

Spring 2019 - Capstone Design Project  
Team D7

# PianoMan

Design Review Presentation

# Team D7



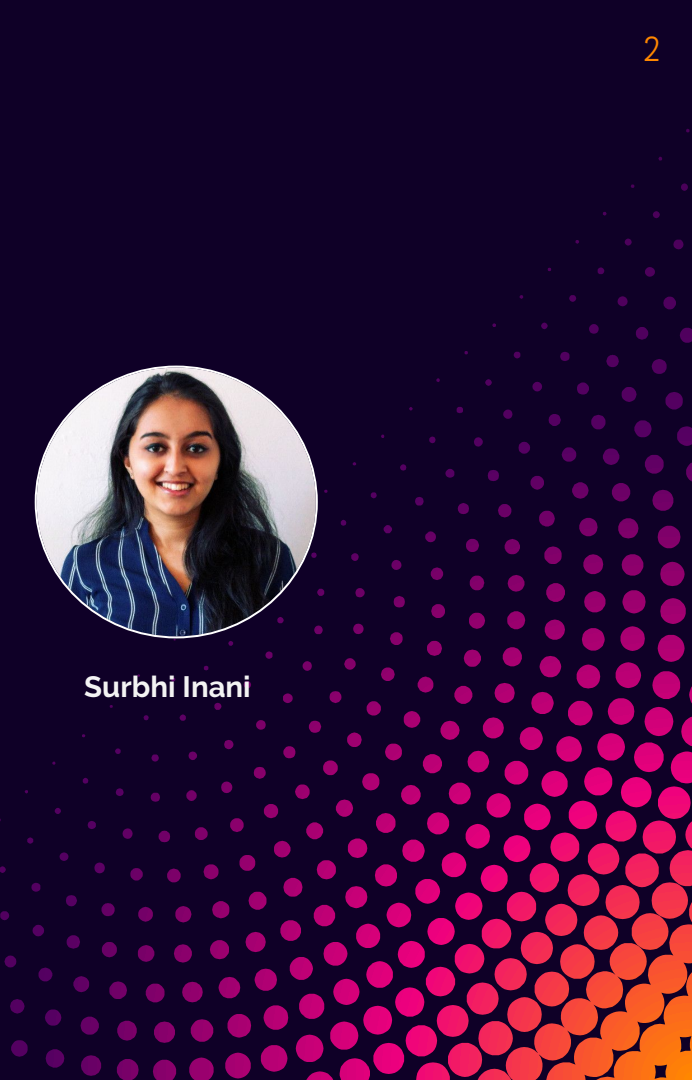
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# APPLICATION AREA

A self-learning tool for Piano players.

Reads sheet music of song, then lights up LED system using a teaching module for that song.



