



VALOR JROTC & TARGET Presentation

Andrea Villalon and Ashank Manda

Ashank Manda



- I am a recent graduate of Bolingbrook High School and have interest in the mechanical and electrical engineering fields.
- In the fall, I plan to attend Carnegie Mellon University majoring in the aforementioned subjects.
- I was a part of my school's AFJROTC program for 4 years, which led to me being part of the Valor program.
- Took this internship to gain exposure towards fields I am interested in and gain experience in the field.



Andrea Villalon



A little bit about me...

- I am a rising senior at St.Charles North High School.
- I have many interests including dance, space, art, and science!
- I am involved in SNHS, MNHS, fashion club, student council, ect.
- I have a high interest in math and science
- I applied for this internship hoping I would gain more exposure to the different STEM fields.

Why Fermilab?

Andrea Villalon

- I chose Fermilab because of how inclusive they are
- I wanted to meet people who shared my interests
- I wanted to learn more about engineering
- I hoped it would help peak my interests in a certain engineering field

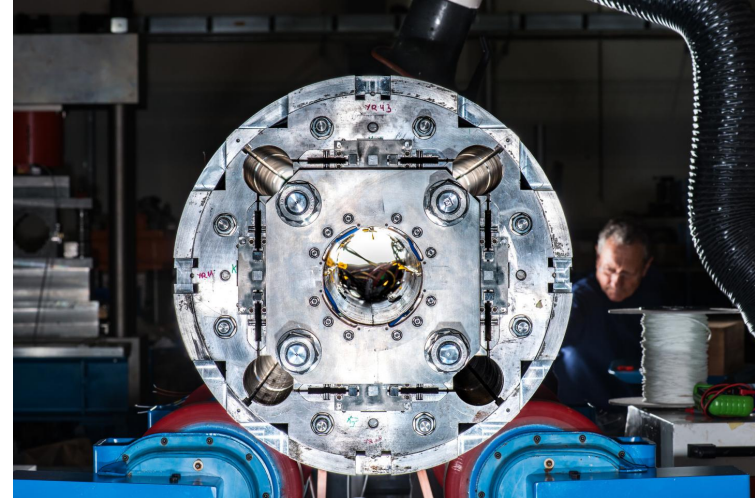
**WHY
NOT?**

Ashank Manda

- Fermilab offers various areas and projects to explore and learn more about
- I wanted to observe and learn what professionals in my field of interest do
- I hope it lays a foundation for future learning opportunities

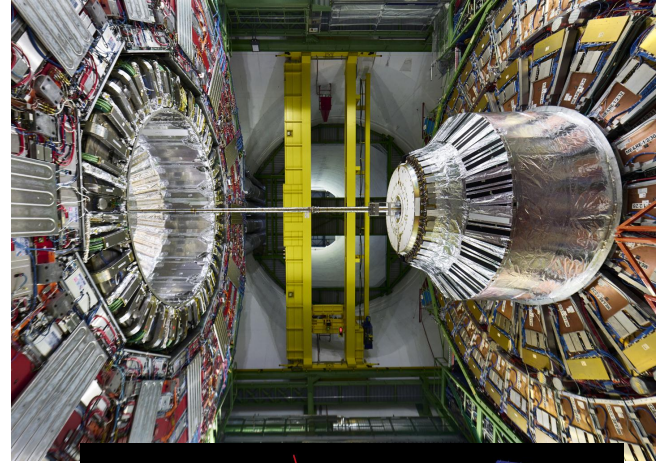
The High luminosity Large Hadron Collider (HL-LHC) upgrade to the Large Hadron Collider (LHC)

- One of the direct projected improvements are an increase in the production of Higgs Bosons per year from 3 million a year in 2017, to over 15 million per year.
- The HL-LHC aims to improve performance of the LHC, by increasing the number of collision
- Luminosity is proportional to the number of collisions, and higher number of collisions allows for more data and to allow for more frequent observation of rare events.

