Use of nuclear energy

Group 10

About us

● Josef Glas	master data science
● Felix Korbelius	master physics
● Frank Ebel	master physics
● Johannes Schabbauer	master physics

Datasets

- Energy production/consumption
- Environmental data (CO_2, pollution)
- Ecological data (GDP, net income)
- Political data (Democracy Indices, nuclear warheads, operating reactors)

Size:

- 8502 samples x 42 features
- timeframe 1980 to 2018

Python Libraries

- Data manipulation
  - pandas, numpy, math
- Modelling
  - sklearn
- Country conversion
  - country_converter
- Widgets
  - ipywidgets
- Visualization
  - matplotlib, seaborn, pycountry, plotly, mplcursors

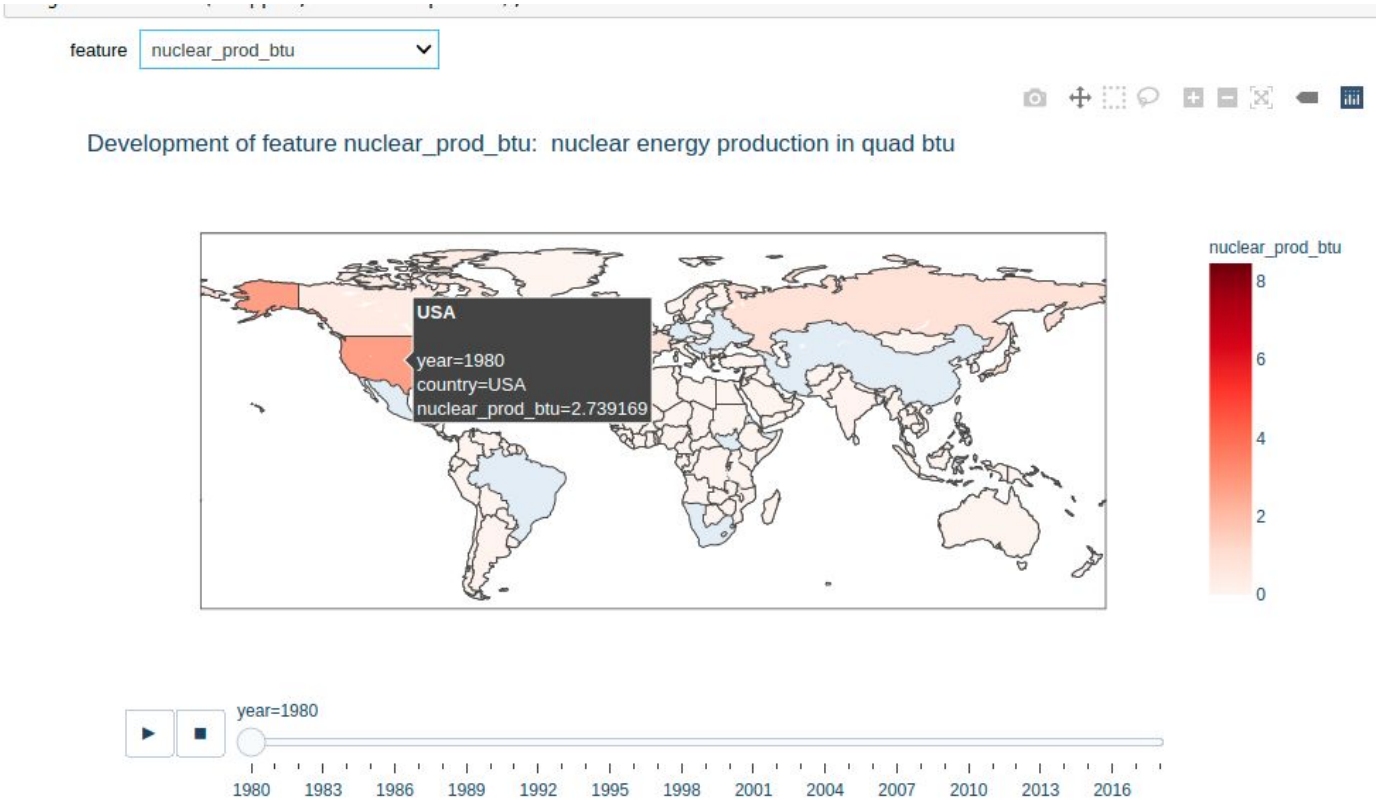
Workflow

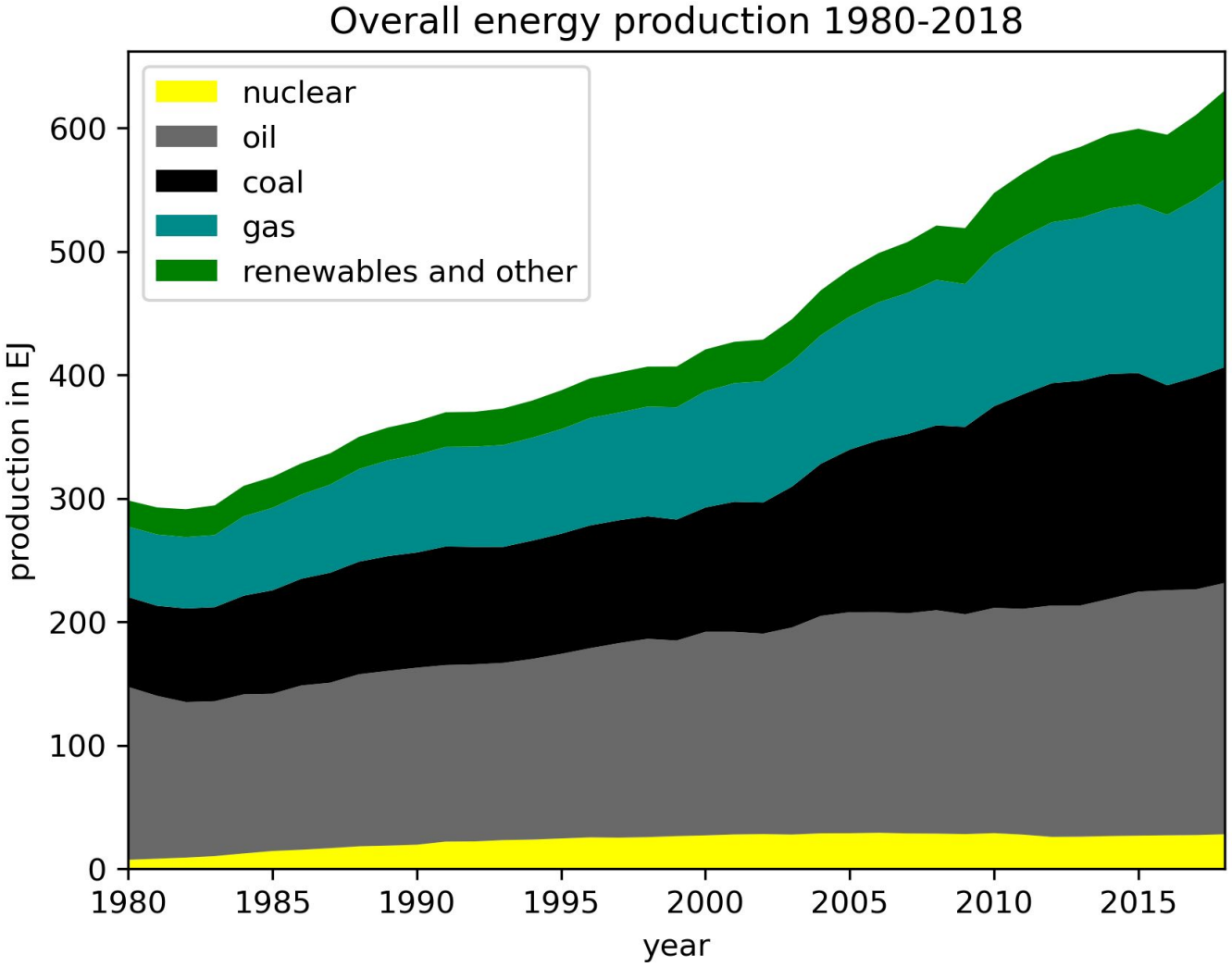
- Weekly meetings
- GitHub repository
- Write small scripts
- Merge scripts in Jupyter Notebook

