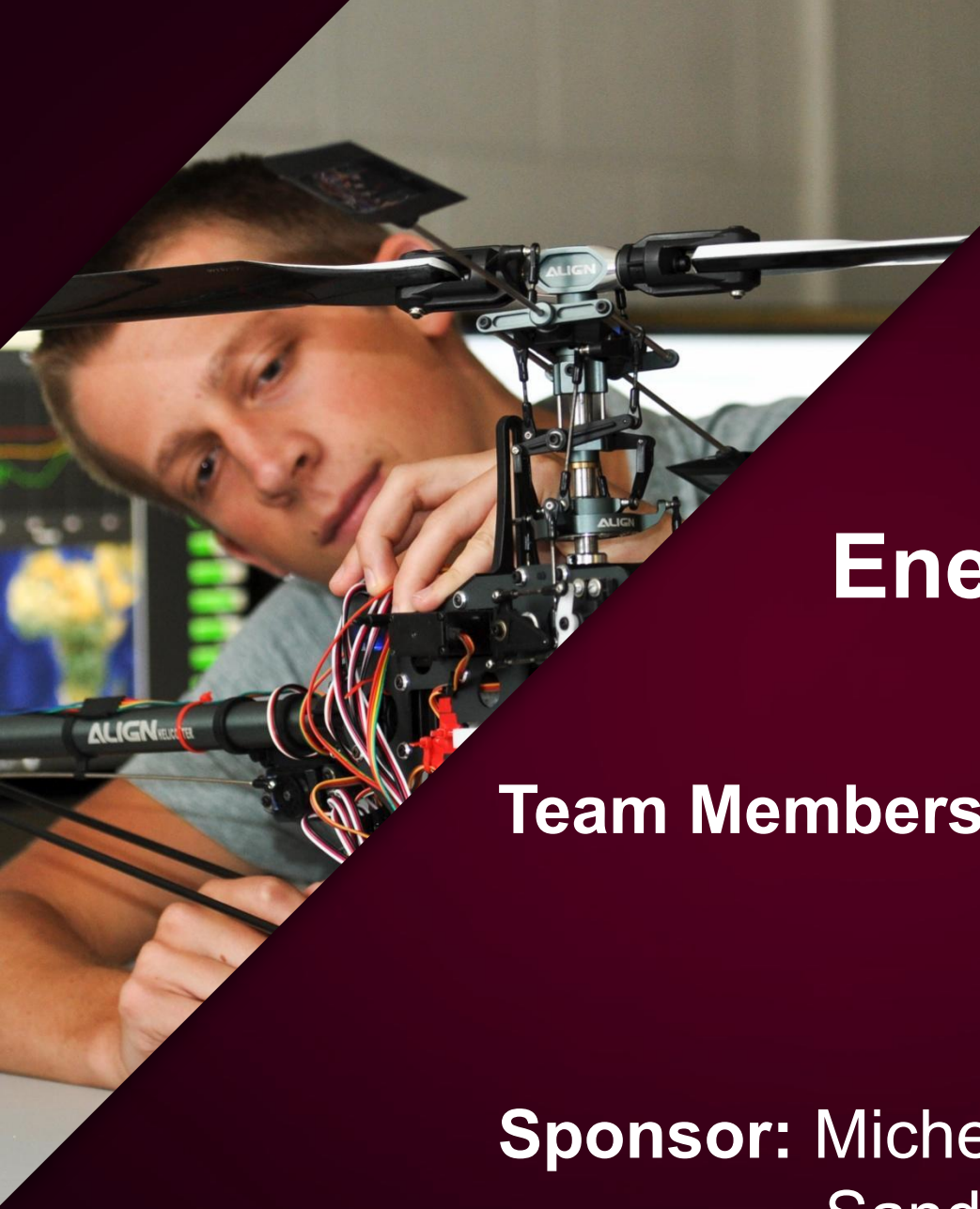


Dwight Look College of ENGINEERING
TEXAS A&M UNIVERSITY

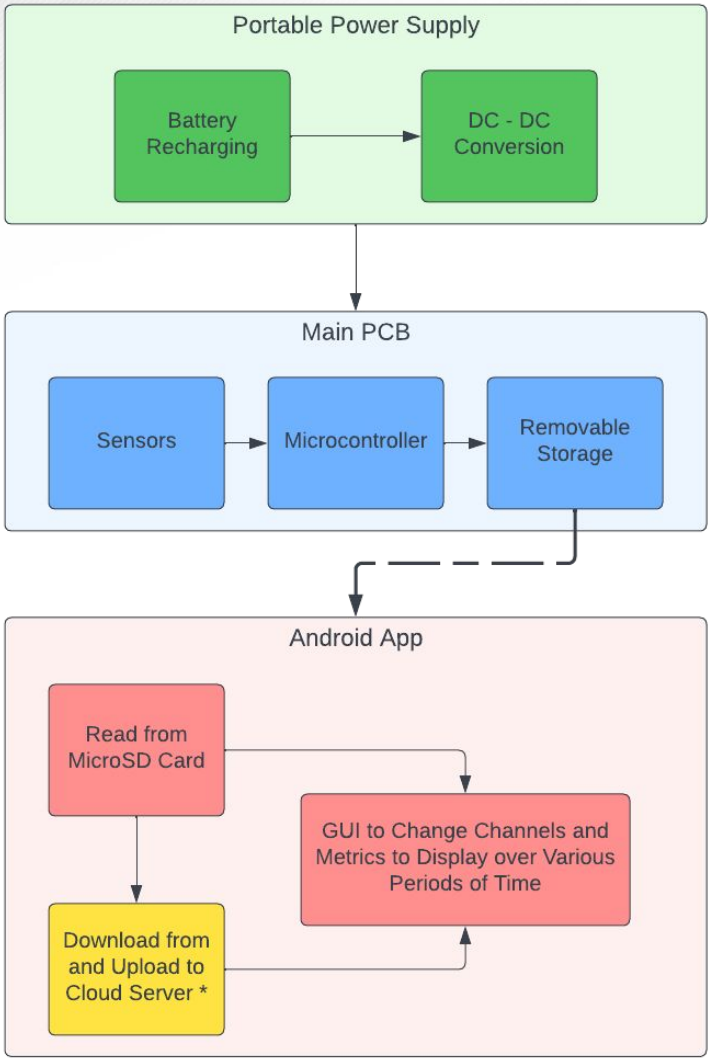
Portable High Energy Experiment (PHEE) DAQ

Team Members: Ethan Barnes
John Sabra
Sang Hoon Chung

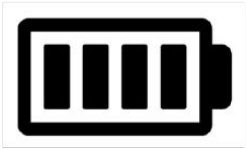
Sponsor: Michelle Chatter
Sandia National Laboratories

