**Methodology for the Project: Computer Vision Model for Lung Cancer Detection Using Biopsy Images**

The mini-project will be in the Domain of Artificial Intelligence and Data Science, and techniques like Computer Vision and Machine Learning will be used in the implementation model for the same.

The methodology for the implementation of this model will include a process of nine phases:

1. Data Collection and Preprocessing

2. Convolutional Neural Network Architecture

3. Model Training

4. Hyperparameter Tuning

5. Evaluation Metrics

6. Interpretability and Explainability

7. Deployment

8. Continuous Monitoring and Improvement

9. Documentation and Knowledge Transfer

Before working on the mini-project, some important aspects will be to be taken into consideration pre-implementation. The ethical and legal compliance law should be taken into account, especially while handling patient data and implementing AI in healthcare. The web deployment of the model should also be in a secure and compliant environment, considering patient data privacy and regulatory requirements (e.g., HIPAA). Also, collaboration and consultation with healthcare professionals, especially oncologists, pulmonologists and radiologists is absolutely essential. This will ensure that the model will align with their clinical requirements and needs, and also is of good quality to use in the medical field.

**Data Collection and Preprocessing**

Data Collection and Preprocessing will be done on a dataset of lung biopsy images, including both benign and malignant cases. The dataset will should be sufficiently large and representative, containing a diverse set of images.

After that, the images will be pre-processed by resizing them to a consistent resolution, normalising pixel values, and augmenting the data to increase diversity and reduce overfitting.

Finally, the dataset will be split into training, validation and testing sets, maintaining class balance.

**Convolutional Neural Network Architecture**

A Convolutional Neural Network (CNN) architecture suitable for image classification tasks, using established architectures like VGG, Res-Net, or Inception.

The network’s output layer should be modified to have two neurons for binary classification (benign or malignant)

**Model Training**

CNN model will be initialised with pre-trained weights (transfer learning) if available or train from scratch. The training set will be utilised to train the model, using techniques such as mini-batch gradient descent and backpropagation.

The model's performance on the validation set will be monitored and early stopping will be implemented to prevent overfitting.

**Hyperparameter Tuning**

Hyperparameters such as learning rate, batch size, dropout rates, and optimizer algorithms (e.g., Adam, RMS-Prop) will be tried and tested to optimize model performance.

To ensure convergence, techniques like learning rate scheduling will be implemented.

**Evaluation Metrics**

The model's performance will be evaluated using appropriate metrics such as accuracy, precision, recall, F1-score, and ROC-AUC on the test set; and based on that a confusion matrix will be created to visualize classification performance, and in order to analyse false positives and false negatives.

**Interpretability and Explainability:**

Techniques to interpret the model's decisions, such as feature visualization, gradient-weighted class activation mapping (Grad-CAM), or SHAP (Shapley additive explanations) will be implemented, and the model's decisions should be concise, accurate and detailed enough such that it can be explained to healthcare professionals to build trust in its predictions.

**Deployment**

A user-friendly interface will be built for healthcare professionals to upload biopsy images and receive predictions, and the model will be deployed for use.

**Continuous Monitoring and Improvement:**

The deployed model's performance will be continuously monitored, and user feedback will also be gathered. It will be fine-tuned periodically using new data to adapt to evolving patterns in lung biopsy images and improve accuracy.

**Documentation and Knowledge Transfer:**

Finally, the entire project will be documented; including data collection, preprocessing, model architecture, training, evaluation, and deployment processes. Also, the appropriate training and documentation will be provided to healthcare professionals and IT staff involved in maintaining the system.