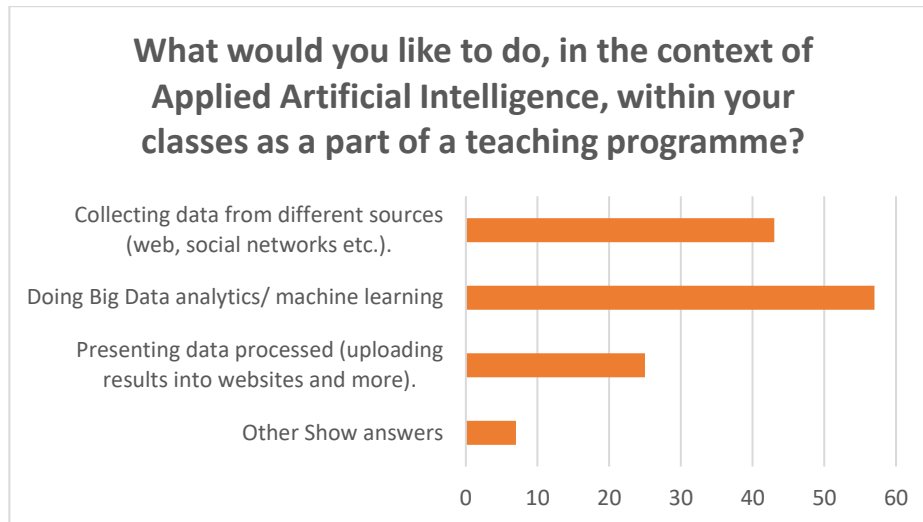**Data description:**
All 80 questionnaires were filled.

Discussion:
Percentages were: Yes, I am participating in bigdata conferences, projects etc. 7.50%, Yes, I am reading a lot of articles trying to be up to date in this area 26.25%, Rather yes, I am occasionally, investigating the area from time to time 35%, Only knowledge which is required to conduct classes/laboratories with students 13.75%, No, at most the basics 17.50%.

Main conclusions:
- While about a third of teachers have a great overview concerning the newest AI trends, another third gets by only with a necessary knowledge. This result stresses a need for continuous education of teachers in this progressing field.

3.16. What would you like to do, in the context of Applied Artificial Intelligence, within your classes as a part of a teaching programme? *

Data description:
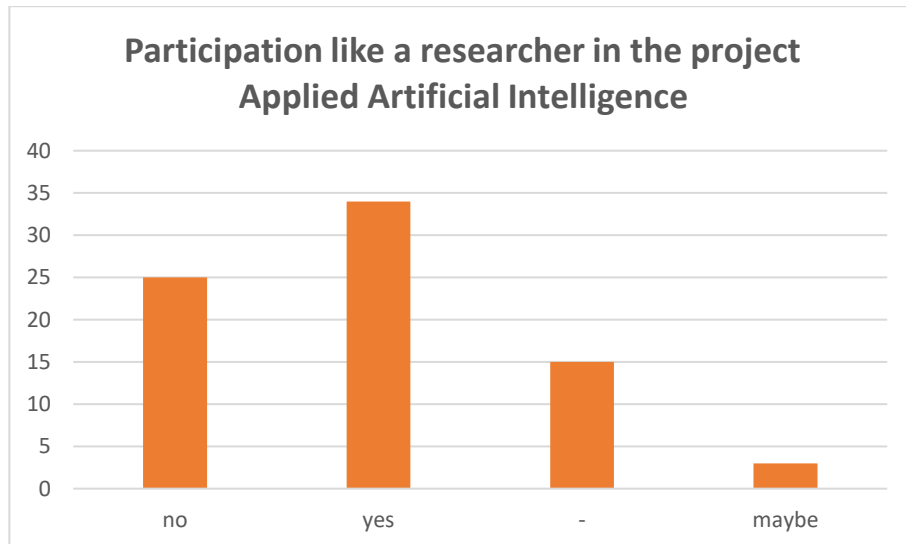All 80 questionnaires were filled.