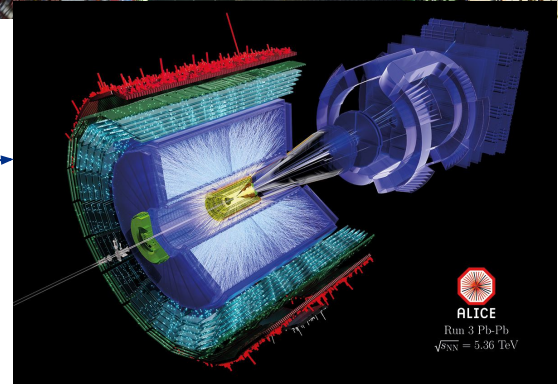


Compact Muon Solenoid (CMS) Detector Upgrade

- The CMS is being upgraded as a part of the overall upgrade of the HL-LHC, it weighs 14,000 tons. The solenoid is the superconducting magnet that coils around the calorimeter
- The CMS detector at CERN is a general purpose detector at the LHC used to study the standard model, to searching for extra dimensions and conducting dark matter research.
- CMS takes 3D “pictures” of the particle collisions, up to 40 million times per second

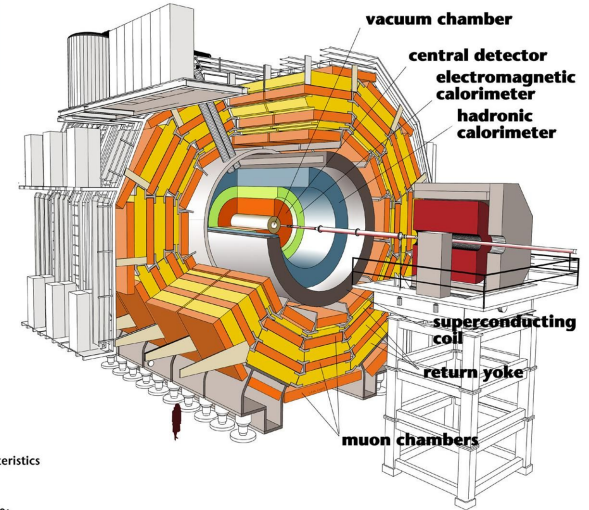
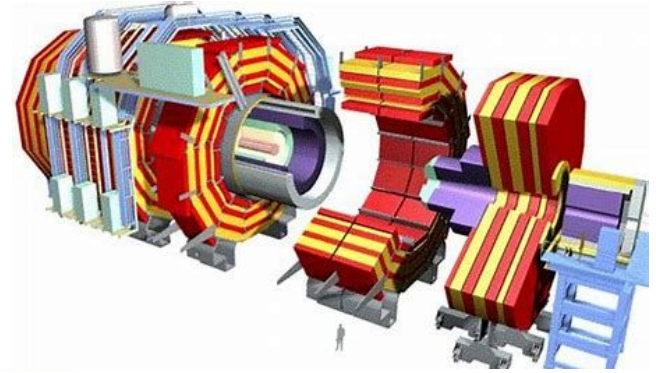


less radiation →
more radiation →



High Granularity Calorimeter(HGCAL)

- CMS detectors to allow for more data collection without interference from radiation.
- Due to the high levels of radiation two radiation tolerant materials have been selected for this upgrade
- This upgrade represents a significant improvement over the original endcap calorimeters by its high readout granularity and precise timing

