

Arcane Table

Card Recognition System for Augmented Tabletop Gaming

MTEC 3501 Final Proposal | 4-Month Prototype

What I'm Building

Real-time card recognition system that overlays digital information on physical playing cards

Input

Overhead camera captures cards
played on table

Processing

Computer vision identifies card
suits and ranks

Output

Projector displays stats,
probabilities, and game info

Focus: Poker overlay showing hand strength, odds, and remaining card probabilities

Why This Matters

The Physical-Digital Gap

Physical card games are tactile and social but lack real-time information. Digital games have stats and analytics but lose the tangibility.

Bridge the Gap

This system keeps the physical cards in your hands while bringing digital intelligence to the table through projection mapping.

Personal Connection

Growing up playing Yu-Gi-Oh and Hearthstone, I always wished my physical cards could evolve and show live stats like digital ones. This prototype starts that journey.

Potential applications: Teaching probability, tournament analysis, accessible gaming, hybrid game design

Current Progress

✓ **Working card recognition system (demo video available)**

✓ **Projector hardware purchased and ready**

Technical Foundation

Computer vision pipeline identifies standard playing cards with rank and suit detection

Hardware Setup

Overhead camera + projector rig design complete, ready for integration testing

Next 4 Months

Integrate recognition with projection overlay, implement poker probability calculator, optimize tracking accuracy

Technical Approach

CAPTURE

Camera Input

Overhead webcam captures table at 30fps, processes frames for card detection

DETECT

Computer Vision

OpenCV + custom model identifies cards, tracks position and orientation

COMPUTE

Game Logic

Python backend calculates probabilities, hand strength, remaining card odds

DISPLAY

Projection Output

Aligned overlay projects stats directly onto and around detected cards

Key Technical Components

Card corner detection
Suit/rank classification

Projector-camera calibration
Real-time coordinate mapping

Stack: Python, OpenCV, real-time projection mapping library

4-Month Prototype Plan

Month 1

System Integration

Connect camera recognition to projection output, calibrate camera-projector alignment, test detection accuracy across lighting conditions

Month 2

Poker Logic Implementation

Build hand evaluation system, implement probability calculator for remaining cards, create overlay UI design for projected information

Month 3

Real-time Optimization

Reduce latency, improve tracking stability with multiple cards, handle occlusion and card overlap scenarios

Month 4

Testing & Documentation

User testing with actual gameplay, document system architecture and code, prepare demo video and presentation

Deliverable: Working poker overlay system that displays hand strength and odds in real-time

Expected Challenges & Solutions

Challenge: Lighting Variations

Different lighting can affect card detection accuracy

Solution: Figure out what lighting works best and plan accordingly, maybe you QR or IR identifiers on card to make it easier.

Challenge: Projector Alignment

Keeping projected overlays precisely aligned with moving cards

Solution: Keystone before the games start and put alignment cues on game surface to help either manual set game surface or auto alignment ideally

Challenge: Card Occlusion

Players' hands blocking camera view of cards

Solution: Recognize what is and isn't a card with playing surface zones.

Challenge: Processing Speed

Real-time performance needs less than 100ms latency

Solution: Optimize CV pipeline, implement frame skipping, and the right raspberry pi machine

Backup Plan: If real-time proves too challenging, implement turn-based mode where players press button to trigger recognition

Future Iterations

Beyond the 4-month prototype

Magic: The Gathering / Custom TCG Version

Custom cards with unique artwork that come alive with animations, particle effects, and battle sequences. Cards track stats, evolution, and battle history across sessions.

Advanced Recognition

QR codes or unique patterns on custom cards for instant identification

Dynamic Content

Cards gain experience, evolve artwork, remember matchups and winning strategies

Sound Integration

Reactive audio triggers when cards clash or special abilities activate

Long-term Vision

Tournament mode with spectator displays
Portable setup for conventions/events

API for indie game designers to create new games
Cloud-connected card databases and matchmaking

The poker prototype proves the system works. Custom cards unlock creative gameplay possibilities.

Questions & Feedback

Areas Where I Need Feedback

Is the 4-month scope appropriate, or should I narrow/expand focus?

Should I prioritize detection accuracy or overlay visual polish?

Any suggestions for testing the system with real players?

Technical recommendations for the CV pipeline or projection mapping?

Ready to Show Demo Video

Current card recognition system in action