TA: Max Lesser

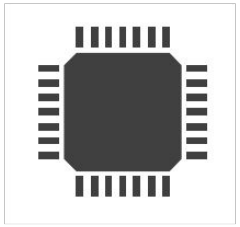
System Overview



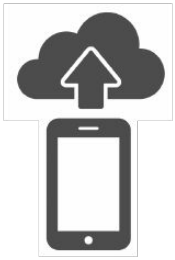
Johnny Sabra



Ethan Barnes



Sang Hoon Chung



Johnny Sabra *

Execution and Validation

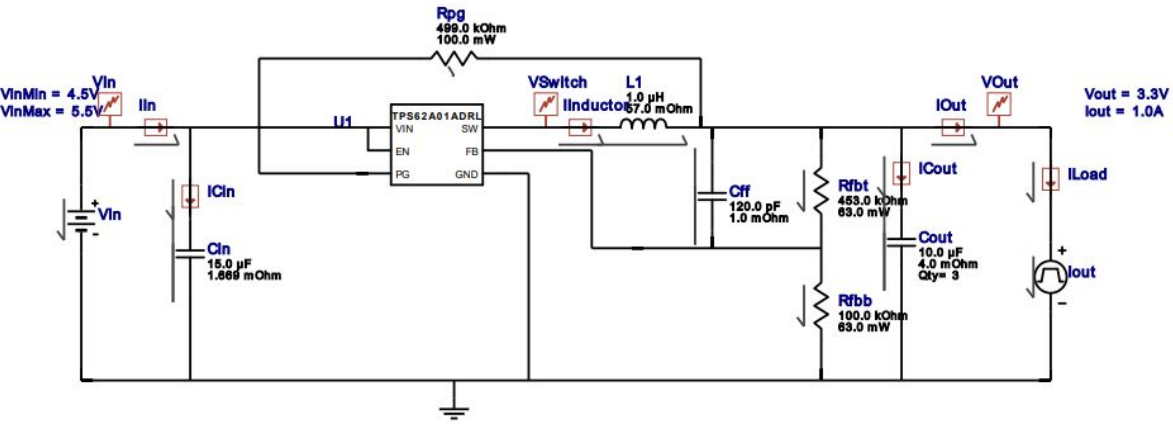
Currently: Outlined needs for each system

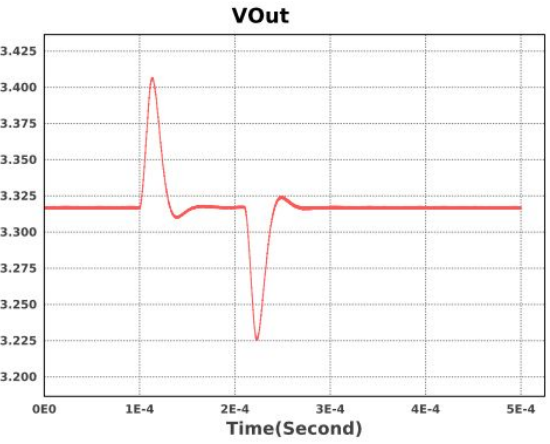
	March 20th	March 27th	April 3rd	April 10	April 17
Power Supply	3 V output from DC/DC Buck Converter	Buck Converter steps down the Power Path IC's output	5 V output from Power Path IC	Power Path IC can take DC input via USB charging	Battery charges at 1C rate
Microcontroller	Sample at ~~2 kHz~~ 100 kHz ~~and get signal to noise ratio above 40 dB~~	Detection algorithm is 90% accurate* (Unverifiable)	Write data to SD card in specified format	Functioning prototype using dev board	PCB design interfaces MCU with sensors and SD card port
Android Application	Develop GUI for users to interact with app	Read data from SD card and compute metrics on data	Set up the cloud server account and file directory	Connect from the cloud server to app	Upload and download the data to and from cloud server

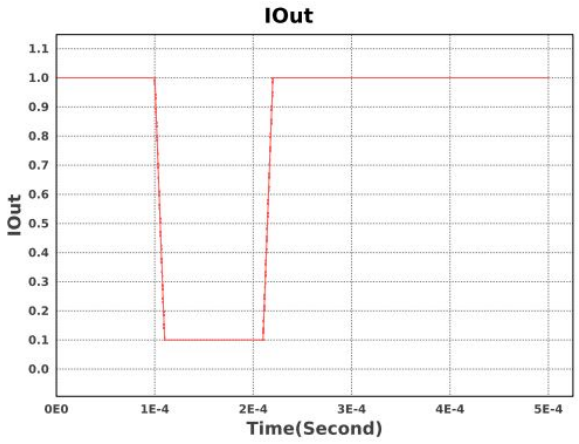
Power Supply Subsystem

John Sabra

Accomplishments since the last presentation	Ongoing progress/problems and plans until the next presentation
• Completed buck converter design and simulation • Completed buck converter validation circuit • Began PCB design for buck converter and battery charger • Completed external part footprints for both battery charger and buck converter • Began battery charger design	• Completing Battery charger Design • Measure a voltage output between 4.5 and 5.5V from the battery charger • Complete PCB footprint • Adjusting battery charger design for 3-cell battery

