Detailed Marking Breakdown for Task 1: Image Classification ML Assignment

Summary of Marks Distribution

Section	Subsection	Marks
1. Approach	Covers data understanding, evaluation, model selection, optimization, and robustness.	30
2. Independent Evaluation	Includes comparative analysis and critical discussion on semi-supervised learning.	10
3. Report Presentation	Logical flow, formatting, visualizations, and text integration.	10
Total		**50**

Note 1: You need two models per label (4 models in total). You may use the same type of model (e.g., CNN or MLP) with different architectures. In practice, only one variable is changed at a time, but here, multiple changes are allowed to show learning.

Note 2: Ensure the implementation in your code matches the corresponding markdown sections. If a section is not implemented correctly, up to 0.5 marks may be deducted.

1. Approach (60%, 30 marks)

1.1 Data Exploration and Understanding (6 marks)

- **Class Imbalance Identification (2 marks)**: Clearly identifies any class imbalance and explains its implications.
- **Exploratory Data Analysis (2 marks)**: Provides visual samples from the dataset and identifies potential issues (e.g., occlusion, blur, embedded text).
- **Justification of Data Handling Methods (2 marks)**: Explains preprocessing steps such as normalization or augmentation with clear rationale.

1.2 Evaluation Framework (6 marks)

- **Performance Metrics Selection (2 marks)**: Chooses appropriate metrics for class imbalance (e.g., F1-score) and justifies their use.
- **Data Splitting Strategy (2 marks)**: Clearly defines the split strategy (e.g., train/test/validation or cross-validation) with justification.
- **Prevention of Data Leakage (2 marks)**: Explains the importance of avoiding patient-based data leakage (the code implementation is not required). Bonus: up to 2 points for identifying and proposing solutions even when patient ID splitting isn't required.

1.3 Model Selection and Justification (6 marks)

- **Base Model Selection (3 marks)**: Justifies choice of model (e.g., CNN, MLP) over alternatives with supporting evidence. Note that 1.5 mark is for the cell type model, and 1.5 point is for the cancer-cell model.
- **Handling Class Imbalance (2 marks)**: Applies and explains relevant techniques like augmentation.
- **Algorithm Configuration (1 mark)**: Describes the chosen hyperparameters and reasoning behind them.

1.4 Model Optimization (6 marks)

- **Overfitting/Underfitting Detection (2 marks)**: Uses visual tools (e.g., learning curves) and explains model fitting status, 0.5 mark per method.
- **Optimization Techniques (2 marks)**: Describes techniques such as dropout or regularization to improve generalization, this need to be examined for both
- **Validation Set Use (2 marks)**: Describes the purpose of the validation set and outlines the hyperparameter tuning approach. Only one hyperparameter needs to be tuned. See Note 1.

1.5 Model Performance and Robustness (6 marks)

- **Final Model Accuracy (3 marks)**: Clearly shows improved accuracy and provides justification (e.g., deeper layers, model switch).
- **Generalizability (3 marks)**: Explains how robustness and generalizability were ensured, including testing on different subsets.

2. Independent Evaluation (20%, 10 marks)

2.1 Comparative Analysis (5 marks)

- **Comparison with Baseline and Literature (3 marks)**: Compares performance for both labels (cell type and cancer label) with baseline and one academic reference (1 mark each).
- **Fairness and Consistency (2 marks)**: Discusses whether the comparison was valid or limited due to differing metrics. Clearly compares baseline vs. secondary method for both labels, considering the fairness of the final justification (for instance, if several changes were made to baseline method in order to generate the second model, you need to clearly mention that it is not possible to indicate which change contributed to the change in the result...).

2.2 Critical Discussion on Semi-Supervised Learning (5 marks)

- **Insightful Discussion (3 marks)**:
  - Defines semi-supervised learning (1 mark)
  - Explains how it applies to this project using the extra data (1 mark)
  - Reflects on strengths and limitations (1 mark)

  Bonus: Up to 2 marks if lab material is adapted and applied for Semi-Supervised Learning.
- **Real-world Applicability (2 marks)**: Describes real-world use cases (1 mark) and how semi-supervised methods can boost task performance (1 mark).

3. Report Presentation (20%, 10 marks)

3.1 Clarity and Structure (5 marks)

- **Logical Flow (2 marks)**: The report follows a coherent and logical narrative.
- **Readability (2 marks)**: The writing is concise, grammatical, and easy to understand.
- **Consistent Formatting (1 mark)**: Formatting is consistent and enhances clarity.

3.2 Visualizations and Integration (5 marks)

- **Quality of Visualizations (3 marks)**: Tables and figures support conclusions and are clearly labeled.
- **Integration with Text (2 marks)**: All visual content is referenced and explained in the text.