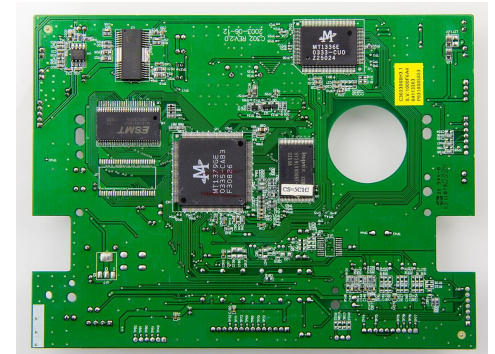


Detector characteristics

Width: 22m
Diameter: 15m
Weight: 14'500t

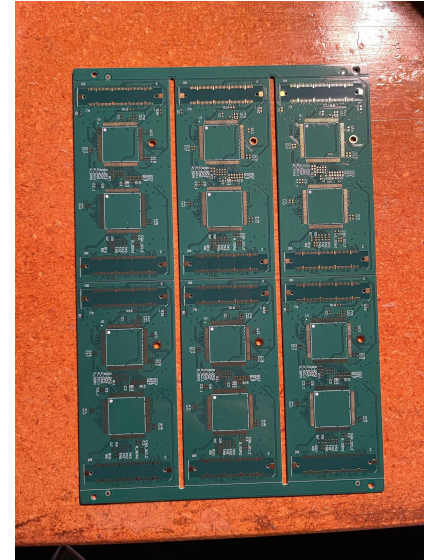
Importance of the PCBs (Printed Circuit Boards)

- Prior to PCBs, electrical circuits were wired point to point, causing circuits to be extremely large, bulky, and heavy.
- Due to the size and complexity of the construction, the production was very labor intensive and made circuits extremely expensive.
- This allows production to be more efficient and allows less room for error given that manual assembly isn't involved, including cheaper production of mass circuits. PCBs are now nearly in all modern electronics.



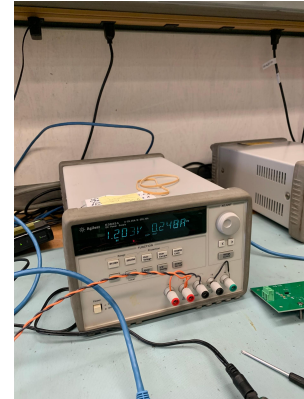
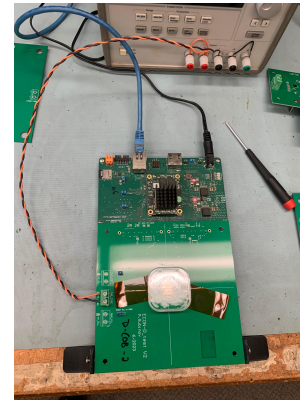
Concentrator Mezzanine Boards(CM)

- The CM boards consists of ECON chips developed and manufactured in a team with Fermilab and CERN. The CM boards consist of 16 different components
- The CM boards include the ECON chips developed at Fermilab, which help concentrate the significant data from large data sets.
- The HGCal project required over 20,000 boards to be produced, including various partial boards, to fit the hexagonal panels.



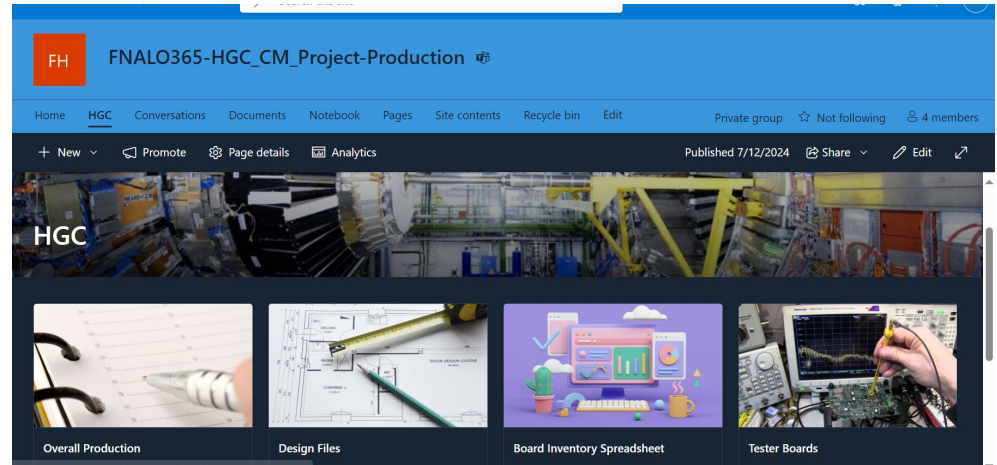
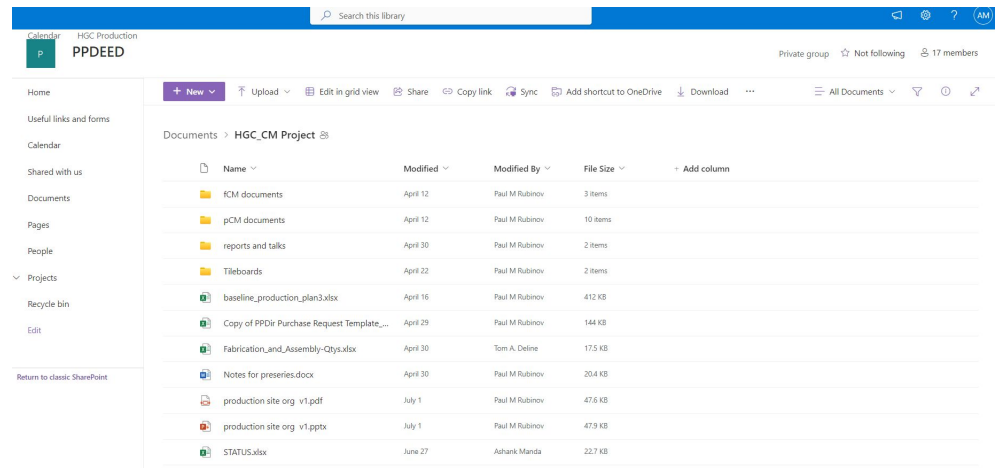
ECON Chips

