RLP-AIDA · RLP AI Design A — Machine Learning, Media and the Human Body

Unit 1: How Machines Learn: Making AI Visible

Practice Workbook. The same problems, in the same order, as the Practice sections of the online lessons.

Name _____ Period _____

Lesson 1.1 — Explaining the Invisible: Designers Who Made Data Visible

FLUENCY

1. Match each designer to the work the lesson describes: (a) Florence Nightingale; (b) Charles Joseph Minard; (c) Otto Neurath. Works: polar-area diagrams of army hospital deaths; a system of repeatable pictograms called Isotype; a map of Napoleon's 1812 campaign into Russia.

2. Define *visual encoding* and *visual hierarchy* in one sentence each.

3. Label each description as narrow AI, AGI or superintelligence: (a) a hypothetical system far beyond human ability in nearly every domain; (b) a tool that transcribes speech; (c) a hypothetical system that could learn the full range of intellectual tasks a person can.

APPLICATION

4. Minard's single image carries five kinds of information. List them and say which visual feature carries the number of soldiers.

5. An Isotype chart uses one figure to stand for 1,000 people. How many figures should it draw for a group of 6,000 people and for a group of 2,500 people? Why does Isotype draw more figures instead of one bigger figure?

6. A news headline says a new hospital app 'thinks like a doctor'. The app flags possible diabetic eye disease in retinal photographs. Which category of AI is it, and how would you rewrite the headline honestly?

7. Nightingale's diagram argued that sanitation, not battle, was the main killer. In 3-4 sentences, explain how encoding and hierarchy work together to make that argument.

CHALLENGE

8. A designer wants to explain a narrow AI tool that flags possible eye disease. Plan, in 4-5 sentences, an image that borrows one of the three moves (encoding, hierarchy or sequence) from Nightingale, Minard or Neurath, and explain why it is more honest than a glowing-brain stock image.

REVIEW

9. Prerequisite review: a chart shows two quantities, 120 and 30. How many times larger is the first? If one Isotype figure stands for 10, how many figures does each need?

Lesson 1.2 — Sorting by Features: Training a Classifier by Hand

FLUENCY

1. Define *supervised learning*, *feature* and *test set* in one sentence each.

2. Compute the length-to-width ratio, to one decimal place, for these drawn cells: (a) 24 mm by 6 mm; (b) 8 mm by 6 mm; (c) 10 mm by 4 mm.

3. Classifier or regression? (a) a model that labels a cell drawing round or sickle-shaped; (b) a model that predicts how many days a hospital stay will last; (c) a model that predicts a patient's heart rate.

APPLICATION

4. In the lesson's TRAIN set, the round cards have ratios from 0.9 up to 1.4, and the sickle cards have ratios from 1.8 (card C06, 11 mm by 6 mm) up to 4.0. Choose a threshold that sorts all 30 TRAIN cards correctly, and write the rule as a sentence.

5. Apply the rule 'If ratio > 1.5, label sickle' to these TEST cards: C35 (14 mm by 12 mm), C36 (17 mm by 5 mm), C38 (17 mm by 8 mm). Then check: the true labels are C35 round, C36 sickle, C38 round. Which card does the rule get wrong?

6. With the rule 'If ratio > 2.0, label sickle', which TRAIN card is misclassified, and which TEST card is misclassified? (C06 is 11 mm by 6 mm, sickle; C38 is 17 mm by 8 mm, round.)

7. For the second, two-feature model, the lesson adds area (length times width). Compute the area for C06 (11 by 6) and C38 (17 by 8).

8. Every sickle card in a training set was drawn in red marker. Explain in 2-3 sentences why a machine-trained model might fail on a red round cell, and what you would change about the TRAIN cards.

CHALLENGE

9. A student sets the threshold at exactly 1.85 after studying all 40 cards, including the TEST cards, and reports a perfect TRAIN score. Explain the two problems with this and what the lesson calls a rule that fits training data perfectly but fails on new data.

REVIEW

10. Review 1.1: Is the cell-sorting rule you built narrow AI, AGI or superintelligence? Explain in one sentence.

Lesson 1.3 — Critiquing AI Explainers: Accuracy, Clarity and Hype

FLUENCY

1. Put the four critique steps in order and give a one-phrase description of each: Interpret, Describe, Evaluate, Analyze.

