ASU Lost & Found CV Project: Team 402 Summary Document

# Project Title

LostSunDevils.com – A Computer Vision-Based Lost and Found System for ASU

# 1. Problem / Opportunity Definition

Arizona State University faces frequent loss of mobile phones, wallets, ID cards, and keys by students and visitors. The current manual lost-and-found processes are inefficient and result in low recovery rates and increased anxiety among the campus community. This presents an opportunity to develop a centralized, automated, and scalable system leveraging computer vision (CV) to modernize and enhance the item recovery process.

# 2. Importance of the Problem

Improving item recovery supports student and visitor satisfaction and security. Our CV-based system aims to eliminate reliance on error-prone manual logs and enable intelligent image-based recognition, making the recovery process faster and more reliable. This contributes to a more tech-enabled campus infrastructure and enhances operational efficiency.

# 3. Stakeholders and Beneficiaries

- Primary beneficiaries: ASU students and campus visitors.

- Stakeholders: Campus Security, Lost & Found Department, Facilities and Academic Services teams.

# 4. Current Solutions & Limitations

Lost items are currently logged through spreadsheets, office-led databases, and manual reporting. These lack standardization, have limited visibility, and often result in misclassification. There's no visual database or image-based search option, causing classification and retrieval failures.

# 5. Proposed End-to-End Product Solution

LostSunDevils.com is a web platform where:  
- Lost items are photographed and uploaded by campus security.  
- The CV system classifies and tags the items based on object type and color.  
- A searchable database allows users to find items using either keywords or images.  
- Upon a successful match, users can initiate a claim process through the website.  
  
The CV component is essential for:  
- Automatic object detection and tagging.  
- Replacing error-prone manual descriptions.  
- Supporting image-based search queries by users.

# 6. System Components and Architecture

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| User Upload/Search |  
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| Image Preprocessing |  
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| CV Model (MobileNetV2 + Color Detection) |  
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| Centralized Database |  
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| Matching & Retrieval |  
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| Item Claim Interface |  
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# 7. CV Model and Technical Implementation

- Base Model: MobileNetV2  
- Frameworks Used: PyTorch, TensorFlow  
- Features:  
 - Item classification by type (laptop, wallet, headphones, calculator, etc.)  
 - Dominant color detection using webcolors for additional metadata tagging  
- Workflow:  
 - Preprocessed images are passed into the model  
 - Outputs are classified into pre-defined categories  
 - Matched against user queries in a centralized database

Code Snippet for Color Extraction:

from PIL import Image  
import webcolors  
  
def get\_dominant\_color(image\_path):  
 image = Image.open(image\_path)  
 image = image.resize((50, 50))  
 pixels = list(image.getdata())  
 avg\_color = tuple(sum(col) // len(col) for col in zip(\*pixels))  
 return webcolors.rgb\_to\_name(avg\_color, spec='css3')

# 8. Dummy Website / UI Prototype

- Platform: Figma  
- URL mockup: LostSunDevils.com  
- Key features:  
 - Search by keyword or category (e.g., calculator, wallet)  
 - Item image and location metadata  
 - 'Claim' buttons and confirmation prompts  
 - "Add Lost Item" functionality with form and image upload

# 9. Limitations and Risks

- Technical:  
 - Misclassification of visually similar items (e.g., different calculators)  
 - Inability to detect rare/unseen items due to limited training data  
- Privacy:  
 - Images of ID cards and personal objects may include sensitive info  
- Deployment:  
 - Resource-intensive setup and need for regular model updates  
 - Long-term maintenance and infrastructure costs

# 10. References

- MobileNetV2: Sandler et al. (2018)  
- PyTorch Official Docs  
- webcolors Python library  
- Figma UI Design Platform