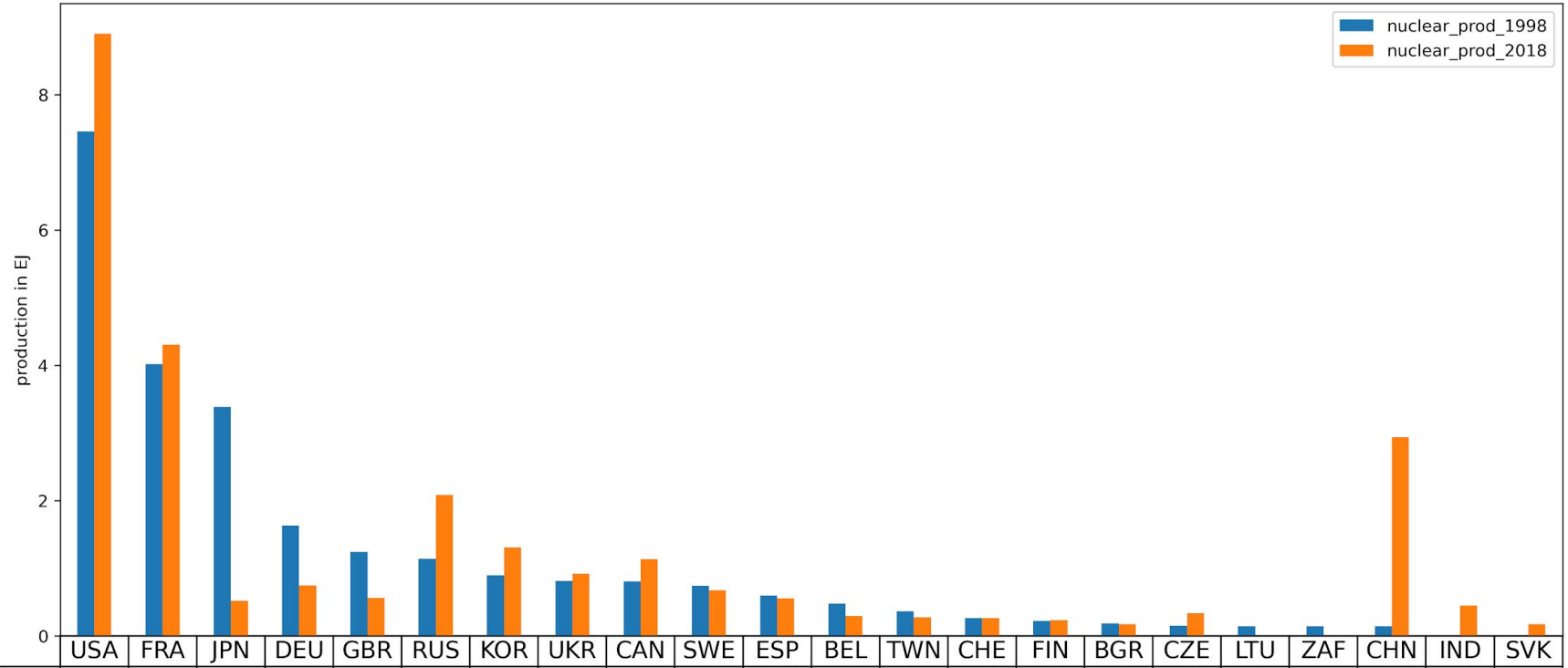
Questions

1. Use of nuclear energy over time
2. Correlation with changes in CO_2 emission
3. Country characteristics which correlate with nuclear energy usage

Choropleth map with animation and feature selector

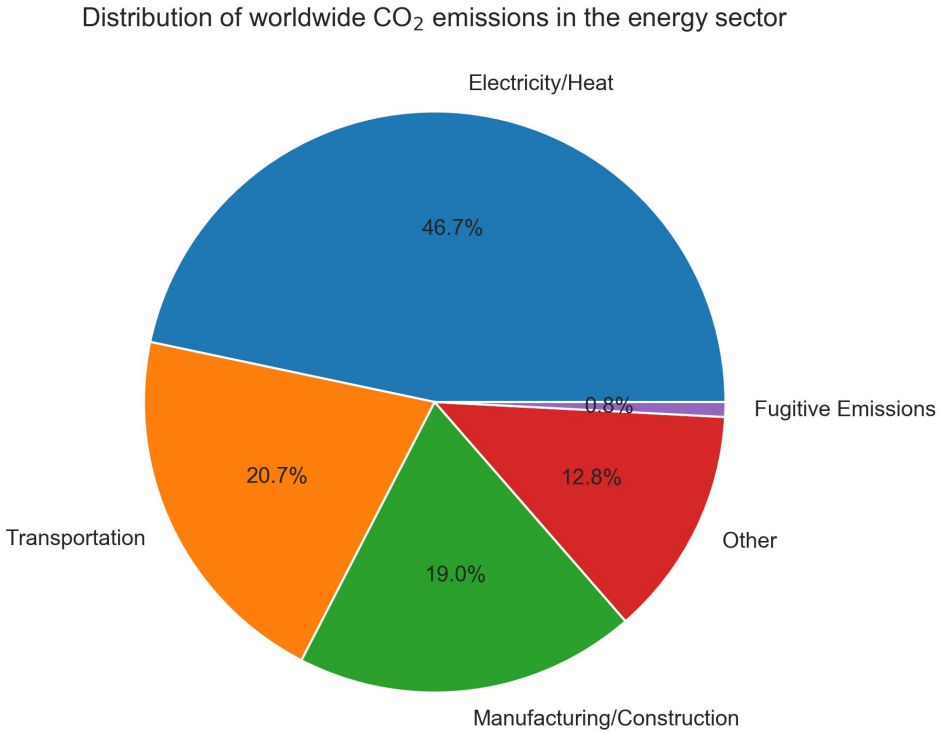



Overall energy production 1980-2018
nuclear
oil
coal
gas
renewables and other
production in EJ
0
100
200
300
400
500
600
1980
1985
1990
1995
2000
2005
2010
2015
year

