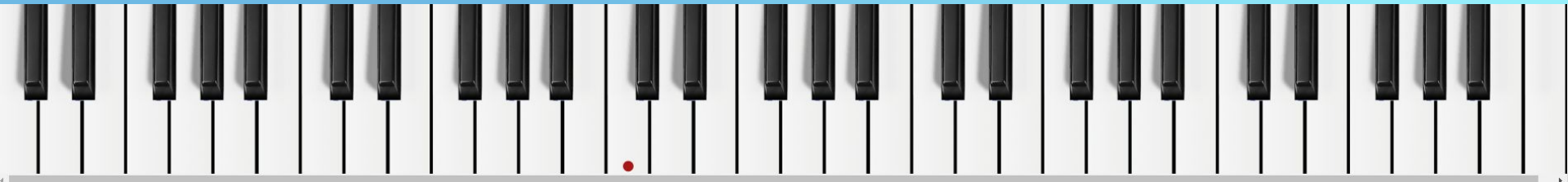
HAND PIANO

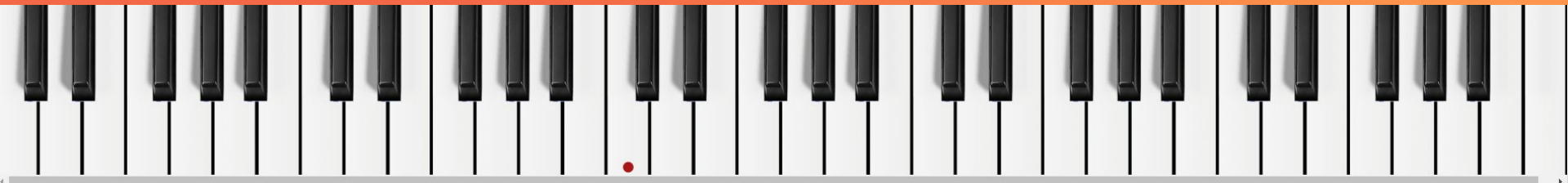
Parth Ray, Gaurav Joshi, Akash Kedia, Ashok Parasa

https://docs.google.com/presentation/d/1PiN0gDxCEjodxxX4bhrAh08CY5x1JmSz8spTk0B9C-o/edit?usp=sharing



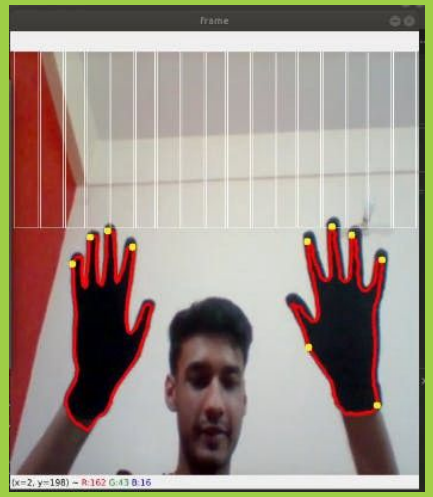
OVERVIEW

- Play piano with fingers through webcam
- Two Parts:
  - Detect hands
  - Play piano key off of a down finger



BACKGROUND

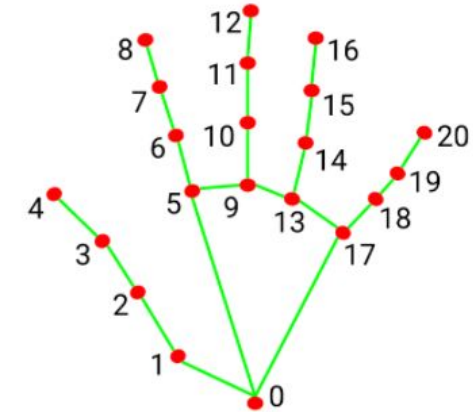
“Air Piano using OpenCV and Python” from Towards Data Science



“OpenCV Piano” from SeanTKeegan on GitHub

DATA AND METHODS

- Hand tracking
  - Detect left and right hand
  - Detect landmarks on each hand
- Trigger note



0. WRIST
1. THUMB_CMC
2. THUMB_MCP
3. THUMB_IP
4. THUMB_TIP
5. INDEX_FINGER_MCP
6. INDEX_FINGER_PIP
7. INDEX_FINGER_DIP
8. INDEX_FINGER_TIP
9. MIDDLE_FINGER_MCP
10. MIDDLE_FINGER_PIP
11. MIDDLE_FINGER_DIP
12. MIDDLE_FINGER_TIP
13. RING_FINGER_MCP
14. RING_FINGER_PIP
15. RING_FINGER_DIP
16. RING_FINGER_TIP
17. PINKY_MCP
18. PINKY_PIP
19. PINKY_DIP
20. PINKY_TIP

