Boston Marathon

Could you be the next winner?

by **Mailei Vargas**

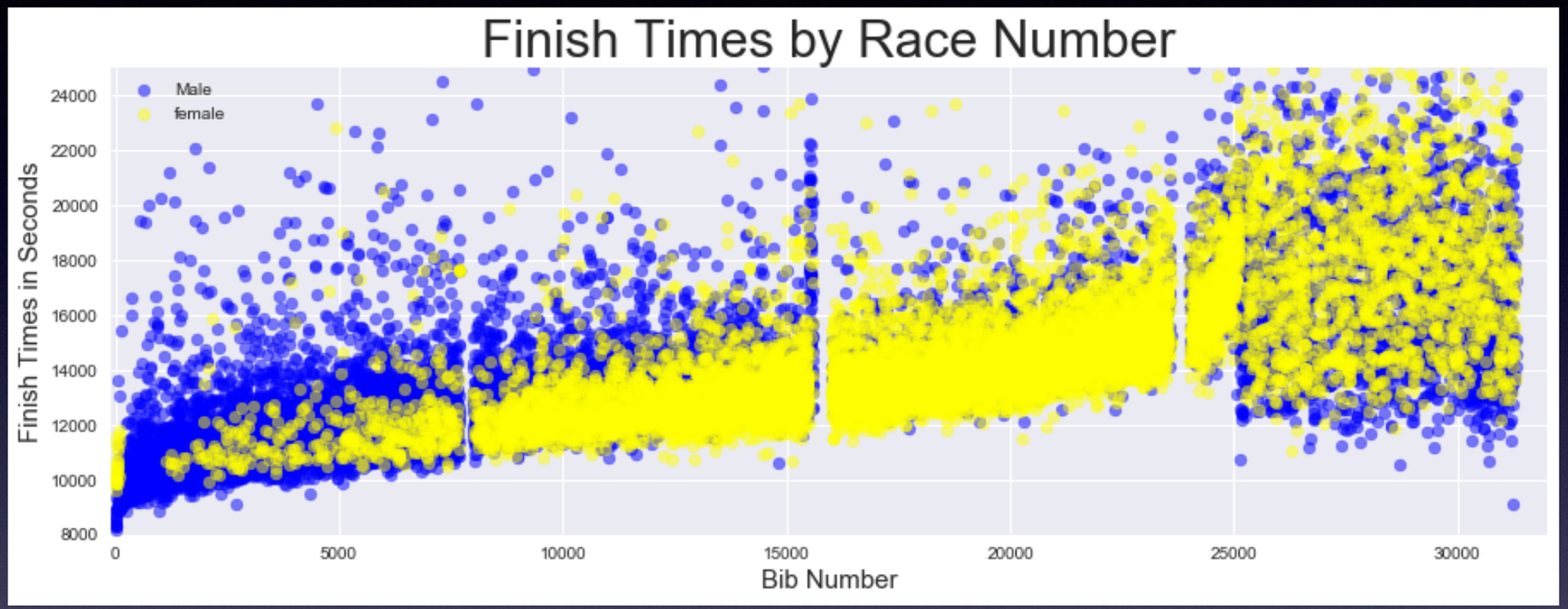
Why Predict Race Times?

