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7. Appendix

7.1. Scale effects of performance evaluation measures

where $A_i = y_{true}$, $F_i = y_{pred}$, $X_i = (n_{floors_i} \times A_{building})$

7.1.1. Coefficient of Variation (CV)

$$CV(A_i, F_i) = \frac{\sqrt{\frac{1}{N} \sum_{i=1}^N (F_i - A_i)^2}}{\frac{1}{N} \sum_{i=1}^N F_i}$$

$$CV\left(\frac{A_i}{X_i}, \frac{F_i}{X_i}\right) = \sqrt{\frac{\frac{1}{N} \sum_{i=1}^N \left(\frac{F_i}{X_i} - \frac{A_i}{X_i}\right)^2}{\frac{1}{N} \sum_{i=1}^N \frac{F_i}{X_i}}} = \sqrt{\frac{\frac{1}{N} \sum_{i=1}^N \left(\frac{F_i - A_i}{X_i}\right)^2}{\frac{1}{N} \sum_{i=1}^N \frac{F_i}{X_i}}} = \sqrt{\frac{\frac{1}{N} \sum_{i=1}^N \frac{X_i^2}{X_i} \left(\frac{F_i - A_i}{X_i}\right)^2}{\frac{1}{N} \sum_{i=1}^N X_i^2 \frac{F_i}{X_i}}} = \sqrt{\frac{\frac{1}{N} \sum_{i=1}^N (F_i - A_i)^2}{\frac{1}{N} \sum_{i=1}^N F_i}} = CV(A_i, F_i)$$

7.1.2. Mean Absolute Percentage Error (MAPE)

$$MAPE(A_i, F_i) = \frac{100\%}{n} \sum_{i=1}^n \left| \frac{A_i - F_i}{A_i} \right|$$

$$MAPE\left(\frac{A_i}{X_i}, \frac{F_i}{X_i}\right) = \frac{100\%}{n} \sum_{i=1}^n \left| \frac{\frac{A_i}{X_i} - \frac{F_i}{X_i}}{\frac{A_i}{X_i}} \right| = \frac{100\%}{n} \sum_{i=1}^n \left| \frac{\frac{X_i}{A_i} A_i - \frac{X_i}{A_i} F_i}{\frac{X_i}{A_i} A_i} \right| = \frac{100\%}{n} \sum_{i=1}^n \left| \frac{A_i - F_i}{A_i} \right| = MAPE(A_i, F_i) = \frac{100\%}{n}$$

7.1.3. Root Mean Squared Error

$$RMSE(A_i, F_i) = \sqrt{\frac{1}{N} \sum_{i=1}^N (F_i - A_i)^2}$$

$$RMSE(A_i/X_i, F_i/X_i) = \sqrt{\frac{1}{N} \sum_{i=1}^N (F_i/X_i - A_i/X_i)^2} = \sqrt{\frac{1}{N} \sum_{i=1}^N \left(\frac{F_i - A_i}{X_i}\right)^2} \neq RMSE(A_i, F_i)$$

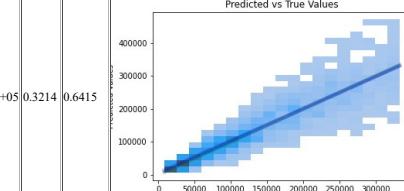
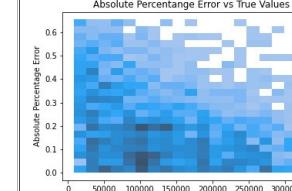
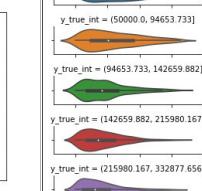
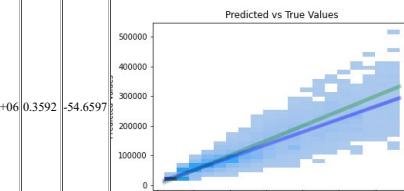
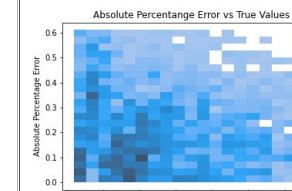
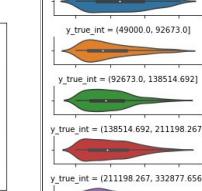
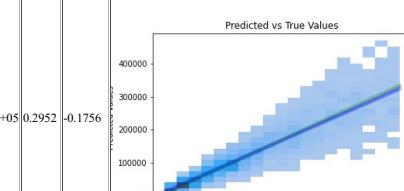
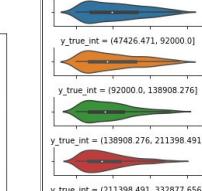
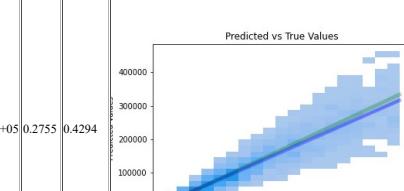
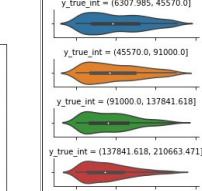
7.1.4. Mean Absolute Error

$$MAE(A_i, F_i) = \frac{1}{N} \sum_{i=1}^N |F_i - A_i|$$

$$MAE(A_i/X_i, F_i/X_i) = \frac{1}{N} \sum_{i=1}^N |F_i/X_i - A_i/X_i| = \frac{1}{N} \sum_{i=1}^N |(F_i - A_i)/X_i| \neq MAE(A_i, F_i)$$

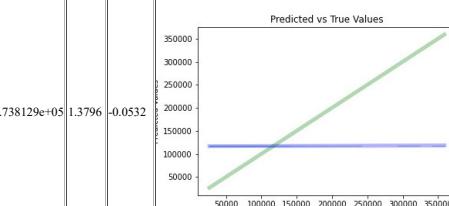
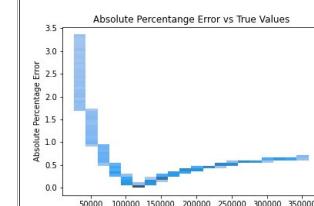
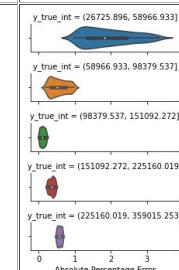
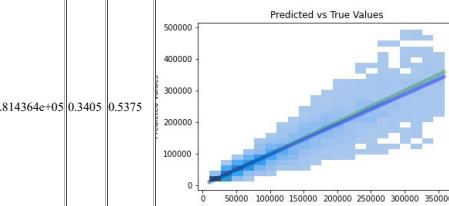
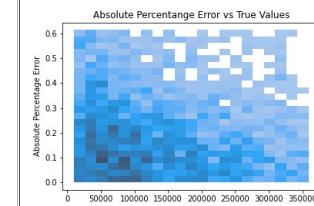
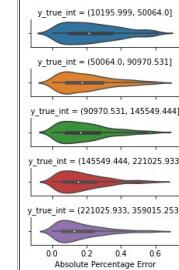
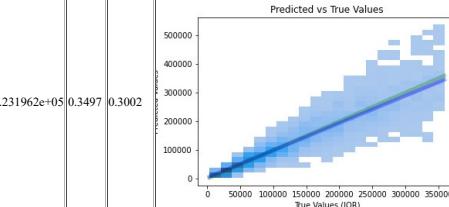
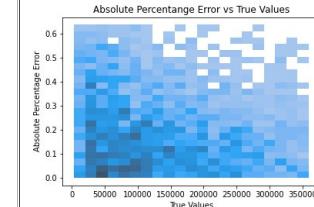
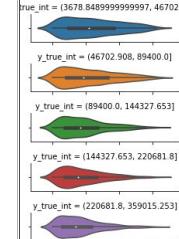
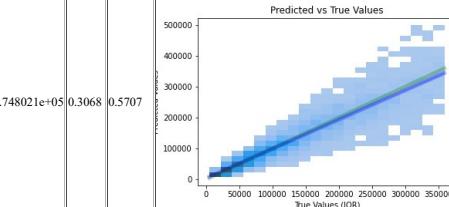
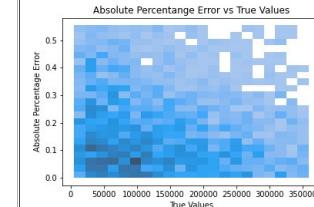
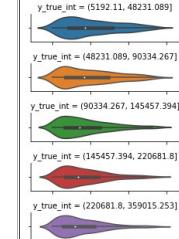
7.2. Results of Regressor Validation (on Test)

