SMA:
Software Modeling and Analysis

Practical Session

Week 11
A10 - Exercise 01 | General knowledge

Exercise 1: General Knowledge (3.5 Points)

- What is the main purpose of RMSE?
  - [ ] It is a code inspection tool used for bug prediction.
  - [ ] It is a measure that represents the quality of the input data.
  - [x] It is a measure to calculate an ML model’s prediction error.
  - [ ] It is an efficient machine learning algorithm.

- Why are prediction error assessments important?
  - [x] The prediction error helps choosing appropriate algorithms.
  - [x] The prediction error helps optimizing configuration parameters.
  - [ ] The prediction error reveals potential memory bottlenecks during the analysis.
  - [ ] The prediction error supports users in choosing the correct colors for bars in bar charts.
  - [ ] The prediction error supports users in profiling the analysis.

- What is the f-measure exactly?
  - [ ] A measurement of a test’s accuracy, i.e. considering only the precision, but not the recall.
  - [ ] A measurement of a test’s accuracy, i.e. considering only the recall, but not the precision.
  - [x] A measurement of a test’s accuracy, i.e. considering the precision and recall.
  - [ ] A measurement of a test’s precision, i.e. considering the precision and recall.
  - [ ] A measurement of a test’s recall, i.e. considering the precision and recall.
• What is the difference between the terms *accuracy* and *precision*?

  □ The term *accuracy* is well-defined, but the term *precision* is not.
  □ The term *precision* is well-defined, but the term *accuracy* is not.
  □ There is no difference between both terms.
  ✔ They are used in different contexts, *i.e.* *accuracy* for systematic errors, and *precision* for statistical variability.

• Does the effort required to raise the test coverage increase linearly?

  □ No, it rather shows behavior of a Dirichlet function.
  □ No, it rather shows behavior of a signum function.
  ✔ No, it rather shows behavior of an exponential function.
  □ Yes, it shows linear behavior.

• What is true regarding precision and recall with respect to anti-virus software on a computer?

  □ Confirmed and detected viruses are false negatives, false alarms are true negatives.
  □ Confirmed and detected viruses are true negatives, false alarms are false positives.
  □ Confirmed and detected viruses are true positives, false alarms are false negatives.
  ✔ Confirmed and detected viruses are true positives, false alarms are false positives.
Exercise 2: WEKA (2.0 Points)

- What are benefits of using the WEKA tool?
  - ✓ It is equipped with a simple to use interface and provides immediate feedback to the majority of your actions.
  - □ It supports only classification problems, but no regression problems.
  - □ It supports in the current version capsule (neural) networks.
  - ✓ It has built-in data preprocessing facilities.
  - ✓ It can import various data formats for later processing.
  - ✓ The core functionality can be integrated into your own Java project.
Exercise 3: Machine learning specifics (4.5 Points)

- Which of these statements are correct?
  - A binary classification problem solver assigns each input data entity one out of two possible output labels. ✔
  - A classification algorithm can have real-valued (\(\mathbb{R}\)) or discrete input variables. ✔
  - A multi-classification problem solver assigns each input data entity the same output label. ☐
  - Classification is the task of predicting a discrete class label for each input data entity. ✔
  - Classifying emails into the categories “spam” and “not spam” is a classification problem. ✔
  - Regression is the task of predicting a real-valued output (\(\mathbb{R}\)) for each input data entity. ✔
  - There is no preference of using a specific algorithm (class) for certain kinds of input data. ☐

- What are the effects of an algorithm stuck in a local minimum?
  - In general, the results are not consistent even with the same input data. ✔
  - The algorithm cannot stop until it finds a way out of the local minimum. ☐
  - The effect of local minima must not be considered while choosing an ML algorithm (suite). ☐
  - The results are legitimate and reproducible. ☐
• Which statements are correct regarding underfitting and overfitting of a model?

☐ Overfitting states a model that adapted too few peculiarities of the input data, hence the model did not gain (completely) its ability for specialization.

☑ Overfitting states a model that adapted too many peculiarities of the input data, hence the model lost (partially) its ability for generalization.

☑ Underfitting states a model that adapted too few peculiarities of the input data, hence the model did not gain (completely) its ability for specialization.

☐ Underfitting states a model that adapted too many peculiarities of the input data, hence the model lost (partially) its ability for generalization.

• What were typical dataset partition sizes used for testing and training of the bug prediction models?

☐ 1% test dataset, 99% training dataset

☑ 30% test dataset, 70% training dataset

☐ 70% test dataset, 30% training dataset

☐ 99% test dataset, 1% training dataset
Assignment 11

Preview
• What is a confusion matrix?

• Which criteria are important when extracting the data?

• Which are the three groups of software data?
A11 - Exercise 02 | Process of SDA

• What is a use case for software data analytics?
• What are types of software analytics problems?
• What is the recommended five-step guideline for working in software data analytics?
You have to **attend the lecture** to reveal such slides.*

*Disclaimer:
The content that has been shown on this slide is irrelevant for the exam.