

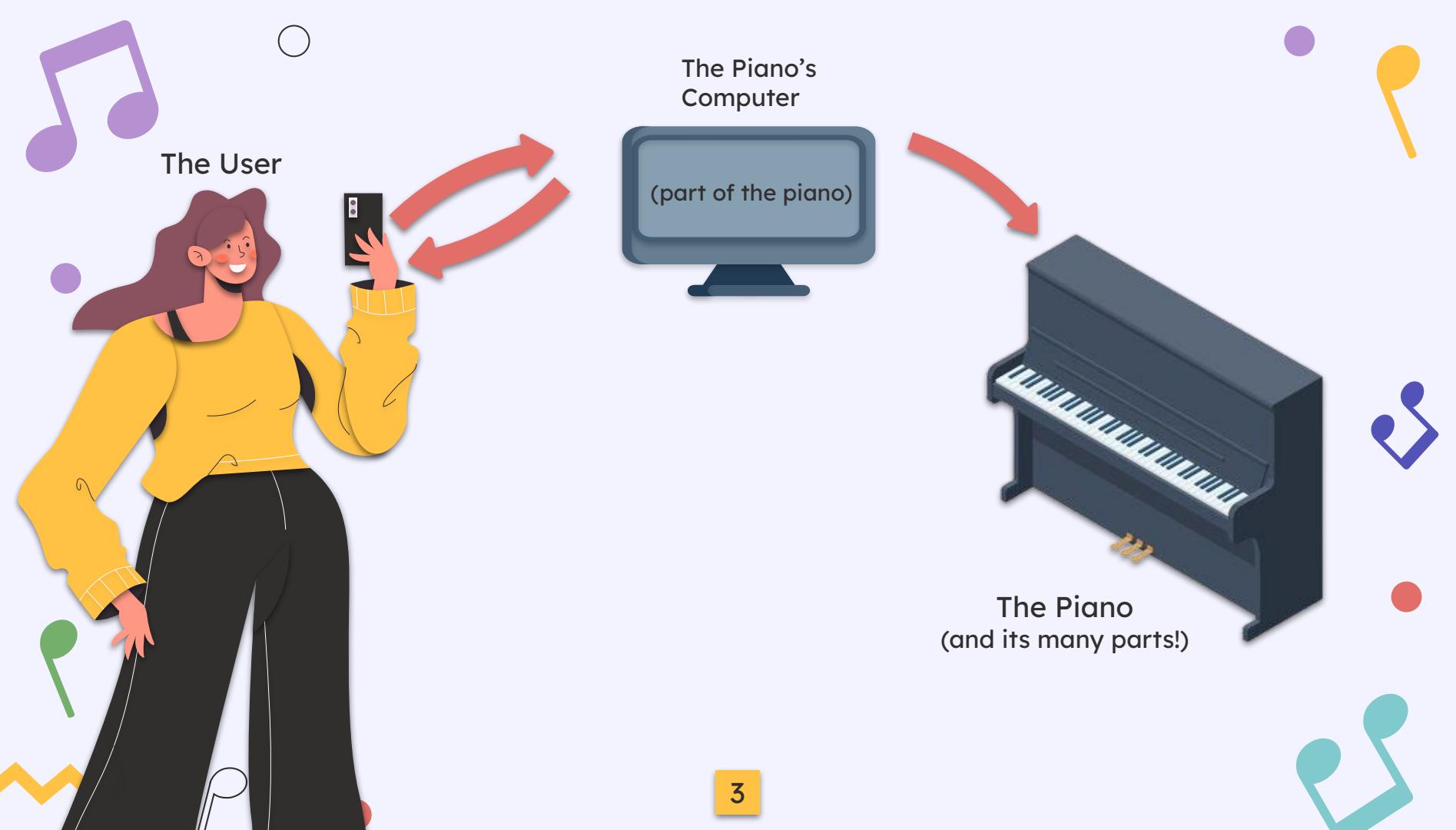
Player Piano

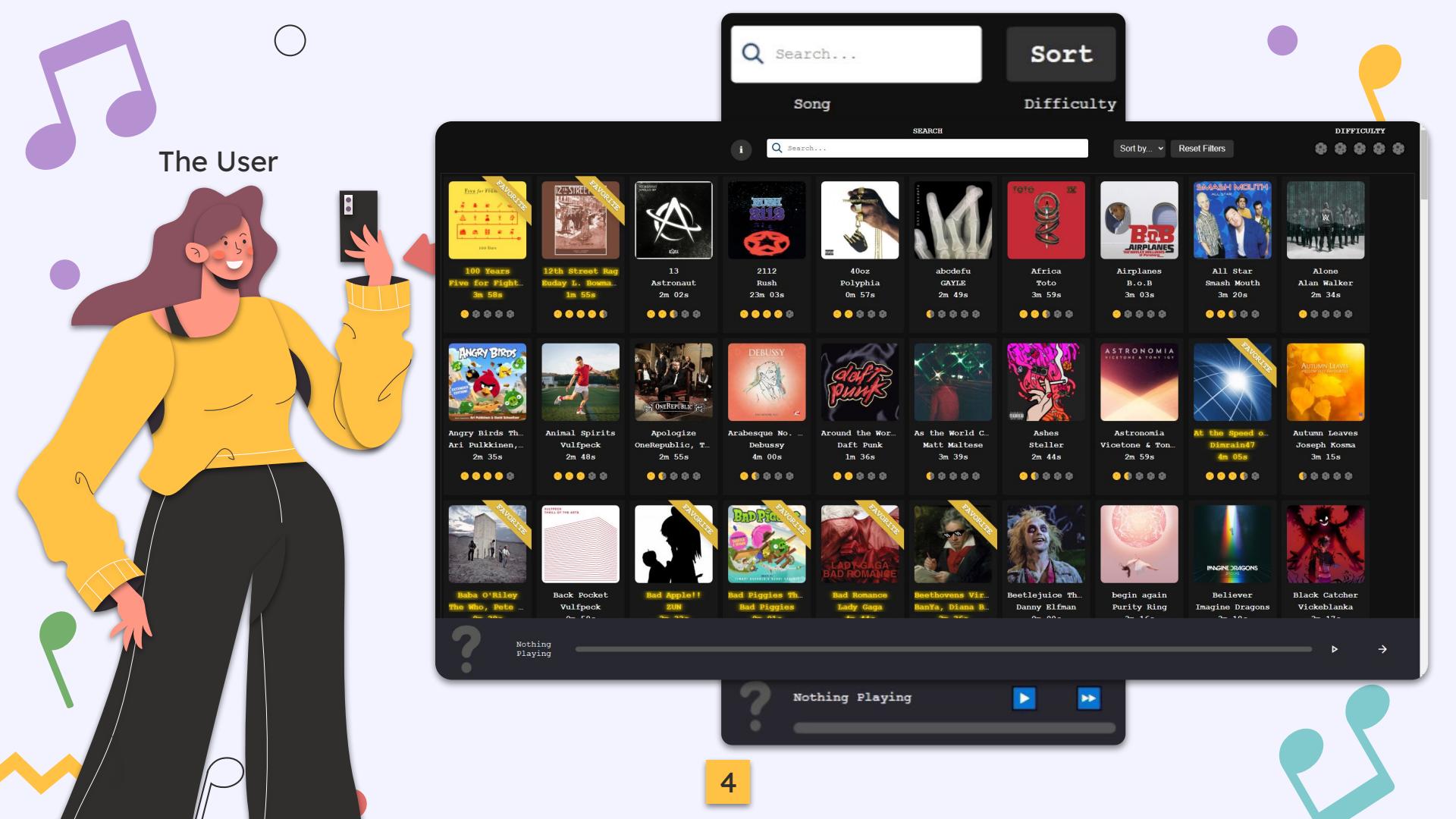
Camden Hunt (BS), Eric Golde (BA)