Discussion:
Percentages were: Collecting data from different sources (web, social networks etc.) 53.75%, Doing Big Data analytics/ machine learning 71.25%, Presenting data processed (uploading results into websites and more) 31.25%, Other Show answers 8.75%

Main conclusions:
- Most of the participants are interested in machine learning.

3.17. Participation like a researcher in the project Applied Artificial Intelligence
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Participation like a researcher in the project Applied Artificial Intelligence

Data description:
All 80 questionnaires were filled. Here a verbal field response was required, the data therefore had to be processed before making a graph.
In the part – were counted answers like *I do not understand the question*, *N/A* or similar, in the part yes were counted answers specifying project or "*DataEngineer*".

Discussion:
There was a potential problem with understanding the question, which could be specified as Have you participated..., or Would you like to participate… or even Do you consider participation as important? This led to many blank answers.

Main conclusions:
- While many teachers have positive attitude towards participation in projects concerning applied AI, the questions in future must be more specific to avoid confusion in the understanding of the question.

3.18. Have you participated in projects (commercial or open-source) which were based on Applied Artificial Intelligence? *

Have you participated in projects (commercial or open-source) which were based on Applied Artificial Intelligence?
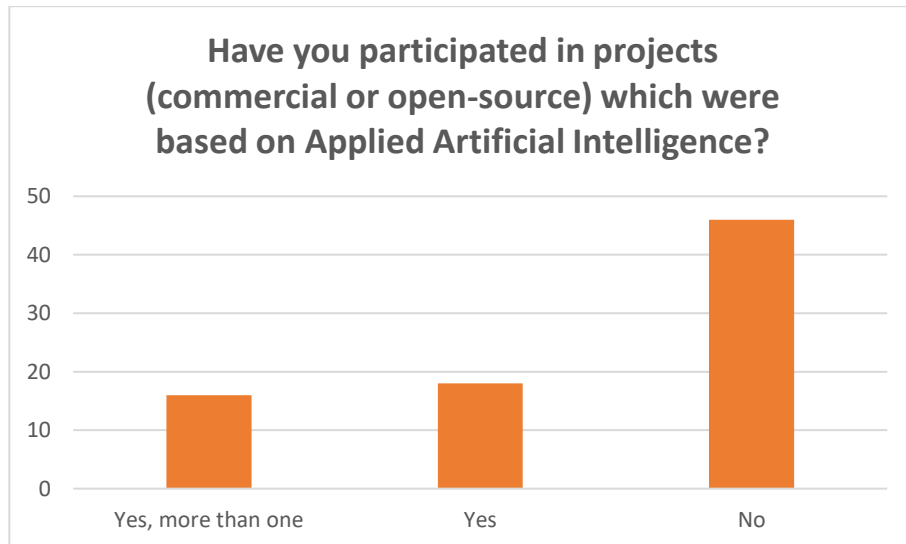
Data description:
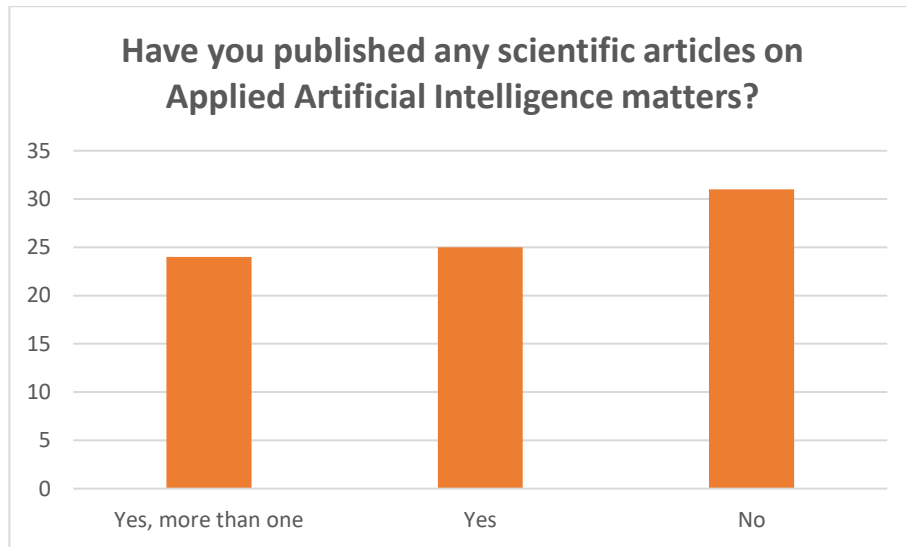All 80 questionnaires were filled.

