Predicting CO₂ Emissions

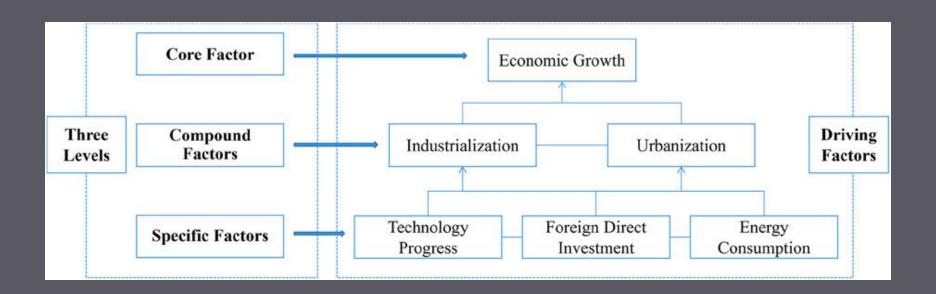
Jack Hlavka and Gabrielle Walrath STATS/DATASCI 112

Question

How well can we predict a country's CO, emissions?

What about if we don't use any factors relating to what type of energy it uses?

Data Collection



Our World in Data

Population Division World Urbanization Prospects 2018



FORTUNE



1	Walmart
2	Amazon
3	State Grid
4	China National Petroleum
5	Sinopec Group
6	Saudi Aramco
7	Apple
8	Volkswagen
9	China State Construction Engineering
10	CVS Health

ISO 3166-1 numeric	Landa.	Note	1950	1951	1952	1953	1954	
	World	INDIG	2 536 275	2 583 817	2 630 584	2 677 230	2 724 302	2 772 243
	More developed rea		814 865	824 213	834 074	844 284	854 632	865 069
	Less developed regi-		1 721 410	1759 604	1 796 510	1 832 967	1 869 671	1 907 173
	Least developed cou		195 259	199 052	202 905	206 885	211 045	215 421
934	Less developed in		1 526 151	1 560 552	1 593 605	1 626 082	1 658 626	1 691 752
934		gions, excluding Chin		1 179 836	1 203 955	1 229 495	1 256 404	1 284 637
	High-income countri		672 896	680 630	688 859	697 440	706 262	715 241
	Middle-income course		1 734 481	1 772 394	1 808 889	1 844 730	1 880 558	1 916 892
	Lower-middle-incom		778 277	792 199	807 013	822 677	839 156	856 427
	Upper-middle-incom		956 204	980 195	1 001 876	1 022 054	1.041.402	1 080 465
	Low-income countrie		128 097	129 969	131 992	134 194	136 594	139 196
	Sub-Saharan Africa		179 621	183 039	186 626	190 378	194 295	198 380
	Africa		228 670	233 277	238 113	243 178	248 471	253 995
	Eastern Africa		228 670 66 758	68 208	238 113 69 712	71 272	72 896	74 586
	Busindi		2 309	2 359	2 404	2 445	2 487	2 531
	Comoms		2 309	2 359	2 404	2 445	2 487	2 531
			159	163	167	170	173	
	Djitouti							1 249
	Eritrea		1 142	1 160	1 180	1 201	1 224	19 947
	Ethiopia		18 128		18 820	19 184		
	Kenya		6 077	6 240	6 412	6 593	6 782	6 980
	Madagascar Malawi		4 084 2 954	4 168	4 257	4 349	4 444 3 187	4 544 3 252
								3 252
	Mauritius	- 1	493	506	521	537	554	
	Mayotte		15	16	16	17	18	
	Mozambique		6 152	6 249	6 353	6 463	6 580	6 702
	Réunion		248	259	268	277	284	
	Rwanda		2 186	2 251	2 313	2 378	2 449	2 526
	Seychelles		36	37	37	38	38	
	Somalia		2 264	2 308	2 352	2 397	2 444	2 492
	South Sudan		2 583	2 602	2 625	2 653	2 685	2 722
	Uganda		5 158	5 309	5 456	5 601	5 748	5 899
	United Republic of 1	2	7 650	7 847	8 056	8 275	8 503	8 741
	Zambia		2 310	2 367	2 428	2 494	2 562	2 634
	Zimbabwe		2 747	2 830	2 917	3 009	3 104	3 202
	Middle Africa		26 454	26 965	27 490	28 032	28 593	29 173
	Angola		4 548	4 659	4 775	4 890	5 005	5 116
120	Cameroon		4 307	4 383	4 460	4 539	4 621	4 704
140	Central African Repu	iblic	1 327	1 340	1 353	1 368	1 383	1 399

Entity	Code	Year	Annual CO, emission
Afghanistan	AFG	1949	14656
Mghanistan	AFG	1960	84272
Afghanistan	AFG	1961	91600
Afghanistan	AFG	1952	91600
Afghanistan	AFG	1953	106256
Afghanistan	AFG	1964	108258
Mghanistan	AFG	1965	153888
Afghanistan	AFG	1966	183200
Afghanistan	AFG	1957	293120
Alghanistan	AFG	1951	329760
Afghanistan	AFG	1969	384571
Mghanistan	AFG	1990	413885
Afghanistan	AFG	1961	490798
Afghanistan	AFG	1962	688594
Alghanistan	AFG	1963	706736
Afghanistan	AFG	1964	838551
Afghanistan	AFG	1965	1006917
Afghanistan	AFG	1966	1091159
Afghanistan	AFG	1967	1281865
Afghanistan	AFG	1961	1223391
Afghanistan	AFG	1903	941232
Afghanistan	AFG	1970	1670397
Mghanistan	AFG	1971	1893554
Afghanistan	AFG	1972	1530347
Afghanistan	AFG	1973	1635454
Afghanistan	AFG	1974	1913152
Afghanistan	AFG	1975	2121383
Mghanistan	AFG	1976	1980859
Afghanistan	AFG	1977	2384175
Afghanistan	AFG	1978	2153300
Afghanistan	AFG	1979	2232754
Afghanistan	AFG	1980	1756302
Afghanistan	AFG	1981	1978463
Afghanistan	AFG	1982	2094580.9
Afghanistan	AFG	1983	2519954
Afghanistan	AFG	1984	2821540
Afghanistan	AFG	1985	3501422
Afghanistan	AFG	1986	3133645
Afghanistan	AFG	1987	3113826
Afghanistan	AFG	1968	2856896
Afghanistan	AFG	1903	2764855
Afsheriaten	AFG	1993	2024326.1