Advised by Dr. Jeffrey A. Caley, Ph.D

Abstract

- Convert an upright piano into a **fully-automatic** player piano
- Piano can play files from a database of **pre-loaded** songs
- Users can access the list of songs on an **easily accessible** website to play them on the piano





Song Database



songs.json

{

}

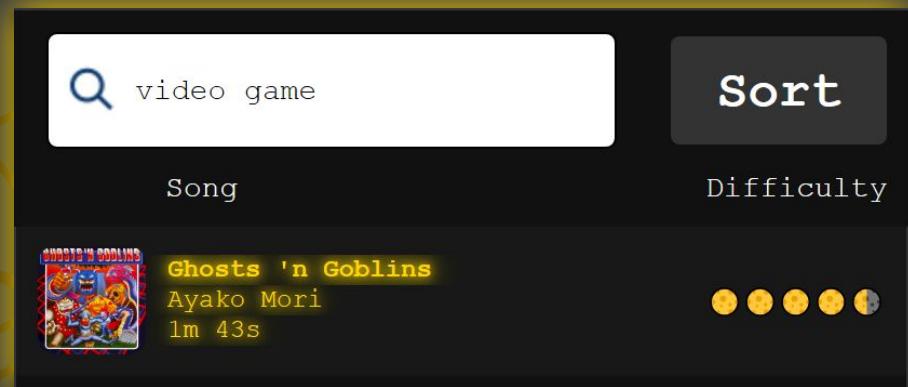
auto-generated



Song Database

```
songs.json

{
  "name": "Ghosts 'n Goblins",
  "artists": [
    "Ayako Mori"
  ],
  "midiFile": "Ghosts_n_Goblins.mid",
  "artwork": "Ghosts_n_Goblins.jpg",
  "genre": [
    "Ragtime"
  ],
  "tags": [
    "video game"
  ],
  "songLengthMS": 103368,
  "noteCount": 2078,
  "favorite": true
}
```



video game

Sort

Song	Difficulty
Ghosts 'n Goblins Ayako Mori 1m 43s	★★★★★
Great Fairy Fountain Koji Kondo 2m 29s	★★★★★
Gusty Garden Mahito Yokota, Avi Mitt... 1m 58s	★★★★★
Gwyn, Lord of Cinder Motoi Sakuraba 3m 36s	★★★★★
Iris Goo Goo Dolls 4m 40s	★★★★★
It's Been So Long The Living Tombstone 2m 51s	★★★★★
Nothing Playing	

