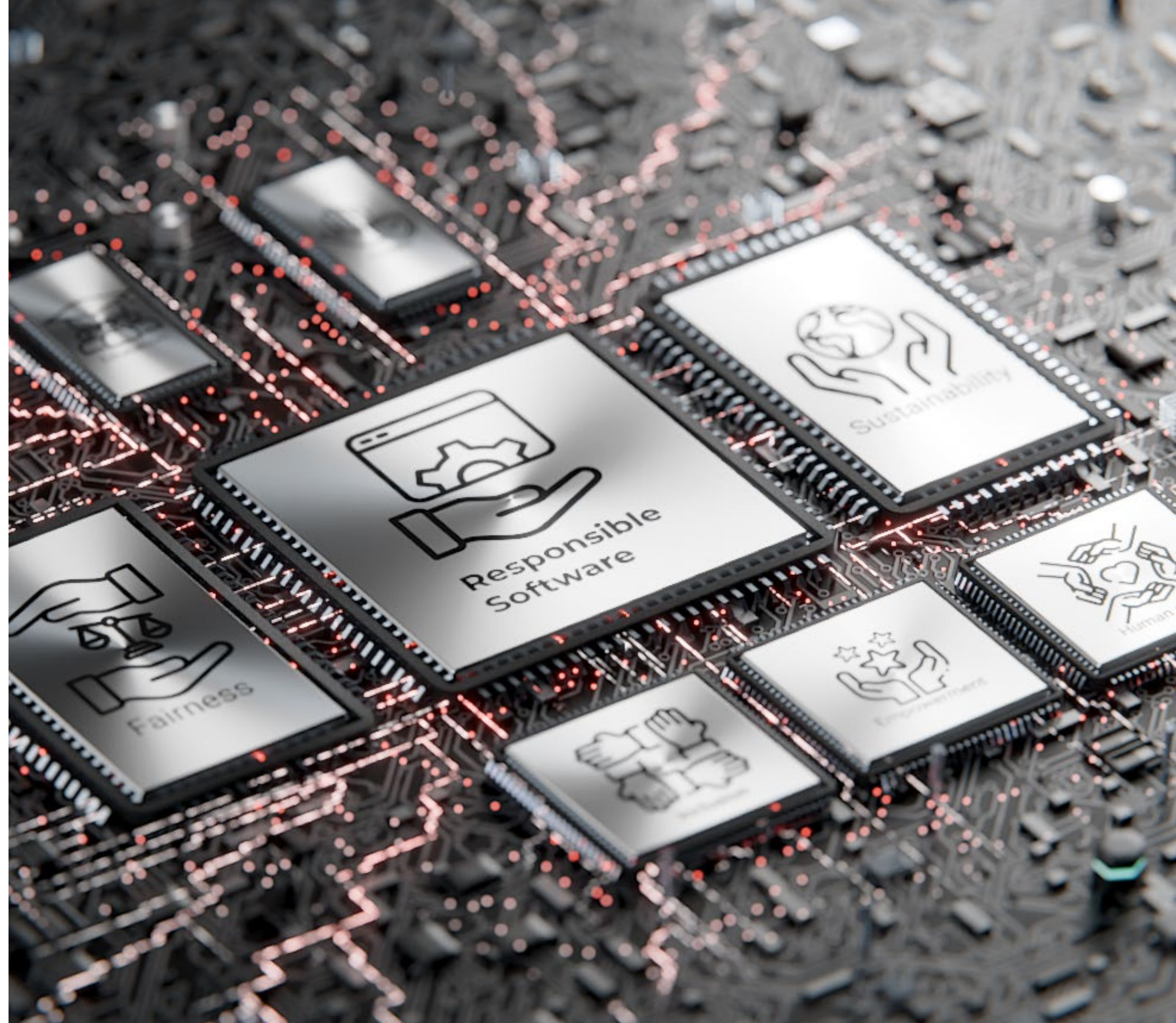


Graded 1 Debriefing

29 oct.

Cécile Hardebolle

**Responsible
Software**



Agenda for today

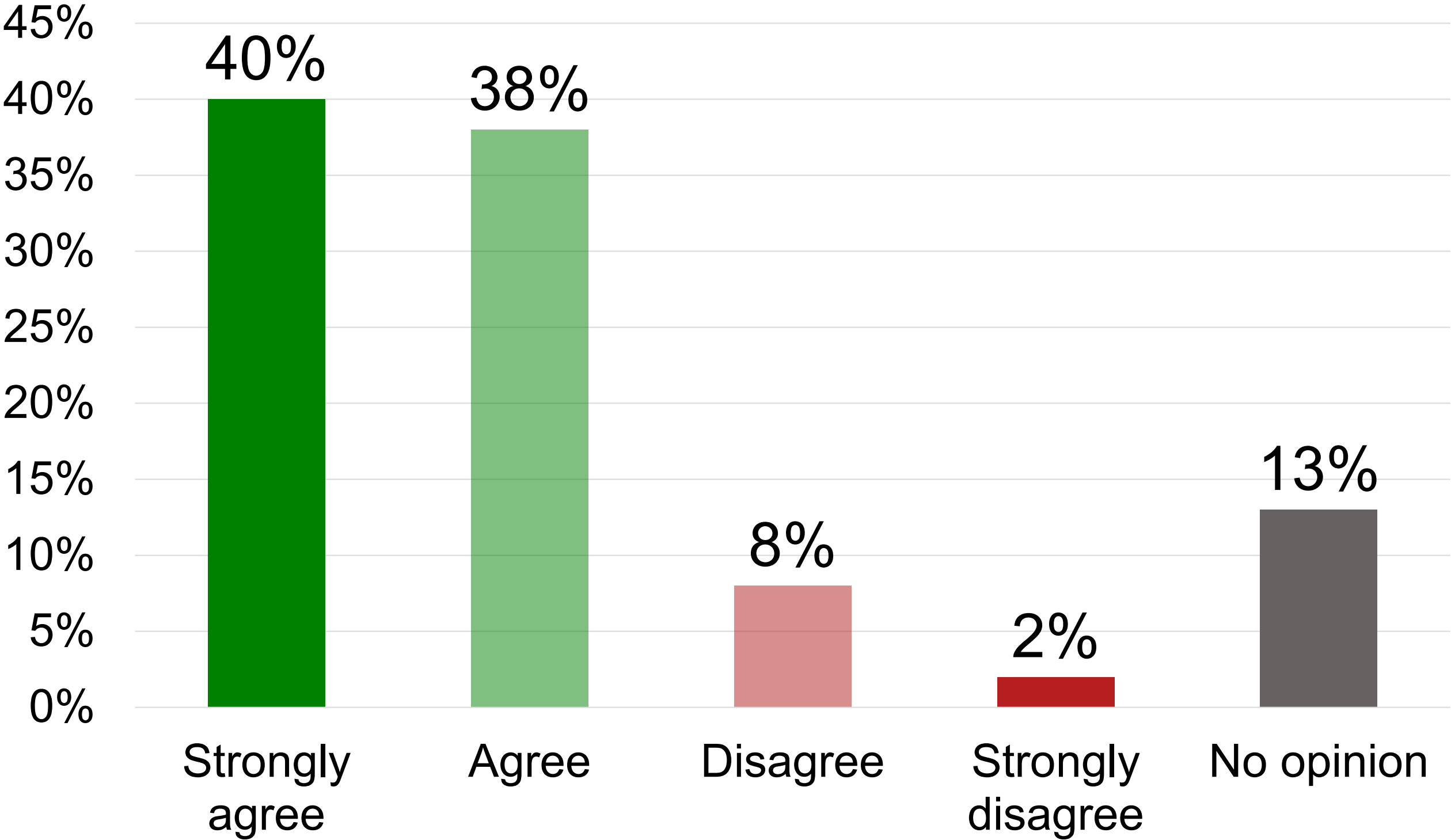
1. Debriefing of the indicative evaluation
2. Feedback on the Graded 1 assignment