	regressor_name	ntest/ntrain	target_variable	RES ONLY	CY>1945	CY<1980	CANTON	YLM	features_significant	CV	MAE	MdAE	RMSE	MAPE	R2	plot_true_against_pred	plot_true_against_apc	plot_true_in_against_apc	
0	LinearRegression	4804/11209	gross_heating_kwh	False	False	False	None	True	['building_use_sia380_1_spital', 'building_use_sia380_1_spital-2', 'energy_reference_area_m2', 'n_apartments', 'volume_egid', 'renovate_neigh', 'construction_period', 'n_floors', 'building_area', 'building_use_sia380_1_schule', 'building_use_sia380_1_wohnen_mfh', 'heating_type_gwrb', 'altitude_egid', 'building_use_sia380_1_verkauf', 'construction_year', 'population_hectar', 'renovation_period', 'building_use_sia380_1_lager', 'building_use_sia380_1_wohnen_efh', 'building_use_sia380_1_industrie', 'minergie', 'has_boiler_for_space_and_water', 'building_use_sia380_1_verwaltung', 'population_growth_hectar']	0.9395	55192.5598	27037.9222	1.698176e+05	0.5113	0.5949				
1	LinearRegression	4804/11209	log_gross_heating_kwh	False	False	False	None	True	['building_use_sia380_1_spital', 'building_use_sia380_1_spital-2', 'building_use_sia380_1_wohnen_efh', 'building_area', 'n_floors', 'n_apartments', 'renovate_neigh', 'volume_egid', 'energy_reference_area_m2', 'construction_period', 'building_use_sia380_1_schule', 'building_use_sia380_1_wohnen_mfh', 'renovation_period', 'has_boiler_for_space_and_water', 'altitude_egid', 'renovpress', 'heating_type_gwrb', 'building_use_sia380_1_industrie', 'building_use_sia380_1_lager', 'building_use_sia380_1_verwaltung', 'construction_year', 'building_use_sia380_1_verkauf', 'population_hectar', 'building_use_sia380_1_versammlungskanal']	8.6627	94207.3345	29452.6385	1.584390e+06	0.5007	-34.2653				
2	LinearRegression	4804/11209	gross_heating_kwh_per_m2	False	False	False	None	True	['building_use_sia380_1_spital-2', 'building_use_sia380_1_spital', 'n_floors', 'construction_period', 'building_area', 'renovate_neigh', 'n_apartments', 'volume_egid', 'altitude_egid', 'has_boiler_for_space_and_water', 'building_use_sia380_1_wohnen_mfh', 'heating_type_gwrb', 'construction_year', 'renovpress', 'building_use_sia380_1_lager', 'building_use_sia380_1_industrie', 'population_hectar', 'population_growth_hectar', 'renovation_period', 'energy_reference_area_m2', 'building_use_sia380_1_versammlungskanal', 'minergie', 'building_use_sia380_1_verwaltung']	1.2890	55199.9190	21033.0304	2.400764e+05	0.3608	0.1903				
3	LinearRegression	4804/11209	log_gross_heating_kwh_per_m2	False	False	False	None	True	['building_use_sia380_1_spital', 'building_use_sia380_1_spital', 'n_floors', 'construction_period', 'building_area', 'renovate_neigh', 'volume_egid', 'n_apartments', 'building_use_sia380_1_wohnen_mfh', 'has_boiler_for_space_and_water', 'altitude_egid', 'heating_type_gwrb', 'energy_reference_area_m2', 'building_use_sia380_1_lager', 'building_use_sia380_1_industrie', 'population_hectar', 'construction_year', 'renovation_period', 'renovpress', 'building_use_sia380_1_wohnen_efh', 'population_growth_hectar', 'minergie', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_versammlungskanal', 'building_use_sia380_1_verkauf']	1.0409	50428.2958	20893.2503	1.839960e+05	0.3299	0.5244				

	regressor_name	ntest/ntrain	target_variable	RES ONLY	CY>1945	CY<1980	CANTON	YLIM	features_significant	CV	MAE	MdAE	RMSE	MAPE	R2	plot_true_against_pred	plot_true_against_apc	plot_true_int_against_apc
4	LinearRegression	4054/9458	gross_heating_kwh	True	False	False	None	True	['energy_reference_area_m2', 'n_apartments', 'volume_egid', 'construction_period', 'renovate_neigh', 'building_area', 'heating_type_gwrb', 'construction_year', 'n_floors', 'has_boiler_for_space_and_water', 'altitude_egid', 'minergie', 'renovation_period', 'population_hectar', 'population_growth_hectar']	0.7694	34811.6835	20151.7150	1.233171e+05	0.3214	0.6415			
5	LinearRegression	4054/9458	log_gross_heating_kwh	True	False	False	None	True	['building_area', 'n_floors', 'energy_reference_area_m2', 'n_apartments', 'renovate_neigh', 'building_use_sia380_1_wohnen_elbh', 'building_use_sia380_1_wohnen_mfh', 'construction_period', 'has_boiler_for_space_and_water', 'construction_year', 'heating_type_gwrb', 'altitude_egid', 'volume_egid', 'population_hectar', 'renovpress', 'renovation_period']	7.7673	84430.5037	22281.0912	1.536653e+06	0.3592	-54.6597			
6	LinearRegression	4054/9458	gross_heating_kwh_per_m2	True	False	False	None	True	['n_floors', 'construction_period', 'building_area', 'renovate_neigh', 'n_apartments', 'volume_egid', 'altitude_egid', 'construction_year', 'has_boiler_for_space_and_water', 'renovpress', 'heating_type_gwrb', 'energy_reference_area_m2', 'renovation_period', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_elbh', 'population_hectar', 'minergie', 'population_growth_hectar']	1.3968	39385.5847	18960.1127	2.233249e+05	0.2952	-0.1756			
7	LinearRegression	4054/9458	log_gross_heating_kwh_per_m2	True	False	False	None	True	['n_floors', 'construction_period', 'building_area', 'renovate_neigh', 'volume_egid', 'n_apartments', 'has_boiler_for_space_and_water', 'altitude_egid', 'construction_year', 'heating_type_gwrb', 'renovpress', 'energy_reference_area_m2', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_elbh', 'population_hectar', 'renovation_period', 'minergie', 'population_growth_hectar']	0.9986	36780.8493	18500.5793	1.555799e+05	0.2755	0.4294			