Discussion:
The percentages were: Yes, more than one 20%, Yes 22.50%, No 57.50%.

Main conclusions:
- Nearly 60 percent of teachers never participated in commercial or open-source projects based on applied AI, which stresses a need for closer cooperation with industry.

3.19. Have you published any scientific articles on Applied Artificial Intelligence matters? *

Data description:
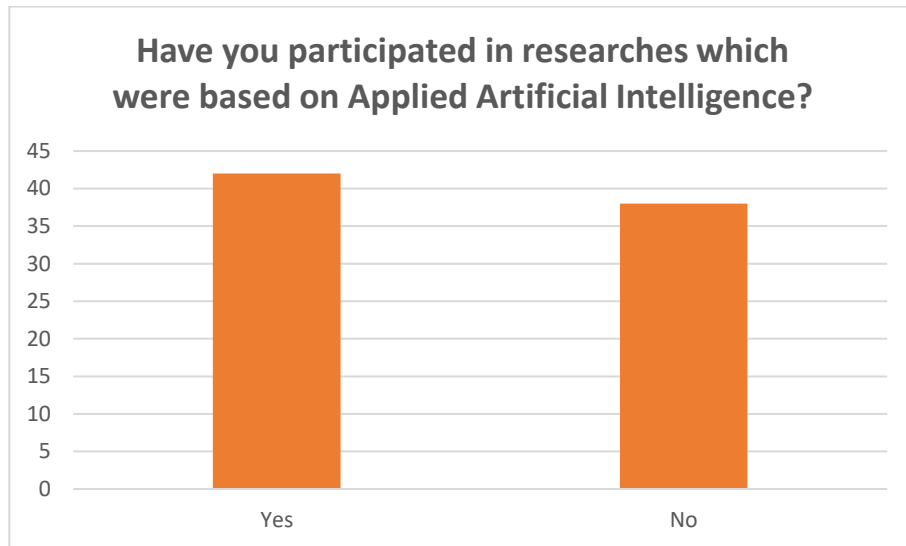All 80 questionnaires were filled.

Discussion:
The percentages were: Yes, more than one 30%, Yes 31.25%, No 38.75%

Main conclusions:
- Nearly 40 percent of teachers never published an article concerning AI, interested colleagues should get more involved in the AI research.

3.20. Have you participated in researches which were based on Applied Artificial Intelligence? *

Yes 52.50%, No 47.50%

Data description:
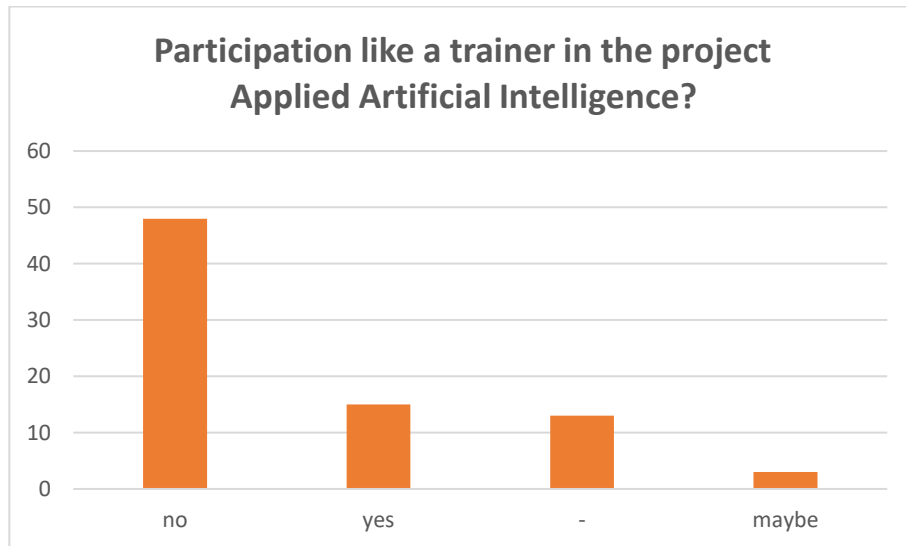All 80 questionnaires were filled.

