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## Appendix: Answers

This appendix presents the answers to all the questions, quizzes, and exercises from all the chapters. We hope that you enjoyed these challenges and that you find the answers enlightening.

**Exercise 2.1** The correct answer is: 2.

**Exercise 2.2** The correct answer is your choice.

**Exercise 2.3** The correct answer is open-ended.

**Exercise 3.1** The correct answers are: 1, 3, 5, 7.

**Exercise 3.2** The correct answers are: 2, 3, 5.

**Exercise 3.3** The *depth camera* allows Pepper to measure its distance from other objects, which is needed, for example, to avoid collision. The *capacitive touch sensor* allows Pepper to register pressure on the hand, which is needed, for example, to avoid the robot trying to push its hand through an object or for it to register when a human is tapping its hand for attention. The *inertial measurement unit* allows Pepper to measure its bodily orientation, which is fundamental for balance and localization.

**Exercise 3.4** The correct answers are: 1, 4, 5, 6.

**Exercise 3.5** The correct answers are: 1, 3, 4.

**Exercise 3.6** The correct answer is: 4.

**Exercise 3.7** The correct answer is: 2.

**Exercise 3.8** The correct answer is: 6.

**Exercise 3.9** The correct answer is: 2.

**Exercise 3.10** The correct answer is: 2.

**Exercise 3.11** The correct answers are: 1, 2.

**Exercise 3.12** The correct answers are: 2, 4, 5.

**Exercise 3.13** The correct answers are: 1, 3 (Option 2 is only true if transfer learning was done with a pretrained model; otherwise, training for a computer-vision task generally requires at least thousands of data points. Option 4 is completely false; don't choose this. Option 5 is not really true; we should care about the topology, considering the characteristic of the task, and CNN is usually the best for simple image classification.)

**Exercise 3.14** The correct answer is open-ended, but it should mention some of the sensors and actuators and perhaps AI techniques described in the chapter.

**Exercise 4.1** The correct answer is open-ended. Show your images to your teacher, friends, and family. Do they see the faces?

**Exercise 4.2** The sequence should be: 1 = E, 2 = D, 3 = C, 4 = B, 5 = A.

**Exercise 4.3** The correct answer is open-ended.

**Exercise 5.1** The correct answers are: 1 → a, 2 → d, 3 → b, 4 → c

**Exercise 5.2** The correct answer is: 3.7 m.

**Exercise 5.3** The correct answer is: 1.2 m.

**Exercise 5.4** The correct answer is: 0.5 m.

**Exercise 5.5** The correct answer is: 3.7 m.

**Exercise 5.6** This is an open-ended question, so answers can vary, but they may involve the robots learning the map of the environment and, in the case of the home, the preferences of individual users. In the public space, users would be more numerous and may not repeat, so the adaptations might be to the specific cultural norms of the general context.

**Exercise 6.1** The correct answer is: 2.

**Exercise 6.2** The correct answer is open-ended.

**Exercise 6.3** 1. False; it is both conscious and unconscious (but more often unconscious than conscious).

2. True

3. False

4. False

5. True

6. False; it is used for other social behavior as well (e.g., joint attention).

7. True; although it was covered in a different chapter (**Chapter 5**), how close or far you position yourself from someone else is a form of nonverbal behavior.

**Exercise 7.1** The correct answer is: 2.

**Exercise 7.2** The correct answer is: 4.

**Exercise 7.3** The correct answers are: 2, 3, 4.

**Exercise 7.4** The correct answer is: 5.

**Exercise 8.1** The correct answer is: 3.

**Exercise 8.2** The correct answers are: 4, 5.

**Exercise 8.3** The correct answers are: 2, 4, 5.

**Exercise 9.1** The correct mapping is:

1. Afraid → A
2. Angry → A
3. Astonished → B
4. Bored → C
5. Calm → D
6. Content → D
7. Delighted → B
8. Depressed → C
9. Frustrated → C
10. Happy → B
11. Relaxed → D
12. Tired → C

**Exercise 9.2** The correct answer is: 3.

**Exercise 9.3** The correct answers are: 1, 4, 5.

**Exercise 9.4** The correct answer is open-ended.

**Exercise 10.1** The correct answer is: 3.

**Exercise 10.2** The correct answer is: 4.

**Exercise 10.3** The correct answer is: 1.

**Exercise 10.4** The correct answer is: 4.

**Exercise 10.5** The correct answers are: 1, 5.

**Exercise 10.6** The correct answer is: 4.

**Exercise 10.7** The correct answer is: 3.

**Exercise 10.8** The correct answer is: 1 = c, 2 = b, 3 = a.

**Exercise 11.1** The correct answers are: 1, 4, 5.

**Exercise 11.2** The correct answers are: 2, 5.

**Exercise 11.3** The correct answers are: 1, 2, 3, 5, 6, 10, 12.

**Exercise 11.4** The correct answers are: 1, 5.

**Exercise 11.5** The correct answer is: 2.

**Exercise 12.1** We hope you enjoyed the story. What are you planning to watch next?

**Exercise 12.2** The correct answers are: 2, 5.

**Exercise 12.3** The correct answers are: 1, 2.

**Exercise 12.4** The correct answers are: 4, 5.

**Exercise 12.5** The correct answer is open-ended.

**Exercise 12.6** The answer is open-ended.

**Exercise 13.1** The correct answers are: 1, 2, 3, 6.

**Exercise 13.2** The correct answer is: 5.

**Exercise 13.3** Is your choice a good choice?

**Exercise 13.4** Is your choice a good choice?

**Exercise 13.5** Explain your choice.

**Exercise 13.6** The answer is open-ended.