	regressor_name	ntest/ntrain	target_variable	RES ONLY	CY>1945	CY<1980	CANTON	YLIM	features_significant	CV	MAE	MdAE	RMSE	MAPE	R2	plot_true_against_pred	plot_true_against_apc	plot_true_int_against_apc
8	RandomForestRegressor	4804/11209	gross_heating_kwh	False	False	False	None	True	['energy_reference_area_m2', 'volume_egid', 'altitude_egid', 'construction_year', 'n_apartments', 'building_area', 'renovate_neigh', 'building_use_sia380_1_spital-2', 'renovpress', 'construction_period', 'has_boiler_for_space_and_water', 'population_growth_hectar', 'population_hectar', 'renovation_period', 'heating_type_gwrb', 'building_use_sia380_1_wohnen_efh', 'n_floors', 'building_use_sia380_1_industrie', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_schule', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_sportbau', 'minergie', 'building_use_sia380_1_lager', 'building_use_sia380_1_versammlungslokal']	0.9746	45198.7015	16572.7525	1.789202e+05	0.3243	0.5503			
9	RandomForestRegressor	4804/11209	log_gross_heating_kwh	False	False	False	None	True	['energy_reference_area_m2', 'volume_egid', 'n_apartments', 'altitude_egid', 'renovate_neigh', 'construction_year', 'building_area', 'population_hectar', 'renovpress', 'population_growth_hectar', 'has_boiler_for_space_and_water', 'heating_type_gwrb', 'renovation_period', 'construction_period', 'building_use_sia380_1_wohnen_efh', 'n_floors', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_verkauf', 'building_use_sia380_1_industrie', 'building_use_sia380_1_lager', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_spital', 'building_use_sia380_1_schule', 'building_use_sia380_1_spital-2', 'building_use_sia380_1_sportbau', 'building_use_sia380_1_versammlungslokal', 'minergie']	0.9899	43334.5472	16503.5681	1.684382e+05	0.2905	0.6014			
10	RandomForestRegressor	4804/11209	gross_heating_kwh_per_m2	False	False	False	None	True	['energy_reference_area_m2', 'altitude_egid', 'construction_year', 'n_apartments', 'renovate_neigh', 'building_area', 'n_floors', 'volume_egid', 'has_boiler_for_space_and_water', 'population_hectar', 'building_use_sia380_1_wohnen_mfh', 'population_growth_hectar', 'heating_type_gwrb', 'construction_period', 'renovation_period', 'building_use_sia380_1_wohnen_efh', 'building_use_sia380_1_industrie', 'building_use_sia380_1_lager', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_schule', 'building_use_sia380_1_spital', 'building_use_sia380_1_spital-2', 'building_use_sia380_1_versammlungslokal', 'building_use_sia380_1_verkauf', 'building_use_sia380_1_sportbau', 'minergie', 'building_use_sia380_1_restaurant']	0.7739	44197.8338	16344.9722	1.433649e+05	0.3155	0.7113			
11	RandomForestRegressor	4804/11209	log_gross_heating_kwh_per_m2	False	False	False	None	True	['energy_reference_area_m2', 'altitude_egid', 'construction_year', 'n_apartments', 'renovate_neigh', 'building_area', 'n_floors', 'volume_egid', 'has_boiler_for_space_and_water', 'renovpress', 'heating_type_gwrb', 'population_hectar', 'population_growth_hectar', 'building_use_sia380_1_wohnen_mfh', 'renovation_period', 'construction_period', 'building_use_sia380_1_wohnen_efh', 'building_use_sia380_1_industrie', 'building_use_sia380_1_lager', 'building_use_sia380_1_verkauf', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_schule', 'building_use_sia380_1_spital', 'building_use_sia380_1_spital-2', 'building_use_sia380_1_sportbau', 'minergie', 'building_use_sia380_1_versammlungslokal', 'building_use_sia380_1_sportbau', 'building_use_sia380_1_restaurant']	0.8076	41945.4182	15975.2082	1.381236e+05	0.2834	0.7320			

	regressor_name	ntrain/ntest	target_variable	RES ONLY	CY>1945	CY<1980	CANTON	YLIM	features_significant	CV	MAE	MdAE	RMSE	MAPE	R2	plot_true_against_pred	plot_true_against_apc	plot_true_int_against_apc
12	RandomForestRegressor	4054/9458	gross_heating_kwh	True	False	False	None	True	['energy_reference_area_m2', 'n_apartments', 'volume_egid', 'construction_year', 'building_area', 'altitude_egid', 'renovate_neigh', 'population_hectar', 'renovpress', 'population_growth_hectar', 'construction_period', 'n_floors', 'renovation_period', 'has_boiler_for_space_and_water', 'heating_type_gwrb', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efh', 'minergie']	0.8420	29823.2045	14670.1281	1.354554e+05	0.2503	0.5675			
13	RandomForestRegressor	4054/9458	log_gross_heating_kwh	True	False	False	None	True	['energy_reference_area_m2', 'volume_egid', 'n_apartments', 'renovate_neigh', 'construction_year', 'altitude_egid', 'building_area', 'population_hectar', 'renovpress', 'population_growth_hectar', 'has_boiler_for_space_and_water', 'heating_type_gwrb', 'renovation_period', 'construction_period', 'n_floors', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efh', 'minergie']	0.9015	29280.5472	14893.6676	1.388666e+05	0.2303	0.5454			
14	RandomForestRegressor	4054/9458	gross_heating_kwh_per_m2	True	False	False	None	True	['energy_reference_area_m2', 'altitude_egid', 'n_apartments', 'construction_year', 'n_floors', 'renovate_neigh', 'volume_egid', 'has_boiler_for_space_and_water', 'renovpress', 'building_area', 'population_hectar', 'population_growth_hectar', 'heating_type_gwrb', 'construction_period', 'renovation_period', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efh', 'minergie']	0.6913	29374.2180	14241.5299	1.123556e+05	0.2454	0.7024			
15	RandomForestRegressor	4054/9458	log_gross_heating_kwh_per_m2	True	False	False	None	True	['energy_reference_area_m2', 'altitude_egid', 'construction_year', 'renovate_neigh', 'n_apartments', 'heating_type_gwrb', 'volume_egid', 'n_floors', 'building_area', 'has_boiler_for_space_and_water', 'renovpress', 'population_hectar', 'population_growth_hectar', 'renovation_period', 'construction_period', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efh', 'minergie']	0.7831	29172.9186	14230.0828	1.216331e+05	0.2261	0.6513			

	regressor_name	ntest/ntrain	target_variable	RES ONLY	CY>1945	CY<1980	CANTON	YLIM	features_significant	CV	MAE	MdAE	RMSE	MAPE	R2	plot_true_against_pred	plot_true_against_apc	plot_true_int_against_apc
16	SVR	4804/11209	gross_heating_kwh	False	False	False	None	True	['n_floors', 'renovate_neigh', 'n_apartments', 'population_hectar', 'altitude_egid', 'energy_reference_area_m2', 'volume_egid', 'building_area', 'construction_year', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efh', 'has_boiler_for_space_and_water', 'construction_period', 'renovation_period', 'renovpress', 'heating_type_gwrb', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_industrie', 'building_use_sia380_1_schule', 'building_use_sia380_1_verkauf', 'building_use_sia380_1_spital', 'building_use_sia380_1_spital2', 'building_use_sia380_1_verksammlungslokal', 'minergie', 'building_use_sia380_1_sportbau', 'building_use_sia380_1_lager']	2.3358	120380.0155	75311.2300	2.738129e+05	1.3796	-0.0532			
17	SVR	4804/11209	log_gross_heating_kwh	False	False	False	None	True	['building_area', 'energy_reference_area_m2', 'n_apartments', 'volume_egid', 'n_floors', 'renovate_neigh', 'building_use_sia380_1_wohnen_efh', 'construction_period', 'construction_year', 'altitude_egid', 'building_use_sia380_1_wohnen_mfh', 'has_boiler_for_space_and_water', 'renovpress', 'population_hectar', 'heating_type_gwrb', 'renovation_period', 'population_growth_hectar', 'building_use_sia380_1_schule', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_industrie', 'building_use_sia380_1_verkauf', 'building_use_sia380_1_lager', 'building_use_sia380_1_spital', 'building_use_sia380_1_spital2', 'minergie', 'building_use_sia380_1_sportbau']	1.0668	46851.5876	19531.1810	1.814364e+05	0.3405	0.5375			
18	SVR	4804/11209	gross_heating_kwh_per_m2	False	False	False	None	True	['n_floors', 'renovate_neigh', 'construction_year', 'altitude_egid', 'n_apartments', 'energy_reference_area_m2', 'construction_period', 'has_boiler_for_space_and_water', 'building_area', 'building_use_sia380_1_wohnen_mfh', 'renovpress', 'heating_type_gwrb', 'renovation_period', 'population_hectar', 'volume_egid', 'building_use_sia380_1_wohnen_efh', 'minergie', 'building_use_sia380_1_spital', 'building_use_sia380_1_spital2', 'building_use_sia380_1_industrie', 'building_use_sia380_1_lager']	1.1922	54224.9352	20713.1871	2.231962e+05	0.3497	0.3002			
19	SVR	4804/11209	log_gross_heating_kwh_per_m2	False	False	False	None	True	['n_floors', 'energy_reference_area_m2', 'n_apartments', 'renovate_neigh', 'volume_egid', 'building_area', 'construction_year', 'construction_period', 'altitude_egid', 'has_boiler_for_space_and_water', 'heating_type_gwrb', 'building_use_sia380_1_wohnen_efh', 'renovation_period', 'population_hectar', 'renovpress', 'building_use_sia380_1_wohnen_mfh', 'population_growth_hectar', 'building_use_sia380_1_industrie', 'building_use_sia380_1_lager', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_verkauf', 'building_use_sia380_1_spital', 'building_use_sia380_1_spital2', 'building_use_sia380_1_spital', 'building_use_sia380_1_schule', 'minergie', 'building_use_sia380_1_verksammlungslokal', 'building_use_sia380_1_sportbau']	0.9915	45242.3272	18401.7674	1.748021e+05	0.3068	0.5707			