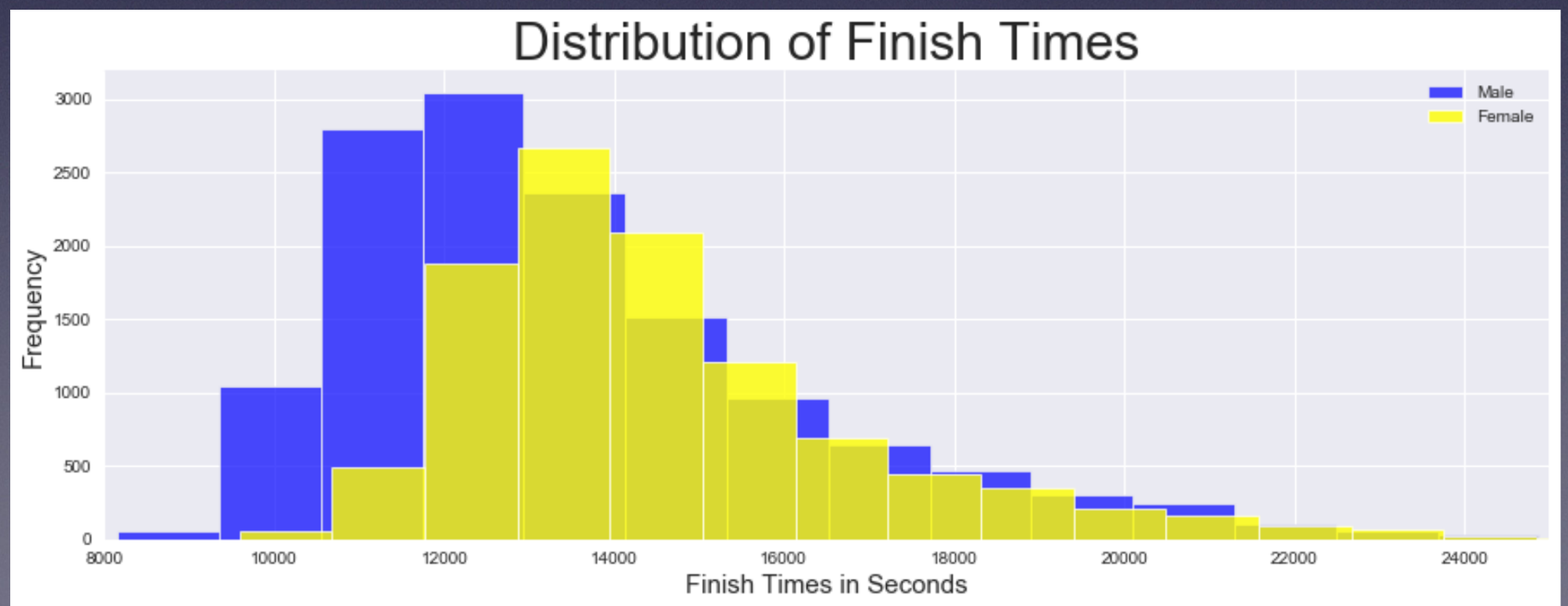
- Road running ~$1.4 billion in 2015 -> millions run!
- Running improves physical/mental health
- ~20,000 Boston qualifiers, ~5000 charity runners
- $830,500 in purse money for elites in 2018
- Can future years be predicted using prior results?

2015-2018 ~100k -> ~13k legacy runners

BIB	NAME	AGE	M/F	CITY	ST	CTRY	CTZ
8341	De La Via, Claudia	32	F	Seattle	WA	USA	

5k	10k	15k	20k	Half	25k	30k	35k	40k
0:23:36	0:47:24	1:11:23	1:36:21	1:41:41	2:01:20	2:26:43	2:52:29	3:17:19
Finish:			Pace	Proj. Time	Offl. Time	Overall	Gender	Division
			0:07:56	-	3:27:54	6495	1245	1016