Indicative evaluation

Overall indicator

“The running of the course enables my learning and an appropriate class climate”

Response rate:
93 / 319
= **29%**



Most frequent comments

Positive

- Interesting course content, real-life and relevant
- Content well organized
- Programming exercises (Jupyter Notebooks) are fun, relevant, engaging
- Helpful teaching team

Negative

- Flipped classroom format (watch videos in advance)
- Not enough ECTS (programming exercises long)
- Too many documents, bugs with tools
- 8am is too early
- Slides from sessions with blank quizzes

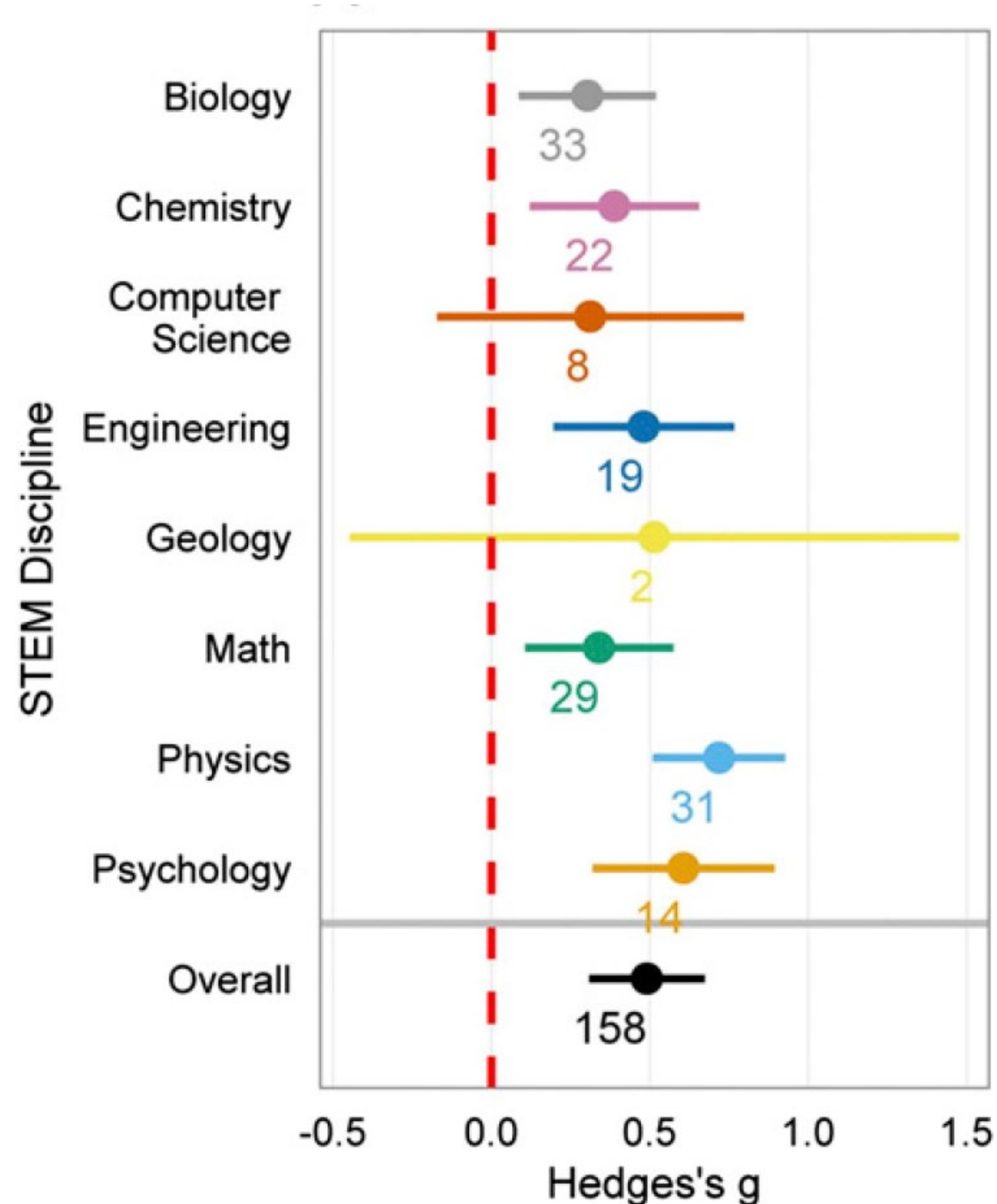
Why a flipped classroom?

(Lo & Hew, 2019; Gong et al., 2024)

- Research indicates a significant and medium **positive effect on learning** in favor of flipped learning over traditional learning models (Hedge's g from 0.263 to 0.289)
- Particularly when the following activities are used:
 - A “link activity” such as a **brief review quiz at the start of class**
 - **Both group and individual activities** in class
 - **Both exercises and quizzes** after class
- Expected benefits:
 - Self-paced learning
 - More **active learning** (e.g., problem solving, quizzes, etc.)