	regressor_name	ntest/ntrain	target_variable	RES ONLY	CY>1945	CY<1980	CANTON	YLIM	features_significant	CV	MAE	MdAE	RMSE	MAPE	R2	plot_true_against_pred	plot_true_against_apc	plot_true_int_against_apc
20	SVR	4054/9458	gross_heating_kwh	True	False	False	None	True	['n_floors', 'renovate_neigh', 'n_apartments', 'population_hectar', 'volume_egid', 'energy_reference_area_m2', 'building_area', 'altitude_egid', 'construction_year', 'building_use_sia380_1_wohnen_mfh', 'has_boiler_for_space_and_water', 'construction_period', 'renovation_period', 'renovpress', 'heating_type_gwrb', 'minergie']	1.7862	101405.8074	73821.1543	2.101013e+05	1.3219	-0.0405			
21	SVR	4054/9458	log_gross_heating_kwh	True	False	False	None	True	['building_area', 'volume_egid', 'n_apartments', 'energy_reference_area_m2', 'n_floors', 'renovate_neigh', 'construction_period', 'construction_year', 'population_hectar', 'altitude_egid', 'has_boiler_for_space_and_water', 'renovpress', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efh', 'population_growth_hectar', 'heating_type_gwrb', 'renovation_period', 'minergie']	1.0021	32178.9631	16868.6379	1.547754e+05	0.2603	0.4353			
22	SVR	4054/9458	gross_heating_kwh_per_m2	True	False	False	None	True	['n_floors', 'renovate_neigh', 'n_apartments', 'construction_year', 'energy_reference_area_m2', 'altitude_egid', 'building_area', 'construction_period', 'has_boiler_for_space_and_water', 'renovpress', 'volume_egid', 'renovation_period', 'heating_type_gwrb', 'population_hectar', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efh', 'minergie']	0.6746	35026.7002	18822.9302	1.088547e+05	0.2896	0.7207			
23	SVR	4054/9458	log_gross_heating_kwh_per_m2	True	False	False	None	True	['n_floors', 'volume_egid', 'n_apartments', 'building_area', 'renovate_neigh', 'energy_reference_area_m2', 'construction_year', 'construction_period', 'altitude_egid', 'has_boiler_for_space_and_water', 'population_hectar', 'heating_type_gwrb', 'renovpress', 'renovation_period', 'population_growth_hectar', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efh', 'minergie']	0.6860	30993.2445	16661.8150	1.084469e+05	0.2526	0.7228			

	regressor_name	ntest/ntrain	target_variable	RES ONLY	CY>1945	CY<1980	CANTON	YLIM	features_significant	CV	MAE	MdAE	RMSE	MAPE	R2	plot_true_against_pred	plot_true_against_apc	plot_true_int_against_apc
24	XGBRegressor	4804/11209	gross_heating_kwh	False	False	False	None	True	['energy_reference_area_m2', 'volume_egid', 'altitude_egid', 'construction_year', 'building_area', 'n_apartments', 'building_use_sia380_1_spital', 'renovrate_neigh', 'renovpress', 'building_use_sia380_1_industrie', 'n_floors', 'population_hectar', 'population_growth_hectar', 'heating_type_gwrb', 'construction_period', 'has_boiler_for_space_and_water', 'building_use_sia380_1_wohnen_effh', 'building_use_sia380_1_schule', 'building_use_sia380_1_verkauf', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_sportbau', 'minergie', 'building_use_sia380_1_lager', 'building_use_sia380_1_versammlungslokal']	1.0883	46269.2485	18805.7536	1.983520e+05	0.33330	0.4473			
25	XGBRegressor	4804/11209	log_gross_heating_kwh	False	False	False	None	True	['energy_reference_area_m2', 'n_apartments', 'building_area', 'renovrate_neigh', 'volume_egid', 'altitude_egid', 'construction_year', 'heating_type_gwrb', 'n_floors', 'population_hectar', 'renovpress', 'population_growth_hectar', 'has_boiler_for_space_and_water', 'construction_period', 'construction_neigh', 'building_use_sia380_1_wohnen_effh', 'building_use_sia380_1_verkauf', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_industrie', 'building_use_sia380_1_spital', 'building_use_sia380_1_lager', 'building_use_sia380_1_schule', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_versammlungslokal', 'minergie', 'building_use_sia380_1_sportbau']	0.8404	44780.1748	17996.4082	1.448026e+05	0.3010	0.7054			
26	XGBRegressor	4804/11209	gross_heating_kwh_per_m2	False	False	False	None	True	['energy_reference_area_m2', 'n_apartments', 'n_floors', 'renovrate_neigh', 'altitude_egid', 'volume_egid', 'construction_year', 'building_area', 'renovpress', 'population_hectar', 'population_growth_hectar', 'has_boiler_for_space_and_water', 'heating_type_gwrb', 'building_use_sia380_1_wohnen_effh', 'construction_period', 'renovation_period', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_spital', 'building_use_sia380_1_industrie', 'building_use_sia380_1_lager', 'building_use_sia380_1_schule', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_versammlungslokal', 'building_use_sia380_1_verkauf', 'minergie', 'building_use_sia380_1_sportbau']	0.6820	44468.2753	17609.7929	1.247446e+05	0.3216	0.7814			
27	XGBRegressor	4804/11209	log_gross_heating_kwh_per_m2	False	False	False	None	True	['energy_reference_area_m2', 'n_apartments', 'n_floors', 'renovrate_neigh', 'altitude_egid', 'construction_year', 'volume_egid', 'heating_type_gwrb', 'building_area', 'renovpress', 'population_hectar', 'population_growth_hectar', 'has_boiler_for_space_and_water', 'renovation_period', 'construction_period', 'building_use_sia380_1_wohnen_effh', 'building_use_sia380_1_lager', 'building_use_sia380_1_verkauf', 'building_use_sia380_1_spital', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_schule', 'minergie', 'building_use_sia380_1_versammlungslokal', 'building_use_sia380_1_sportbau']	0.8237	44098.2541	18132.3239	1.413213e+05	0.2996	0.7194			