- The ECON chips here at Fermilab come in two different forms. ECON-D and ECON-T.
- The ECON-T chips save only the potential interesting events every second. This is an algorithm that condenses the collisions so they are easier to process.
- The ECON-D chips take this condensed data and chose the most interesting events to send out for further research
- These stored phenomena and are subsequently processed at a later stage, contributing to the ongoing development of the experiment.



Our focus

- We developed a new web interface to organize the fabrication and purchasing of CM boards to ensure production ran smoothly.
- We implemented various design techniques to ensure the data was easily accessible.
- We created data spreadsheets to coordinate and record the inventory of new parts for the HGC project.
- Helped manage the production of the tester boards, alongside with the final production.



Resume Workshop

Andrea

- Added new experiences to my current resume
- Learned creative techniques to make my resumes stand out
- Learned how to tailor my resume based on the job description
- I got exposure to more resources that help in enhancing my resume.



Ashank

- Got exposure towards resumes of multiple levels to see how to change your resume based on your background
- Networked with someone who reviews resumes
- Developed personal additions to resume based on the workshop

Intro to Robotics

Andrea

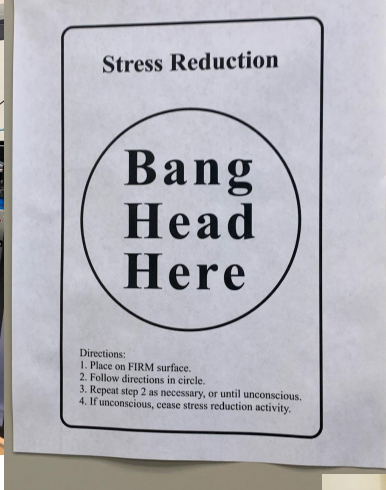
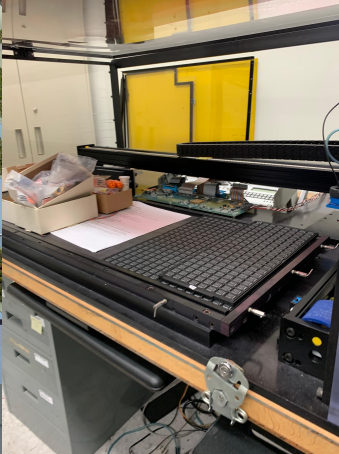
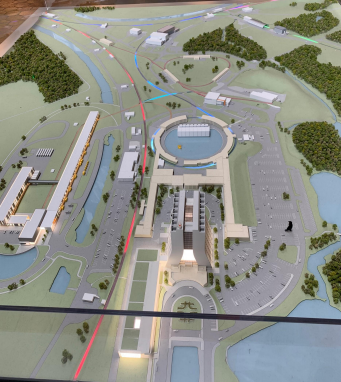
- Gained knowledge about the uses of robots here at Fermilab
- Gained interest in a new field and reached out to learn more
- Learned the importance of robotics for the future
- Learned that computer science is present in all engineering fields