Active Learning

(Freeman et al., 2014)



“[...] average examination scores improved by about 6% in active learning sections, and that students in classes with traditional lecturing were 1.5 times more likely to fail than were students in classes with active learning.”

(Freeman et al., 2014)

Learning more in less time with videos

- Use the **blank slides** provided
👉 first “page” in the Theory section
(called “Index”)
- Watch a **little bit slower** than
normal speed to be able to **take
notes without stopping the video**
like you would do in a lecture
 - Notes should be **synthetic** i.e.,
reduced to the main points
- You can use the **transcript** or the
“BOOC” (= slides + transcript) to
check your notes (faster to read!)

The screenshot shows a video player interface with several annotations in blue circles and text. At the top, a green icon with a checkmark is circled. Below it, the word "Index" is underlined, and a link "Blank slides for note taking" points to it. A link "download here the slides of all the videos in this chapter." is circled. Below that, a link "Transcript" points to a section containing "Download SubRip (.srt) file" and "Download Text (.txt) file", both of which are circled. At the bottom, a link "Download here the PDF document corresponding to the above video." is circled, and a link "BOOC" points to it. The video player itself shows a video titled "Cécile Hardebolle Responsible Software" with a duration of 0:00 / 8:07 and a speed of 1.0x. The video content shows a circuit board.

Blank slides for note taking

Transcript

BOOC

Feedback on Graded 1

Technical issues

We are:

- Working with the technical teams (wifi, noto...) to analyze the issues and try to identify the cause
- Exploring alternative ways of doing the next graded assignment

Advice for next time – logistics

Process:

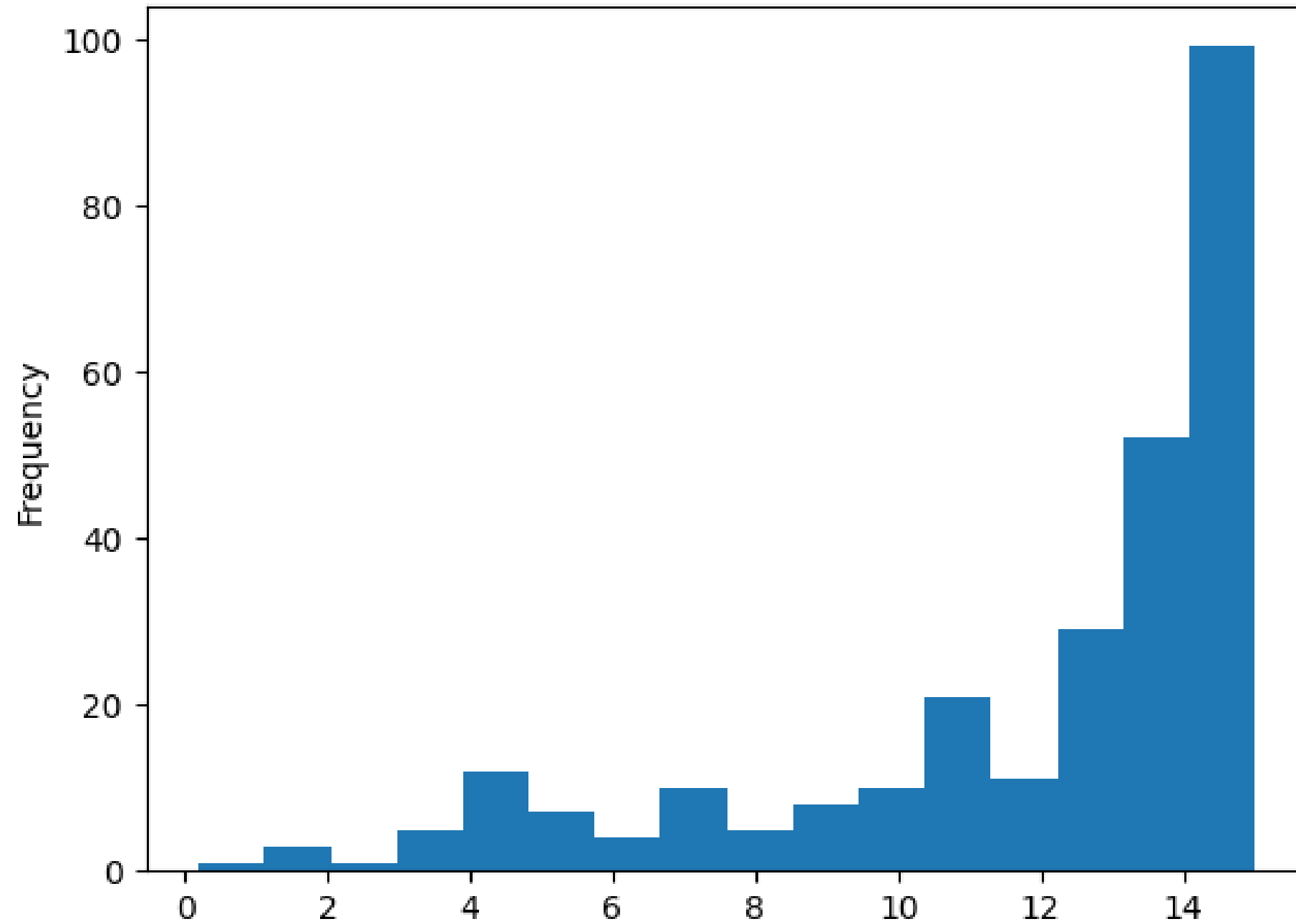
- Make sure to **do the tests** (note, submission) **in advance** so that:
 - We can fix the technical issues we can before the assignment
 - You know how it goes before hand (in particular the submission)

We will probably have to change the process for Graded 2 to avoid technical issues 👉 **I will ask you to test the new process!**

Other:

- Make sure to have your **camipro card** (or another identification document)
- **Do NOT delete cells** in the notebook