Ghosts_n_Goblins.mid



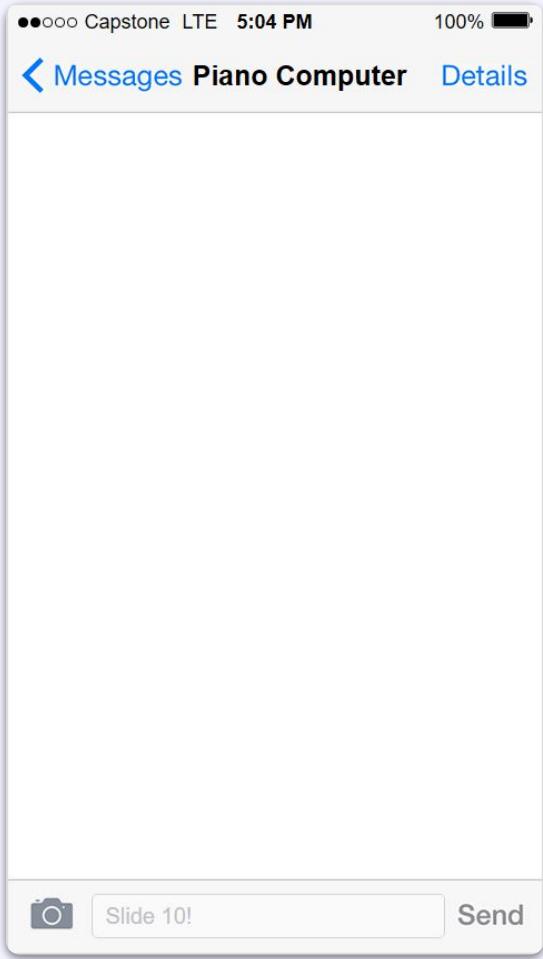
Queueing a Song

1. Data is sent from the website to the server
2. Song file is cleaned
3. Song added to the queue

Queueing a Song

1. Data is sent from the website to the server

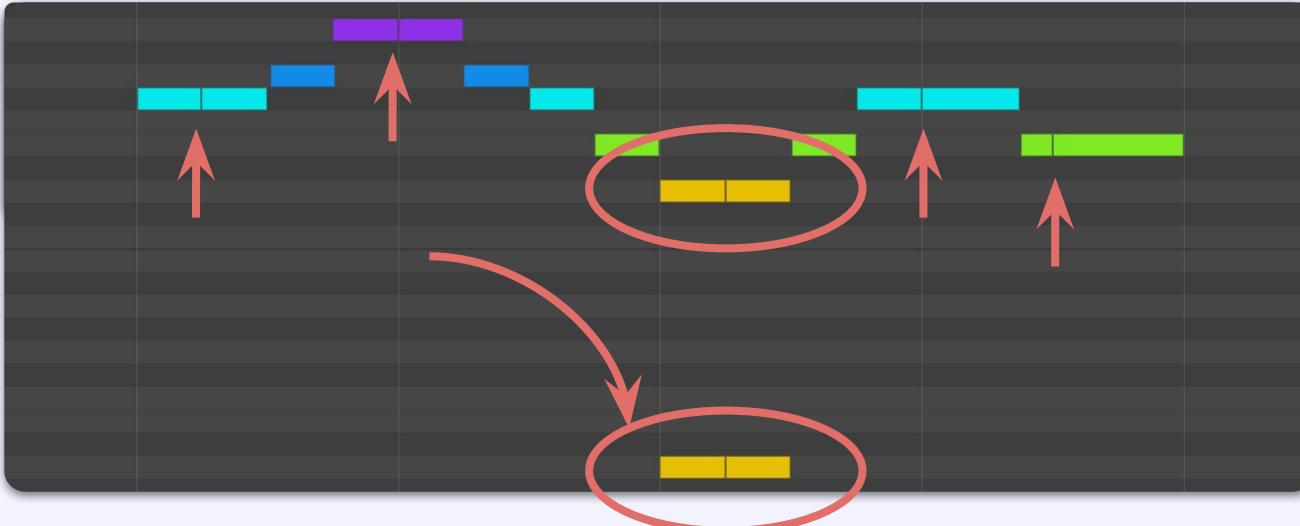
Queueing a Song



Queueing a Song

1. Data is sent from the website to the server
2. **Song file is cleaned**

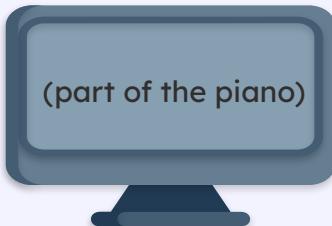
Cleaning the Song



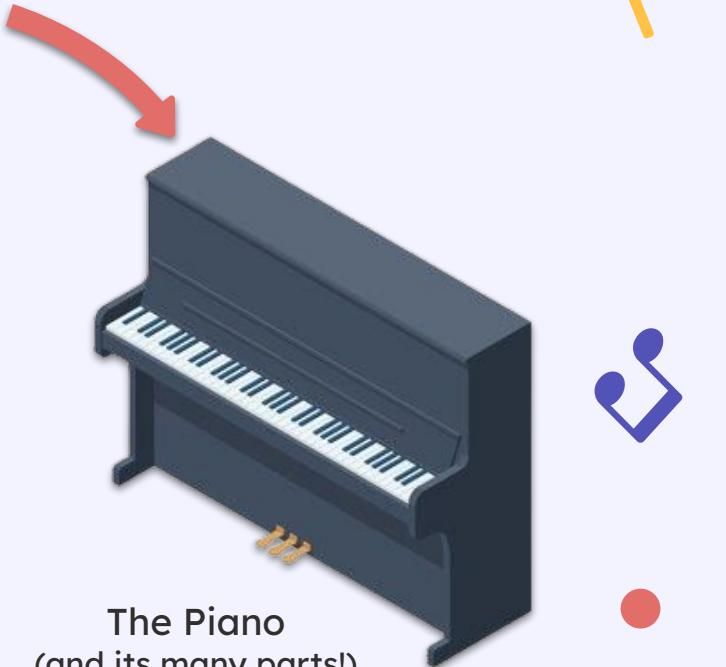
Queueing a Song

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2. Song file is cleaned
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The Piano's
Computer

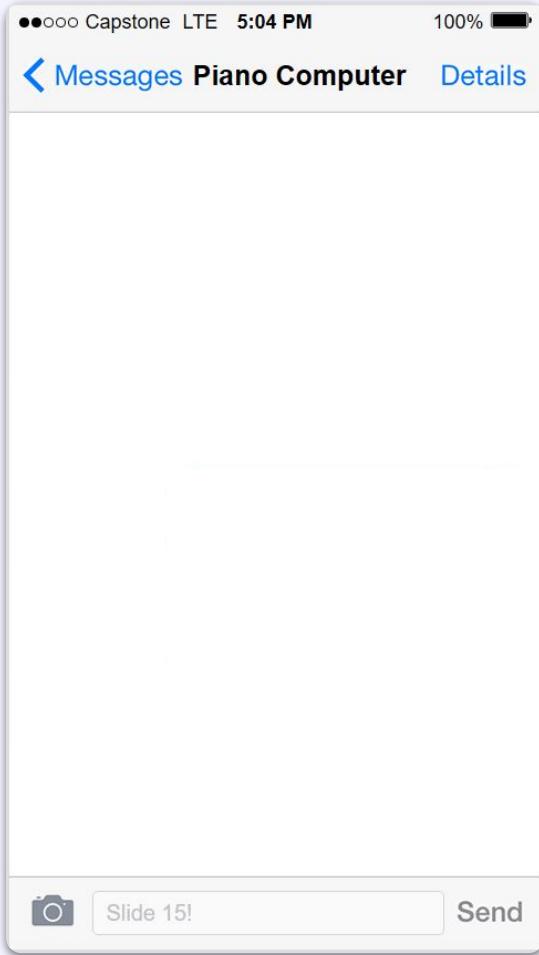


(part of the piano)



The Piano
(and its many parts!)