2. Name the three criteria for AI explainers and the question each asks.

3. Supervised or unsupervised? (a) grouping patient records by resting heart rate and hours of sleep, with no diagnoses attached; (b) training on retinal photographs labeled 'disease' or 'no disease'; (c) clustering.

APPLICATION

4. Rewrite this claim so it is accurate: 'The AI discovered three kinds of patients.' The method was clustering on unlabeled records.

5. Turn this opinion into a critique statement that follows the lesson's rules: 'The poster is bad because it is creepy.' The poster shows a glowing humanoid robot reading an X-ray; the product only outputs a probability that an X-ray shows a fracture.

6. A clustering method finds two groups in heart-rate records. Later you learn that one clinic measured heart rate lying down and another sitting up. What might the groups really reflect, and what lesson does this hold for an explainer?

7. Before judging a choice, the lesson asks you to restate what the maker was probably trying to do. Why does this rule make a critique fairer? Answer in 2 sentences.

REVIEW

8. Review 1.2: Explain why holding back a test set matters, using the word *overfitting*.

9. Review 1.1: An explainer about a narrow classifier shows a glowing brain. Which of the three AI terms does that image suggest, and why is it misleading?

Lesson 1.4 — Designing the Explainer: Hierarchy, Sequence and Storyboard

FLUENCY

1. Define *thumbnail*, *storyboard* and *palette* as the lesson uses them.
2. What three things does each storyboard frame contain, according to the lesson? How many frames is enough for a 60-90 second piece?
3. Using the illustrative model heart rate = 80.2 - 0.25 x minutes, compute the prediction for (a) 0 minutes, (b) 20 minutes, (c) 40 minutes of walking.

APPLICATION

4. The invented data point (20, 75) has a predicted value of 75.2 on the line. What is the difference between the actual and predicted value, and what does showing the points as well as the line tell the viewer?

5. A student writes under the regression chart: 'Walking lowers your heart rate by 0.25 beats per minute for every minute.' Name two problems with this sentence, using the lesson.

6. Write a one-sentence takeaway for an infographic explaining how an image classifier learns, then list the five unit facts the accuracy check requires.

7. An infographic uses four typefaces and uses blue for 'training data', for headings and for the background of the test panel. Give two specific fixes based on the lesson's hierarchy rules.

8. Describe the three thumbnail layouts the lesson asks for, and name one explainer idea each would suit.

REVIEW

9. Review 1.3: Your storyboard frame says 'The AI understands the X-ray.' Using the accuracy criterion, rewrite the caption.

10. Review 1.2: A sickle cell drawn 16 mm long and 4 mm wide: what is its ratio, and what does the rule 'ratio > 2.0 means sickle' predict?

Unit 1 checkpoint

1. In Minard's map of Napoleon's 1812 campaign, what does the width of the band stand for?
   A. Temperature
   B. The number of soldiers
   C. The distance traveled
   D. The date
2. True or false: Some AI systems in use in hospitals today are artificial general intelligence.
3. In Isotype, one symbol always stands for a fixed _____.
4. A drawn cell is 12 mm long and 10 mm wide. With the rule 'if ratio > 2.0, label sickle', what is predicted?
   A. Sickle, ratio 1.2
   B. Round, ratio 1.2
   C. Round, ratio 0.8
   D. Sickle, ratio 2.2
5. Labeled examples held back from training to measure performance on unseen data form the _____ set.
6. True or false: If every sickle card in the training set is drawn in red, a model may learn color instead of shape.
7. Which description fits unsupervised learning?
   A. Learning from examples people have labeled
   B. Finding structure, such as groups, in examples with no labels
   C. Writing every rule by hand
   D. Predicting a number from labeled data

8. Which critique step comes directly after Describe?
   A. Evaluate
   B. Interpret
   C. Analyze
   D. Suggest

9. True or false: An explainer whose sentences are all true cannot mislead its audience.

10. Using the illustrative model heart rate = 80.2 - 0.25 x minutes, what is predicted for 12 minutes of walking?
    A. 77.2
    B. 83.2
    C. 79.0
    D. 68.2

11. A small, fast sketch used to compare layout options is a _____.