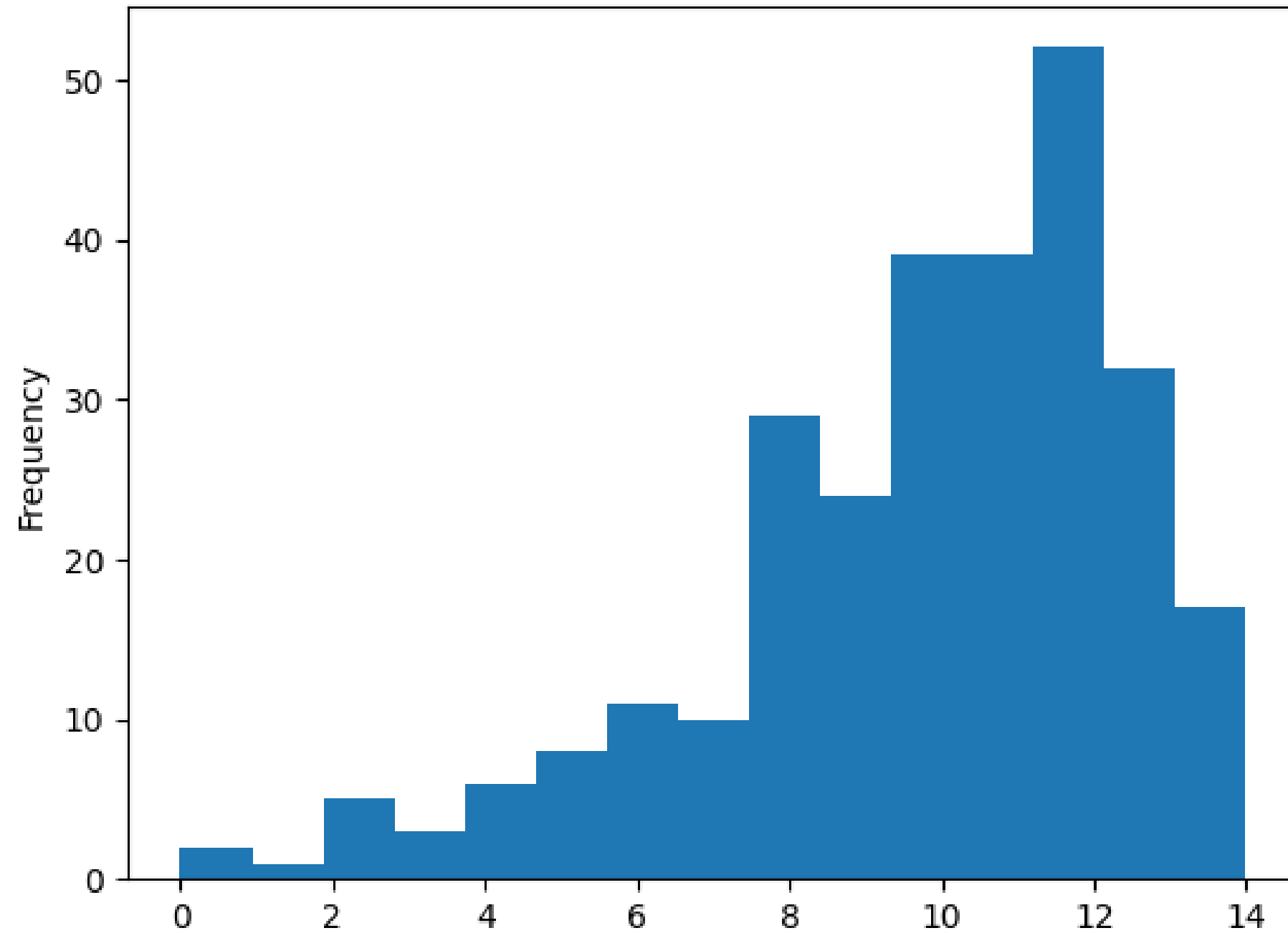
Programming + SCQ questions



Maximum possible:
15 points

Mean: 12.1 points
Median: 14 points
(std: 3.7 points)

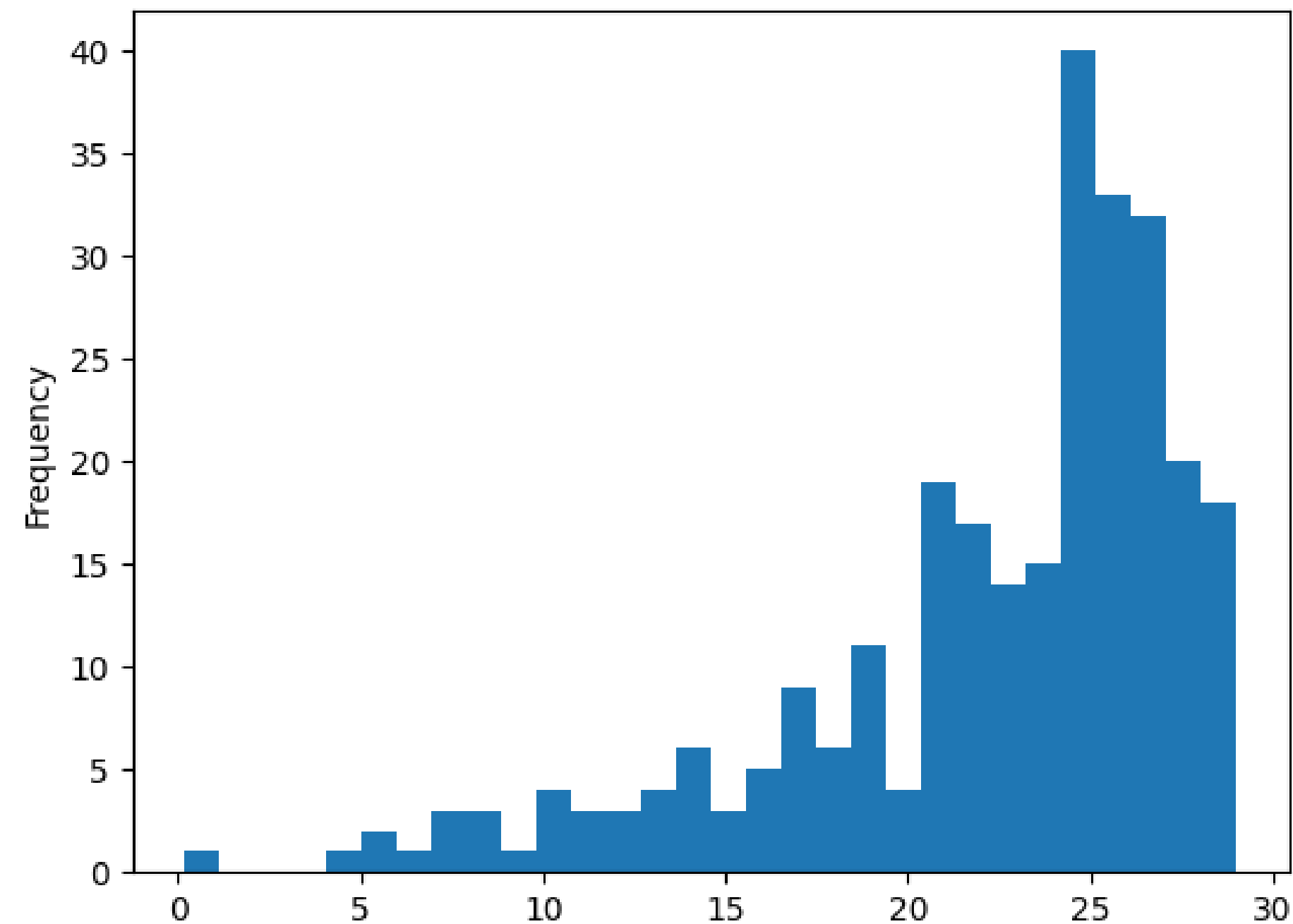
Open reflection questions



Maximum possible:
15 points

Mean: 9.8 points
Median: 10.4 points
(std: 2.8 points)

