



University of Massachusetts, Amherst  
College of Engineering

# ITS LIT

Preliminary Design Review

Senior Design Project '17

Department of Electrical and Computer Engineering



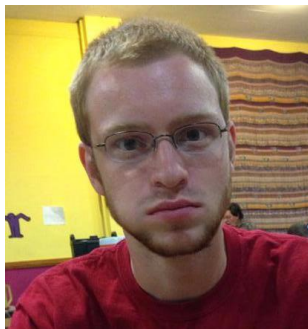
# Meet The Team



Advisor:  
Professor David  
McLaughlin



Tommy Zhen  
CSE



Michael Polin  
CSE



Patrick Browne  
EE



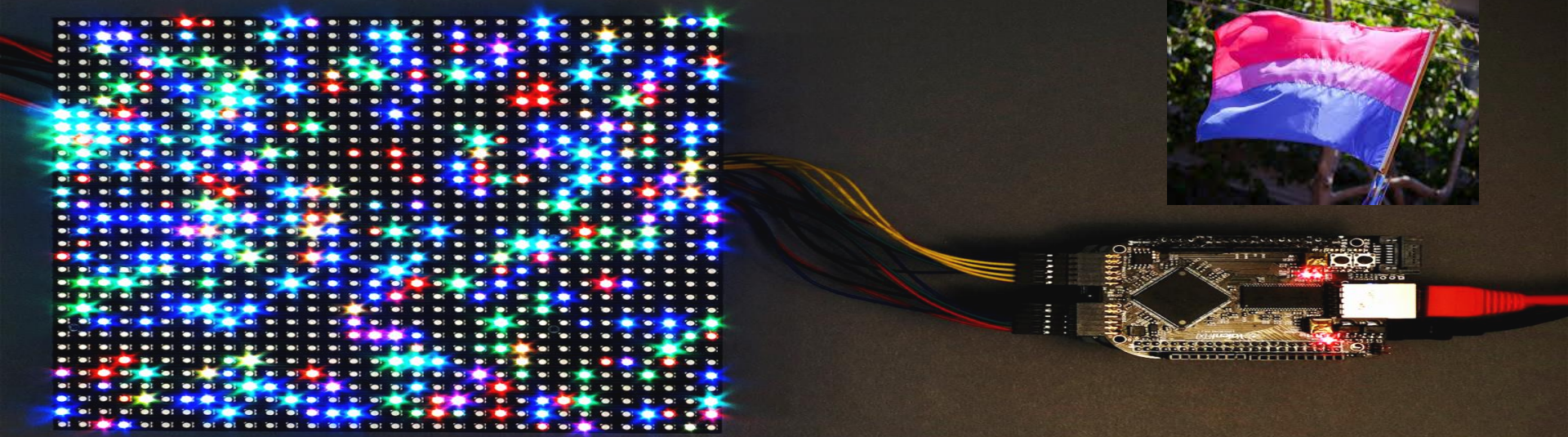
Varun  
Menon  
EE



Emma Bryce  
EE

# ITS LIT

Interactive Timed Synchronized Lights In Technicolor



# Goal

Create a semi-permanent nighttime LED display mounted on a window at DuBois Library or the Old Chapel that exhibits LGBT+ pride-related images amongst other presets that are controlled by the public through a mobile app.

# Problem

- Discrimination against LGBT+ students and other groups
- Invisibility and erasure of identities
- Out at school but not at home
- Coming out in college
- “Otherness”



**92% of LGBT youth say they hear negative messages about being LGBT. The top sources are school, the Internet and their peers.**

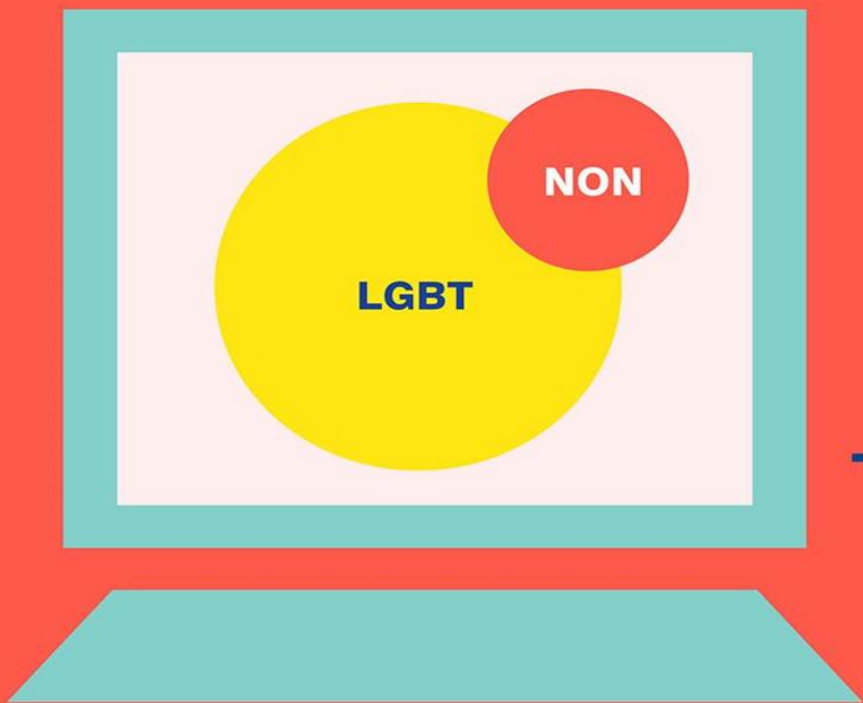
[www.hrc.org/youth](http://www.hrc.org/youth)