EVALUATION

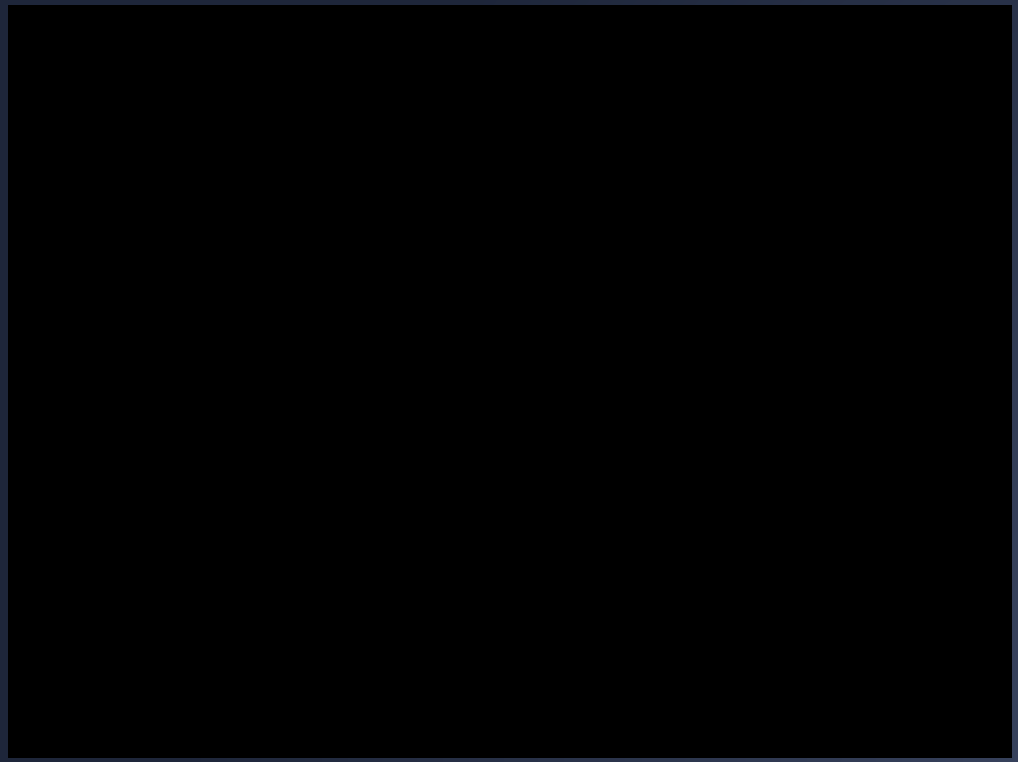
Dataset Problem

- Attempts to perform discrete “presses” were difficult when fingers move conjointly
- Worked around this with metrics

Metrics

- Micro-average precision of finger-press detection totals
  - **Higher is better**
- Average percent error of finger-press detection totals
  - **Lower is better**

RESULTS (VIDEO 1)



RESULTS (VIDEO 1) CONT.

First Iteration (**High detection confidence**)

- Micro average precision: **80%**
- Mean percent error: **20%**

Second Iteration (**Low detection confidence**)

- Micro average precision: **80%**
- Mean percent error: **20%**

RESULTS (VIDEO 2)

RESULTS (VIDEO 2) CONT.

First Iteration (**High detection confidence**)

- Micro average precision: **60%**
- Mean percent error: **20%**

Second Iteration (**Low detection confidence**)

- Micro average precision: **60%**
- Mean percent error: **20%**

RESULTS (VIDEO 3)

RESULTS (VIDEO 3) CONT.

First Iteration (**High detection confidence**)

- Micro average precision: **30.0%**
- Mean percent error: **26.4%**

Second Iteration (**Low detection confidence**)

- Micro average precision: **50%**
- Mean percent error: **11.4%**

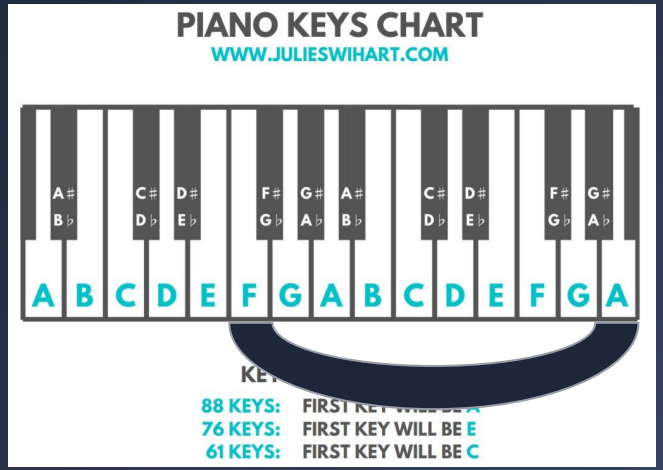
OUTLOOK

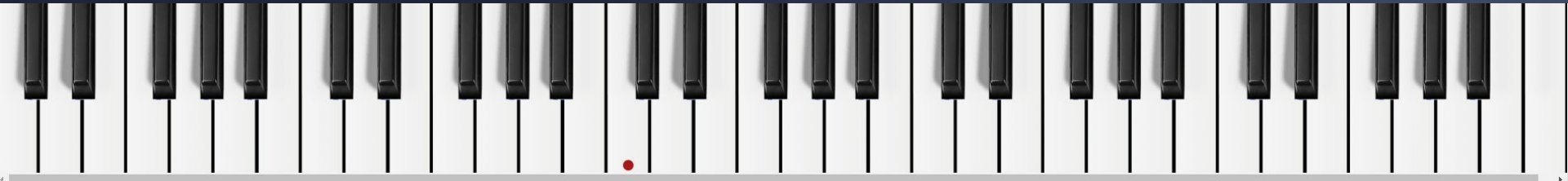
Supports:

- Two hands
- Play the notes:
  - F, G, A, B, C, D, E, F, G, A

Future:

- Overlay, interactive elements






THANK YOU!
ANY QUESTIONS?