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Brookhaven National Laboratory is managed by Brookhaven Science Associates and is strongly linked with Stony Brook University. The first session had guest speakers Alexandra Gunderson and Rebecca Trojanowski and they both worked at BNL. Alexandra co-founded a company called UNIFAI that helps companies create datasets easily. They explained how heat pumps work and considerations with operating them. Two topics that they also talked about was how we can use our energy efficiently and how **industrial data can be manipulated**. The question that was asked was "**How do we interpret data that we have collected**?" This lab session did not have an exact answer how the data was being collected, but we learned about **how we can use Python in data analysis** and using a large amount of data at once. The **results that we should notice in our presented data** should be able to tell us something useful, such as a graph or chart. For example, a meter may show high volatility with erratic jumps in a graph, which could suggest that there may be a blockage somewhere. We need to follow a 5 step guideline to define a problem to solve, collect data, polish data, analyze the polished data, then visualize and present the results. In the demonstration part of the session, we learned about Google Colab and completed exercises with data manipulation in Colab by using various methods from Python libraries. This program is suitable for data scientists working online together. I liked the Colab activity as it was relatively easy to set up and relatively simple to understand. The demo Python notebook helped us practice making simple yet applicable visualizations. I think it was a helpful starting point for those who wanted to learn more about data visualization or data analysis as I am a major which may apply these concepts.

The second session of BNL was with Salvador Gonzalez and Elisha Siddiqui. Salvador explained what they do at BNL and their internship opportunities. Elisha taught us about **quantum computing**. The context of this research is quantum computing, which allows us to **expand past traditional computation**. There wasn't an exact question asked but we explored **how quantum computing can be used** and how it is beneficial to current fields of study. Computation with qubits can return different states with fewer resources and **this is much more efficient than regular bits**. Thus, we may be able to allow computers to carry out instructions at exponentially faster rates. This can be combined with logic gates to make various complementary states which also takes advantage of the superpositions states that qubits can have. Towards the end of the session, we looked at a demo with Elisha on using qiskit and python libraries to interact with quantum computations and we **learned that we can create our own gates** and functions. There are **various applications of quantum computing across multiple fields of science**. For example, Elisha mentioned imaging with microscopic specimens with quantum sensors or studying different structures of molecules in chemistry. Mathematics is also involved with these quantum calculations and AI may implement quantum machine learning calculations in the future due to the vast amount of states that they can be in. I liked that Elisha was able to break down the fundamentals of quantum computing so that we could understand it easily. However, I feel that this math still may be beyond my ability to actually apply and understand on my own. I hope that I will be able to learn more about quantum computing because it has so much potential for advancing our current technologies. Additionally, I feel that as a prospective data scientist/analyst I may have to learn and implement this in my own research.