Computer to Piano Communication





Start Playing

→ [Packet Type]

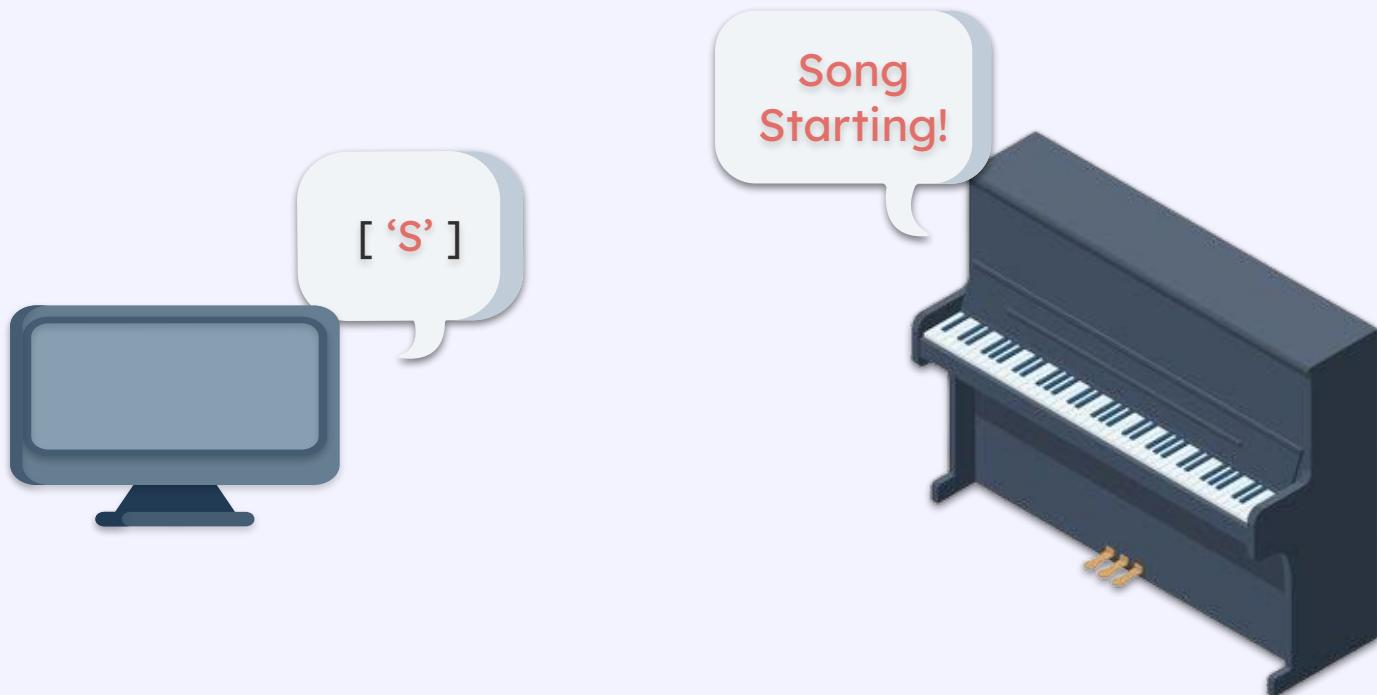
◆ ['S']

Song
Starting





Start Playing





Play Note

→ [Packet Type, Amount of notes, [Notes]]

↳ Notes: [Note Number, Velocity]

→ ['N', 1, 60, 255]

Play Note

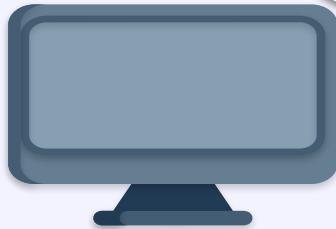
How many Notes

Middle C
on the piano

Hit the note as hard as we can



Play Note



Playing a
middle C as
hard as I can!





Play Note

→ [Packet Type, Amount of notes, [Notes]]

↳ Notes: [Note Number, Velocity]

→ ['N', 2, 60, 255, 67, 127]

Play Note

How many Notes

Middle C on the piano

Hit the note as hard as we can

G4 on the piano

Hit the note only 50% strength



Play Notes

['N', 2, 60, 255, 67, 127]