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Data Analysis

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2 Australia AUS 1992 1748000 85.3 18024 100 494906071 0 42.072 95.648 15.80 15.80 1 3. Australia AUS 1995 17687000 85.2 17770 100 345484443 0 42.05 95.649 15.80 15.80 1 4. Australia AUS 1995 18077000 85.0 12040 100 120807155 0 41.522 90.000 116.03 1 16.0	
Australia AUS 1969 17687000 66.2 17700 100 5312435141 0 42.06 96.654 15.808	4.331 37.20
4 Australia AUS 1994 17883000 8.8 18129 100 4485848243 0 41.263 95.871 16.881 5 Australia AUS 1995 18077000 8.4.9 20440 100 1726867155 0 41.502 95.009 16.003 7 Australia AUS 1996 18272000 8.4.8 20200 100 456936246 0 42.796 96.058 16.373 7 Australia AUS 1997 18468000 8.4.6 22.845 100 808068982 0 42.796 96.058 16.373 8 Australia AUS 1998 18868000 8.4.5 21.478 100 7597610028 0 44.139 96.246 15.718 9 Australia AUS 1999 18868000 8.4.4 2008 100 22.7991791 0 44.911 96.238 11.8.425 10 Australia AUS 2000 19068000 8.4.2 21.853 100 14.09279180 0 44.511 96.238 11.8.425 11 Australia AUS 2001 192000 8.4.1 1998 100 10771731510 0 44.911 96.246 11.5.78 11 Australia AUS 2001 19478000 8.4.2 2029 100 14.058321800 0 44.511 96.341 16.599 13 Australia AUS 2002 19478000 8.4.2 2029 100 14.058321800 0 44.511 96.341 16.599 13 Australia AUS 2004 1948000 8.4.5 2029 100 14.058321800 0 45.90 96.276 11.8.39 14 Australia AUS 2004 1948000 8.4.5 30.919 100 42.90757230 0 45.106 96.276 11.8.39 15 Australia AUS 2005 20574000 8.4.5 30.919 100 42.90757230 0 45.90 96.246 11.7407 16 Australia AUS 2006 20574000 8.4.8 41023 100 44.0060007 0 .056 44.1.4 96.46 11.520 17 Australia AUS 2009 21738000 8.5.1 42.910 10 22.8054200 0 45.910 96.34 19.023 18 Australia AUS 2009 22.90700 8.8.8 41023 100 44.0060007 0 .056 44.1.4 96.46 11.520 18 Australia AUS 2009 22.90700 8.5.1 42.910 100 22.80542020 0 .056 43.54 96.98 11.520 18 Australia AUS 2009 22.90700 8.5.1 42.910 0 .056540000007 0 .056 44.1.4 96.46 11.520 19 Australia AUS 2009 22.90700 8.5.1 42.910 100 22.80542020 0 .056 44.1.4 96.46 11.520 19 Australia AUS 2009 22.90700 8.5.5 6.9574 100 3555100056 0.053 43.976 96.14 11.520 19 Australia AUS 2009 22.90700 8.5.5 6.9574 100 3555100056 0.053 43.977 94.958 12.220 20 Australia AUS 2010 22.90000 8.5.5 6.958 100 555689004 1.06 83.34 14 95.44 99.44	4.352 36.99
6 Australia AUS 1966 18677000 84.8 20246 100 13268875165 0 41.562 96.089 16.03 6 Australia AUS 1966 18272000 84.8 22020 100 4569052446 0 42.106 96.08 16.313 7 Australia AUS 1967 1468000 84.6 23045 100 808006982 0 43.239 96.146 15.023 8 Australia AUS 1998 18685000 85.5 21.176 100 759751028 0 44.139 96.246 15.023 10 Australia AUS 1969 19866000 84.4 2098 100 221097910 0 44.911 96.238 15.6425 10 Australia AUS 2000 19066000 84.2 21853 100 14892375160 0 45.039 96.241 15.649 11 Australia AUS 2001 19280000 84.1 1998 100 10777133150 0 44.177 96.406 116.724 11 Australia AUS 2002 1947000 84.2 22091 100 14695237500 0 44.517 96.406 116.724 11 Australia AUS 2003 1987000 84.2 22091 100 1869524000 0 45.109 96.275 16.039 13 Australia AUS 2004 1948000 84.5 30819 100 14695237500 0 45.109 96.275 16.039 14 Australia AUS 2004 1948000 84.5 30819 100 1869524009 0 45.109 96.276 16.039 15 Australia AUS 2005 20574000 84.7 36570 100 869524029 0 45.409 96.284 16.023 16 Australia AUS 2006 20574000 84.7 36570 100 30551100666 0.063 43.576 96.146 17.747 16 Australia AUS 2007 20977000 84.8 41023 100 4440000007 0.239 43.046 96.19 192.20 17 Australia AUS 2008 2124000 86.9 40979 100 3055110066 0.063 43.576 96.146 17.747 16 Australia AUS 2008 2124000 86.9 40979 100 45100024270 0.554 44.14 96.148 15.598 19 Australia AUS 2016 2212000 85.2 62134 100 355110066 0.063 43.576 96.14 11.20 11.20 1.20 1	4.346 37.79
6 Australia AUS 1996 18272000 84.8 22020 100 4563952446 0 42.196 96.058 16.313 7 Australia AUS 1997 18468000 84.6 22645 100 808605892 0 43.239 96.146 11.5023 8 Australia AUS 1998 1868000 84.4 20888 100 759775028 0 44.139 96.246 15.718 9 Australia AUS 1998 1868000 84.4 20888 100 22097991 0 44.311 96.233 115.425 11 Australia AUS 2000 1968000 84.2 21853 100 1489297181 0 0 45.511 96.00 10.	4.129 37.72
1	3.931 37.90