Overall distribution of points



Maximum possible:
30 points

Mean: 22.3 points
Median: 24.4 points
(std: 5.5 points)

Advice for next time – open questions

- Follow the **instructions** provided for the question:
 - **Include numbers** in your text
=> we need them for the grading!
 - The **number of sentences** provided is a good indicator to know whether your answer is developed enough
 - Make your **thinking** visible
- If your code is not working, when possible, work with hypotheses and **show your knowledge** as much as possible (e.g. provide a definition, explain what it means in the context of the exercise...)

Questions which created more difficulty

- 1.2.2 Disparate Impact Ratio
- 1.2.5 Proxy variables
- 1.3.1 & 1.3.2 Fairness + improvement of fairness

- 2.4.6 Dilemma

Feedback on Graded 1

Exercise 1:

Healthcare program admission

Difference in sickness

URL: ttpoll.eu
Session ID: cs290

1.1.2. Is there an important difference of sickness for black and white patient?

Number of patients: 49000

White patients: mean cost = 8366.674

Black patients: mean cost = 7372.051

White patients: mean illnesses = 1.152

Black patients: mean illnesses = 1.146



6%

a. Yes



94%

b. No

Disparate impact ratio - 1

URL: ttpoll.eu
Session ID: cs290

1.2.2. Interpret the disparate impact ratio you calculated: what does it mean for the patients?

Proportion admitted black: 0.0107

Proportion admitted white: 0.0327

Disparate impact ratio: 0.3262



0%

a. Black people are more admitted than White people



100%

b. White people are more admitted than Black people

Disparate impact ratio - 2

1.2.2. Interpret the disparate impact ratio you calculated: what does it mean for the patients? Explain your interpretation **citing the data you obtained (2 sentences).**

Proportion admitted black: 0.0107

Proportion admitted white: 0.0327

Disparate impact ratio: 0.3262

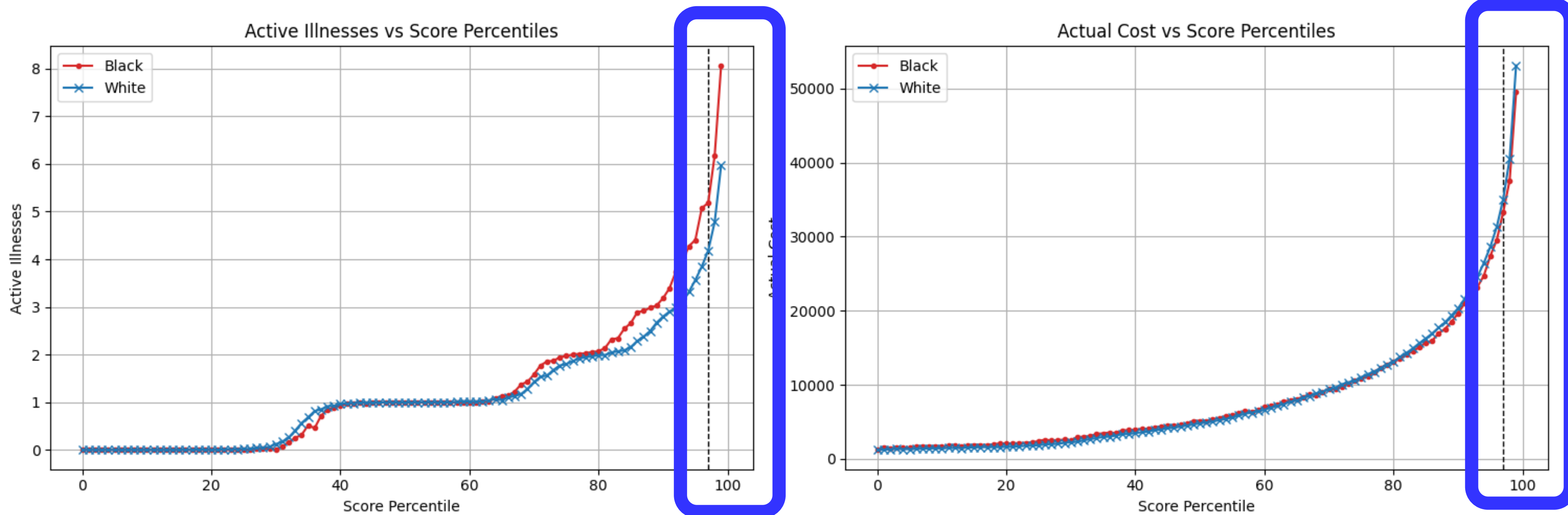
- Meaning of the DIR in context
- Value provided
- Ideal reference provided
- Consequences identified

- a. “The disparate impact ratio tell us whether the same number of black people are admitted in comparison to white people. Here, the value of 0.3262 is very far from the ideal value, which should be at least 0.8 and preferably closer to 1 to indicate fairness. White people are admitted 3 times more than black people, so, the system is discriminating against black people.” [\[Note: this answer has been modified from the original\]](#)
- b. “If you are Black, you have much less chances to get admitted in the program.”

Score, illnesses & cost

1.2.3 For the admitted group, compare the number of active illnesses and the cost of healthcare of black and white patients for a same risk score.

1.2.4 Is there a difference of health condition between black and white patients when admitted to the program?



Score, illnesses & cost

1.2.3 For the admitted group, compare the number of active illnesses and the cost of healthcare of black and white patients for a same risk score.