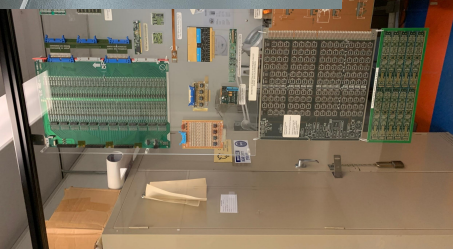
Ashank

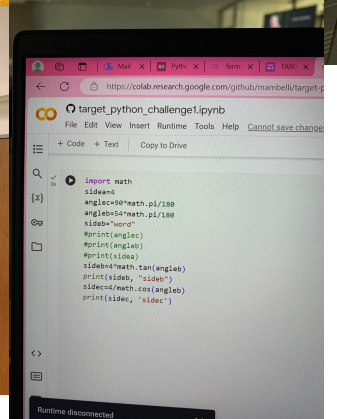
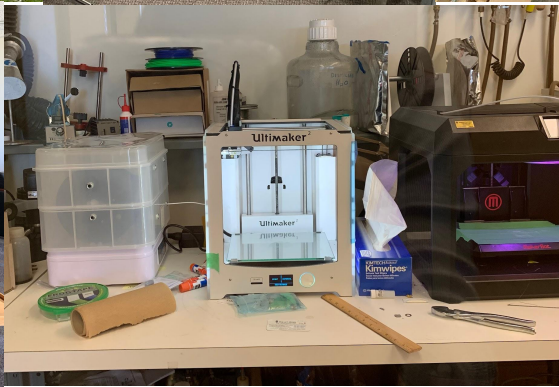
- Learned about different robotics projects at FermiLab
- Got exposure to how multidisciplinary robotics is including mechanics, electronics, computer science, and mechatronics.
- Learned importance of collaboration in development of robots

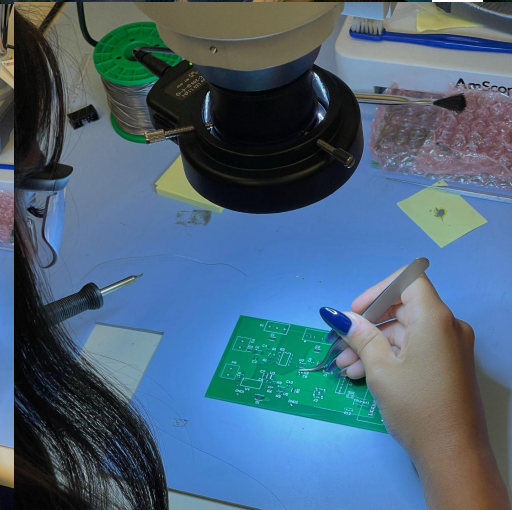




Pictures







Reflection

Andrea

- I learned so many new skills as well as important information including soldering, PCB boards and their different parts, and more.
- I narrowed down my field of interest
- I made friends who share my interests
- I was able to collaborate and work in a team to finish a project

Ashank

- I got exposure to how electronics are produced from testing of chips to soldering pieces for test boards
- Got exposure to real electrical engineering work and hope to pursue my knowledge further in college
- Networked with so many different individuals in various fields
- I love Fermilab



Thank you!!

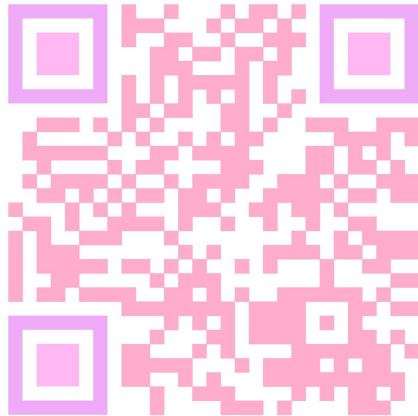
Acknowledgements

- Anahi Ruiz Beltran
- Cortez Watkins
- Paul Rubinov
- Brian Wells
- Angel Verdi
- Major Thomas
- Mrs. Johnson

The End

To connect with us scan the QR codes below!

Andrea Villalon



Ashank Manda