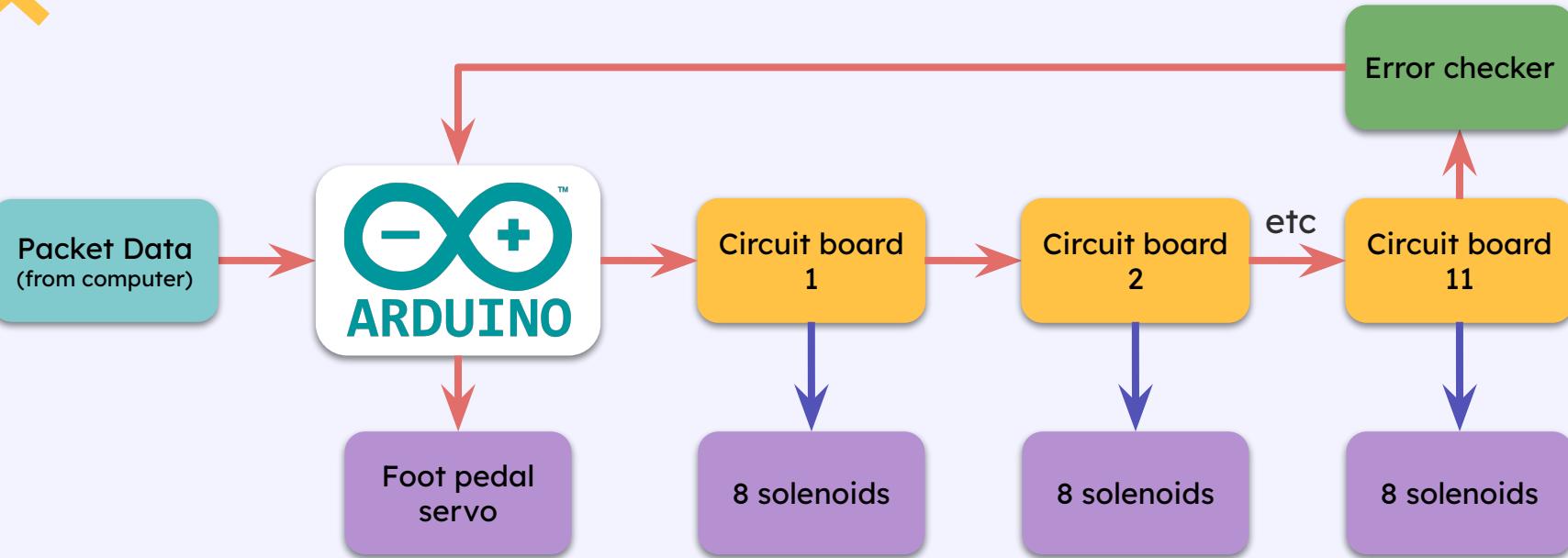


Playing middle C
as hard as I can,
and hitting G4 at
half strength!



The Hardware

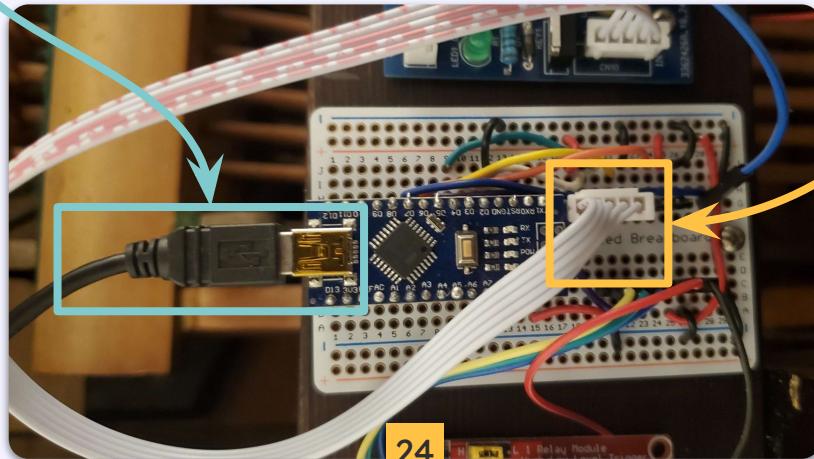
Piano Controller Flow



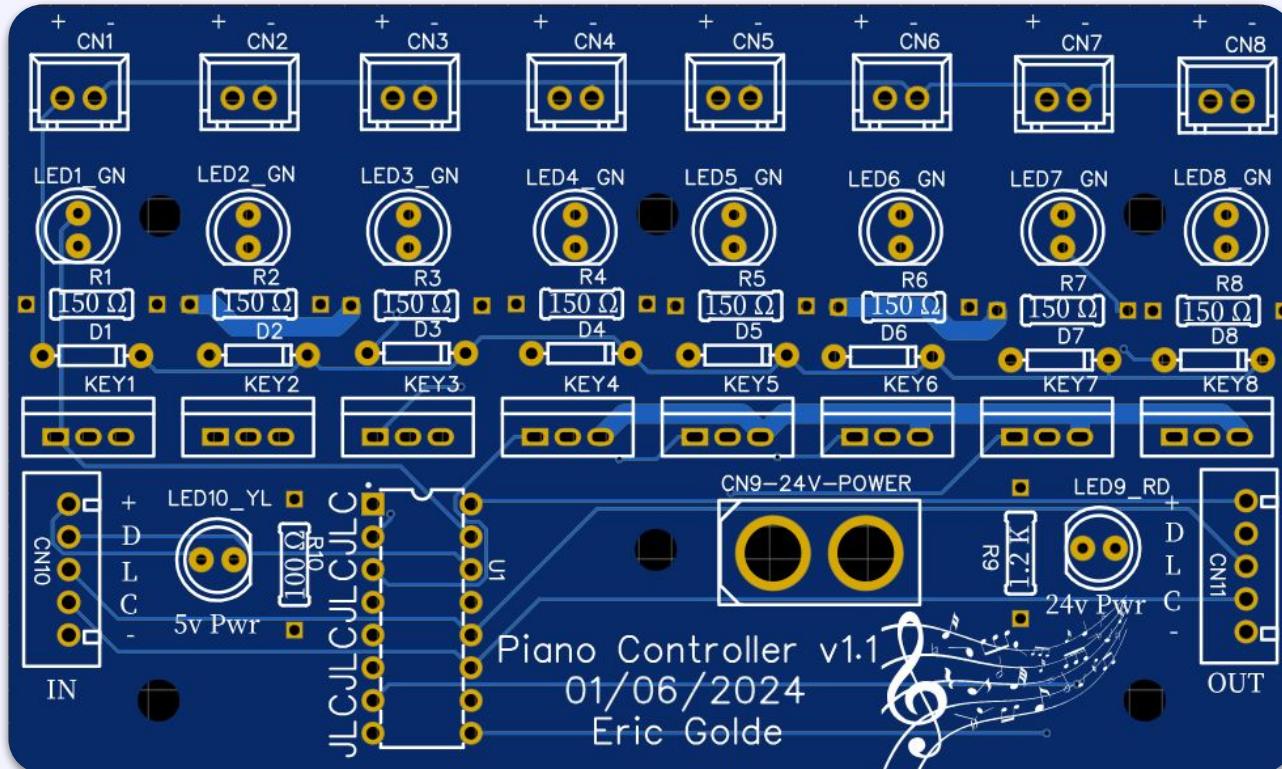
Arduino

[‘N’, 2, 60, 255, 67, 127]