B Aufmilla AUS 1998 1868000 64.5 21478 100 759781928 0 44.139 96.246 15.718 D Aufmilla AUS 1998 18884000 84.4 2098 100 22197991 0 44.911 98.233 115.425 Aufmilla AUS 2000 19828000 84.1 19881 100 19717915 0 44.911 98.241 15.425 11 Aufmilla AUS 2001 19280000 84.1 19881 100 1071713150 0 44.177 98.406 15.724 12 Aufmilla AUS 2002 1977000 84.2 22991 100 14658321600 0 44.510 96.275 16.839 13 Aufmilla AUS 2003 19677000 84.3 22705 100 8985246029 0 45.106 96.275 16.839 14 Aufmilla AUS 2004 19948000 84.5 30819 100 4397772820 0 44.510 96.244 116.823 15 Aufmilla AUS 2006 2057400 84.7 35570 100 30551100566 0.683 43.576 96.146 17.407 16 Aufmilla AUS 2007 20947000 84.8 41023 100 44440000037 0.238 43.046 96.19 19.226 17 Aufmilla AUS 2008 2124000 84.9 48979 100 45160024270 0.554 44.14 96.148 16.598 18 Aufmilla AUS 2010 21220000 85.1 42810 100 25883286147 0.835 43.041 95.689 15.152 19 Aufmilla AUS 2011 2240000 85.2 62714 100 3507137374 1.256 33.77 94.483 22.123 20 Aufmilla AUS 2012 22222000 85.4 6804 100 35507287260 1.275 37.415 93.370 22.299 21 Aufmilla AUS 2012 22322000 85.5 68198 100 4588026667 0.917 33.454 93.14 23.546 23 Aufmilla AUS 2014 22472000 85.5 68198 100 4588026667 0.917 33.266 93.76 23.547 24 Aufmilla AUS 2016 22472000 85.5 68198 100 4588026667 0.917 33.369 22.643 24 Aufmilla AUS 2016 22472000 85.5 68198 100 458802667 0.917 33.366 93.77 93.145 23.97 24 Aufmilla AUS 2016 22472000 85.5 68198 100 458802667 0.917 33.366 93.77 93.145 23.97 24 Aufmilla AUS 2016 22472000 85.5 68198 100 458802667 0.917 33.366	3.942 37.54
9 Auffaila AUS 1899 1886000 84.4 2089 100 2210917991 0 44.911 96.283 15.425 10 Auffaila AUS 2000 1806000 84.2 2183 100 1462971890 0 44.579 96.406 16.724 11.4447814 AUS 2001 1870000 84.1 19881 100 19717133150 0 44.577 96.406 18.724 11.4447814 AUS 2001 1870000 84.2 20291 100 1455031800 0 44.571 96.406 18.724 11.4447814 AUS 2001 1870000 84.3 20705 100 8985246025 0 45.510 96.275 16.839 11.5425 11.54	3.854 37.28
11 Australia AUS 2000 19066000 64.1 1988 100 14802978180 0 45.039 98.291 15.649 11. Australia AUS 2001 19269000 64.1 1988 100 107173150 0 44.4177 89.046 15.724 12. Australia AUS 2002 1947900 84.2 20291 100 14658321800 0 44.511 96.44 198.99 13. Australia AUS 2003 19697000 64.3 22705 100 6885246029 0 45.106 96.275 18.839 13. Australia AUS 2004 194600 64.5 30919 100 4290767220 0 45.849 96.224 16.623 15. Australia AUS 2009 20574000 84.7 36570 100 3055110056 0.063 43.976 96.146 11.7407 16. Australia AUS 2009 20574000 84.6 41023 100 44.4000037 0.239 43.046 89.19 12.226 17. Australia AUS 2009 2134000 84.6 41023 100 44.4000037 0.239 43.046 89.19 19.226 17. Australia AUS 2009 2134000 86.1 42970 100 2685246147 0.035 43.146 95.44 15.623 11. Australia AUS 2009 2134000 86.1 42970 100 2685246147 0.035 43.146 95.48 11.522 11. Australia AUS 2009 2134000 86.1 42970 100 2685246147 0.035 43.146 95.48 11.522 11. Australia AUS 2009 2134000 86.1 42970 100 2685246147 0.035 43.146 95.48 11. Australia AUS 2009 2139000 85.1 42970 100 2685246147 0.035 43.144 95.48 11. Australia AUS 2010 2240000 85.2 62134 100 2685246147 0.035 43.144 95.48 11. Australia AUS 2011 2240000 85.2 62134 100 268524614 1.276 37.415 93.777 22.299 12. Australia AUS 2012 2232000 85.4 68044 100 6755048822 11.152 33.474 93.349 22.433 12.24 24. Australia AUS 2012 2232000 85.5 6818 100 6555489044 1.09 33.444 99.14 23.406 12. Australia AUS 2015 2345000 85.5 6818 100 63502728075 1.025 32.667 93.756 25.103 12. Australia AUS 2015 2345000 85.5 6818 100 63202728075 1.025 32.667 93.756 25.103 12. Australia AUS 2016 23450000 85.7 68710 100 4892005667 0.917 33.326 93.346 25.37 12. Australia AUS 2016 2345000 85.8 68.975 100 4892005667 0.917 33.326 93.346 25.37 12. Australia AUS 2016 2345000 85.8 68.8 48975 100 489800567 0.917 33.346 92.793 25.535 12. Australia AUS 2016 2445000 85.8 68.5 6598 100 449805675 0.917 33.326 92.793 25.535 12. Australia AUS 2016 2445000 85.8 68.5 6598 100 449805675 0.952 30.074 93.145 22.475 10. Australia AUS 2016 2445000 85.8 68.5 6598 100 449805675 0.9	3.754 36.38
11 Australia AUS 2001 19289000 84.1 19881 100 10717133180 0 44.177 96.406 16.724 12 Australia AUS 2002 19475000 84.2 20291 100 14585214002 0 45.106 96.275 15.839] 14 Australia AUS 2004 19648000 84.5 30391 100 4280752825 0 0 45.401 96.244 118.839 114 Australia AUS 2004 2074000 84.7 36570 100 30551100565 0.0683 43.376 96.146 17.407 116 Australia AUS 2004 2074000 84.5 44029 100 4280752825 0 0 45.401 96.244 118.839 116 Australia AUS 2004 2074000 84.7 36570 100 30551100565 0.0683 43.376 96.146 17.407 116 Australia AUS 2006 2074000 84.8 44023 100 4444090007 0.239 43.046 96.19 19.226 17 Australia AUS 2009 21342000 84.9 48079 100 456002277 0.364 44.14 96.146 96.149 119.226 17 Australia AUS 2009 21342000 85.1 42810 100 2688326447 0.335 43.641 95.689 119.152 119 Australia AUS 2009 21342000 85.1 42810 100 35210733743 1.256 35.77 94.83 22.123 124 124 124 124 124 124 124 124 124 124	3.717 35.94
