

# BCD – Visual Anomaly Awareness System (VAS)

**Status:** Concept → Design Phase

**Audience:** Non-technical stakeholders, developers, reviewers, collaborators

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## 1. What This Project Is (In Simple Words)

This project aims to build a **breast health awareness tool** that helps women notice **visual or contextual changes over time** using something they already have: **a smartphone camera**.

**It does not diagnose breast cancer.**

Instead, it answers a simpler and safer question:

**"Does anything look or feel different compared to before, and is it worth getting checked?"**

The goal is **early attention**, not medical replacement.

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## 2. Why This Exists

Many breast cancer cases are detected late not because tools don't exist, but because:

- Regular screenings are skipped
- Symptoms are ignored or delayed
- Medical access feels intimidating or inconvenient

This system lowers the *activation energy*.

If someone notices a risk **earlier**, they are more likely to visit a professional **in time**.

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## 3. What This Project Is NOT

To be very clear:

- ✗ Not a diagnostic tool
- ✗ Not a replacement for doctors, mammograms, or ultrasounds
- ✗ Not claiming medical accuracy
- ✗ Not detecting cancer directly

This clarity is intentional and critical.

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## 4. Core Idea (Technical + Non-Technical)

### Traditional Approach (What Others Do)

- Use medical imaging (mammograms, ultrasound, MRI)
- Train supervised models
- Require specialized hardware

### Our Approach (This Project)

- Use **phone camera images**
- Track **changes over time** (time-series)
- Focus on **visual and contextual anomalies**

Instead of asking "*Is this cancer?*", we ask:

"Is this different from before, and combined with other factors, is it worth attention?"

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## 5. What the System Looks At

### A. Visual Signals (from camera images)

Examples (non-exhaustive):

- Skin texture changes
- Color or pigmentation differences
- Visible swelling or asymmetry
- Dimpling or surface irregularities
- Nipple appearance changes

These are **surface-level indicators only**.

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### B. Time-Series Comparison (Key Innovation)

Each user becomes **their own baseline**.

The system compares:

- This month vs last month
- Gradual vs sudden changes
- Localized vs global changes

This reduces dependency on massive labeled datasets.

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### C. Contextual Inputs (Non-Image Data)

Optional user-provided signals:

- Family medical history
- Age range
- Pain, discomfort, or lump awareness
- Discharge or sensitivity
- Self-reported changes

These **do not diagnose**, but improve risk awareness.

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## 6. Output: What the User Sees

The system outputs **risk awareness**, not medical claims.

Examples:

- "Noticeable visual change compared to last month."
- "Changes detected + family history present."
- "No significant change detected compared to baseline."

When risk crosses a threshold:

"We recommend consulting a healthcare professional."

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## 7. Machine Learning Strategy (High Level)

### Key Design Choice

We prioritize **not missing potential risk** over being precise.

### Likely ML Approaches

- Anomaly detection
- Semi-supervised learning
- Change detection models
- Embedding similarity over time

This avoids over-claiming accuracy and fits real-world constraints.

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## 8. Data Strategy

### Why Labeled Data Is Hard

- Medical privacy
- Ethical constraints
- Lack of public phone-camera datasets

### How This Project Adapts

- User-specific baselines
  - Synthetic augmentation (non-diagnostic)
  - Focus on *change*, not absolute classification
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## 9. Ethics & Safety Principles

This project follows these rules strictly:

1. **Transparency** – Clear disclaimers everywhere
2. **No diagnosis claims** – Ever
3. **User control** – Opt-in, deletable data
4. **Privacy first** – No unnecessary storage
5. **Bias awareness** – No universal assumptions

If these cannot be guaranteed, the system should not be deployed.

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## 10. Legal Positioning (Intent)

The system is positioned as:

- A **health awareness aid**
- A **self-monitoring assistant**
- A **non-medical informational tool**

This framing is deliberate to reduce harm and misuse.

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## 11. Why This Is Worth Building

Even with limited accuracy:

- Awareness > ignorance
- Early attention > delayed diagnosis
- Accessibility > perfection

If this helps **even a small percentage** of users seek help earlier, it has value.

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## 12. Current Status & Next Steps

**Current:** - Concept validated - Scope redefined - Ethical framing established

**Next:** - Define technical pipeline - Decide minimal viable signals - Build prototype anomaly model - Iterate with caution

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## Final Note

This project is intentionally modest in claims but ambitious in impact.

It is designed to **start conversations**, not end them.