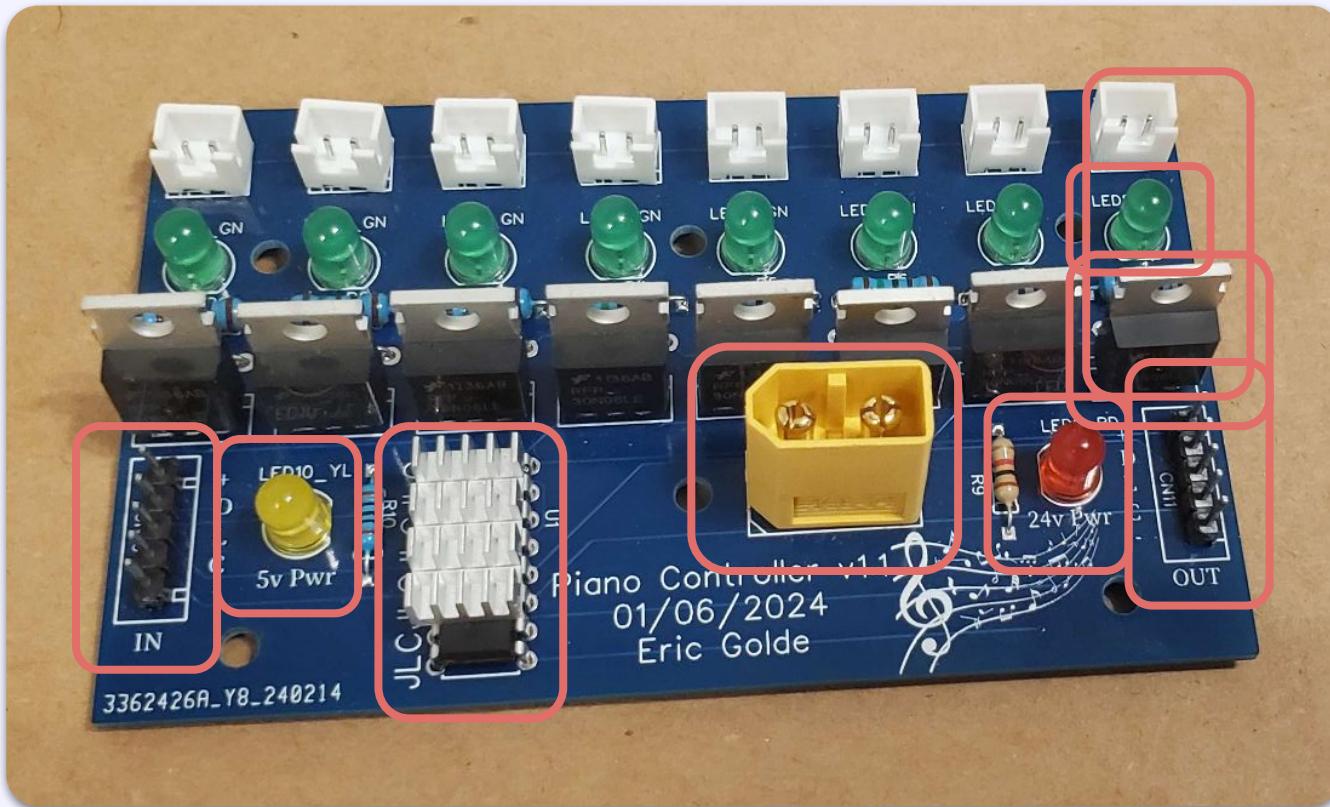
Packet Data



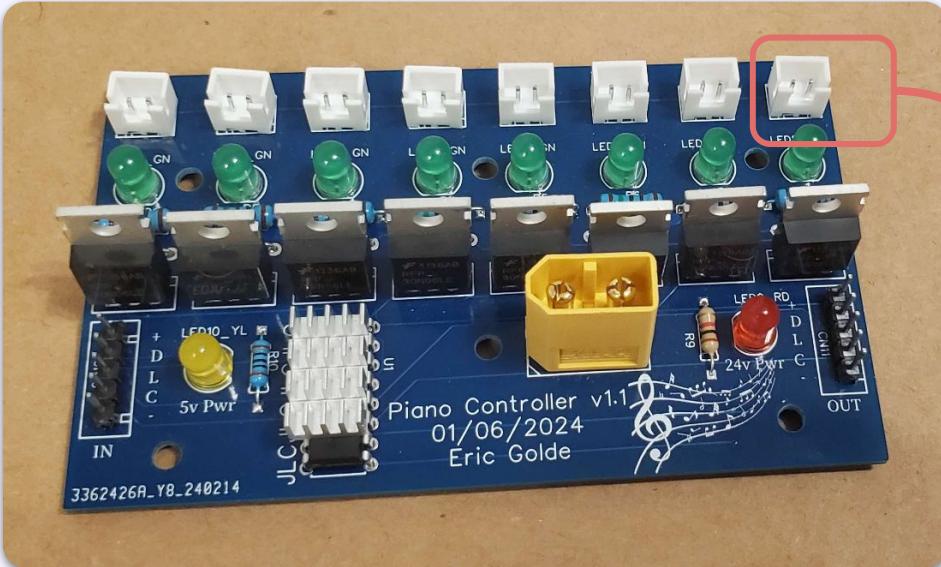
Our Custom Circuit Board



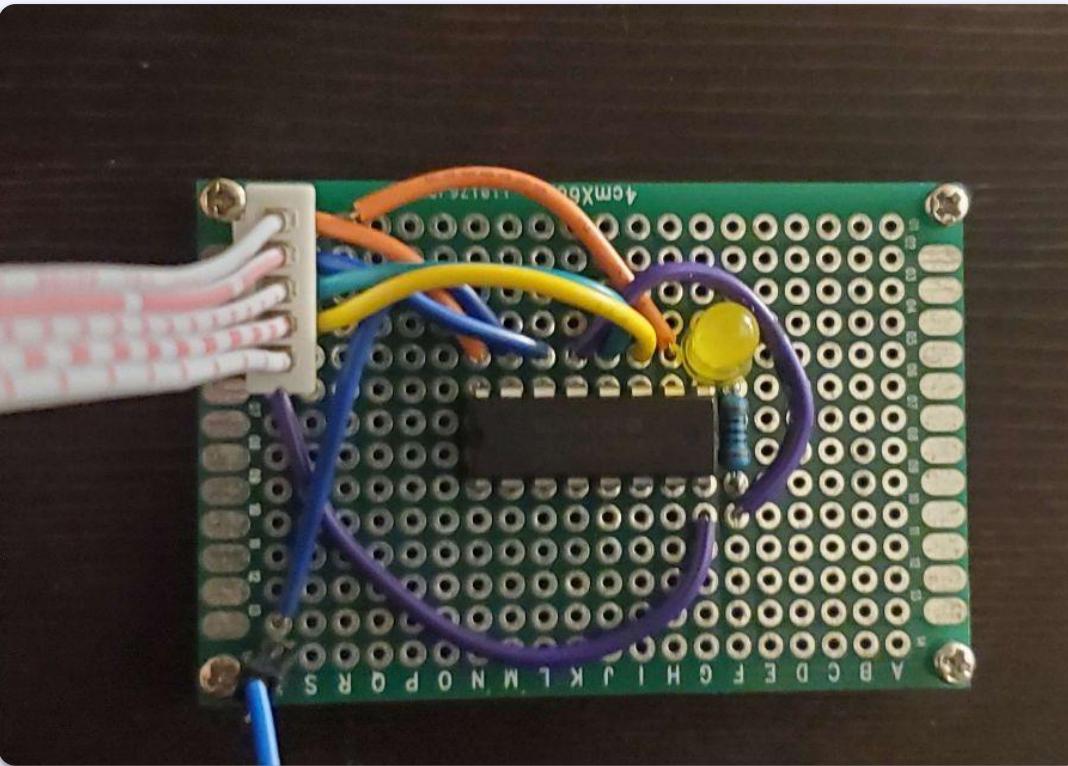
Our Custom Circuit Board



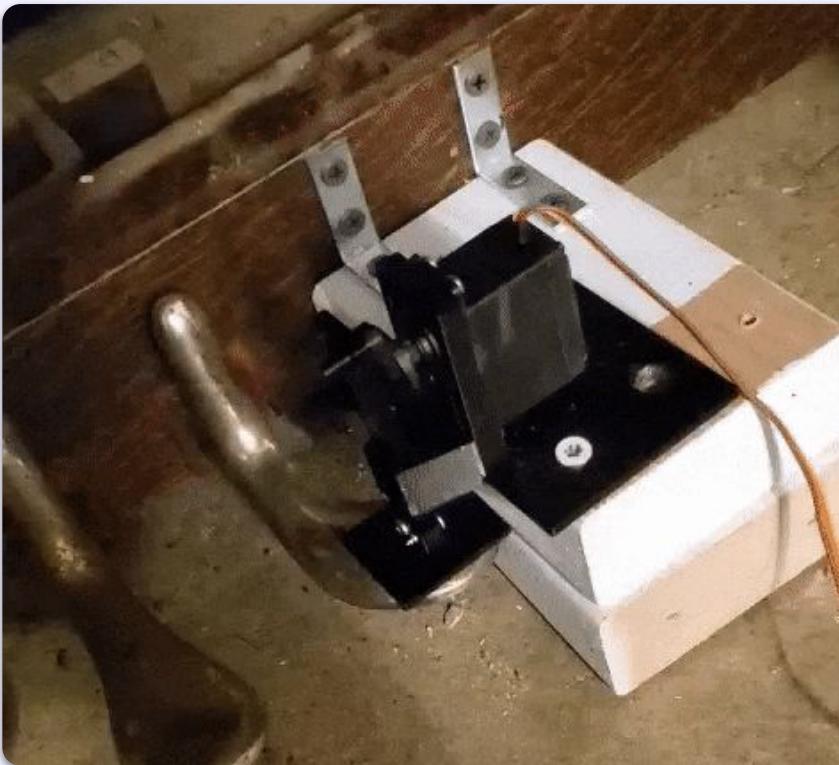
Our Custom Circuit Board

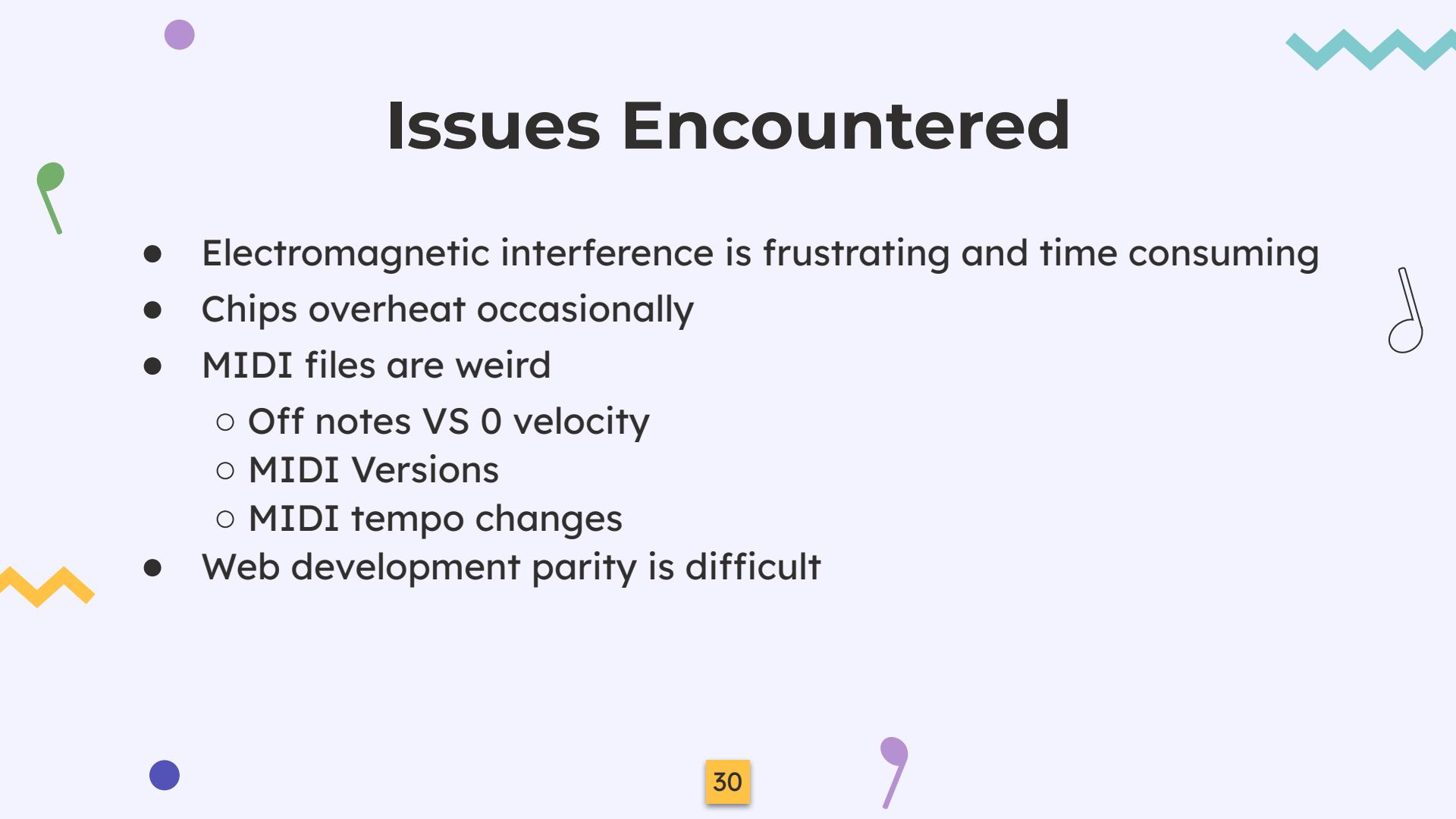