13 Australia AUS 2002 19675000 84.3 22705 100 14656321800 0 44.511 96.341 16.999 14 Australia AUS 2003 19697000 84.3 22705 100 895246029 0 45.106 96.275 11.839 15 Australia AUS 2004 1964800 84.5 30819 100 42807672280 0 45.940 96.284 19.6.23 15 Australia AUS 2006 20574000 84.7 96.570 100 3055100556 0.063 43.576 96.146 17.407 16 Australia AUS 2006 21342000 84.8 41023 100 444009037 0.236 43.046 96.19 119.226 17 Australia AUS 2009 21342000 84.9 49679 100 4516002427 0.564 44.1 96.146 11.598 18 Australia AUS 2009 21739000 85.1 42210 100 2885226147 0.355 43.041 96.689 119.522 19 Australia AUS 2009 21739000 85.1 42210 100 2885226147 0.355 43.041 96.689 119.52 20 Australia AUS 2009 2017 22480000 85.2 65134 100 3521073373 1.255 33.77 94.883 22.213 20 Australia AUS 2011 22480000 85.2 65134 100 65554890649 1.276 37.415 93.707 22.239 21 Australia AUS 2012 2242000 85.4 68044 100 5755042822 1.152 33.474 93.359 22.643 22 Australia AUS 2015 2351500 85.5 68189 100 64465400054 1.084 33.414 93.14 22.806 23 Australia AUS 2016 242000 85.5 68189 100 64465400054 1.084 33.414 93.14 22.806 24 Australia AUS 2016 242000 85.5 68189 100 63207278076 1.025 32.867 93.756 25.103 25 Australia AUS 2016 242000 85.6 62513 100 6320728076 1.025 32.867 93.756 25.103 26 Australia AUS 2016 242000 85.8 49675 100 6480200567 0.017 33.326 93.756 25.103 27 Australia AUS 2016 242000 85.8 6975 100 6480800515 0.776 33.64 92.733 25.515 28 Australia AUS 2016 2412000 85.8 6975 100 4480800515 0.776 33.64 92.733 25.515 28 Australia AUS 2016 2412000 85.8 65727 100 608890478 0.952 0.076 93.74 93.151 25.299 28 Australia AUS 2016 2412000 85.6 65930 100 449985015 0.776 33.056 92.733 13.615 29 Australia AUS 2016 2412000 85.8 65727 100 608890478 0.952 0.076 93.754 93.155 28 Australia AUS 2016 242000 85.6 65990 100 45995015 0.076 93.274 93.157 93.158 29 Australia AUS 2016 2412000 85.6 65990 100 449985015 0.776 33.056 93.756 93.756 93.756 93.756 20 Australia AUS 2016 2412000 85.6 65990 100 449985015 0.776 33.056 93.756 93.756 93.	3.709 35.60
13 Australia AUS 2003 19697000 64.5 23705 100 8985244025 0 45.106 96.275 16.839 14 Australia AUS 2004 19986000 84.5 30819 100 4240778225 0 45.4515 89.0244 16.823 15 Australia AUS 2006 2074000 84.7 36570 100 30551100666 0.065 43.707 95.146 17.407 16 Australia AUS 2007 20947000 84.8 41023 100 4440000037 0.239 43.046 96.19 19.226 17 Australia AUS 2008 2124000 88.9 48679 100 45160024270 0.554 44.14 98.148 18.598 18 Australia AUS 2008 2124000 85.0 45.1 42810 100 28683266147 0.835 43.041 95.689 19.152 19 Australia AUS 2009 21739000 85.1 42810 100 28683266147 0.835 43.041 95.689 19.152 19 Australia AUS 2010 22120000 85.2 63134 100 35210733743 1.256 38.77 93.463 22.123 10.0 40.0000000000000000000000000000000	3.594 35.50
16 Australia AUS 2004 19948000 84.5 30819 100 42907872820 0 45.491 96.284 16.023 15 Australia AUS 2006 20974000 84.7 36570 100 3055100656 0.065 43.376 96.146 17.407 14 Australia AUS 2007 20974000 84.8 41.023 10.0 444.0090007 0.239 43.046 96.19 19.226 17 Australia AUS 2008 21342000 84.9 49679 100 45160024270 0.544 44.14 96.148 18.598 18 Australia AUS 2009 21795000 85.1 42810 100 288526647 0.355 43.044 95.869 11.152 19 Australia AUS 2010 2210000 85.2 52114 100 288526647 0.355 43.041 95.869 11.152 20 Australia AUS 2011 2240000 85.3 62596 100 65554890649 1.276 33.7415 93.377 22.299 21 Australia AUS 2011 2240000 85.3 62596 100 65554890649 1.276 37.415 93.377 22.299 22 Australia AUS 2011 223515000 85.5 68158 100 5446546004 1.084 33.414 93.41 22.646 23 Australia AUS 2014 23475000 85.5 68158 100 5446546004 1.084 33.414 93.14 22.666 24 Australia AUS 2014 23475000 85.6 62513 100 63520737375 1.025 32.667 93.756 22.513 25 Australia AUS 2015 2390000 85.7 56710 100 6392072076 1.025 32.667 93.756 22.513 26 Australia AUS 2016 24126000 85.8 49975 100 4892806515 0.977 33.366 92.733 25.515 25 Australia AUS 2017 24451000 85.8 63936 100 44982806515 0.977 33.366 92.733 25.515 26 Australia AUS 2016 2217 22415000 85.8 63936 100 44982806515 0.977 33.366 92.733 25.515 26 Australia AUS 2016 24126000 85.8 63730 100 44982806515 0.977 33.366 92.733 25.515 26 Australia AUS 2016 24126000 85.8 63936 100 44982806515 0.977 33.366 92.733 25.515 27 Australia AUS 2016 24126000 85.8 63936 100 44982806515 0.977 33.366 92.733 25.515 28 Australia AUS 2016 24126000 85.8 63936 100 44982806515 0.977 33.366 92.733 25.515 28 Australia AUS 2016 24126000 85.8 63936 100 44982806515 0.976 33.366 92.733 25.515 28 Australia AUS 2016 24126000 85.8 63927 100 0389549751 0.952 27.141 91.647 24.873 29 Australia AUS 2016 24126000 85.8 63936 100 44982806515 0.976 33.366 92.733 25.515 20 Australia AUS 2016 24126000 85.8 63936 100 44989806515 0.976 33.366 92.733 25.515 20 Australia AUS 2016 24126000 85.8 6393	3.659 34.8
