

# 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