1.2.4 Is there a difference of health condition between black and white patients when admitted to the program?

- Focus on admitted group
- For same risk score, black people have more illnesses but the same cost as white people
- Number provided

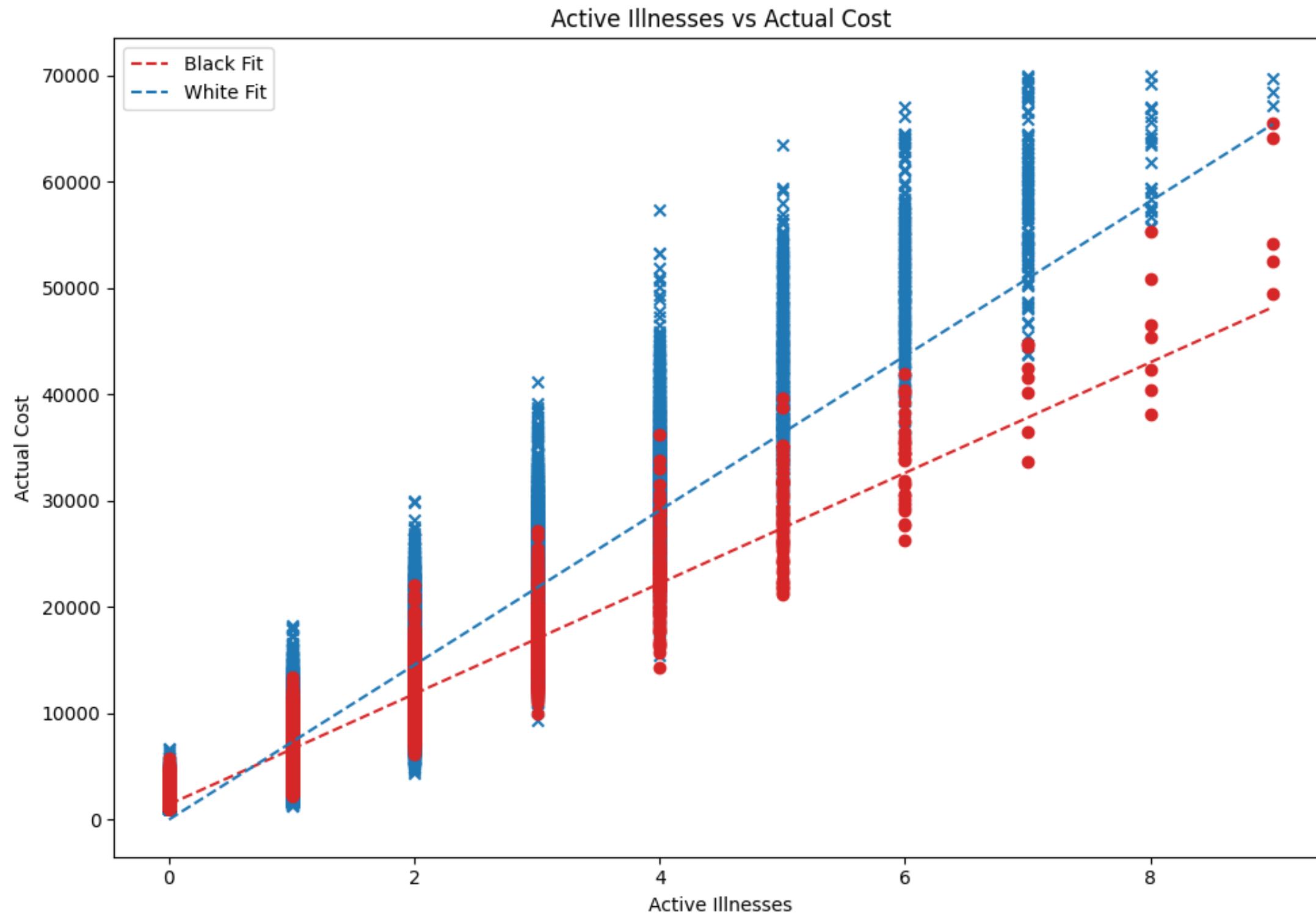
a. “They are similar on the right graph.”

b. “We can see that black people have more illnesses compared to white people when getting in the program”

c. “For the admitted group, and for a given score, black patients have more active illnesses but a healthcare cost similar (or a bit lower) than white patients. At the 97th percentile, black people have around 5 active illnesses, compared to white patients who have around 4. Black patients are admitted sicker than white patients.”

Illnesses vs. cost

1.2.5 Compare and contrast the number of active illnesses and healthcare costs of black patients to that of white ones.



The dashed line represents a linear regression on the data i.e., it represents a “trend”

Illnesses vs. cost

1.2.5 Compare and contrast the number of active illnesses and healthcare costs of black patients to that of white ones.

- a. “Except for patients with 0 active illnesses, the cost for black people is lower than for white people for every number of active illnesses. We also see an increase in the difference: the more active illnesses, the bigger the difference in cost.”
- b. “For the same number of active illnesses, white patients have a much higher cost.”

- Difference for sickness > 0
- Trend: increase in difference

Illnesses vs. cost

URL: ttpoll.eu

Session ID: cs290

1.2.6 How can you explain this difference from a socio-economic point of view? We recall that this dataset is derived from the USA.

-
- | Category | Percentage |
|--|------------|
| a. Restricted access to care because of geography/transportation | 21% |
| b. Competing demands from jobs or childcare | 4% |
| c. Direct discrimination in access to quality/costly care or procedures | 21% |
| d. Implicit stereotypes/perceptions from doctors e.g., on pain tolerance | 18% |
| e. Distrust towards the medical system so reduced use of care | 11% |
| f. Differences in insurance coverage for costly treatments | 21% |
| g. Other | 3% |
- All proposal above are accepted
 - Has to be plausible + go beyond a difference in income to explain the link with healthcare (as all patients have insurance coverage)

Proxy variable

URL: ttpoll.eu
Session ID: cs290

1.2.7 Which column of the dataset is a proxy of the patient's race?

$$\text{Score} = w_{AI} \times \text{Activellnesses} + w_A \times \text{Age} + w_C \times \text{Cost}$$

= Why is your **score** **affected by race** even though race is not part of the equation?



- Cost is the proxy
- Age has a (very) small link with race so could be considered proxy

Note: “Biological sex” is also a proxy for Race BUT it is not used in our score calculation!

Proxy variable

1.2.7 Which column of the dataset is a proxy of the patient's race?

$$\text{Score} = w_{AI} \times \text{Activellnesses} + w_A \times \text{Age} + w_C \times \text{Cost}$$

= Why is your **score affected by race** even though race is not part of the equation?