16 Australia AUS 2000 20574000 84.8 41023 100 30551100856 0.083 43.976 96.146 17.407 16 Australia AUS 2007 2047000 84.8 41023 100 444000037 0.238 43.046 86.19 112.20 17 Australia AUS 2008 2124000 85.9 48.976 100 45100024270 0.564 44.14 96.146 115.938 18 Australia AUS 2009 21273000 85.1 42210 100 2688226147 0.355 43.041 95.689 15.152 20 Australia AUS 2010 2212000 85.2 52134 100 2688226147 0.355 39.77 94.989 122.123 21 Australia AUS 2011 22240000 85.3 62586 100 65554890649 1.278 37.415 93.707 22.239 21 Australia AUS 2012 22222000 85.4 68044 100 5755426822 1.152 35.471 93.859 22.643 22 Australia AUS 2013 2315100 85.5 68198 100 65548950649 1.084 33.414 99.14 23.4068 23 Australia AUS 2014 22475000 85.8 62513 100 6320728075 1.025 32.667 93.756 25.103 24 Australia AUS 2015 23100000 85.7 56710 100 68202728075 1.025 32.667 93.756 25.103 24 Australia AUS 2016 242000 85.8 6975 100 6489280667 0.917 33.326 92.346 25.97 25 Australia AUS 2017 24451000 85.9 6398 100 419884224 0.476 33.147 92.35 92.36 22.99 26 Australia AUS 2018 2017 24451000 85.9 6398 100 4498864234 0.476 33.147 93.15 25.249 27 Australia AUS 2018 2019 22508000 86.1 54041 100 6068890478 0.952 27.919 91.43 3.3148	3.725 34.3
116 Australia AUS 2007 20947000 84.9 41023 100 44440090037 0.239 43.046 96.9 152.26 17 Australia AUS 2008 271342000 84.9 40679 100 45160024279 0.368 44.14 96.148 15.598 115.598 116 Australia AUS 2009 27139000 85.1 42810 100 28883268147 0.335 43.041 95.689 15.152 119 Australia AUS 2010 22120000 85.2 62134 100 35210733743 1.256 39.77 94.893 22.123 100 Australia AUS 2011 2240000 85.3 6299 100 68554890049 1.278 37.415 93.707 22.299 121 Australia AUS 2012 22822000 85.4 68044 100 6755048022 1.152 35.47 93.859 22.243 122 Australia AUS 2012 22822000 85.5 68198 100 6755048022 1.152 35.47 93.859 22.643 122 Australia AUS 2013 2315000 85.5 68198 100 6755048022 1.152 35.47 93.49 23.606 12.27 34.144 93.27 37.415 23.060 12.27 34.144 93.27 34.145 93.707 22.29 12.24 34.144 93.24 34.145 93.24 22.24 22.2	3.716 34.16
16 Australia AUS 2008 21342000 86.1 42810 100 45160024270 0.564 44.14 96.148 18.588 1 16.588 1 16.48411	3.854 34.76
18 Australia AUS 2008 21342000 86.1 42910 100 45160024270 0.564 44.14 96.148 18.588 18.588 18.4411 AUS 2009 21739000 85.1 42910 100 288266417 0.385 43.041 95.689 11.152 11.0411	3.81 33.91
19 Australia AUS 2010 2210000 85.2 62134 100 35210733743 1.255 39.77 94.963 22.123 20 Australia AUS 2011 22400000 85.3 62596 100 65554800449 1.276 37.415 93.707 22.299 21 Australia AUS 2012 2322000 85.4 68044 100 75750426822 1.1572 35.474 93.359 22.643 22 Australia AUS 2013 23151000 85.5 68158 100 54465480054 1.084 33.414 93.14 23.606 23 Australia AUS 2014 22475000 85.6 62513 100 63207272079 1.025 32.667 93.756 22.103 24 Australia AUS 2015 2380000 85.7 65710 100 45892808567 0.917 33.326 93.756 25.103 25 Australia AUS 2016 24128000 85.8 49875 100 4296960135 0.776 33.045 92.793 25.535 26 Australia AUS 2016 24128000 85.8 49875 100 4296960135 0.776 33.045 92.793 25.535 26 Australia AUS 2017 24451000 85.9 63936 100 44596808547 0.917 33.326 92.793 25.535 26 Australia AUS 2017 24451000 85.9 63936 100 4459680747 0.9592 30.764 91.847 24.873 28 Australia AUS 2018 2218 22679000 86.1 54941 100 38959497515 0.87 27.819 91.43 33.144	3.852 33.4
19 Australia AUS 2010 2210000 85.2 62134 100 35210733743 1.255 39.77 94.963 22.123 20 Australia AUS 2011 22400000 85.3 62596 100 65554800449 1.276 37.415 93.707 22.299 21 Australia AUS 2012 2322000 85.4 68044 100 75750426822 1.1572 35.474 93.359 22.643 22 Australia AUS 2013 23151000 85.5 68158 100 54465480054 1.084 33.414 93.14 23.606 23 Australia AUS 2014 22475000 85.6 62513 100 63207272079 1.025 32.667 93.756 22.103 24 Australia AUS 2015 2380000 85.7 65710 100 45892808567 0.917 33.326 93.756 25.103 25 Australia AUS 2016 24128000 85.8 49875 100 4296960135 0.776 33.045 92.793 25.535 26 Australia AUS 2016 24128000 85.8 49875 100 4296960135 0.776 33.045 92.793 25.535 26 Australia AUS 2017 24451000 85.9 63936 100 44596808547 0.917 33.326 92.793 25.535 26 Australia AUS 2017 24451000 85.9 63936 100 4459680747 0.9592 30.764 91.847 24.873 28 Australia AUS 2018 2218 22679000 86.1 54941 100 38959497515 0.87 27.819 91.43 33.144	4.311 33.49