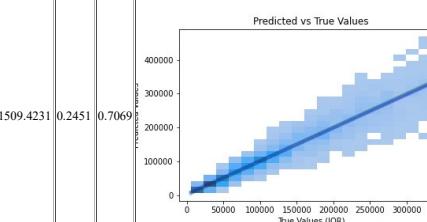
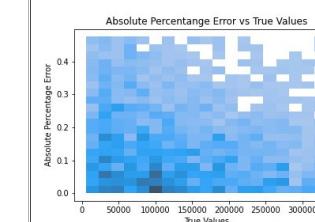
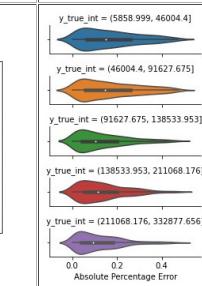
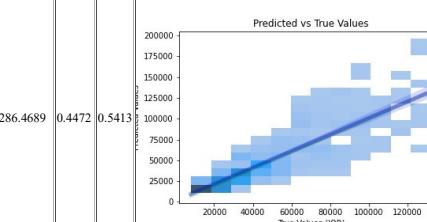
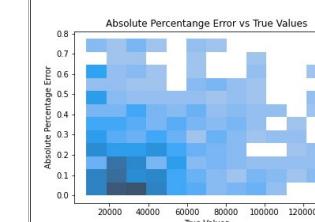
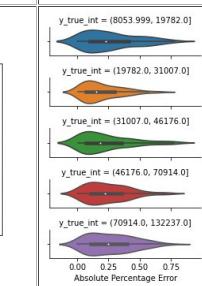
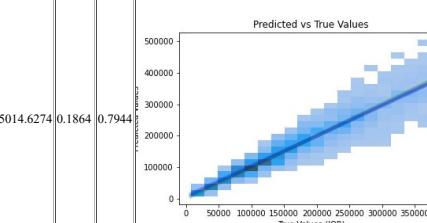
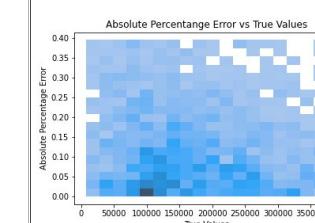
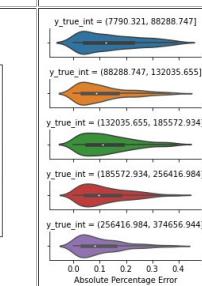
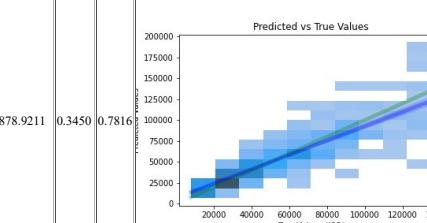
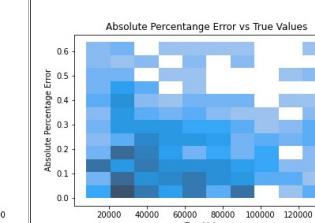
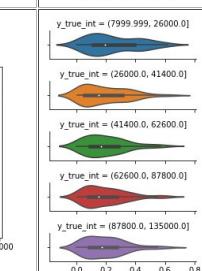
	regressor_name	ntest/ntrain	target_variable	RES ONLY	CY>1945	CY<1980	CANTON	YLIM	features_significant	CV	MAE	MdAE	RMSE	MAPE	R2	plot_true_against_pred	plot_true_against_apc	plot_true_int_against_apc
28	XGBRegressor	4054/9458	gross_heating_kwh	True	False	False	None	True	['energy_reference_area_m2', 'n_apartments', 'volume_egid', 'construction_year', 'building_area', 'altitude_egid', 'renovrate_neigh', 'population_hectar', 'renovpress', 'population_growth_hectar', 'n_floors', 'construction_period', 'has_boiler_for_space_and_water', 'heating_type_gwrb', 'renovation_period', 'minergie', 'building_use_sia380_1_wohnen_efh']	0.8776	31820.4599	16029.9095	1.410092e+05	0.2629	0.5313	Predicted vs True Values 	Absolute Percentage Error vs True Values 	<ul style="list-style-type: none">y_true_int = (8483 999, 46568.0)y_true_int = (46568.0, 92119.869]y_true_int = (92119.869, 139143.342]y_true_int = (139143.342, 211424.85]y_true_int = (211424.85, 332877.656]
29	XGBRegressor	4054/9458	log_gross_heating_kwh	True	False	False	None	True	['energy_reference_area_m2', 'renovrate_neigh', 'n_apartments', 'building_area', 'volume_egid', 'altitude_egid', 'construction_year', 'heating_type_gwrb', 'renovpress', 'population_hectar', 'population_growth_hectar', 'has_boiler_for_space_and_water', 'n_floors', 'renovation_period', 'construction_period', 'building_use_sia380_1_wohnen_efh', 'minergie']	0.8822	31599.5934	16015.9212	1.374754e+05	0.2437	0.5545	Predicted vs True Values 	Absolute Percentage Error vs True Values 	<ul style="list-style-type: none">y_true_int = (5858 999, 45145.014]y_true_int = (45145.014, 91000.0]y_true_int = (91000.0, 138053.35]y_true_int = (138053.35, 211552.991]y_true_int = (211552.991, 332877.656]
30	XGBRegressor	4054/9458	gross_heating_kwh_per_m2	True	False	False	None	True	['energy_reference_area_m2', 'n_apartments', 'renovrate_neigh', 'n_floors', 'volume_egid', 'altitude_egid', 'construction_year', 'renovpress', 'building_area', 'population_hectar', 'population_growth_hectar', 'heating_type_gwrb', 'has_boiler_for_space_and_water', 'construction_period', 'building_use_sia380_1_wohnen_efh', 'renovation_period', 'minergie']	0.7570	31291.6882	15545.9202	1.228018e+05	0.2546	0.6445	Predicted vs True Values 	Absolute Percentage Error vs True Values 	<ul style="list-style-type: none">y_true_int = (5858 999, 45507.0)y_true_int = (45507.0, 91833.14)y_true_int = (91833.14, 138876.666]y_true_int = (138876.666, 211183.539)y_true_int = (211183.539, 332877.656)
31	XGBRegressor	4054/9458	log_gross_heating_kwh_per_m2	True	False	False	None	True	['energy_reference_area_m2', 'altitude_egid', 'n_apartments', 'n_floors', 'renovrate_neigh', 'construction_year', 'volume_egid', 'building_area', 'heating_type_gwrb', 'renovpress', 'population_hectar', 'population_growth_hectar', 'has_boiler_for_space_and_water', 'renovation_period', 'building_use_sia380_1_wohnen_efh', 'construction_period', 'minergie']	0.7613	30098.6219	15752.7803	1.189861e+05	0.2385	0.6663	Predicted vs True Values 	Absolute Percentage Error vs True Values 	<ul style="list-style-type: none">y_true_int = (5858 999, 45167.055)y_true_int = (45167.055, 91000.0]y_true_int = (91000.0, 138028.733]y_true_int = (138028.733, 210900.414)y_true_int = (210900.414, 332877.656)