Discussion:
The percentages were: Yes 52.50%, No 47.50%

Main conclusions:
- Nearly half of the teachers never participated in ANY projects based on applied AI, which stresses a need for involving more colleagues in AI projects, when most of them are clearly interested.

3.21. Participation like a trainer in the project Applied Artificial Intelligence *

Participation like a trainer in the project Applied Artificial Intelligence?

Data description:
All 80 questionnaires were filled. Here a verbal field response was required, the data therefore had to be processed before making a graph.
In the part – were counted answers like *I do not understand the question*, *N/A* or similar.

Discussion:
There was a potential problem with understanding the question, which could be specified as Have you participated…, or Would you like to participate… or even Do you consider participation as important? This led to many blank answers.

Main conclusions:
- Most of the teachers would not yet like to be a trainer on the course, but the questions in future must be more specific to avoid confusion in the understanding of the question.

3.22. Would you like to get into Applied Artificial Intelligence teaching? *

Would you like to get into Applied Artificial Intelligence teaching?

Category	
I am already in	
Yes, I know about it and I know how to…	
Yes, I have heard about the it but I have…	
Yes, I have not heard about it and but I…	
Maybe	
No, I am not interested at all	

0%   5%   10%   15%   20%   25%   30%   35%
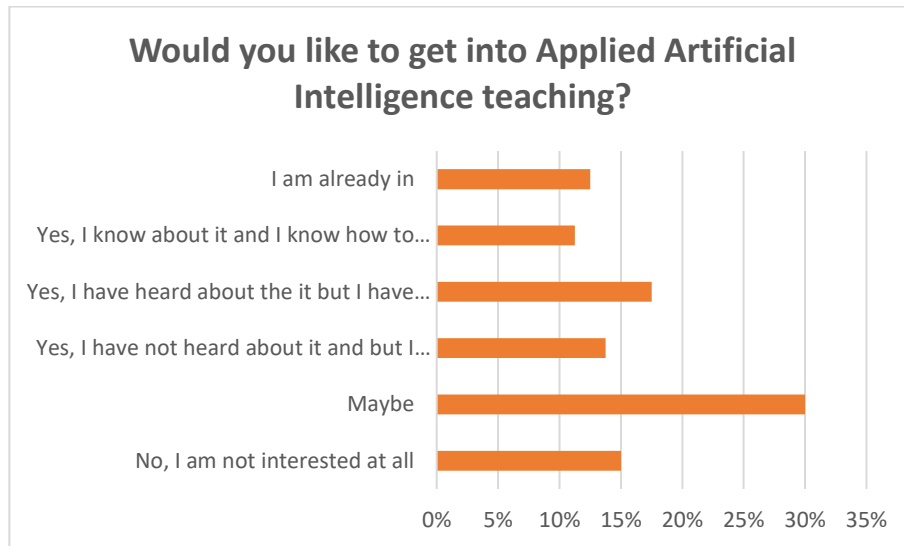
Data description:
All 80 questionnaires were filled.

Discussion:
I am already in 12.50%, Yes, I know about it and I know how to use it. 11.25%, Yes, I have heard about the it but I have never opportunity to use it. 17.50%, Yes, I have not heard about it and but I would like to start using it. 13.75%, Maybe 30%, No, I am not interested at all 15%.

Main conclusions:
- While about 15 percent are not interested in applied AI teaching themselves, most of the other teachers show a more positive attitude.