**#LGBTYOUTH**

HUMAN RIGHTS CAMPAIGN



# Problem



**Roughly three-quarters (73%) of LGBT youth say they are more honest about themselves online than in the real world.**



HUMAN  
RIGHTS  
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[www.hrc.org/youth](http://www.hrc.org/youth)

**#LGBTYOUTH**

# Application & Impact

## Social Impact:

- Fosters and sends message of LGBT inclusion
- Attracts visiting HS students and current UMass students to ECE
- Cultivates campus wide cohesiveness
- “Gives back” to campus community



# Application & Impact

## Personal Impact:

- Interactive decorative display
- App allows users to dynamically change and update the panel
- Potential to replace posters and tapestries in dorm rooms

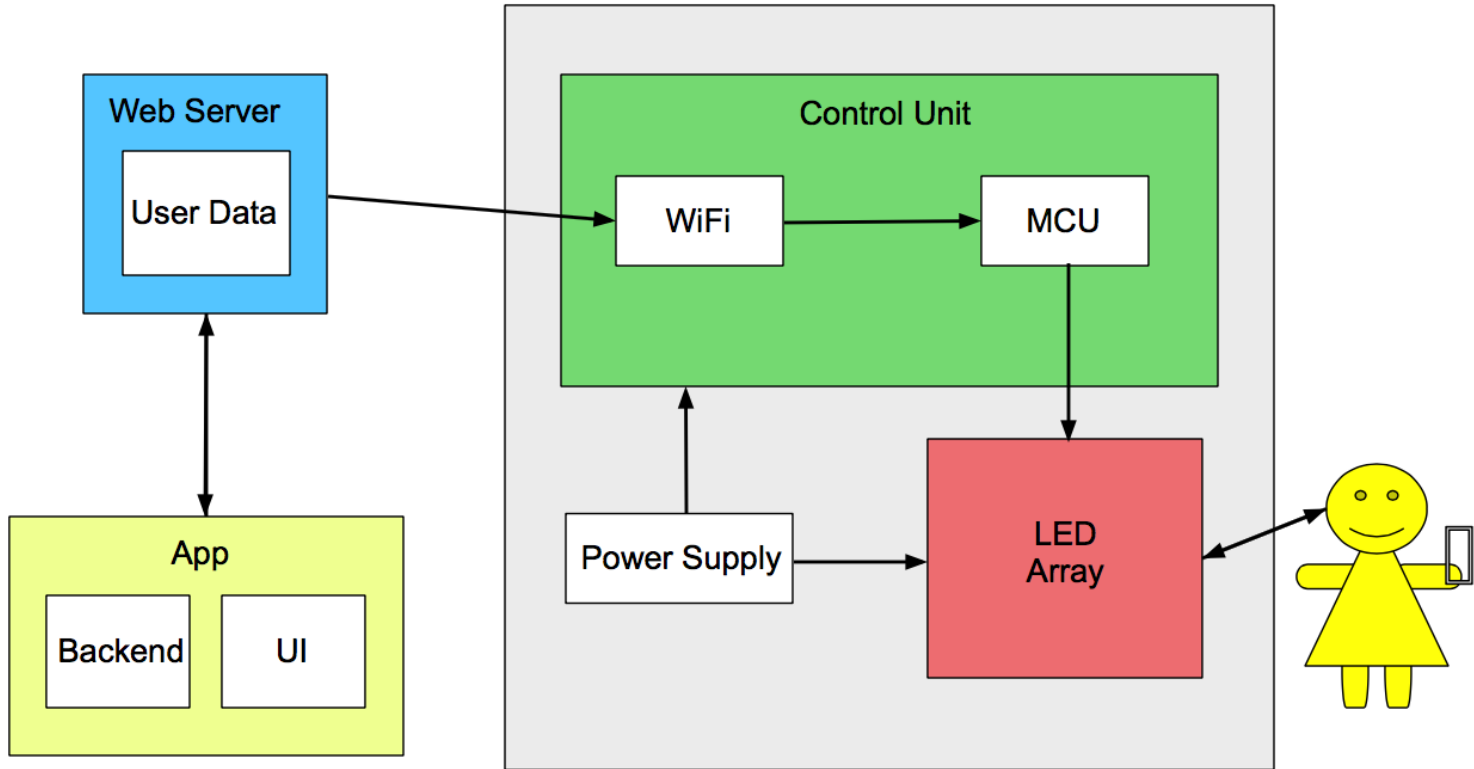




# Requirements

- App
- Server monitored by controller
- Limited delay
- Query
- Display should be of a size that can be viewed clearly from below—around 3' x 3'
- Complete set of LGBT+ pride flags