7.3. Results of Subset Validation (on Test)

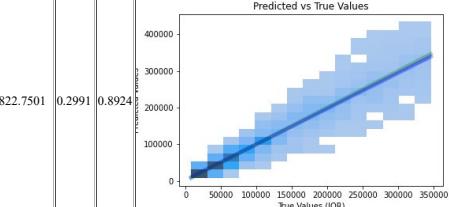
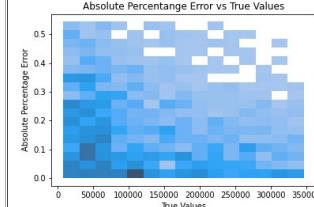
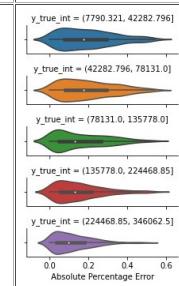
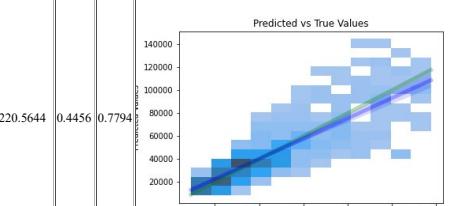
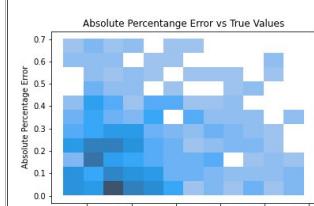
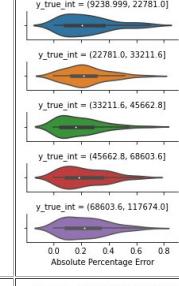
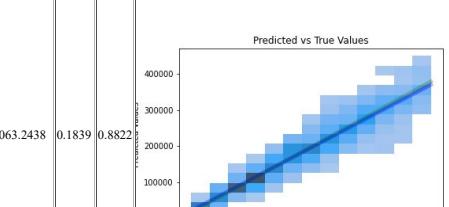
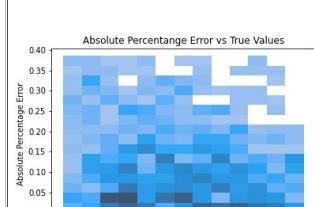
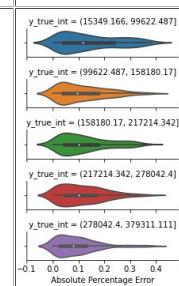
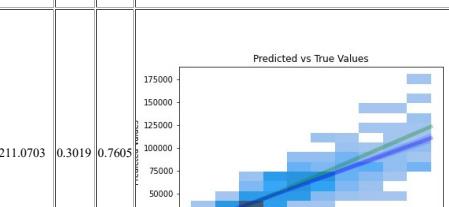
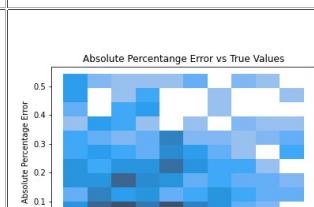
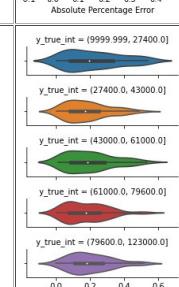
	regressor_name	ntest/ntrain	target_variable	RES ONLY	CY>1945	CY<1980	CANTON	YLIM	features_significant	CV	MAE	MdAE	RMSE	MAPE	R2	plot_true_against_pred	plot_true_against_ape	plot_true_imAgainstApe
0	RandomForestRegressor	6864/11209	gross_heating_kwh	False	False	False	None	True	['energy_reference_area_m2', 'volume_egid', 'altitude_egid', 'n_apartments', 'construction_year', 'building_area', 'renovate_neigh', 'construction_period', 'renovpress', 'building_use_sia380_1_spital-2', 'building_use_sia380_1_spital', 'population_growth_hectar', 'population_hectar', 'has_boiler_for_space_and_water', 'renovation_period', 'heating_type_gwrb', 'n_floors', 'building_use_sia380_1_wohnen_efh', 'building_use_sia380_1_industrie', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_schule', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_verkauf', 'building_use_sia380_1_sportbau', 'minergie', 'building_use_sia380_1_lager', 'building_use_sia380_1_versammlungskanal', 'building_use_sia380_1_restaurant']	0.7677	41313.6716	16428.8157	138411.3470	0.3100	0.6933			
1	RandomForestRegressor	1051/1715	gross_heating_kwh	False	False	False	BE	True	['energy_reference_area_m2', 'n_apartments', 'volume_egid', 'altitude_egid', 'population_hectar', 'construction_period', 'renovpress', 'building_area', 'construction_year', 'renovate_neigh', 'has_boiler_for_space_and_water', 'population_growth_hectar', 'heating_type_gwrb', 'renovation_period', 'minergie', 'building_use_sia380_1_schule', 'n_floors', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_industrie', 'building_use_sia380_1_versammlungskanal', 'building_use_sia380_1_verkauf', 'building_use_sia380_1_wohnen_efh', 'building_use_sia380_1_sportbau']	1.4643	34435.0371	10228.5495	110370.2963	0.4707	0.5222			
2	RandomForestRegressor	4866/7945	gross_heating_kwh	False	False	False	GE	True	['energy_reference_area_m2', 'volume_egid', 'construction_year', 'n_apartments', 'building_area', 'altitude_egid', 'renovate_neigh', 'renovation_period', 'renovpress', 'building_use_sia380_1_wohnen_mfh', 'population_growth_hectar', 'population_hectar', 'construction_period', 'n_floors', 'heating_type_gwrb', 'has_boiler_for_space_and_water', 'building_use_sia380_1_spital', 'building_use_sia380_1_spital-2', 'building_use_sia380_1_industrie', 'building_use_sia380_1_schule', 'building_use_sia380_1_verkauf', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_wohnen_efh', 'building_use_sia380_1_sportbau', 'building_use_sia380_1_lager', 'minergie', 'building_use_sia380_1_versammlungskanal', 'building_use_sia380_1_restaurant']	0.9397	48976.8446	18509.5384	202373.1332	0.2572	0.5691			
3	RandomForestRegressor	948/1547	gross_heating_kwh	False	False	False	SG	True	['energy_reference_area_m2', 'volume_egid', 'renovate_neigh', 'altitude_egid', 'building_area', 'population_growth_hectar', 'n_apartments', 'renovpress', 'population_hectar', 'construction_year', 'renovation_period', 'construction_period', 'has_boiler_for_space_and_water', 'n_floors', 'building_use_sia380_1_spital', 'building_use_sia380_1_spital-2', 'heating_type_gwrb', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_industrie', 'building_use_sia380_1_schule', 'building_use_sia380_1_verkauf', 'building_use_sia380_1_wohnen_efh', 'minergie', 'building_use_sia380_1_sportbau']	0.7332	23547.3903	11716.0000	60831.4955	0.3512	0.6700			

	regressor_name	ntest/ntrain	target_variable	RES_ONLY	CY>1945	CY<1980	CANTON	VLIMIT	features_significant	CV	MAE	MdAE	RMSE	MAPE	R2	plot_true_against_pred	plot_true_against_ape	plot_true_int_against_ape
4	RandomForestRegressor	6864/11209	gross_heating_kwh_per_m2	False	False	False	None	True	['energy_reference_area_m2', 'altitude_egid', 'n_apartments', 'n_floors', 'construction_year', 'renovate_neigh', 'volume_egid', 'renopress', 'building_area', 'has_boiler_for_space_and_water', 'population_hectar', 'population_growth_hectar', 'building_use_sia380_1_wohnen_mfh', 'heating_type_gwrb', 'construction_period', 'renovation_period', 'building_use_sia380_1_wohnen_efh', 'building_use_sia380_1_lager', 'building_use_sia380_1_industrie', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_schule', 'building_use_sia380_1_spital-2', 'building_use_sia380_1_spital', 'building_use_sia380_1_verkauf', 'building_use_sia380_1_versammlungslokal', 'building_use_sia380_1_sportbau', 'minergie', 'building_use_sia380_1_restaurant']	0.7694	40953.3503	16264.9977	140030.0766	0.3036	0.6861			
5	RandomForestRegressor	1051/1715	gross_heating_kwh_per_m2	False	False	False	BE	True	['energy_reference_area_m2', 'n_apartments', 'volume_egid', 'renovate_neigh', 'building_area', 'construction_year', 'renopress', 'altitude_egid', 'has_boiler_for_space_and_water', 'population_hectar', 'n_floors', 'heating_type_gwrb', 'construction_period', 'renovation_period', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efh', 'building_use_sia380_1_schule', 'building_use_sia380_1_versammlungslokal', 'building_use_sia380_1_verkauf', 'building_use_sia380_1_industrie', 'building_use_sia380_1_verwaltung', 'minergie', 'building_use_sia380_1_sportbau', 'building_use_sia380_1_spital-2', 'building_use_sia380_1_spital']	1.4279	33038.8793	10225.9499	107650.3787	0.4649	0.5455			
6	RandomForestRegressor	4866/7945	gross_heating_kwh_per_m2	False	False	False	GE	True	['energy_reference_area_m2', 'n_apartments', 'construction_year', 'n_floors', 'volume_egid', 'renopress', 'altitude_egid', 'renovate_neigh', 'building_area', 'population_hectar', 'population_growth_hectar', 'building_use_sia380_1_wohnen_mfh', 'renovation_period', 'has_boiler_for_space_and_water', 'heating_type_gwrb', 'construction_period', 'building_use_sia380_1_industrie', 'building_use_sia380_1_wohnen_efh', 'building_use_sia380_1_lager', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_schule', 'building_use_sia380_1_spital-2', 'building_use_sia380_1_spital', 'building_use_sia380_1_verkauf', 'building_use_sia380_1_sportbau', 'building_use_sia380_1_versammlungslokal', 'minergie', 'building_use_sia380_1_restaurant']	0.8252	48155.6481	18189.6635	180221.1427	0.2525	0.6583			
7	RandomForestRegressor	948/1547	gross_heating_kwh_per_m2	False	False	False	SG	True	['energy_reference_area_m2', 'renopress', 'has_boiler_for_space_and_water', 'volume_egid', 'building_area', 'altitude_egid', 'population_hectar', 'construction_year', 'population_growth_hectar', 'renovate_neigh', 'n_floors', 'n_apartments', 'renovation_period', 'construction_period', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efh', 'building_use_sia380_1_verwaltung', 'building_use_sia380_1_industrie', 'building_use_sia380_1_schule', 'building_use_sia380_1_spital-2', 'building_use_sia380_1_spital', 'minergie', 'building_use_sia380_1_versammlungslokal', 'building_use_sia380_1_sportbau', 'building_use_sia380_1_verkauf']	0.9490	26857.4960	11305.9189	83180.9442	0.3518	0.3831			