3.23. Recommendations *

While most of the participants did not provide any recommendation, those who did were valuable:
Focus more on the free versions.
Select proper computing language and libraries first
Attention on Computer Vision, Explainable AI, Human-AI interaction
Add more doing by examples activities
Solving real AI cases at classes
To be promoted not only in higher education

24. What would you propose to implement on your university to better understand Applied Artificial Intelligence matters? *

	1-low-importance	2	3	4	5-high importance
Organising regular presentations, webinars on Applied Artificial Intelligence matters	1/80 (1.3%)	8/80 (10%)	26/80 (32.5%)	23/80 (28.7%)	22/80 (27.5%)
Patronizing a Applied Artificial Intelligence event to gather people, companies involved in this matter.	5/80 (6.3%)	8/80 (10%)	26/80 (32.5%)	25/80 (31.3%)	16/80 (20%)
Setting up a students scientific group devoted for Applied Artificial Intelligence.	2/80 (2.5%)	9/80 (11.3%)	17/80 (21.3%)	28/80 (35%)	24/80 (30%)
Getting into cooperation which some Applied Artificial Intelligence company, open-source community or experts to speed up the knowledge acquisition.	0/80 (0%)	3/80 (3.8%)	17/80 (21.3%)	25/80 (31.3%)	35/80 (43.8%)

Data description:
All 80 questionnaires were filled.

Discussion:
While oral presentations and student scientific groups are important, as well as webinars, cooperation with experts from AI companies is considered most important.

Main conclusions:
- Getting AI companies or open/source communities involved is paramount.

25. Why is it important to include Applied Artificial Intelligence subject in the education process? *

	1-low-importance	2	3	4	5-high importance
Job market requirements	2/80 (2.5%)	4/80 (5%)	18/80 (22.5%)	23/80 (28.7%)	33/80 (41.3%)
Provide students with better knowledge on data processing what becomes critical nowadays.	1/80 (1.3%)	3/80 (3.8%)	11/80 (13.8%)	21/80 (26.3%)	44/80 (55%)
More opportunities for students and teachers to build their scientific skills.	0/80 (0%)	4/80 (5%)	19/80 (23.8%)	28/80 (35%)	29/80 (36.3%)

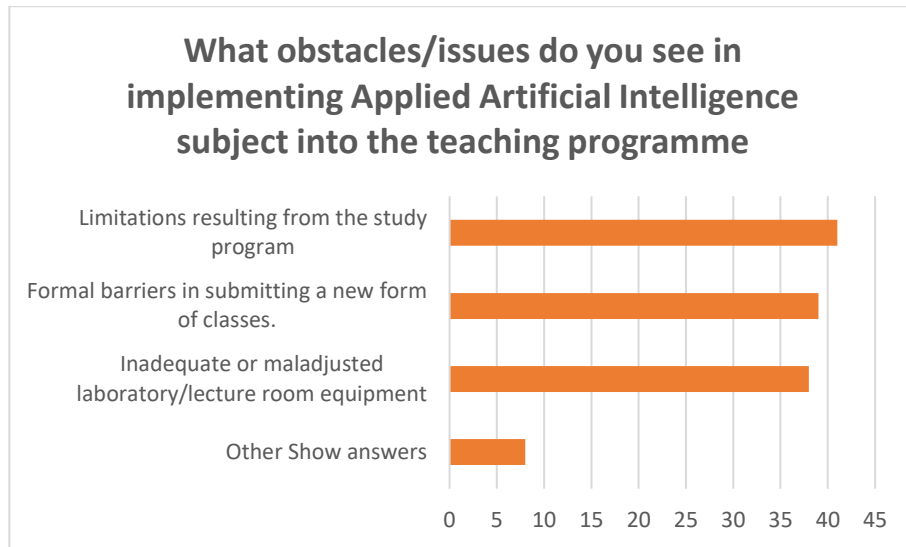**Data description:**
All 80 questionnaires were filled.