20 Australia AUS 2011 22480000 85.3 62596 100 65554890645 1.276 37.415 93.707 22.299 21 Australia AUS 2012 22820000 85.4 68044 100 67556489262 1.192 33.457 93.859 22.643 22 Australia AUS 2015 2315000 85.5 68198 100 54465460054 1.084 33.414 93.14 23.806 22 Australia AUS 2016 22475000 85.6 62513 100 63207278079 1.025 32.667 93.756 22.513 24 Australia AUS 2016 22800000 85.7 56710 100 48290278079 1.025 32.667 93.756 25.97 25.9	5.037 33.07
21 Australia ALS 2012 22822000 85.4 680.44 100 37550-428622 1.152 35.47 93.859 22.643 22 Australia ALS 2013 23151000 85.5 68158 100 65465540000 1.025 32.467 93.756 22.5006 23 Australia ALS 2014 22475000 85.6 62513 100 63202728076 1.025 32.667 93.756 22.5103 24 Australia ALS 2015 22800000 85.7 66710 100 64892808667 0.917 33.269 32.469 25.57 25.67 25 Australia ALS 2016 242000 85.8 48975 10.0 4289680615 0.776 33.646 92.793 25.515 26 Australia ALS 2017 24451000 85.9 53936 100 4319864224 0.476 31.577 93.115 25.249 27 Australia ALS 2018 2477200 86 5727 100 6088590478 0.952 30.764 91.647 24.673 28 Australia ALS 2018 2477200 86 5727 100 6088590478 0.952 30.764 91.647 24.673 30.144 10.0 38956497515 0.87 27.719 91.143 30.144 10.0 38956497515 0.97 27.719 91.143 30.144 10.0 38956497515 0.97 27.719 91.143 30.144 10.0 38956497515 0.97 27.719 91.143 30.144 10.0 38956497515 0.97 27.719 91.143 30.144 10.0 38956497515 0.97 27.719 91.143 30.0 380564975 0.97 27.719 91.143 30.0 380564975 0.97 27.719 91.143 30.0 38056497	6.293 33.99
23 Australia AUS 2014 23475000 8.5.8 482513 100 632027281075 1.025 32.867 93.756 25.103 24 Australia AUS 2016 23800000 85.7 66710 100 46982808667 0.917 33.326 93.496 22.537 25.807 25 Australia AUS 2016 242000 85.8 48975 100 42806805135 0.776 33.645 92.793 25.535 26 Australia AUS 2017 24451000 85.9 63936 100 4819864324 0.878 31.977 93.115 25.289 27 Australia AUS 2018 2477200 86 57207 100 60685908478 0.952 30.764 91.647 24.873 28 Australia AUS 2019 25098000 86.1 54041 100 38950497515 0.87 27.919 91.433 30.184	6.141 35.74
24 Australia AUS 2015 23800000 85.7 56710 10 46892208567 0.917 33.326 93.496 25.97 25 Australia AUS 2016 24120000 85.8 49875 100 4289656115 0.776 33.045 92.793 25.535 26 Australia AUS 2017 24451000 85.9 5398 10 48198614234 0.876 31.977 93.117 93.117 25.289 27 Australia AUS 2018 24772000 86 67207 100 6088590478 0.952 30.764 91.647 24.873 28 Australia AUS 2019 25889000 86.1 54941 10 38956497519 0.87 27.819 91.43 30.184	6.86 36.11
25 Australia AUS 2016 24126000 85.8 49875 100 42969506135 0.776 33.045 92.793 25.535 26 Australia AUS 2017 24451000 85.9 53936 100 4519641224 0.476 31.577 93.115 25.289 27 Australia AUS 2018 2477200 86 5727 100 6068590478 0.592 30.764 91.647 24.873 28 Australia AUS 2019 25099000 86.1 54941 100 38955497519 0.87 27.819 91.433 30.184	6.244 35.98
26 Australia AUS 2017 24451000 85.9 53936 100 48198614234 0.878 31.977 93.115 25.289 27 Australia AUS 2018 24772000 86 57207 100 60685908476 0.952 30.764 91.647 24.873 28 Australia AUS 2019 25089000 86.1 54641 100 38955497515 0.87 27.819 91.433 30.184	6.504 34
27 Australia AUS 2018 24772000 86 57207 100 60885908476 0.952 30.764 91.647 24.873 28 Australia AUS 2019 25089000 86.1 54941 100 38955497515 0.87 27.819 91.433 30.184	7.207 34.21
28 Australia AUS 2019 25089000 86.1 54941 100 38959497515 0.87 27.819 91.433 30.184	6.885 35.84
28 Australia AUS 2019 25089000 86.1 54941 100 38959497615 0.87 27.819 91.433 30.184	8.353 36.0
	8.567 33.4
42 Iceland ISL 1992 260000 91.1 27124 100 8648079 0 2.904 40.448 0	59.552 37.54
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44 Iceland ISL 1996 270000 91.8 27614 100 83381484 0 3.006 41.624 0	58.376 38.61
45 Iceland ISL 1997 273000 92 27919 100 148012830 0 2.976 39.155 0	60.845 36.17
46 Iceland ISL 1998 275000 92.1 31030 100 154082591 0 2.47 36.741 0	63.259 34.27
47 Iceland ISL 1969 278000 92.3 32381 100 66639312 0 2.637 33.872 0	66.128 31.23
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49 Iceland ISL 2001 283000 92.5 28897 100 163445772 0 3.688 31.539 0	68.461 27.85
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53 Iceland ISL 2005 295000 93 56794 100 3093680067 0 3.373 32.543 0	67.457 29.1
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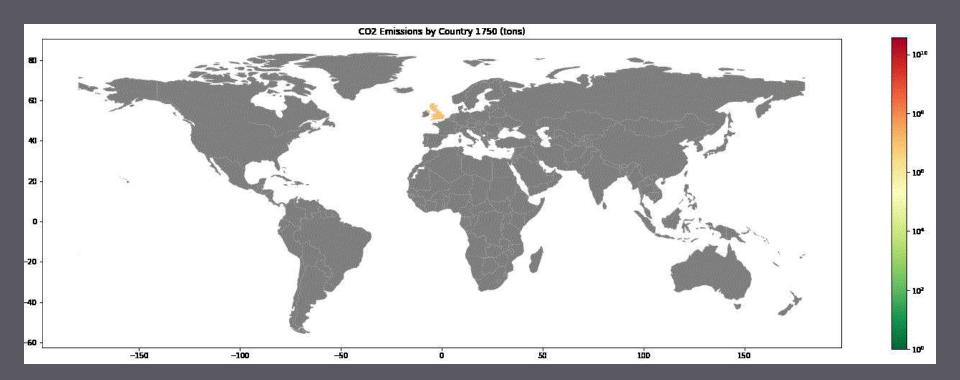
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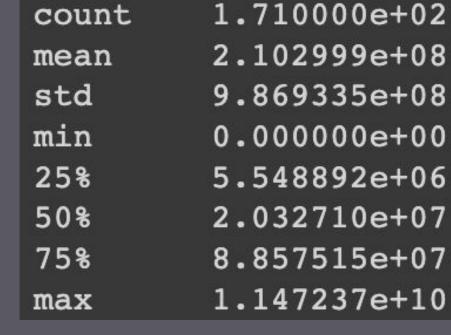
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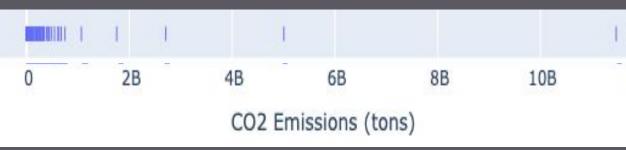
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CO₂ Emissions