	regressor_name	ntest/ntrain	target_variable	RES ONLY	CY>1945	CY<1980	CANTON	YLIM	features_significant	CV	MAE	MdAE	RMSE	MAPE	R2	plot_true_against_pred	plot_true_against_ape	plot_true_int_against_ape
8	RandomForestRegressor	4054/9458	gross_heating_kwh	True	False	False	None	True	['energy_reference_area_m2', 'n_apartments', 'volume_egid', 'construction_year', 'renovate_neigh', 'altitude_egid', 'building_area', 'population_hectar', 'renovpress', 'population_growth_hectar', 'construction_period', 'n_floors', 'renovation_period', 'heating_type_gwrb', 'has_boiler_for_space_and_water', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efh', 'minergie']	0.8346	29502.6478	14716.2275	134207.8177	0.2482	0.5754			
9	RandomForestRegressor	642/1497	gross_heating_kwh	True	False	False	BE	True	['energy_reference_area_m2', 'n_apartments', 'volume_egid', 'n_floors', 'building_area', 'construction_period', 'renovate_neigh', 'population_growth_hectar', 'population_hectar', 'renovpress', 'altitude_egid', 'construction_year', 'has_boiler_for_space_and_water', 'renovation_period', 'heating_type_gwrb', 'building_use_sia380_1_wohnen_efh', 'building_use_sia380_1_wohnen_mfh', 'minergie']	0.8294	22464.8454	9059.8192	49250.0170	0.4431	0.6225			
10	RandomForestRegressor	2854/6659	gross_heating_kwh	True	False	False	GE	True	['energy_reference_area_m2', 'volume_egid', 'n_apartments', 'construction_year', 'building_area', 'population_hectar', 'altitude_egid', 'renovate_neigh', 'renovpress', 'population_growth_hectar', 'construction_period', 'n_floors', 'renovation_period', 'heating_type_gwrb', 'has_boiler_for_space_and_water', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efh', 'minergie']	0.8275	34662.8608	17658.0606	166533.3624	0.1886	0.4829			
11	RandomForestRegressor	558/1301	gross_heating_kwh	True	False	False	SG	True	['energy_reference_area_m2', 'volume_egid', 'building_area', 'altitude_egid', 'n_apartments', 'renovate_neigh', 'renovpress', 'population_hectar', 'construction_year', 'population_growth_hectar', 'construction_period', 'n_floors', 'heating_type_gwrb', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efh', 'minergie']	0.4731	18461.6237	10735.0000	33332.4071	0.3418	0.7612			

	regressor_name	ntest/ntrain	target_variable	RES ONLY	CY>1945	CY<1980	CANTON	YLIM	features_significant	CV	MAE	MdAE	RMSE	MAPE	R2	plot_true_against_pred	plot_true_against_ape	plot_true_int_against_ape
12	RandomForestRegressor	4054/9458	gross_heating_kwh_per_m2	True	False	False	None	True	['energy_reference_area_m2', 'altitude_egid', 'n_apartments', 'construction_year', 'n_floors', 'renovate_neigh', 'volume_egid', 'has_boiler_for_space_and_water', 'renovpress', 'building_area', 'population_hectar', 'population_growth_hectar', 'heating_type_gwrb', 'construction_period', 'renovation_period', 'building_use_sia380_1_wohnen_efh', 'building_use_sia380_1_wohnen_mfh', 'minergie']	0.6861	29330.5187	14304.5830	111509.4231	0.2451	0.7069			
13	RandomForestRegressor	642/1497	gross_heating_kwh_per_m2	True	False	False	BE	True	['energy_reference_area_m2', 'n_apartments', 'construction_year', 'volume_egid', 'renovate_neigh', 'building_area', 'population_hectar', 'altitude_egid', 'renovpress', 'population_growth_hectar', 'has_boiler_for_space_and_water', 'heating_type_gwrb', 'renovation_period', 'construction_period', 'building_use_sia380_1_wohnen_efh', 'building_use_sia380_1_wohnen_mfh', 'minergie']	0.8719	23904.1621	9507.7962	54286.4689	0.4472	0.5413			
14	RandomForestRegressor	2854/6659	gross_heating_kwh_per_m2	True	False	False	GE	True	['energy_reference_area_m2', 'construction_year', 'n_apartments', 'n_floors', 'volume_egid', 'altitude_egid', 'renovpress', 'population_hectar', 'renovate_neigh', 'building_area', 'population_growth_hectar', 'construction_period', 'heating_type_gwrb', 'renovation_period', 'building_use_sia380_1_wohnen_efh', 'building_use_sia380_1_wohnen_mfh', 'has_boiler_for_space_and_water', 'minergie']	0.5117	33533.5673	17047.2719	105014.6274	0.1864	0.7944			
15	RandomForestRegressor	558/1301	gross_heating_kwh_per_m2	True	False	False	SG	True	['energy_reference_area_m2', 'has_boiler_for_space_and_water', 'volume_egid', 'renovpress', 'altitude_egid', 'construction_year', 'building_area', 'renovate_neigh', 'n_apartments', 'population_hectar', 'population_growth_hectar', 'renovation_period', 'construction_period', 'heating_type_gwrb', 'building_use_sia380_1_wohnen_efh', 'building_use_sia380_1_wohnen_mfh', 'minergie']	0.4429	18311.5763	10579.8654	31878.9211	0.3450	0.7816			