Discussion:
While job market requirements are important, critical knowledge comes from AI companies.

Main conclusions:
- Again, getting AI companies or open/source communities involved is paramount.

26. What obstacles/issues do you see in implementing Applied Artificial Intelligence subject into the teaching programme *

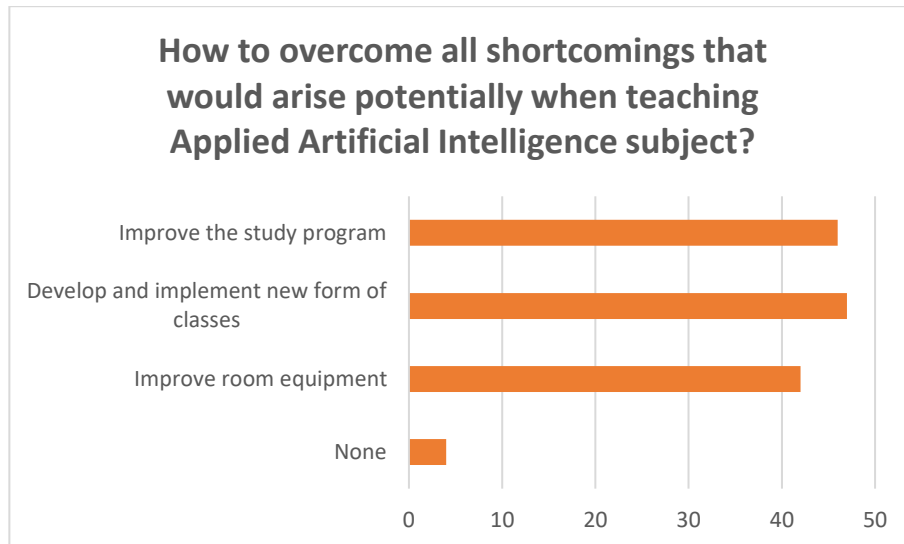**Data description:**
All 80 questionnaires were filled.

Discussion:
Percentages of results: Limitations resulting from the study program 51.25%, Formal barriers in submitting a new form of classes 48.75%, Inadequate or maladjusted laboratory/lecture room equipment 47.50%, Other Show answers 10%.

Main conclusions:
- Problems with a study program, formal barriers to new form of classes and inadequate equipment create equally frustrating obstacles for improving applied AI teaching.

27. How to overcome all shortcomings that would arise potentially when teaching Applied Artificial Intelligence subject? *

Data description:
All 80 questionnaires were filled.

Discussion:
Percentages of results: Improve the study program 57.50%, Develop and implement new form of classes 58.75%, Improve room equipment 52.50%, None 5%

Main conclusions:
- Again, the road to improving AI teaching must involve all parts: study program, formal barriers to new form of classes as well as adequate equipment.

4. Conclusions

From the given statement, it can be observed that there is a need for teachers to improve their skills in teaching and promoting applied AI. The desired competences include teaching, promoting, and improving knowledge in the field of AI. The hard skills required for effective teaching and learning of applied AI include machine learning, selected programming languages and libraries, data analysis and visualization, algorithm design and optimization, deep learning, and natural language processing.

Moreover, soft skills such as communication, collaboration, adaptability, creativity, problem-solving, and leadership are also necessary for effective teaching and learning of applied AI. It is essential to participate in AI communities and seek support from

experts in the field to stay up to date with the latest trends and advancements in the industry.

Competences	Hard Skills	Soft Skills
Teaching	Machine learning	Communication
Promoting	Programming languages and libraries	Collaboration
Applied AI real cases	Data analysis and visualization	Adaptability
Improving knowledge	Human-AI interaction, Algorithm design and optimization	Creativity
Participation in AI communities	Deep learning	Problem-solving
Staying up-to-date	Natural language processing, explainable AI	Leadership

Overall, it is crucial to provide teachers with the necessary support and resources to improve their knowledge and skills in the field of applied AI. By doing so, they can effectively promote the subject and prepare their students for the ever-evolving demands of industry.