Predicting Variables

1 Population

Foreign Direct Investment

2 GDP Per Capita

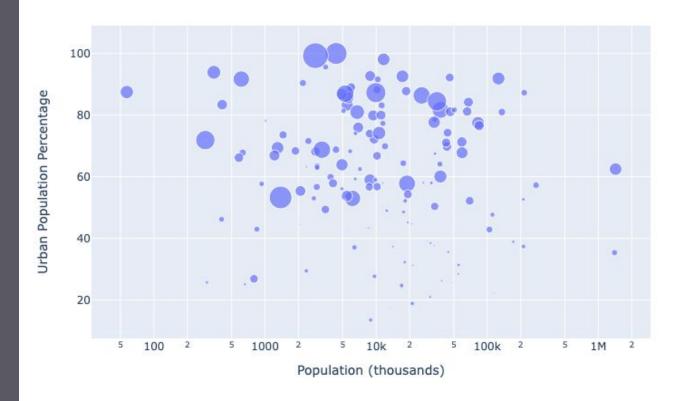
Fortune Global 500 Companies

Electrification

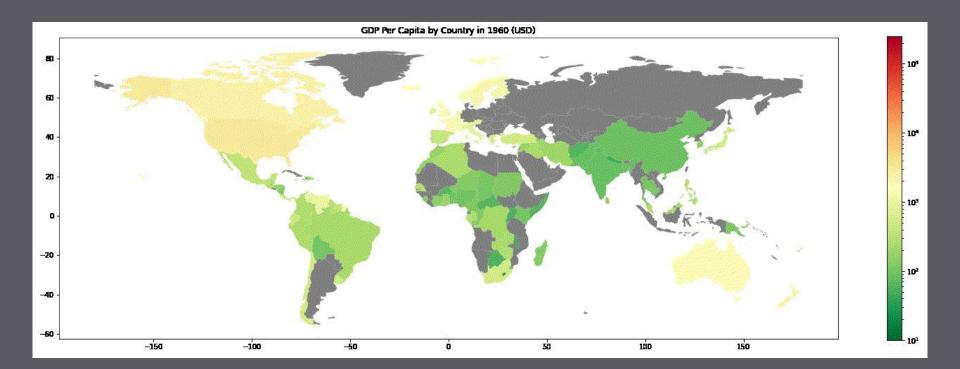
6 Energy Sectors

01 Population

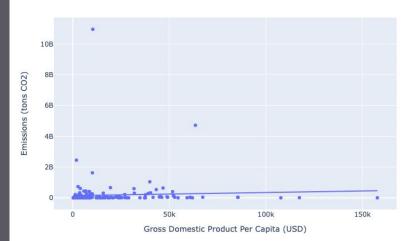
Per Capita Emissions vs Population and Urban Population Percentage



