

Kobe:

- **Slide 1 & 2: Introduction**
  - Hello everyone, my name is Kobe and our group project covers annual global emissions and how electric vehicles are a possible solution to combat the risks of global warming.
  - Our group name is Green Wave and our team consists of myself, Ruchita, Avneesh, Tarini, and Mikhail.
- **Slide 3: Project Outline**
  - Starting off with our project objectives, we will first test how EV has been contributing to global GHG emission decrease and how effective it has been over the past few years.
  - We will also show what kind of datasets we've chosen and how we were able to interpret the data itself so that we are able to make calculations and future predictions.
  - Additionally, we'll also cover the data preprocessing phase that shows how each dataset was identified, cleaned, and merged altogether.
  - Then, we'll wrap everything up by presenting our machine learning model, charts, interactive graphs, and an example that supports our hypothesis.
- **Slide 4: Main Objectives**
  - The main objectives of this project begins with analyzing and deconstructing each factor that contributes to GHG emissions by sector and its global impacts.
  - We will then determine if there are any correlations between the emission sectors and if there are any potential risks and warnings that come with it.
  - Then we will run tests based on our merged datasets and will determine if the EV factor will be significant enough to combat global transportation emissions altogether.
  - The last objective will be to verify our hypothesis that electric vehicles can be a valuable asset in lowering total transportation emission sectors with a peer research review example in Norway.
- **Slide 5: Importance of Reducing GHG Emissions**
  - The call for reducing greenhouse gas emissions is very important because carbon comprises the majority of total GHG emissions, and this can negatively impact the air quality, economic growth, climate change, and cost savings.
  - It is very important that we reduce carbon emissions because not only will it benefit our economy, but reversing the impacts of global warming will also improve the lives of people in cities all over the world.

Ruchita: 6, 7, 20

Michael: 8-10, 19

Avneesh:

### **Slide 11: Univariate Analysis**

- Used univariate analysis to detect and remove outliers and applied log transformation to skewed features
- After performing the following we were able to detect that most of the data is skewed to the left
- Fossil Fuels (% equivalent of primary energy) is skewed to the right, and Fossil Fuels (% electricity is bimodal)

### **Slide 12: Multivariate Analysis**

- It is quite evident after performing a multivariate analysis that everything has a positive correlation. Some have strong positive correlations and the others relatively weaker positive correlations

### **Slide 13: Correlations Matrix**

- Point out the correlation we highlighted

Tarini:

### **Slide 14: Machine Learning Design**

In this slide

Hi, I worked on machine learning design.

- We started with a hypothesis that EVs lead to reduction in GHG. This is our alternative hypothesis.
- We defined our X values as features — related to ghg emissions by sectors, and energy production sources.

### **Slide 15: Machine Learning design**

As we merged our data sources, our training dataset was limited to 2004-2015, which we further divided into train-test-validation splits.

### **Slide 16: Model Performance**

- Our initial model had an abysmal R2 score of around 50%.
- But as we applied further improvements, we were able to achieve an R2 score of over 72%.
- Mainly, we removed features with low significance, and performed train-test-validation splits to generalize our model.

### **Slide 17: Hypothesis testing**

- Our hypothesis testing yielded some interesting but expected results.
- The features that support rejection of our null hypothesis are circled in red.
- These features are the ones, which are significantly involved in manufacturing, production, and use of EVs in practice.

**Slide 18: Predictions**

- Our target variable Y in the training dataset was limited to 2004-2015 but we did have feature values X till 2019.
- So as a thought exercise, we decided to hypothetically forecast the Y-values – i.e. CO2 offset by EVs – from 2016-2019
- As expected, we can see that the model predicts that CO2 offset keeps increasing YoY. This matches reality based on our research.