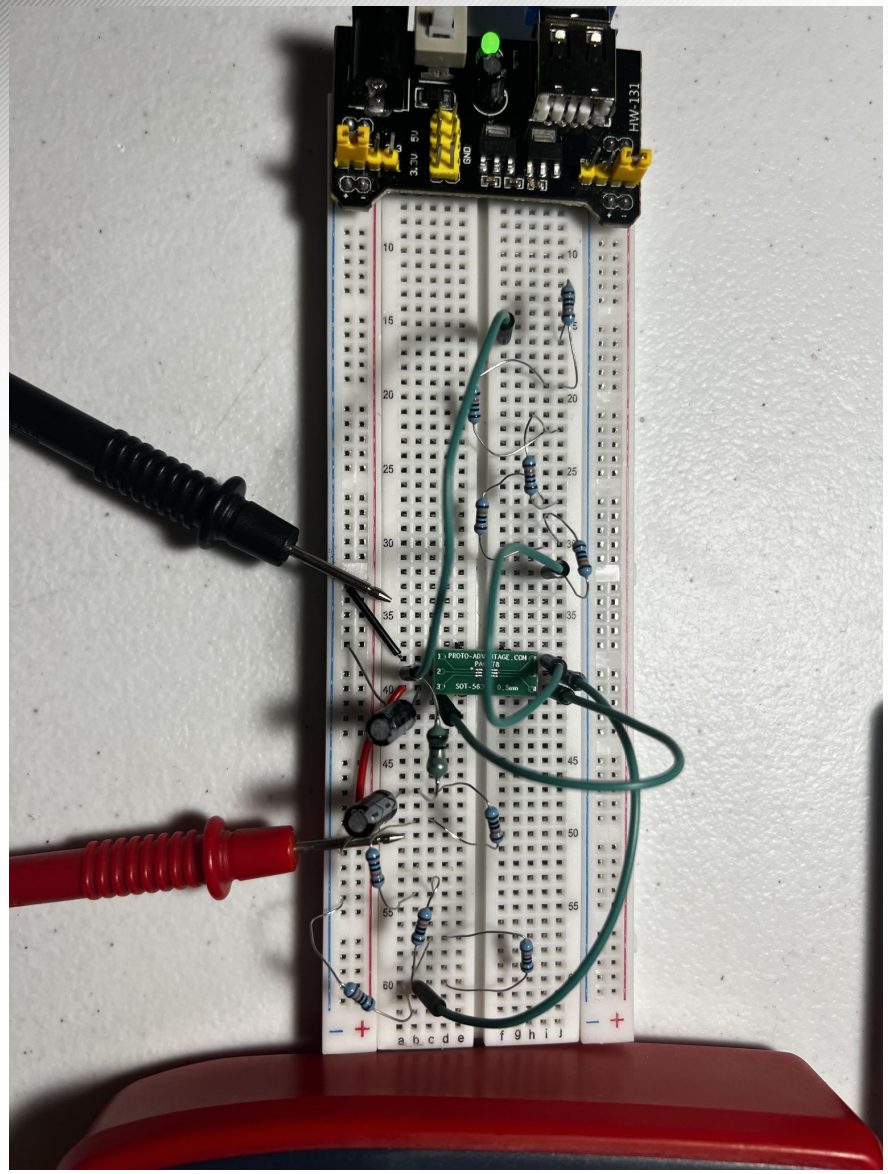


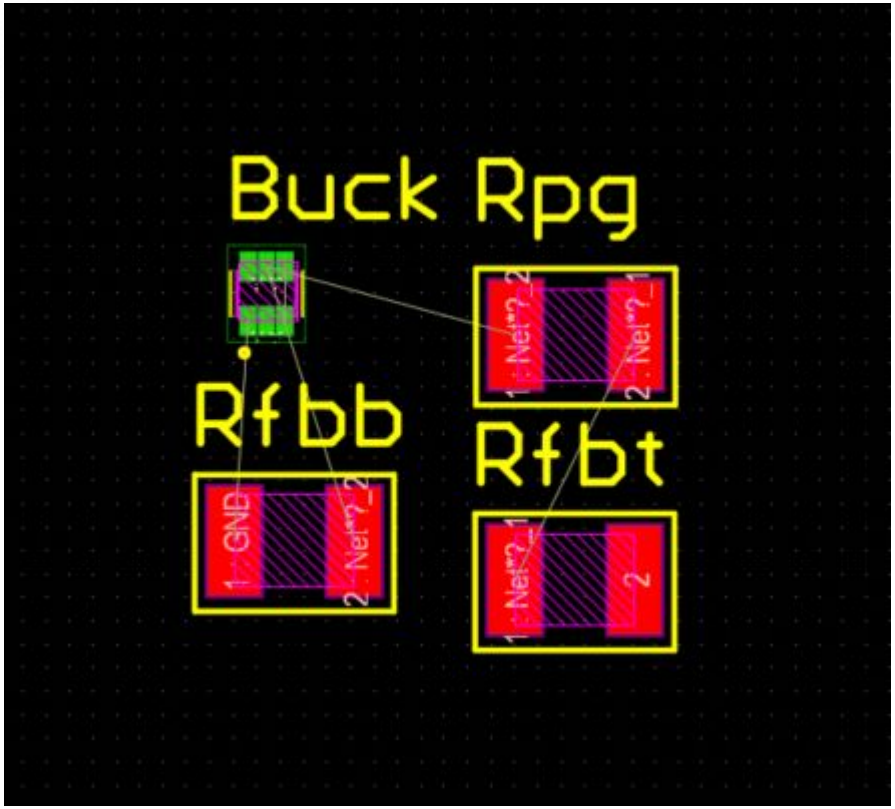


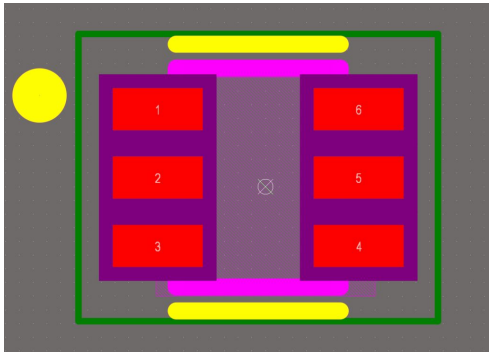


	Simulation	Validation
Rpgg	499kOhm	500kOhm
Rfbt, Rfbb	453kOhm, 100kOhm	400kOhm, 100kOhm
Cin, Cout	15uF,15uF	10uF, 10uF
Vin	5.5 V	5.07 V
Vout	**3.318 V**	**3.081 V**