02 GDP Per Capita



Emissions vs GDP Per Capita

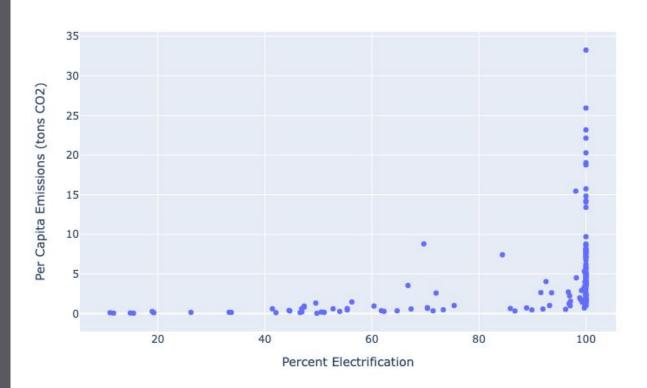


Per Capita Emissions vs GDP Per Capita



03 Electrification

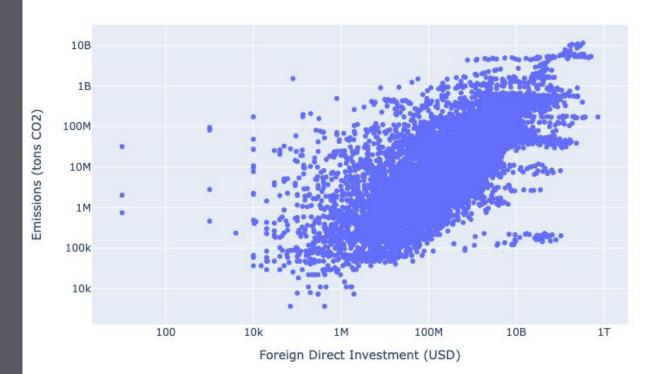
Electrification vs Per Capita Emissions



04

Foreign Direct Investment

FDI vs Emissions



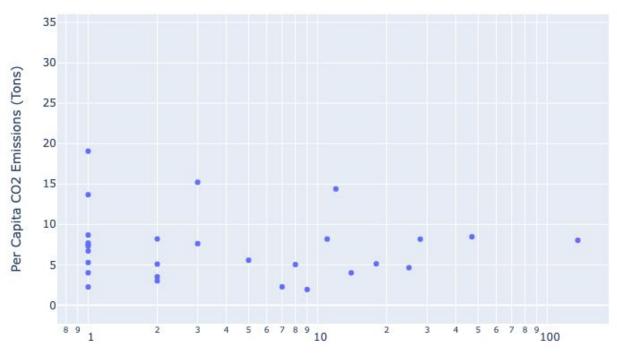
05

Fortune Global 500 Companies

Fortune Global 500 Countries by City

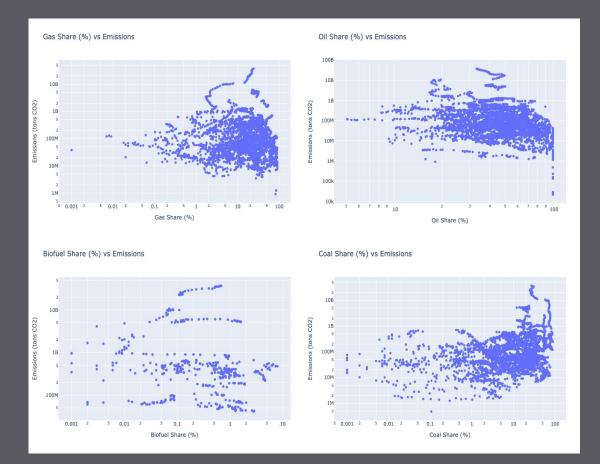


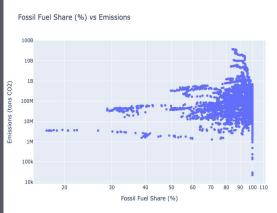
Fortune 500 Companies vs Per Capita Emissions



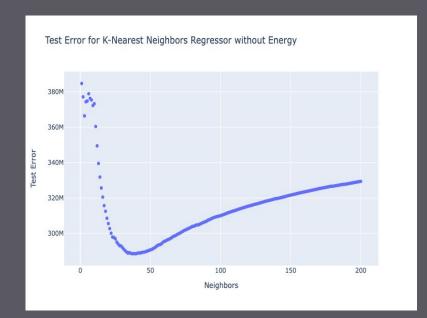
Number of Fortune Global 500 Companies

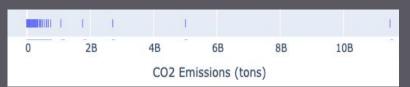
06Energy Sectors

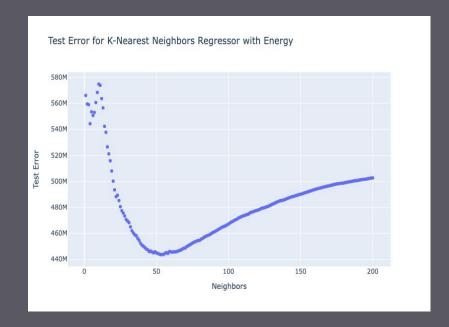


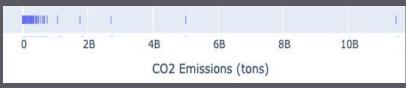


Machine Learning



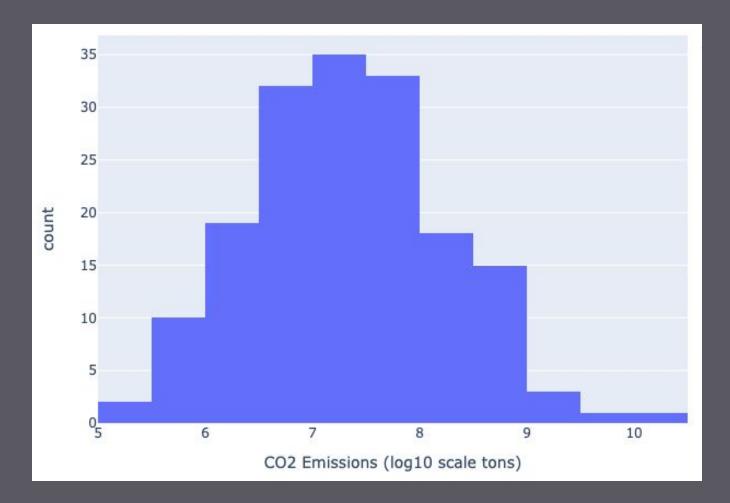


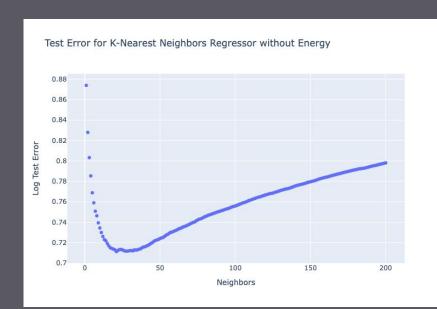


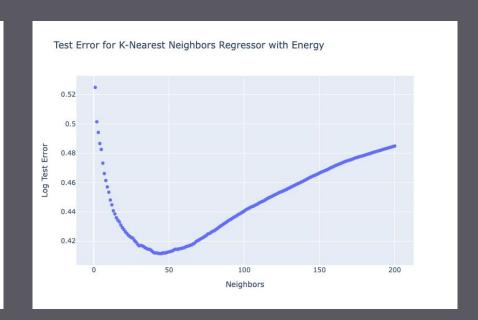


	Without Energy Data	With Energy Data
K-Nearest Neighbors	2.9 x 108 tons CO2	4.4 x 10 ⁸ tons CO ₂
Linear Regression	4.4 x 10 ⁸ tons CO ₂	7.9 x 10 ⁸ tons CO ₂
Voting Ensemble	3.3 x 10 ⁸ tons CO ₂	5.6 x 10 ⁸ tons CO ₂
XGBoost	3.2 x 10 ⁸ tons CO ₂	6.4 x 10 ⁸ tons CO ₂
XGBoost with Hyperparameter Tuning	2.7 x 10 ⁸ tons CO ₂	5.1 x 10 ⁸ tons CO ₂

Log Normal Distribution







	Without Energy Data	With Energy Data
K-Nearest Neighbors	0.711	0.411
Linear Regression	0.846	0.423
Voting Ensemble	0.739	0.374
Stacking Ensemble	0.707	0.385
XGBoost	0.325	0.268
XGBoost with Hyperparameter Tuning	0.301	0.258

Accuracy

Normal RMSE

RMSE > Mean

RMSE ≈ 30% std

ML is about 3x as accurate as guessing the average value

Log Scale RMSE

RMSE = 0.258

y_pred * 10^{0.258} = y_true y_pred * 1.8 = y_true

ML is within a factor of 2 on average

Questions?