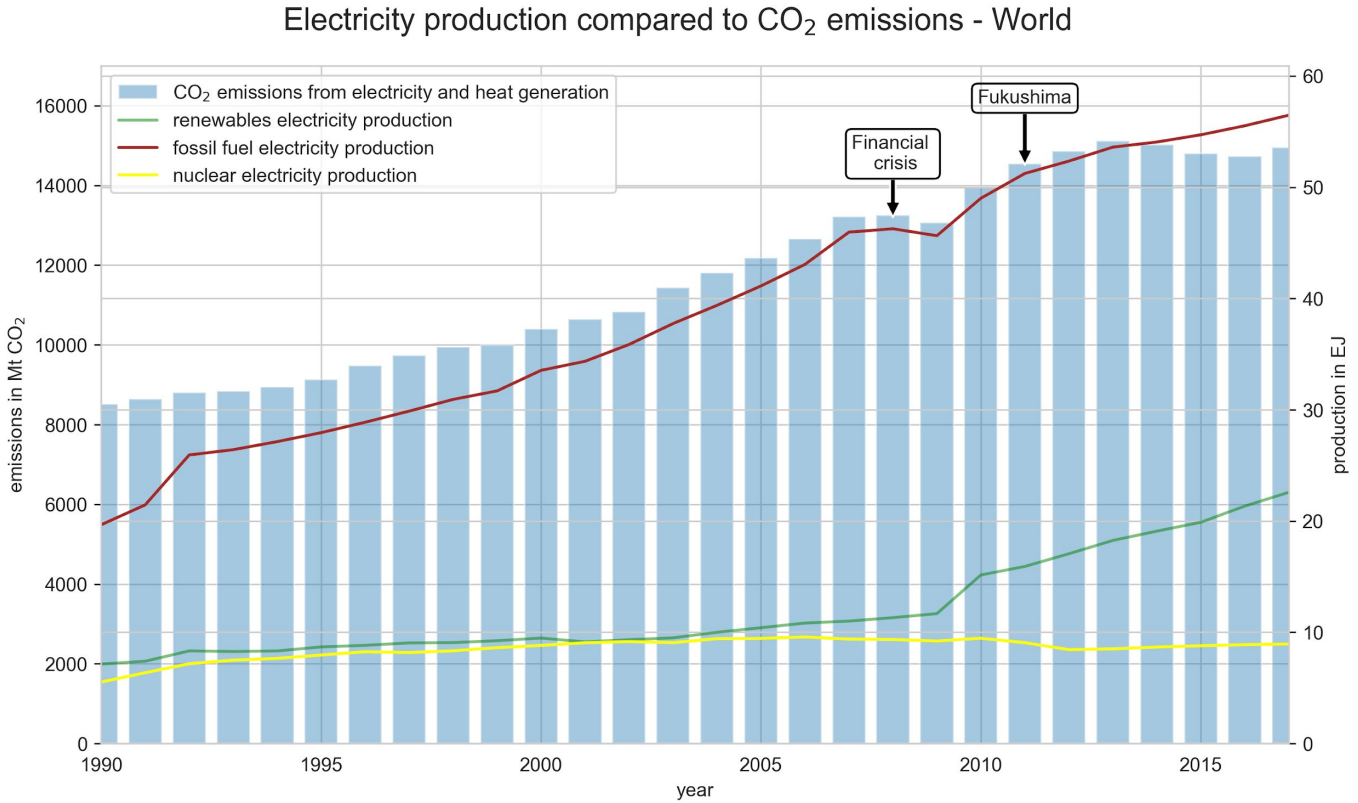


	USA	FRA	JPN	DEU	GBR	RUS	KOR	UKR	CAN	SWE	ESP	BEL	TWN	CHE	FIN	BGR	CZE	LTU	ZAF	CHN	IND	SVK
rank 1998	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	0	0
rank 2018	1	2	12	8	10	4	5	7	6	9	11	15	16	17	18	19	14	0	0	3	13	20
delta ranking	0	0	-9	-4	-5	2	2	1	3	1	0	-3	-3	-3	-3	-3	3	0	0	17	0	0
reactors 1998	104	58	53	19	35	30	15	14	22	12	9	7	6	5	4	6	4	2	2	3	0	0
reactors 2018	98	58	38	7	15	36	24	15	19	8	7	7	5	5	4	2	6	0	0	45	22	4
delta reactors	-6	0	-15	-12	-20	6	9	1	-3	-4	-2	0	-1	0	0	-4	2	0	0	42	0	0
accident deaths	6	2	580	0	0	2	0	4056	0	1	0	0	0	0	0	0	0	0	0	0	0	0