Table. Simulation vs. Verification Results


HW-131
3.3V
5V
GND


Buck Rpg
Rfbb
Rfbt
GND
Net"?_2
Net"?_1


1
2
3
4
5
6

Microcontroller Subsystem

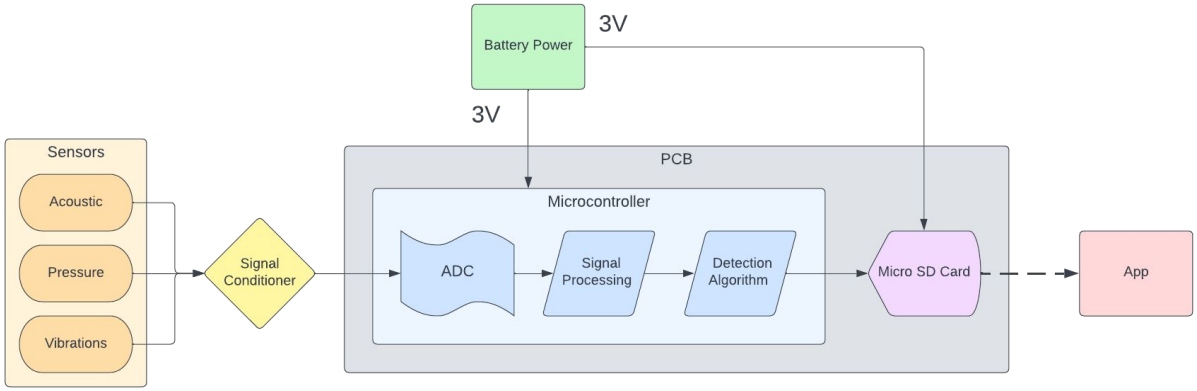
Ethan Barnes

Accomplishments since the last presentation	Ongoing progress/problems and plans until the next presentation
• Able to read data from all 5 channels of ADC at 100 kHz • Code implemented to mount SD card every time the program is run and save test files	• Can't output through serial monitor for debugging • Need to interface SD card reader with MCU to confirm code works • Still don't have signal conditioner from Sandia to power sensors • Need to begin PCB design

Starter code to save to SD card for proof of concept

```
204  // Mount SD card
205  fresult = f_mount(&fs, " ", 0);
206
207  if(fresult != FR_OK){
208      send_uart("error in mounting SD card...\n");
209  }
210  else{
211      send_uart("SD card mounted successfully...\n");
212  }
213
214  // Check free space on card
215  f_getfree("", &fre_clust, &pfs);
216
217  total = (uint32_t)((pfs->n_fatent - 2) * (pfs->csize * 0.5));
218  sprintf(buffer, "SD card total size: \t%lu\n", total);
219  send_uart(buffer);
220  bufclear();
221  free_space = (uint32_t)(fre_clust * pfs->csize * 0.5);
222  sprintf(buffer, "SD card free space: \t%lu\n", free_space);
223  send_uart(buffer);
224
225  // Create and open file, then close file
226  fresult = f_open(&fil, "file2.txt", FA_OPEN_ALWAYS | FA_READ | FA_WRITE);
227  fresult = f_puts("This data is from the first file\n\n", &fil);
228  fresult = f_close(&fil);
229
230  send_uart("file1.txt created and the data is written\n");
231  fresult = f_open(&fil, "file1.txt", FA_READ);
232
233  // Everything worked good except the "file.size" reference
234  // This has been replaced in ChaN's FatFs R0.12c version with f_size(&fil)
235  f_gets(buffer, f_size(&fil), &fil);
236  send_uart(buffer);
237  f_close(&fil);
238  bufclear();
```

Signal conditioner to power sensors will be provided by Sandia



Variables | Live Expressions | Breakpoints | Expressions | Registers

Name	Type	Value
UART_counter	int	134241721
previous_audio	uint32_t	2477
previous_pressure	uint32_t	2073
previous_acc	uint32_t	5309
previous_acc_x	uint32_t	1707
previous_acc_y	uint32_t	4081
previous_acc_z	uint32_t	2937
current_audio	uint32_t	134218229
current_pressure	uint32_t	0
current_acc	uint32_t	134249928
current_acc_x	uint32_t	134249932
current_acc_y	uint32_t	15728640
current_acc_z	uint32_t	0

Expression	Type	Value
count	uint8_t	28 '\034'
adc_buf_max	uint32_t	2521
adc_value[0]	uint32_t	2437
adc_value[1]	uint32_t	2021
adc_value[2]	uint32_t	4095
adc_value[3]	uint32_t	4061
adc_value[4]	uint32_t	2901