Error Checker



Sustain Pedal





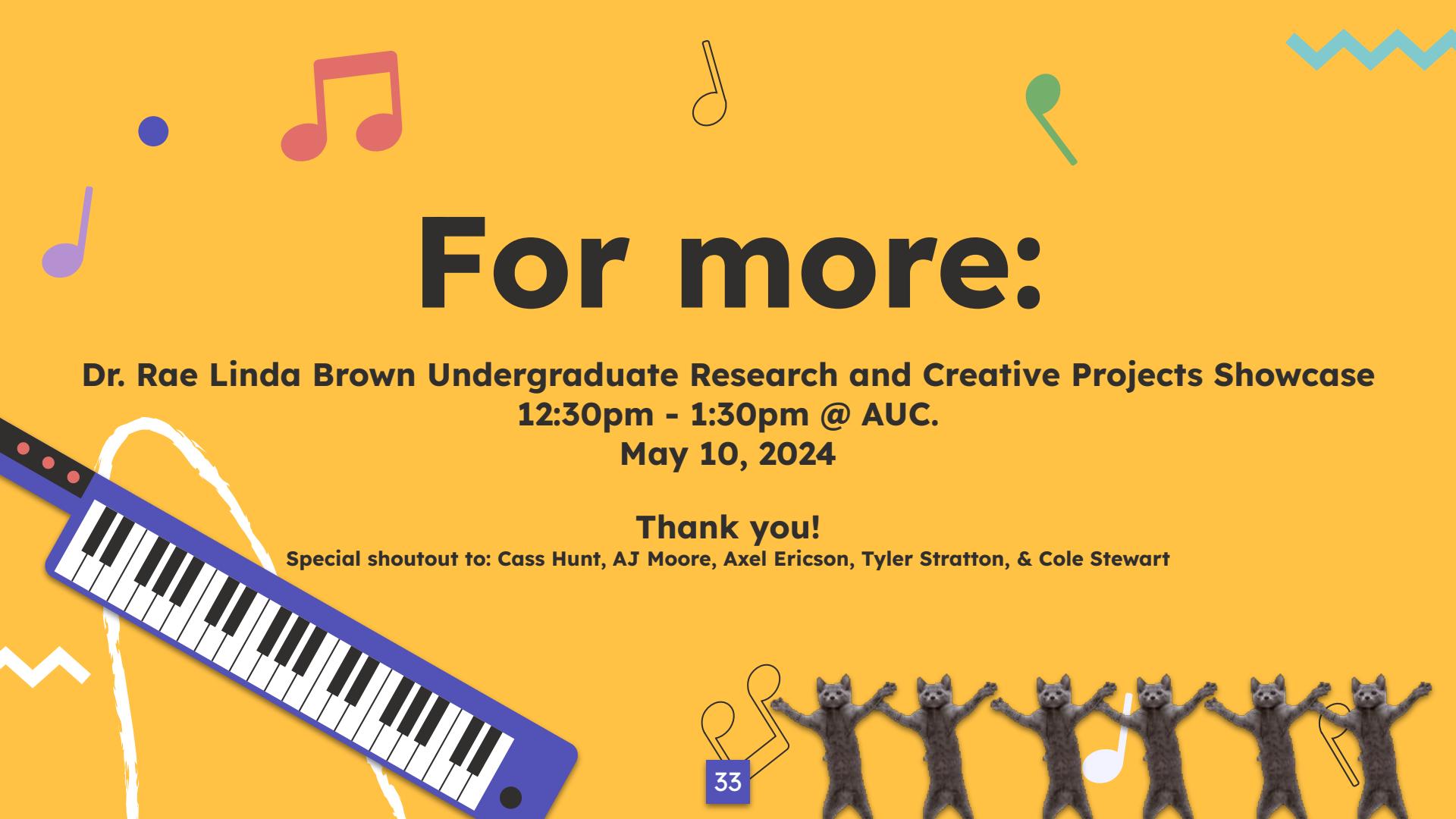
Issues Encountered

- Electromagnetic interference is frustrating and time consuming
- Chips overheat occasionally
- MIDI files are weird
 - Off notes VS 0 velocity
 - MIDI Versions
 - MIDI tempo changes
- Web development parity is difficult

Demo!

Fantaisie in F sharp minor by Frédéric Chopin

Questions?



For more:

Dr. Rae Linda Brown Undergraduate Research and Creative Projects Showcase
12:30pm - 1:30pm @ AUC.
May 10, 2024

Thank you!

Special shoutout to: Cass Hunt, AJ Moore, Axel Ericson, Tyler Stratton, & Cole Stewart