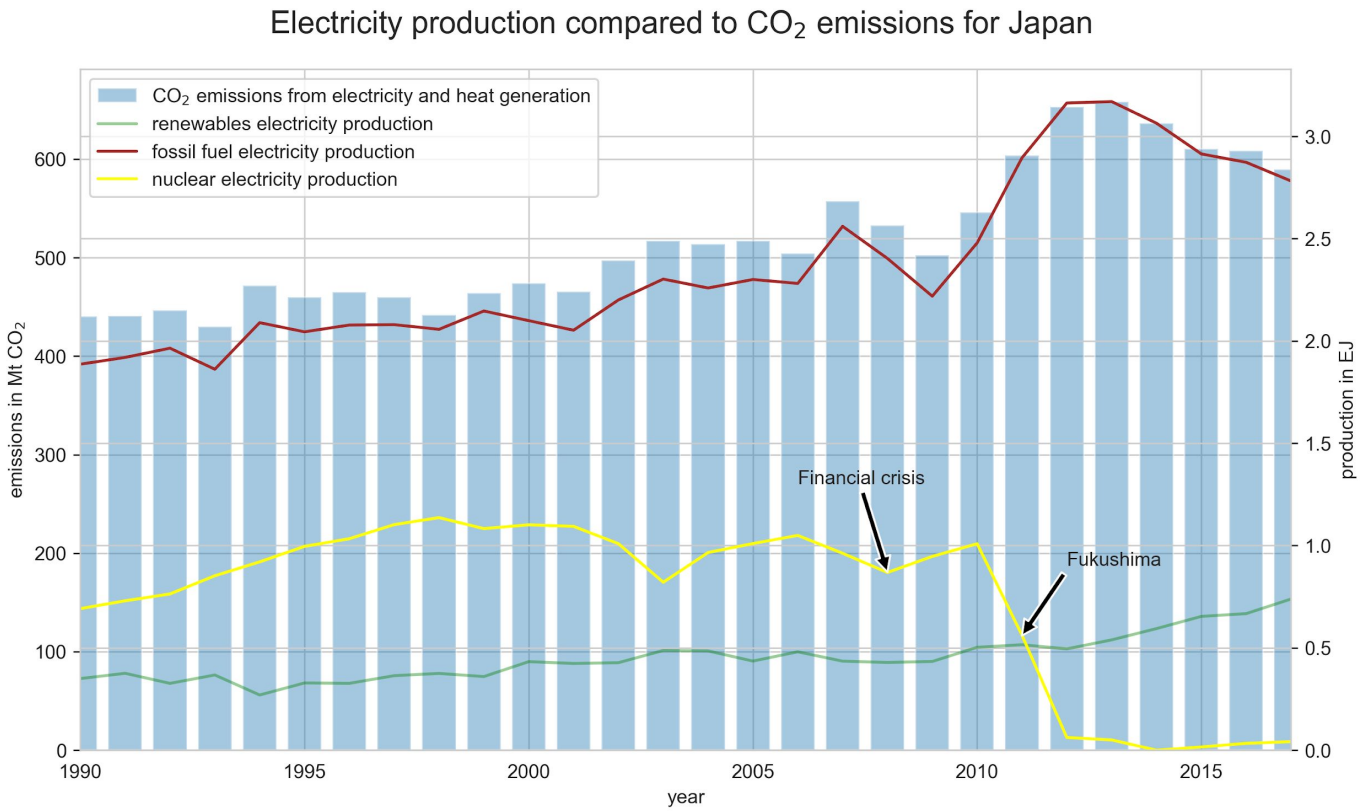
CO_2 emissions



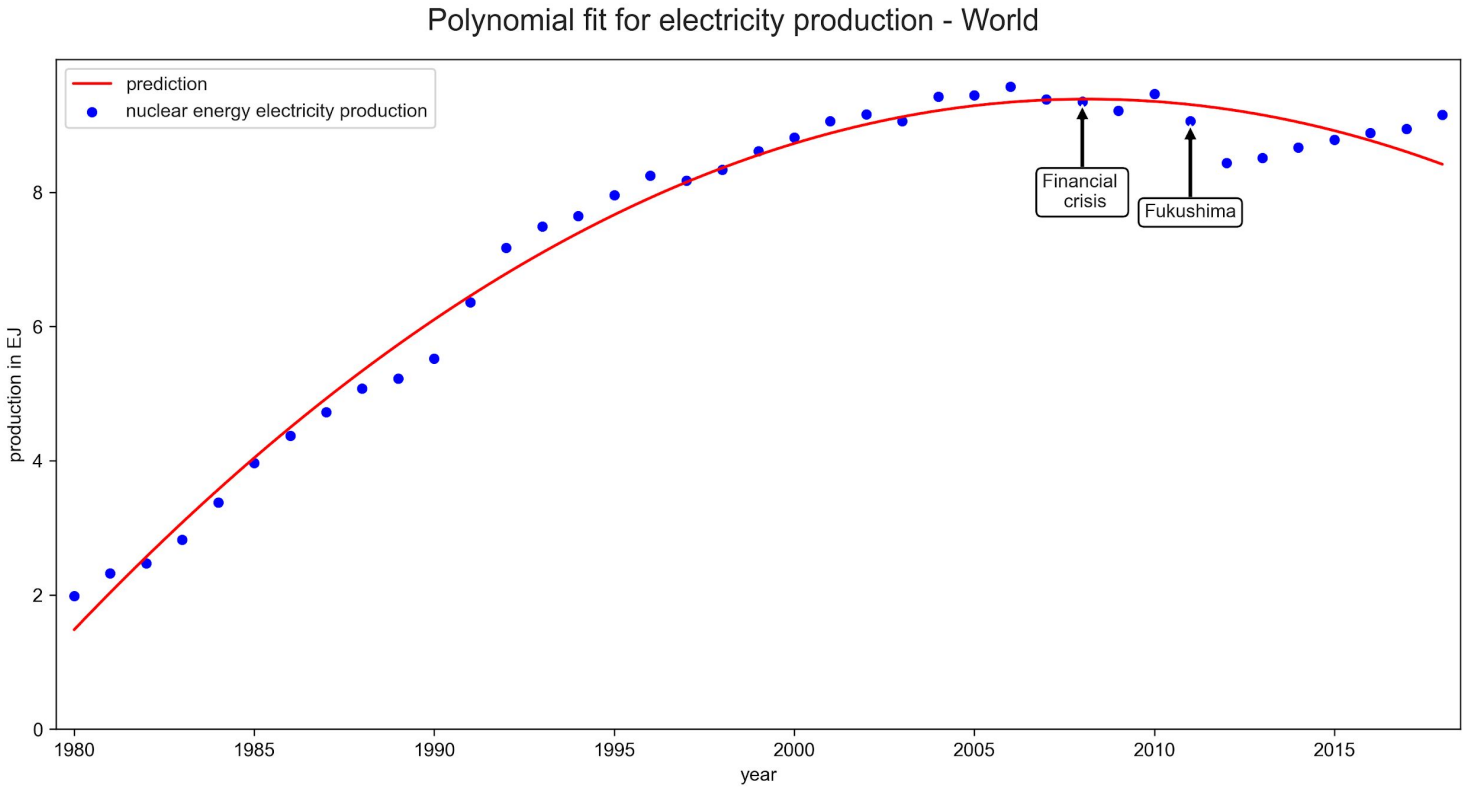
Nuclear energy vs. CO_2 emission



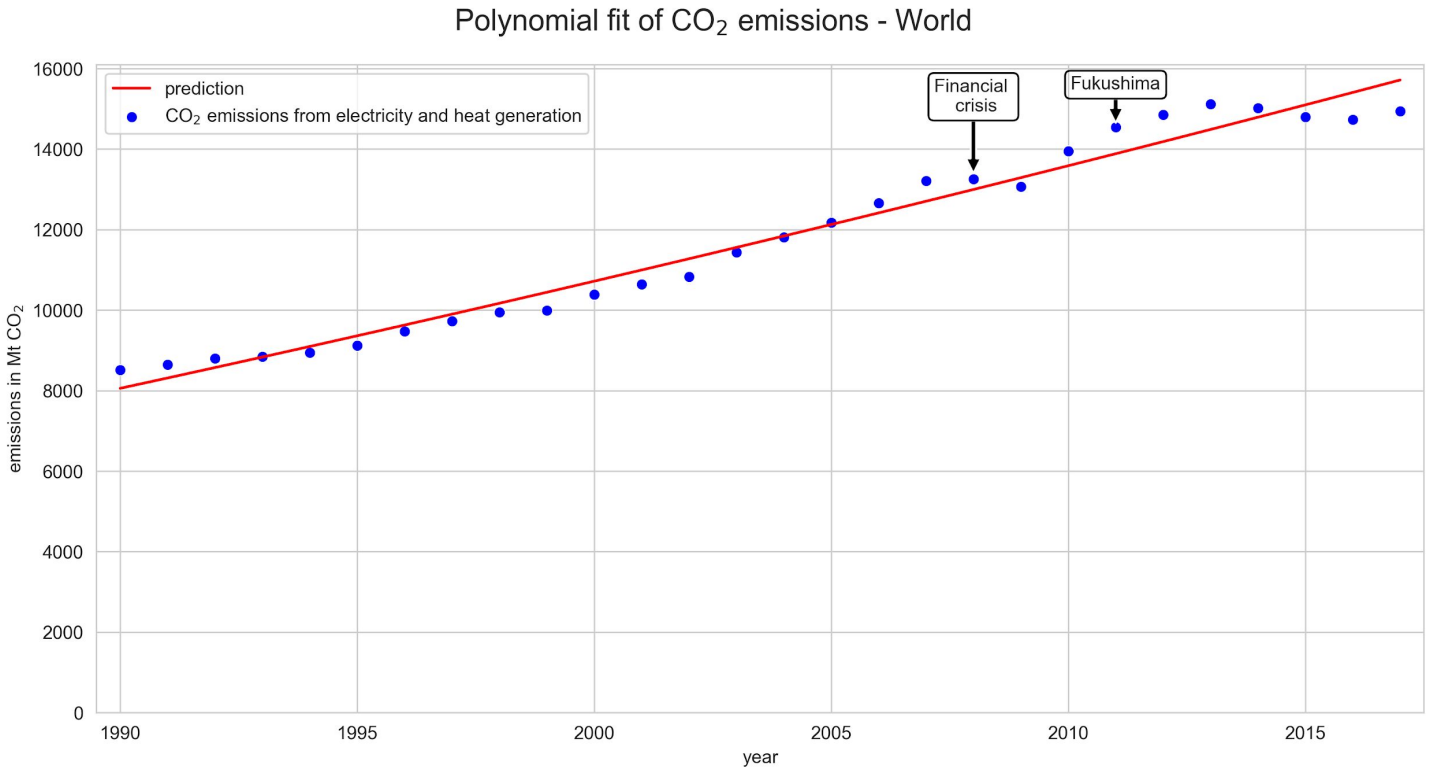
Japan


Electricity production compared to CO_2 emissions for Japan
CO_2 emissions from electricity and heat generation
renewables electricity production
fossil fuel electricity production
nuclear electricity production
Financial crisis
Fukushima
emissions in Mt CO_2
production in EJ
year
0
100
200
300
400
500
600
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1990
1995
2000
2005
2010
2015