# Block Diagram



# Block 1: App

- The interactive app will allow users to choose from a host of presets to change the designs on the LED panel
  - Easy navigation
  - Real time communication between app, server and microcontroller
  - Wifi protocols
- The app will send the image to a server, which in turn communicates with the microcontroller
- Option to add administrator who can add custom images

# Block 1: App

## Queuing

- App will be available for download on respective app store
- Users will be able to change presets as they pass by the public installation
- App handles requests based on timing of request
- Consecutive requests will be stored in a queue
- There will be a 'minimum time' before the preset is changed
- App also handles overloading, and makes sure one preset doesn't dominate

# Block 1: App

- We will have one app complete and if time permits, we will develop the second one as well

## iOS App

- Will be developed using Swift (similar to objective C)



## Android App

- Will be developed using Android SDK



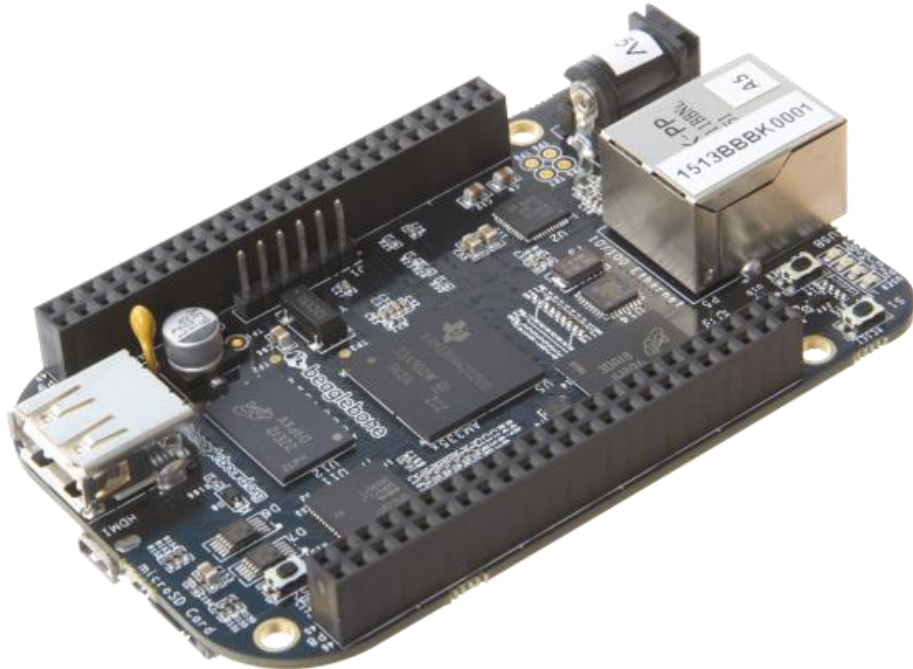


# Block 2: Server

- Provide temporary storage for presets/commands between app and controller
- Handles potential traffic if multiple users input at similar times



# Block 3: Microcontroller



- Accepts input from the server
- Connects to wifi
- Must be able to accept an image and reformat it to fit our panel size
- Must also be able to coordinate the panels to display the image accepted
- Must have enough processing power

# Block 4: LED Array Panel

- Receives input from the microcontroller
- 32 by 32 or 64 by 64 LED's
- Displays the picture by using each LED as a pixel
- Use multiple panels that can be daisy chained together to form a bigger panel
- Installed Indoors
- Pixel Pitch(Resolution)



# Cost

Item	Quantity	Unit Cost	Total Cost
LED array	9+	\$40.00	\$360.00+
Raspbery Pi	1	\$40.00	\$40.00
BeagleBone	1	\$55.00	\$55.00
Smart Phone	1	N/A	N/A
Software (Xcode, etc)	N/A	N/A	N/A
WiFi USB	1	\$10.00	\$10.00
Total			\$465.00

# Design Alternatives

- Controller
  - Raspberry Pi vs Beaglebone
- Server
  - Third Party Server vs UMass Server
- App
  - iOS vs Android
- Ethernet vs WiFi



# MDR Deliverables

- Microcontroller drives display on LED array
  - Display can be controlled via laptop
- Server created
  - Microcontroller interaction tested
- Basic app functionality
  - GUI and user input
- Beginning vetting with school or faculty member

# Questions?

