**Lung Disease Detection Using Cough Spectral Images: Weekly Plan & Proof of Concept**

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**Program:** MSc Computer Science  
**Submission Deadline:** 27 August 2025

**✅ Validation of Project Methods and Datasets**

**🔍 Are the Chosen Datasets Appropriate?**

Yes. The selected datasets for this project are well-suited for the task of cough-based multi-disease respiratory classification, including lung cancer simulation:

| **Dataset** | **Description** | **Relevance** |
| --- | --- | --- |
| **COUGHVID** | >25,000 cough recordings with expert annotations. | Used for healthy, symptomatic, and COVID-19 classes. Widely accepted. |
| **Coswara** | Public cough + breath dataset with health status metadata. | Adds diversity in symptomatic and COVID-class examples. |
| **ICBHI 2017** | Clinical respiratory sound recordings (mostly breathing). | Used for potential lung abnormal sound examples. |
| **Chest Diseases (Kaggle)** | Medical images and metadata for lung cancer and other diseases. | Not used directly in training, but provides label guidance and discussion illustrations. |

📬 **Note:** As real lung cancer cough datasets are unavailable, symptomatic and severe-class samples are used to simulate the cancer class.

**🤔 Are the Selected Techniques Suitable?**

| **Technique** | **Description** | **Justification** |
| --- | --- | --- |
| **Log-Mel Spectrograms (CSI)** | Converts audio to 2D image-like time–frequency representations (Cough Spectral Images). | Enables use of powerful CV models like ResNet and AST. |
| **ResNet-50 (Baseline)** | CNN pre-trained on ImageNet, adapted to multi-class output. | Performs reliably on spectrogram images. |
| **AST (Audio Spectrogram Transformer)** | Transformer architecture for spectrograms, pretrained on AudioSet. | High accuracy in audio-based deep learning tasks. |
| **PEFT (Adapter Tuning)** | Efficient transformer fine-tuning by adding adapters. | Reduces computational load and enhances accuracy on limited data. |

🔁 **Conclusion**: The approach of using cough-based CSI images for multi-disease classification combines modern architectures and validated datasets. Cancer classification is addressed via representative cough categories, and the system can be extended with true cancer data in future studies.

**📅 8-Week Project Plan (15 July – 27 August)**

This schedule assumes ~25 hours/week, split as 3.5 hours/day on weekdays and 6 hours/day on weekends. The project is structured to first build a binary classifier (healthy vs symptomatic/cancer), then extend to multi-class respiratory classification.

**Weekly Schedule Table**

| **Week** | **Dates** | **Goals / Tasks** | **Estimated Time** | **Deliverables** |
| --- | --- | --- | --- | --- |
| 1 | Jul 15 – 21 | Data download (COUGHVID, Coswara, Kaggle), create metadata, organize audio by class, set up GitHub. | ~25 hrs | Raw dataset folders, metadata CSV, GitHub repo initialized |
| 2 | Jul 22 – 28 | Convert audio to CSI (log-Mel spectrograms); organize per class; create dataset.csv. | ~25 hrs | CSI image dataset prepared; metadata files finalized |
| 3 | Jul 29 – Aug 4 | Train baseline ResNet-50 model on CSI; evaluate binary setup (e.g., cancer/symptomatic vs healthy). | ~25 hrs | Baseline binary model trained and logged |
| 4 | Aug 5 – 11 | Integrate AST model; run initial multi-class classification training; evaluate performance. | ~25 hrs | AST multi-class model tested |
| 5 | Aug 12 – 18 | Apply PEFT to AST; improve accuracy; perform data augmentation with SpecAugment. | ~25 hrs | PEFT-enhanced model trained |
| 6 | Aug 19 – 25 | Final experiments; generate plots (ROC, confusion, accuracy); write discussion and results. | ~25 hrs | Model evaluation visuals; analysis written |
| 7 | Aug 26 – 27 | Finalize dissertation writing and formatting; submit. | ~12 hrs | Dissertation submitted |

**✍️ Final Notes**

* The project builds a working classifier using **Cough Spectral Images (CSI)** as input ✅
* Includes both binary (healthy vs abnormal) and multi-class disease prediction ✅
* Uses real audio from COUGHVID/Coswara and modern deep learning models ✅
* Lung cancer detection is approximated via proxy classes; real datasets are unavailable ⚠️
* The project lays groundwork for audio-based pre-screening tools for public health 🩺

📄 **Prepared By:** ChatGPT Research Assistant, July 2025