	regressor_name	test/ntrain	target_variable	RES ONLY	CY>1945	CY<1980	CANTON	YLIM	features_significant	CV	MAE	MdAE	RMSE	MAPE	R2	plot_true_against_pred	plot_true_against_ape	plot_true_int_against_ape
16	RandomForestRegressor	2531/5903	gross_heating_kwh	True	False	True	None	True	['energy_reference_area_m2', 'n_apartments', 'volume_egid', 'altitude_egid', 'renovrate_neigh', 'building_area', 'renovpress', 'population_hectar', 'population_growth_hectar', 'construction_year', 'n_floors', 'has_boiler_for_space_and_water', 'construction_period', 'renovation_period', 'heating_type_gwrb', 'building_use_sia380_1_wohnen_efrh', 'building_use_sia380_1_wohnen_mfh', 'minergie']	0.3801	29219.8491	15545.6787	60056.8249	0.3029	0.8497			
17	RandomForestRegressor	506/1178	gross_heating_kwh	True	False	True	BE	True	['energy_reference_area_m2', 'n_apartments', 'volume_egid', 'renovpress', 'population_growth_hectar', 'altitude_egid', 'n_floors', 'population_hectar', 'has_boiler_for_space_and_water', 'building_area', 'renovrate_neigh', 'construction_year', 'heating_type_gwrb', 'renovation_period', 'construction_period', 'building_use_sia380_1_wohnen_efrh', 'building_use_sia380_1_wohnen_mfh']	0.6143	19323.5550	9849.2845	36192.9731	0.4683	0.7217			
18	RandomForestRegressor	1542/3596	gross_heating_kwh	True	False	True	GE	True	['energy_reference_area_m2', 'n_apartments', 'volume_egid', 'building_area', 'population_hectar', 'population_growth_hectar', 'renovrate_neigh', 'altitude_egid', 'renovpress', 'construction_year', 'n_floors', 'renovation_period', 'construction_period', 'heating_type_gwrb', 'has_boiler_for_space_and_water', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efrh', 'minergie']	0.2311	30350.7864	19352.2527	48872.1528	0.1874	0.8831			
19	RandomForestRegressor	483/1127	gross_heating_kwh	True	False	True	SG	True	['energy_reference_area_m2', 'volume_egid', 'n_apartments', 'renovpress', 'building_area', 'altitude_egid', 'renovrate_neigh', 'population_growth_hectar', 'population_hectar', 'has_boiler_for_space_and_water', 'construction_period', 'renovation_period', 'construction_year', 'n_floors', 'heating_type_gwrb', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efrh', 'minergie']	0.4026	16345.7671	10455.5000	26389.6974	0.3104	0.7573			

	regressor_name	ntest/ntrain	target_variable	RES ONLY	CY>1945	CY<1980	CANTON	YLIM	features_significant	CV	MAE	MdAE	RMSE	MAPE	R2	plot_true_against_pred	plot_true_against_ape	plot_true_int_against_ape
20	RandomForestRegressor	2531/5903	gross_heating_kwh_per_m2	True	False	True	None	True	['energy_reference_area_m2', 'altitude_egid', 'n_apartments', 'n_floors', 'renovrate_neigh', 'volume_egid', 'has_boiler_for_space_and_water', 'building_area', 'renovpress', 'population_hectar', 'population_growth_hectar', 'construction_year', 'renovation_period', 'heating_type_gwrb', 'construction_period', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efh', 'minergie']	0.3209	28019.8483	15263.1551	50822.7501	0.2991	0.8924			
21	RandomForestRegressor	506/1178	gross_heating_kwh_per_m2	True	False	True	BE	True	['energy_reference_area_m2', 'volume_egid', 'n_apartments', 'renovrate_neigh', 'building_area', 'has_boiler_for_space_and_water', 'renovpress', 'population_growth_hectar', 'altitude_egid', 'population_hectar', 'heating_type_gwrb', 'renovation_period', 'construction_year', 'construction_period', 'n_floors', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efh']	0.5152	18232.2246	9465.8794	32220.5644	0.4456	0.7794			
22	RandomForestRegressor	1542/3596	gross_heating_kwh_per_m2	True	False	True	GE	True	['energy_reference_area_m2', 'n_apartments', 'n_floors', 'volume_egid', 'altitude_egid', 'renovpress', 'population_hectar', 'renovrate_neigh', 'building_area', 'population_growth_hectar', 'renovation_period', 'construction_year', 'heating_type_gwrb', 'construction_period', 'has_boiler_for_space_and_water', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efh', 'minergie']	0.2311	30250.8910	19518.4377	49063.2438	0.1839	0.8822			
23	RandomForestRegressor	483/1127	gross_heating_kwh_per_m2	True	False	True	SG	True	['energy_reference_area_m2', 'volume_egid', 'renovpress', 'n_floors', 'has_boiler_for_space_and_water', 'altitude_egid', 'population_growth_hectar', 'building_area', 'renovrate_neigh', 'population_hectar', 'n_apartments', 'renovation_period', 'construction_year', 'construction_period', 'heating_type_gwrb', 'building_use_sia380_1_wohnen_mfh', 'building_use_sia380_1_wohnen_efh', 'minergie']	0.3996	16121.1275	9960.6402	26211.0703	0.3019	0.7605			

7.4. Survey Questionnaire

Modelling the energy usage of all buildings in Switzerland

1 - Where is the building located?

Street

House number

ZIP

City

2 - How do you use the building?

- Living in an apartment house
- Living in a family house

Another type of use

3 - How many rooms does your apartment have? On which floor is it?

Living rooms, bedrooms, children's rooms and study rooms count as whole rooms. The kitchen (except for the kitchen-living room) and the bathroom do not count as rooms. A 2-room or 2.5-room flat (as a rule) has a living room, a bedroom, a kitchen or eat-in kitchen and a bathroom. ([Hausinfo 2021](#))

Number of rooms

Floor

- 1st floor (ground floor/parterre)
- 2nd floor
- 3rd floor
- 4th floor
- 5th floor
- 6th floor
- 7th floor
- 8th floor
- 9th floor
- 10th floor
- 11th floor
- 12th floor
- 13th floor
- 14th floor
- 15th floor
- 16th floor

4 - How many rooms does the house have?

Number of rooms

5 - Which system is heating the building?

- Heating oil
- Gas
- District heating
- Heat pump geothermal
- Heat pump air
- Holz

6 - Enter the annual consumption of heating oil

Enter the consumption of heating oil in litres or, if applicable, in kWh. If this information is not available, please enter the amount in CHF.

Heating oil in litres per year

Litres per year
Heating oil in kWh per year

kWh per year
Heating oil in CHF per year

CHF per year

7 - Enter the annual consumption of gas

Enter the gas consumption in m³ or, if applicable, in kWh. If this information is not available, please enter the amount in CHF.

Gas in m³ per year

m³ per year
Gas in kWh per year

kWh per year
Gas in CHF per year

CHF per year

8 - Enter the annual consumption of district heating

Enter the consumption of district heating in kWh. If this information is not available, please enter the amount in CHF.

District heating in kWh per year

kWh per year
District heating in CHF per year

CHF per year

9 - Enter the annual consumption of heating electricity here (if not included in the electricity bill).

Enter the consumption of heating electricity in kWh. If this information is not available, please enter the amount in CHF.

Heating electricity in kWh per year

kWh per year

Heating electricity in CHF per year

CHF per year

10 - Enter the annual consumption of wood here.

Wood in m³ (1 m³=1 ster) per year

m³ per year

11 - Or upload your heating cost statement (service charge statement)

*Please ensure that the document covers **an entire year's** heating costs.*

12 - Is a power generation system installed? If yes, which one?

- none
- Photovoltaic system (PV, solar panels)
- Solar thermal system

13 - How much electricity do you produce in a year with your plant?

Electricity produced in kWh per year

kWh per year
Area of the system in m²

m²

14 - How large is your solar thermal system?

Area of the plant in m²

m²

15 - Do you charge electric cars at the given address?

- Yes
- No

16 - How much electricity does charge the electric car consume within a year?

Electric car power consumption in kWh per year

kWh per year

17 - Enter the annual power consumption in kWh

*Enter the consumption of electrical energy in kWh of your household here (**without self-production, without heating current, and without the charging current for electric cars**).*

If you do not know the kWh, you can enter the electricity costs in CHF or upload the electricity bill.

Power consumption in kWh per year

kWh per year

Pure electricity costs (without grid usage and charges) in CHF per year

CHF per year

Total electricity costs in CHF per year

CHF per year

18 - Or upload your electricity bill

*Please ensure that the document includes **an entire year's worth** of electricity costs.*

19 - Would you like to be informed about the results of my work?

- Yes, gladly
- No, thanks

20 - Enter your email address through which you would like me to contact you

Email

21 - Anything else you would like to share with me?

Appendix

Andy Gubser
Lucerne University of Applied Science and Arts
Master in Applied Information and Data Science (MScIDS)
Heitenried, 23 December 2021