You should look at the **relationship of the 3 variables with race**, NOT the score (you already know it is biased)

Three ways to analyze:

1. Use data from Q 1.1.1
2. Use the graph Illnesses vs. Cost
3. Change the score equation and check the Disparate Impact Ratio when you put a very low coeff on
 - a) Illnesses
 - b) Cost

Proxy variable

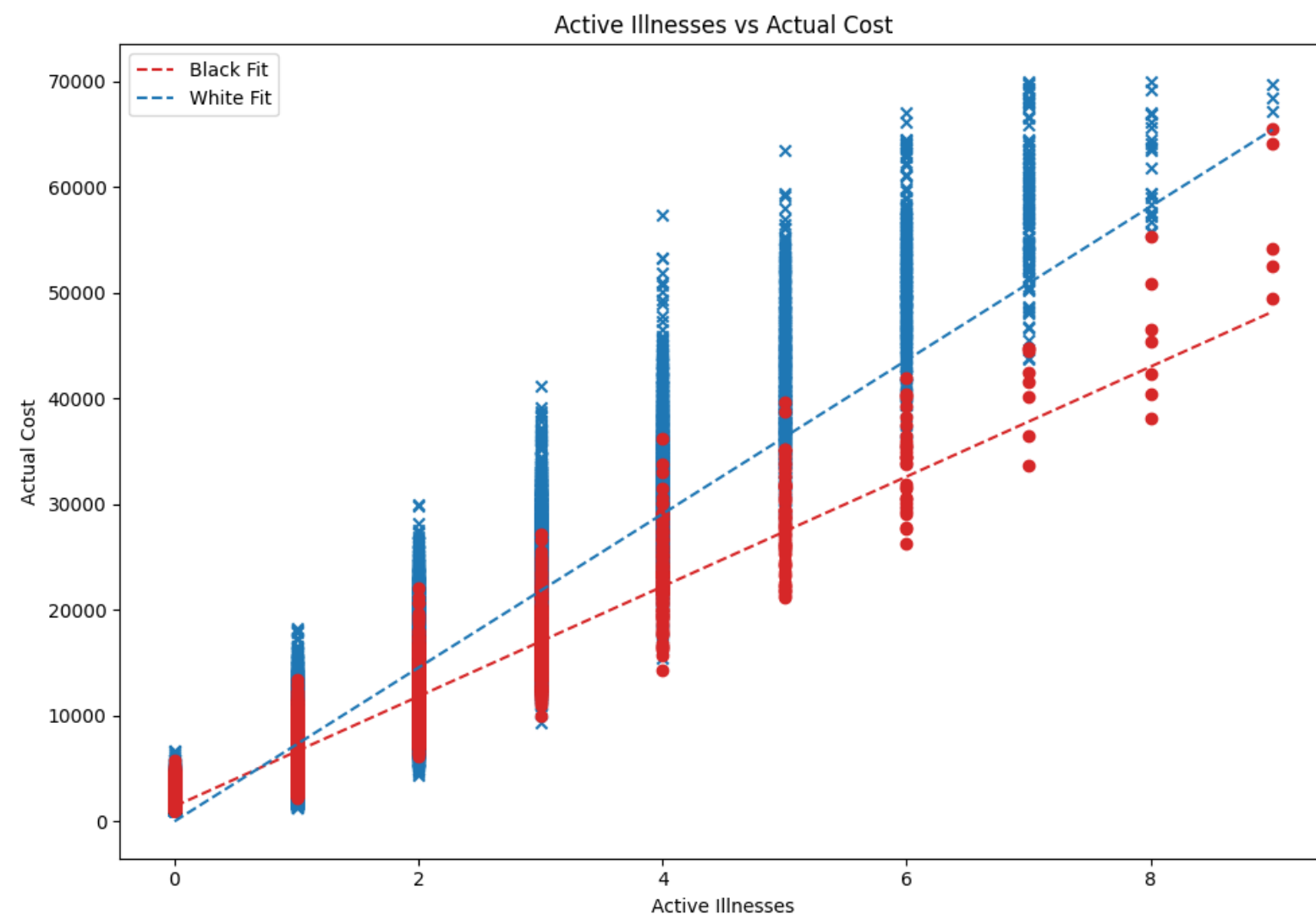
Number of patients: 49000

White patients: mean cost = 8366.674

Black patients: mean cost = 7372.051

White patients: mean illnesses = 1.152

Black patients: mean illnesses = 1.146



■ Remove Active Illnesses (x 0,01)

Proportion admitted black: 0.0087

Proportion admitted white: 0.0330

Disparate impact ratio: 0.2628

■ Remove Cost (x 0,01)

Proportion admitted black: 0.0270

Proportion admitted white: 0.0304

Disparate impact ratio: 0.8876

Cost as a proxy means that Black patients get **lower scores** than White patients for the same number of illnesses, and so they are **less admitted** for similar sickness level

Fairness?

- Identifies which group is discriminated
- Explains how the score is influenced by the proxy
- Mentions de DIR + cites number
- Concludes on the effect of the bias

1.3.1 Is this algorithm fair? If not, which group does it discriminate? Justify your answer (2-3 sentences, citing data from the analysis above).

“No, this algorithm is not fair, since it favors white patients over black patients. Even though it doesn't use the race to compute who gets admitted, it uses the actual cost as a proxy for race, which induces a racial bias. This can be seen in the disparate impact ratio for admissions, since white patients are 3 times more likely to get admitted than black patients. Another way to look at this is to say that black patients need to have more illnesses than white patients to get admitted, since their cost of healthcare for the same number of illnesses is lower, and the cost of healthcare is the main factor used by the algorithm to decide who gets admitted.”

Improve fairness

- Lower the influence or remove cost
 - Identifies a drawback (e.g., similar to university admissions)
-

1.3.2 If you answered no to 1.3.1, propose one solution to improve it. What could be the **drawback of this solution? (2 sentences)**

- “As we have done in the homework we should find weight for the score that give a better disparate impact ratio. However this could result in an admission system that is favorable for black patient at equal condition, because the admission algorithm needs to compensate for the actual disparity of actual cost that there is in real life .”
- “As we identified the cost as a proxy, we can attempt to remove it or at least minimize its importance. Nevertheless, it is also reflective of certain diseases: cancer poses a great risk even if it is the only active illness, but the compared cost of treating it to other active illnesses would potentially disfavor cancer patients of admittance.”

Feedback on Graded 1

Exercise 2:

Heart failure prediction

Balanced dataset

URL: ttpoll.eu
Session ID: cs290

For recall, we're trying to predict heart failure events.