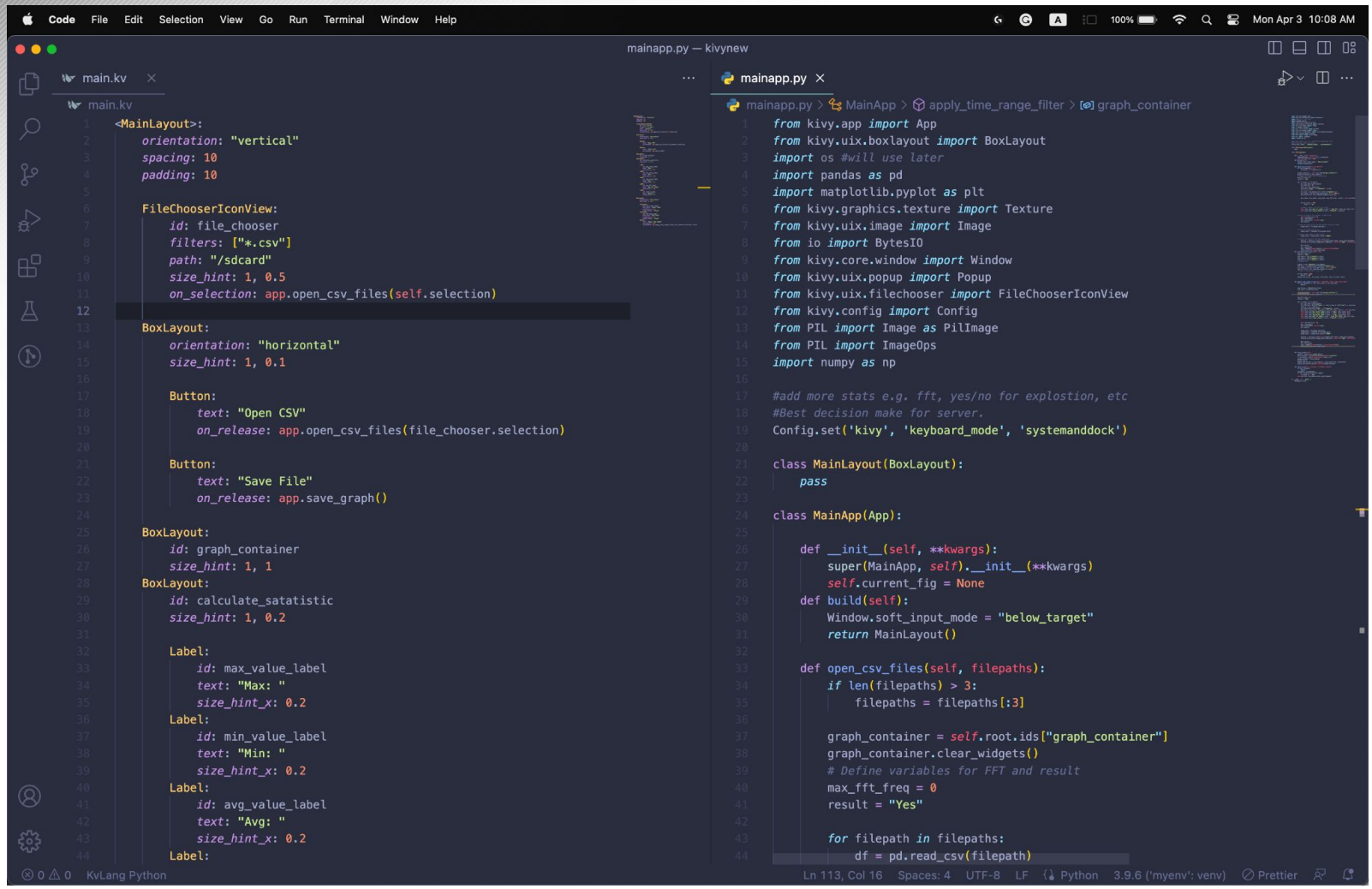
Values for current and previous ADC samples for each channel

Raw ADC readings for each channel

Android Application Subsystem

Sang Hoon Chung

Accomplishments since the last presentation	Ongoing progress/problems and plans until the next presentation
• Develop GUI for users to interact with app using KIVY Framework • Read data from SD card and compute metrics on data (Max, Min, Avg, FFT, and presence or absence of explosion) • Upload and download the data	• Deploy the app to computer and smartphone • Set up the cloud server account and file directory • Connect from the cloud server to app



Code to develop GUI for analyzing the signal

The app shows:

- Open and Save file button
- The figure of the signal
- The information value from the signal
- Time adjustment button