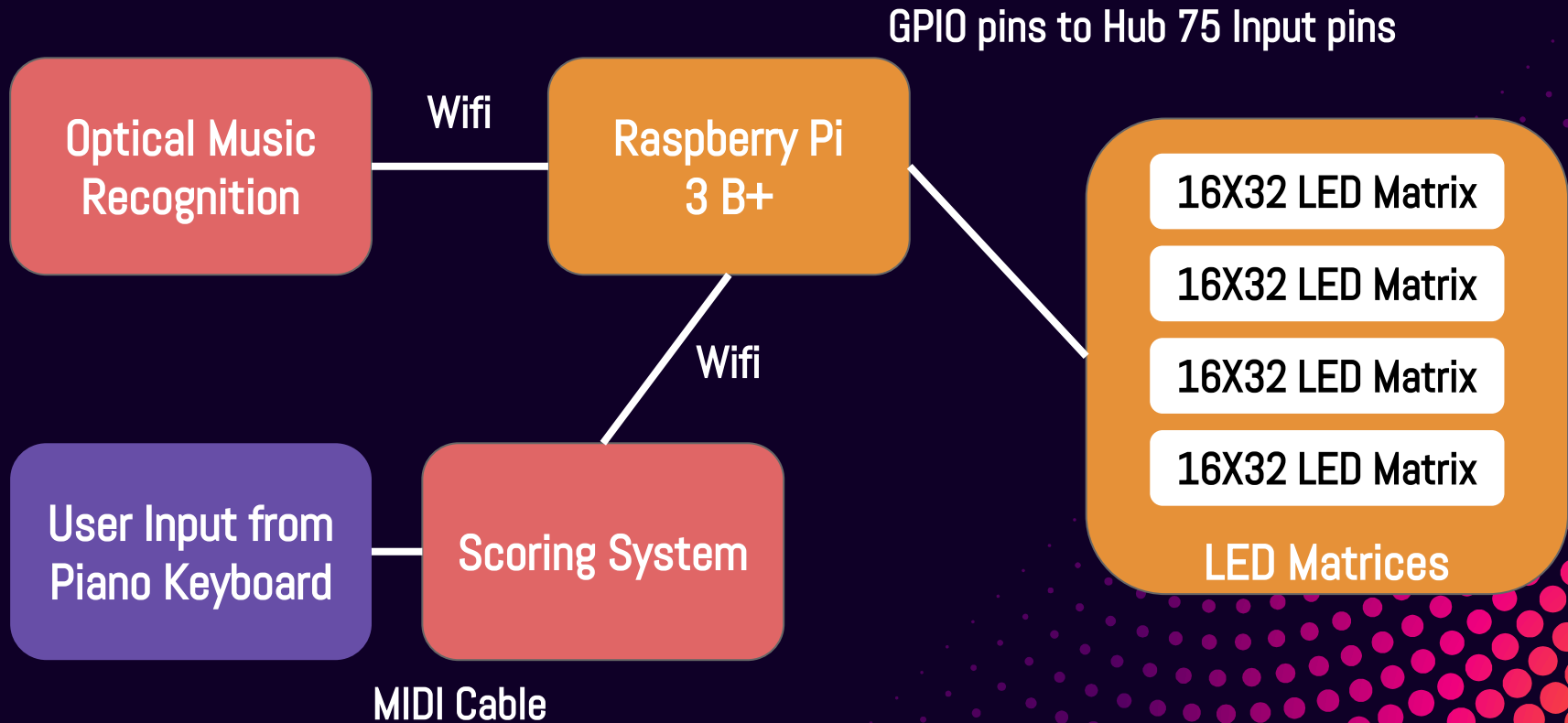
# SOLUTION APPROACH

- ⊗ Taking ideal scans of sheet music
- ⊗ Lighting up LED MATRICES BAR set above the keyboard at appropriate times in a game-like teaching module
- ⊗ Keeping track of what keys the user pressed and calculating a performance score for improvement



<https://youtu.be/wfF0zHeU3Zs>

# BLOCK DIAGRAM



# IMPLEMENTATION PLAN - OMR

- ⊗ **Borrowing/Buying:** Electronic Piano Keyboard (61 keys)
- ⊗ **Downloading:** PDF to JPG python library, openCV python library, Sheet Music PDFs
- ⊗ **Designing and Developing:** Full OMR software using these two libraries

# IMPLEMENTATION PLAN - HARDWARE

- ⊗ **Buying:** Raspberry Pi 3 B+ model, Four 16x32 LED Matrices, Power Supplies for both, M-M and F-F Jumper Cables
- ⊗ **Assembling:** Daisy-Chaining 4 LED matrices and wiring the first's Hub 75 Input pins to the GPIO Pins of Raspberry Pi
- ⊗ **Downloading:** Henner Zeller's LED Matrix Controller Library
- ⊗ **Designing and Developing:** C++ program in Raspberry Pi to receive file from OMR program output and lighting up the notes at the correct times with a game-like effect to teach the song

# IMPLEMENTATION PLAN - PERFORMANCE SCORE

- ⊗ **Buying:** MIDI cable that connects to the piano keyboard and sends user input midi files to the computer
- ⊗ **Assembling:** Keyboard → MIDI → Raspberry Pi configuration for interpreting keys the player pressed evaluating performance score
- ⊗ **Designing and Developing:** Python code for parsing MIDI file's User Input to evaluate performance and generate score that will be pushed to the Raspberry Pi over Wifi to be displayed by LED Matrix



# METRICS AND VALIDATION

## ⊗ Test for Optical Music Recognition (OMR)

### **Data:**

Ideal scans of sheet music from MuseScore (<https://musescore.com>)

### **Test:**

1. Use SoundSlice (<https://www.soundslice.com>) to convert OMR's output MusicXML to PDF
2. Check the difference between original PDF and converted PDF / played MIDI file

# METRICS AND VALIDATION

## ⊗ Test for Raspberry Pi - LED Matrices

### **Data:**

MusicXML from MuseScore (<https://musescore.com>)

### **Test:**

1. Test if the microcontroller can successfully transfer data to LEDs
2. LEDs light up correctly according to the design requirements

# METRICS AND VALIDATION

## ⊗ Test for Scoring system

**Data:** MusicXML from MuseScore (<https://musescore.com>)

**Test:**

1. Test if the scoring system correctly calculates the performance score of the input MIDI file
2. LED matrix correctly displays the performance score

## ⊗ User testing

**Data:** Classmates

**Test:**

1. Let them learn basic songs from MuseScore and collect feedback