2.1.2 Is the dataset balanced ?

Number of heart failure events: 96

Percentage of heart failure events: 32.1 %



0%

a. Yes



100%

b. No

Consequences of FN

URL: ttpoll.eu
Session ID: cs290

2.4.5 What are the **consequences** of a false negative in this context (1 sentence)?

- ☒ 57% a. The patient does not receive care they need
- ☒ 25% b. Heart failure
- ☒ 16% c. The patient continues with unhealthy habits e.g. smoking...
- ☐ 2% d. Other

Consequences of FP

URL: ttpoll.eu
Session ID: cs290

2.4.3 What are the **consequences** of a false positive in this context (1 sentence)?

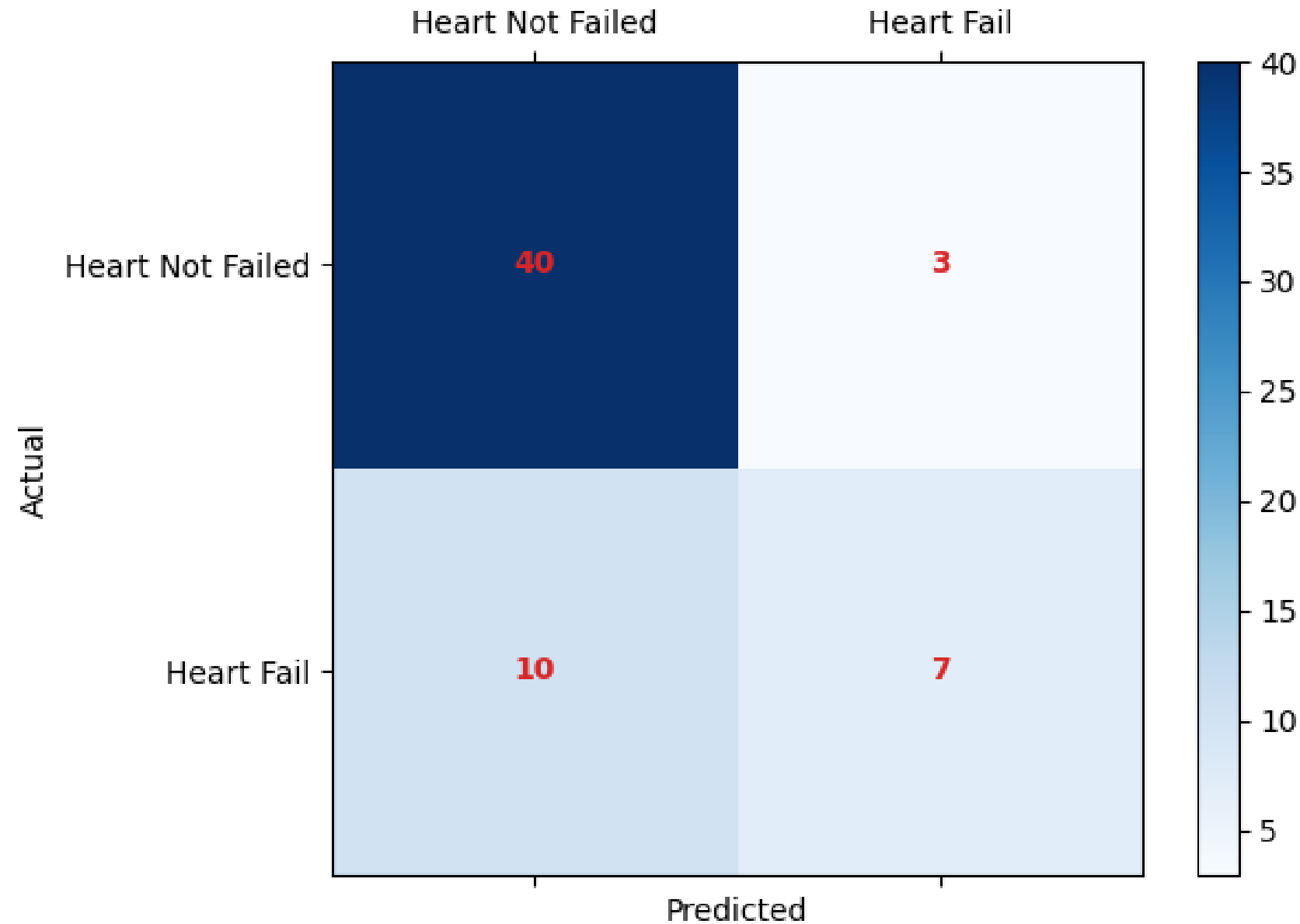
- ☒ 15% a. Care not given to someone else who would have needed it
- ☒ 22% b. Unnecessary additional exams with cost
- ☒ 24% c. Unnecessary treatment
- ☒ 19% d. Stress or mental health issues
- ☒ 19% e. The patient will be extra cautious
- ☐ 1% f. Other

Good to think about other stakeholders than the patients.

Accuracy and FP & FN

How can you get the accuracy out of this confusion matrix?

Confusion Matrix - Logistic Regression Classifier



- FP = 3
- FN = 10
- TP = 7
- TN = 40

Accuracy depends
on FN and FP

- Accuracy = $(TP + TN) / (FP + FN + TP + TN)$
- Total error rate = $(FP + FN) / (FP + FN + TP + TN)$

The dilemma

- Arguments for the two sides with FP vs. FN, including numbers
- Identification of dilemma in terms of safety consequences

2.4.6 If you were to choose a classifier, what would be the argument for the first one? For the second one? What is the **dilemma here? Provide **numerical data** to support your answer based on the metrics you calculated above (3-4 sentences).**

“The first one (logistic) has 3 false positive and 10 false negatives (less false positive), which means that if I don't want to waste hospital resources, and would rather risk others dying of heart failure, I would pick logistic. It also has a higher accuracy (78%) compared to random forest (73%). However, the second (random forest) has 9 false positives and 7 false negatives (less false negative), which means if I want to minimize people dying of heart failure, but risk wasting hospital resources and potentially risk other people not getting the care they need, also risking their life. The dilemma is that both outcomes are bad and risk the lives of others, whether directly (predicting a patient does not have heart disease when they do) or indirectly (wasting resources to treat unsick people when there are other sick people who need treatment).”

What's next?

Next dates

- Monday 4 November: debriefing of the Blank Test
- Tuesday 5 November: notebook for Sustainability 1!

+ I will also be **available for answering individual questions regarding the Graded Assignment 1**

👉 **Tuesday 5 from 8h15 to 10h in CM 1 111**

- ◆ In person only
- ◆ First come first served
- ◆ 10h is a hard deadline