Product Requirements:

Use Cases:

The prototype can be used by researchers as a tool to explore how combining ultrasound images with biomarker data (like CA-125 and BRCA status) might improve tumor classification. It helps in testing hypotheses, generating insights, and planning larger studies with more diverse datasets.

While not a substitute for clinical diagnosis, this proof-of-concept can support clinicians by:

- Highlighting suspicious regions in ultrasound scans (via Grad-CAM).
- Explaining how biomarker values influence predictions (via SHAP).
- Providing an additional layer of decision support, can help reduce human oversight errors and improve early detection (if validated with more data).

Tech Stack:

- PyTorch
- SHAP
- CNN
- Grad-CAM
- Pandas/Numpy
- Matplotlib/Seaborn

Pipeline:

Data (images + biomarkers) → Preprocessing → CNN + MLP → Fusion → Prediction + Explainability