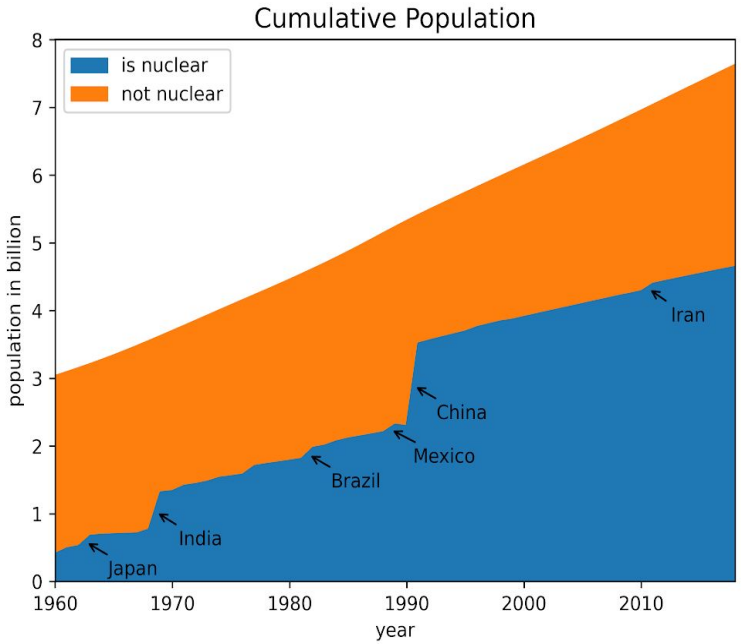
Prediction - nuclear

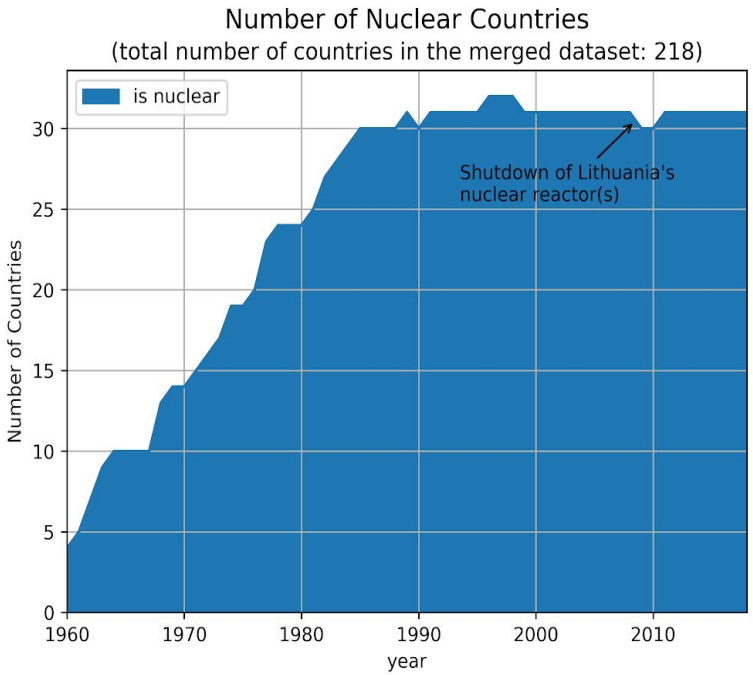


Prediction - CO_2

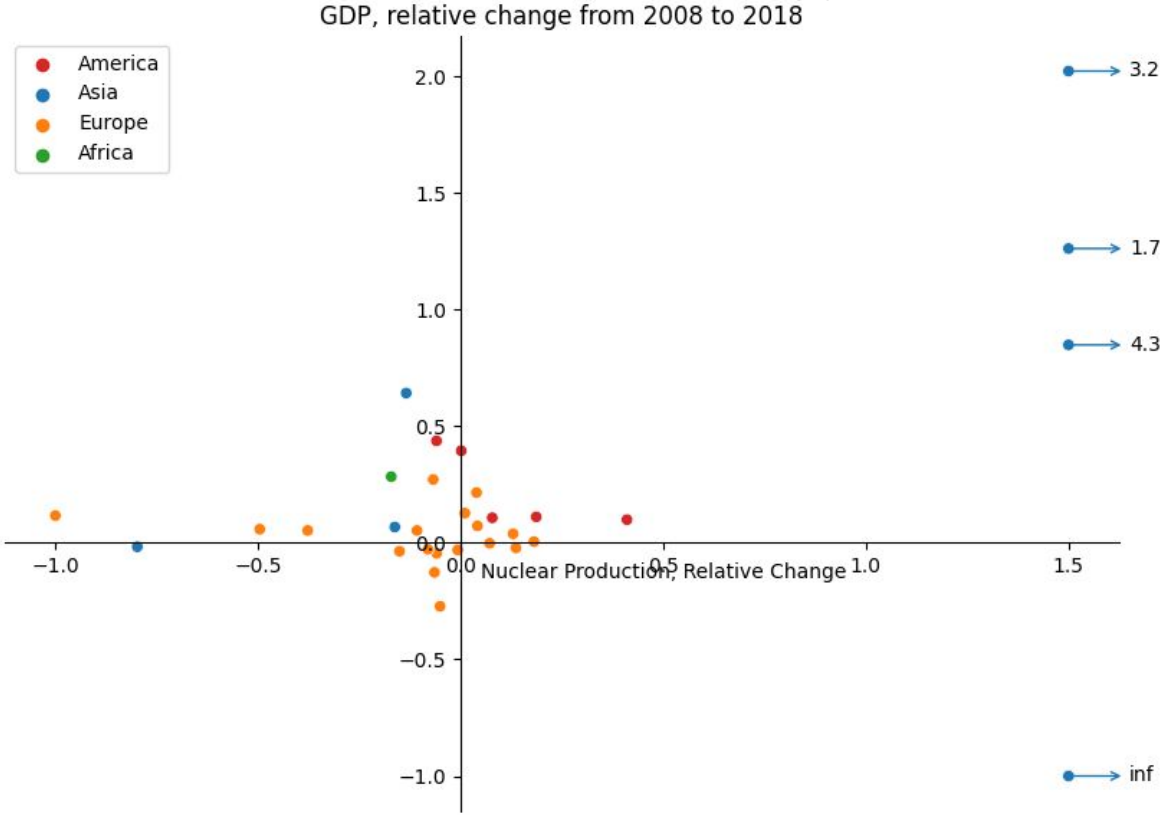


Population in Countries with Nuclear Energy

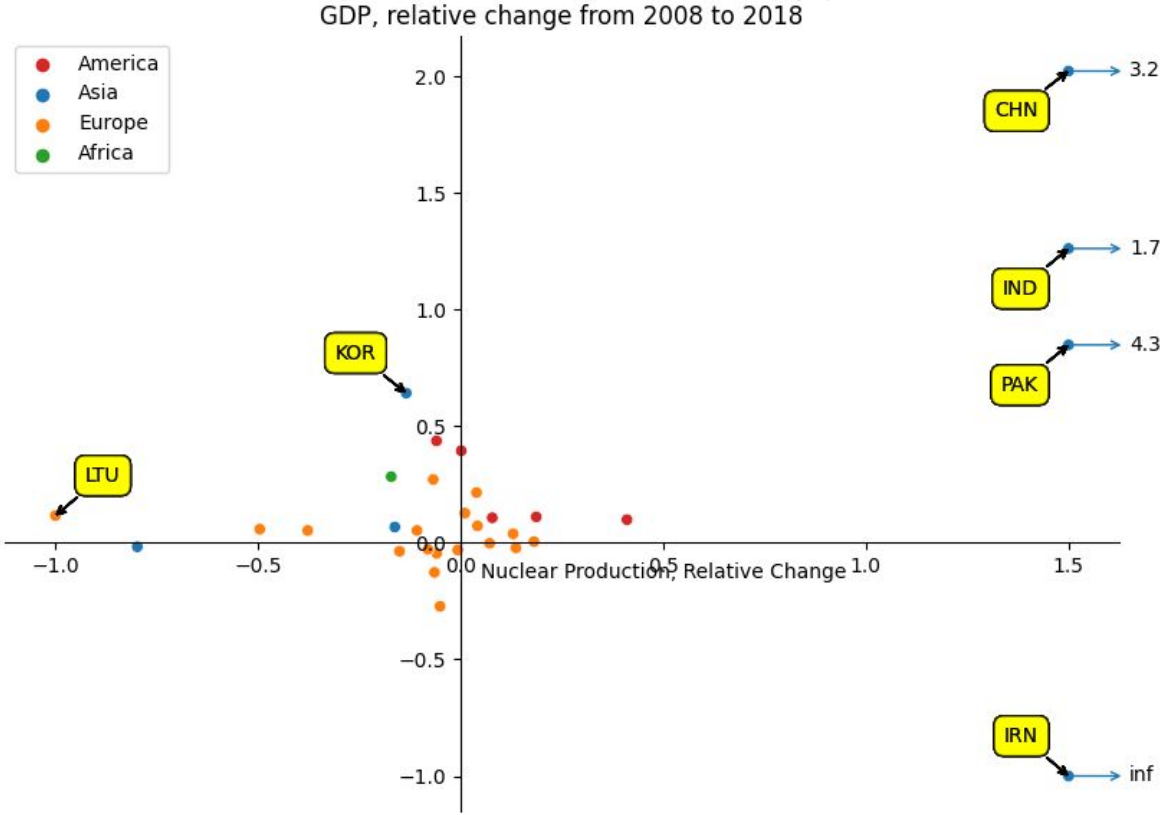




