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Level II of CFA Program

Item-set - **Questions**
Study Session 3
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Questions 1 through 6 relate to Reading 7

Abigail Consultants Case Scenario

Lisa Clarkson is a portfolio manager at Abigail Consultants (AC), an asset management and advisory firm. Clarkson is working in consultation with Ellie Lewis, AC's senior fund manager in respect to re-classifying equities comprising the firm's large-cap equity fund. Clarkson feels that component securities can be further classified into smaller investment categories such that the holdings are more closely aligned with the risk and return requirements of the fund. Currently, fund securities comprise equities issued by companies at different stages of operating and financial growth.

As a starting point, Clarkson decides to rely on a machine learning- (ML) based algorithm with the hope of making a more accurate classification. She divides constituent securities into groups which are similar based on operating and financial characteristics according to the k-means approach.

AC's senior fund manager, Ellie Lewis, states that the process of segregating equity securities can be further refined by predicting returns over the next four quarters using ML techniques and removing the bottom fifteen of the worst performers. While Clarkson agrees with Lewis's proposal she believes overfitting risk is a reality which cannot be ignored. She makes the following statements with respect to overfitting risk:

Statement 1: "Models with high bias errors and low variance errors have a high potential for overfitting risk."

Statement 2: "A well generalized model will have low overfitting risk."

Clarkson believes that Lewis can further improve the risk and return characteristics of the reclassified securities by segregating each issuer into one of two categories – highly likely to declare bankruptcy and less likely to declare bankruptcy. She furthermore proposes that each security issuer be assigned a ranking between 1 and 10; issuers with a ranking of 6 or above will be classified as most likely to declare bankruptcy while those with a ranking below 6 are classified as less likely to declare bankruptcy. Lewis proposes the liquidation of the latter securities from the fund.

Lewis and Clarkson conclude their discussion by exploring the concept of ensemble learning. They make the following statement each:

Clarkson: "I have read somewhere that the ensemble learning technique, random forest, is used to summarize or reduce highly correlated features of data into a few main, uncorrelated composite variables."

Lewis: "Based on my limited knowledge, ensemble learning can help generate more accurate predictions compared to those generated by the single best ML-based model."

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1. Clarkson's choice of the k-means approach for organizing securities into groups indicates her reliance on:

   A. clustering.
   B. regression.
   C. classification.

2. Which of the following reasons supports Clarkson's use of the k-means approach?

   A. The technique is fast and works well on large data sets.
   B. The hyperparameter, k, does not need to be specified in advance.
   C. A visual representation of the data into two or three dimensions is generated.

3. Considering Clarkson's statements regarding overfitting risk, she is *most likely* correct regarding:

   A. Statement 1 only.
   B. Statement 2 only.
   C. neither of the two statements.

4. Which of the following techniques can Clarkson employ to reduce overfitting risk in her ML-based return forecasting, security selection model?

   A. Increase model complexity
   B. Employ a greater number of holdout samples
   C. Employ LASSO with a penalty term which increases with number of features

5. Which of the following ML-based algorithms will be *most* suitable for ranking equity issuers based on bankruptcy probability?

   A. CART
   B. Dimension reduction
   C. Penalized regression

6. Which individual is *most likely* correct regarding her perspective on ensemble learning?

   A. Clarkson only
   B. Lewis only
   C. Both Clarkson and Lewis