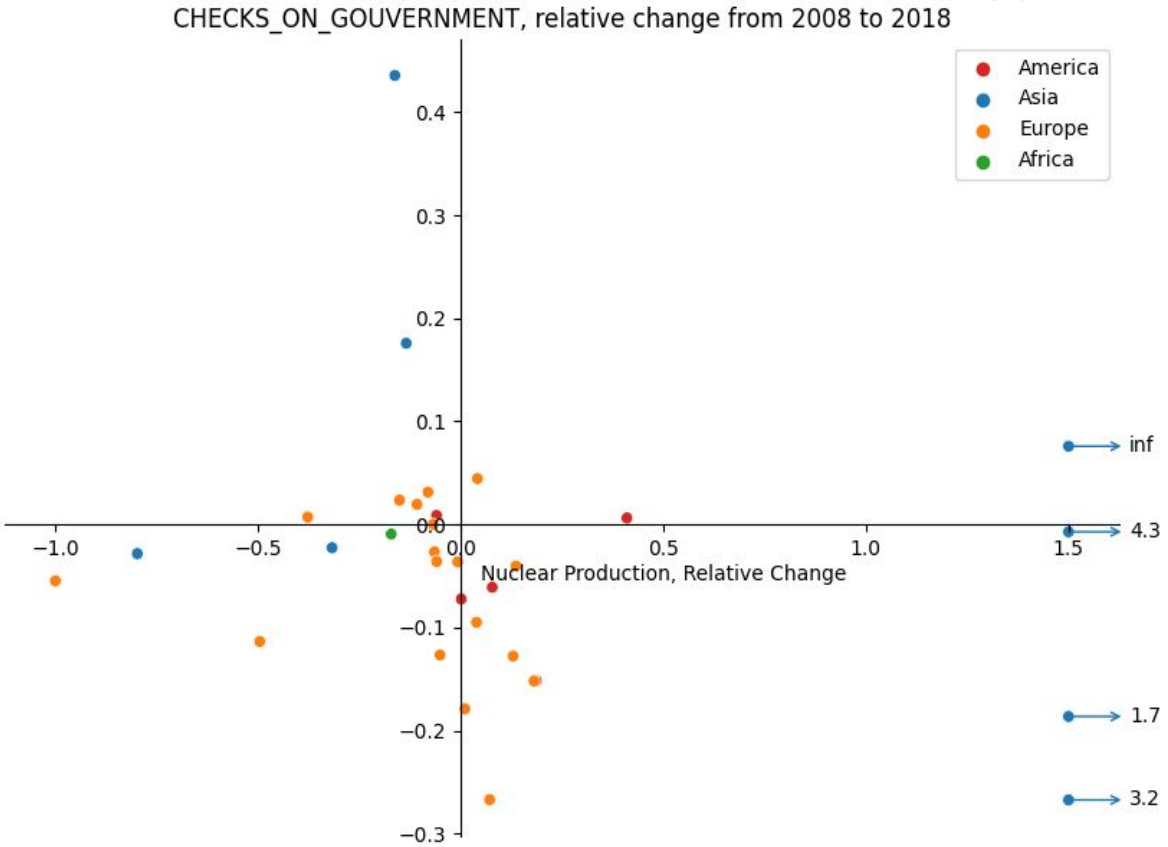
Correlation of GDP with Nuclear Energy



Correlation of GDP with Nuclear Energy



Correlation of Democracy with Nuclear Energy



Correlation of Democracy with Nuclear Energy