Workflow and Tools

Webscrape with Selenium/ Beautiful Soup

Clean and analyze Data

Feature engineering

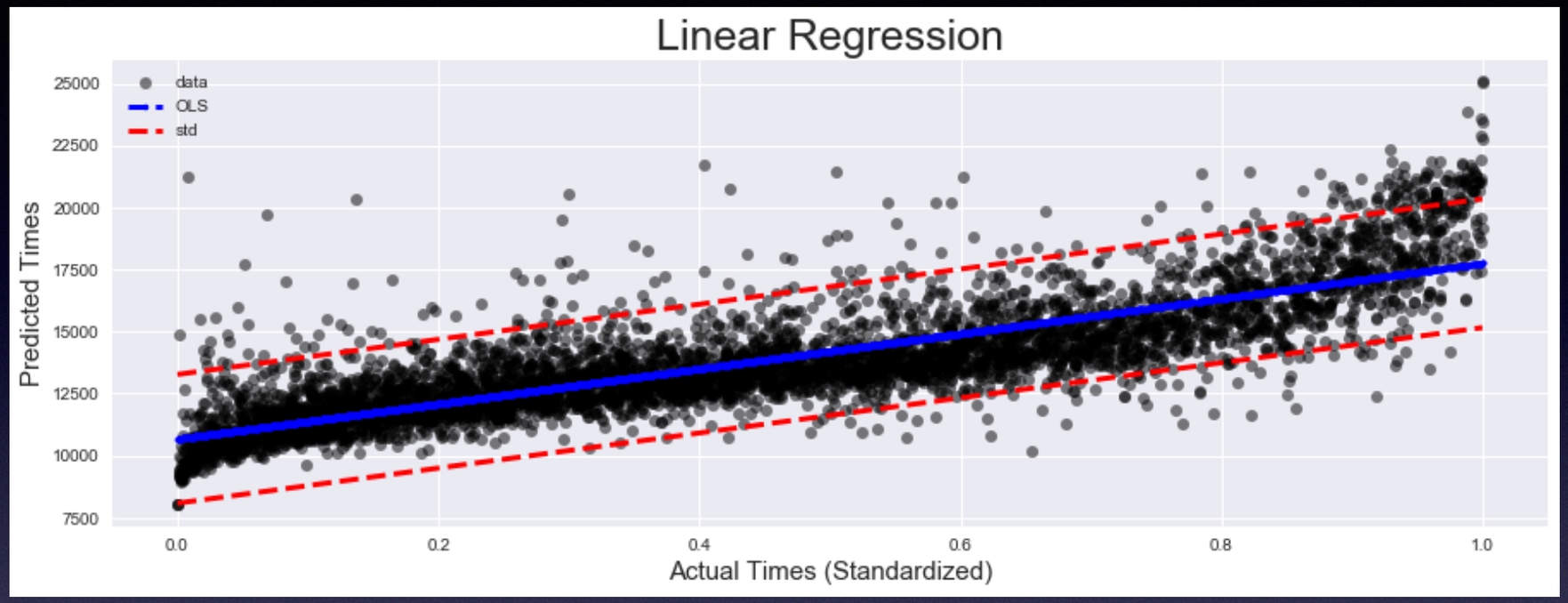
Tune hyper-parameters

Train/Validate

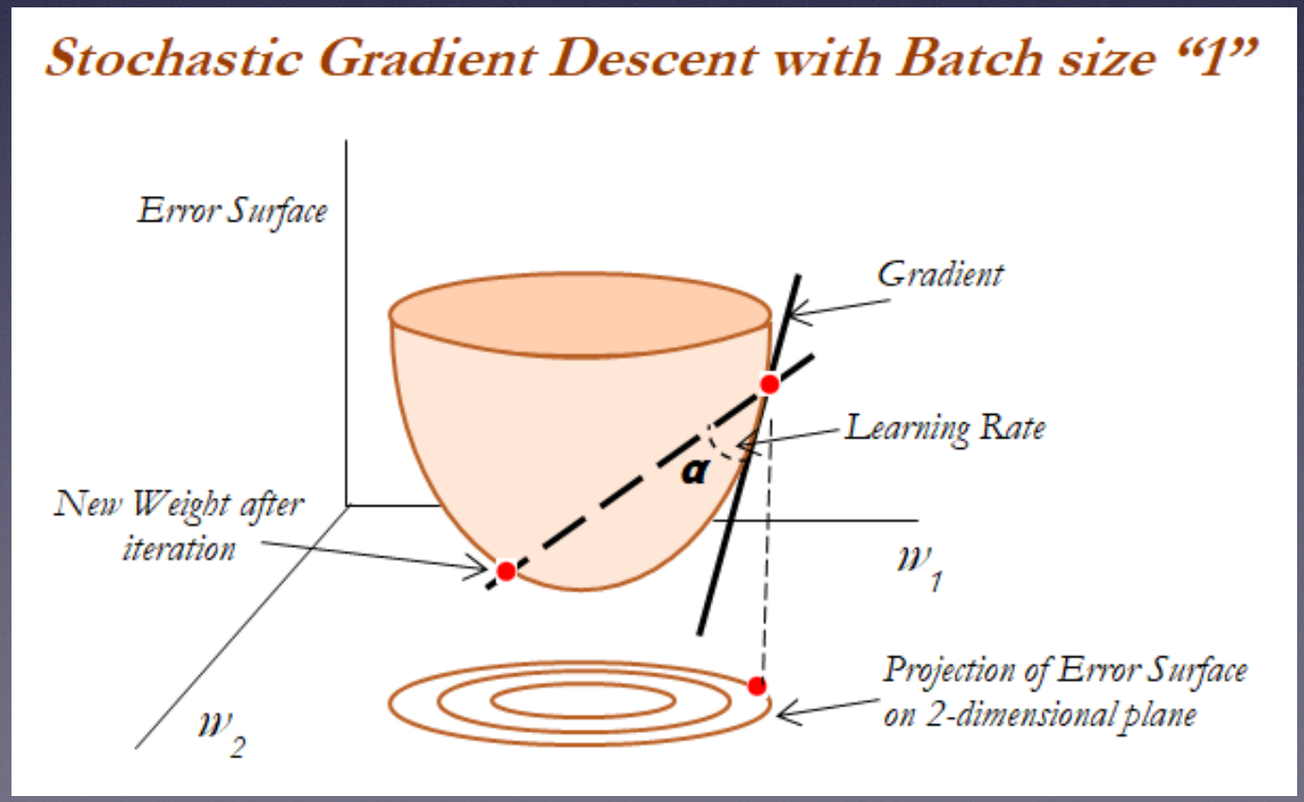
Model selection and test

Models

Linear Regression



Stochastic Gradient Descent



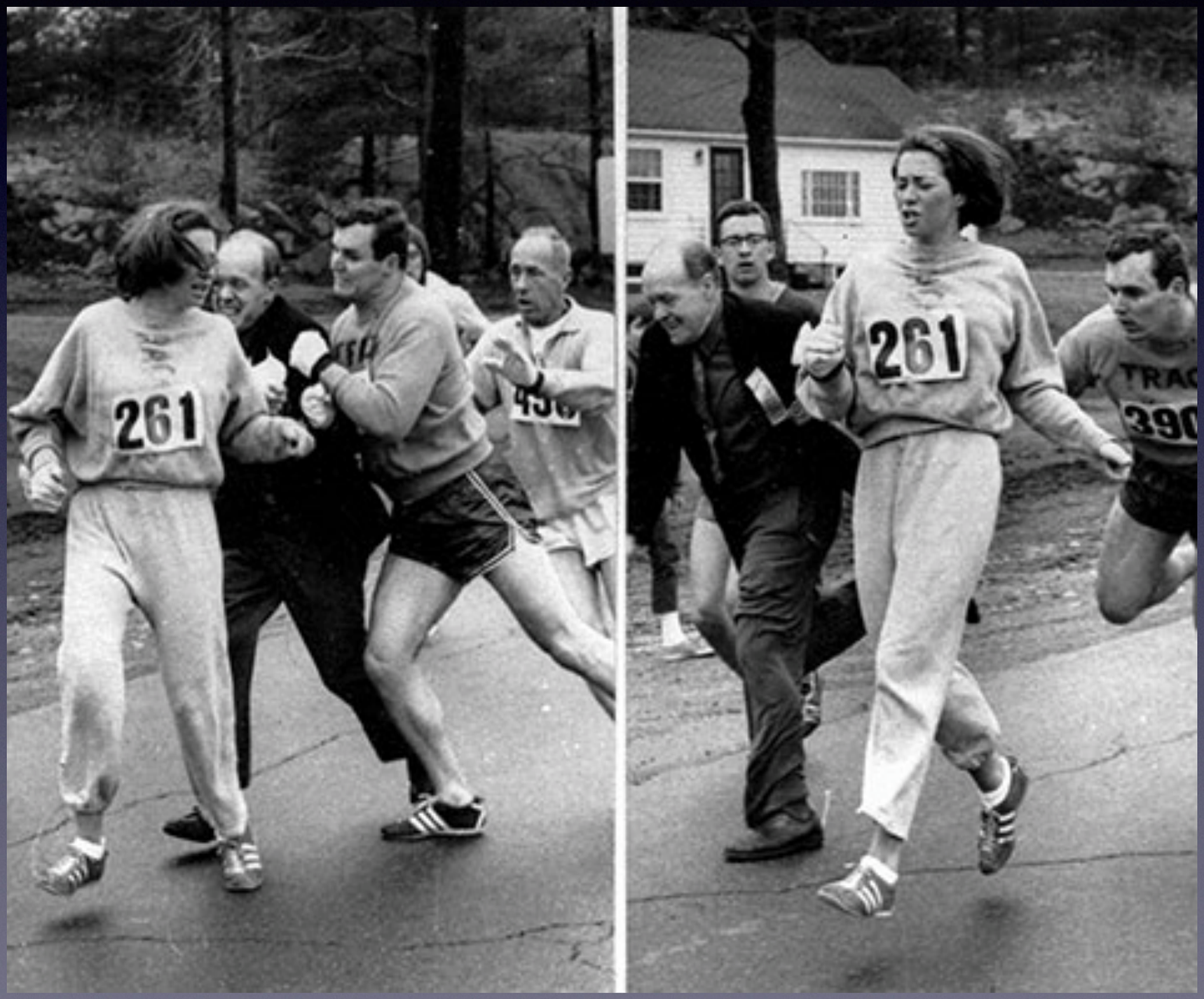
Metrics and Results

Model	R^2	RMSE	Minutes
Linear Regression	0.66	1426.35	23.77
Linear Regression CV	**0.69**	**1353.81**	**22.56**
SDGRegressor (No penalty)	-1.83x10^16	1.02x10^16	1.75x10^15
SDGRegressor (Limit X)	0.63	1486.79	24.78
SDGRegressor (Std)	0.65	1458.81	24.31
SDGRegressor (LASSO)	0.65	1463.54	24.39
SDGRegressor (RIDGE)	0.31	2035.24	33.92

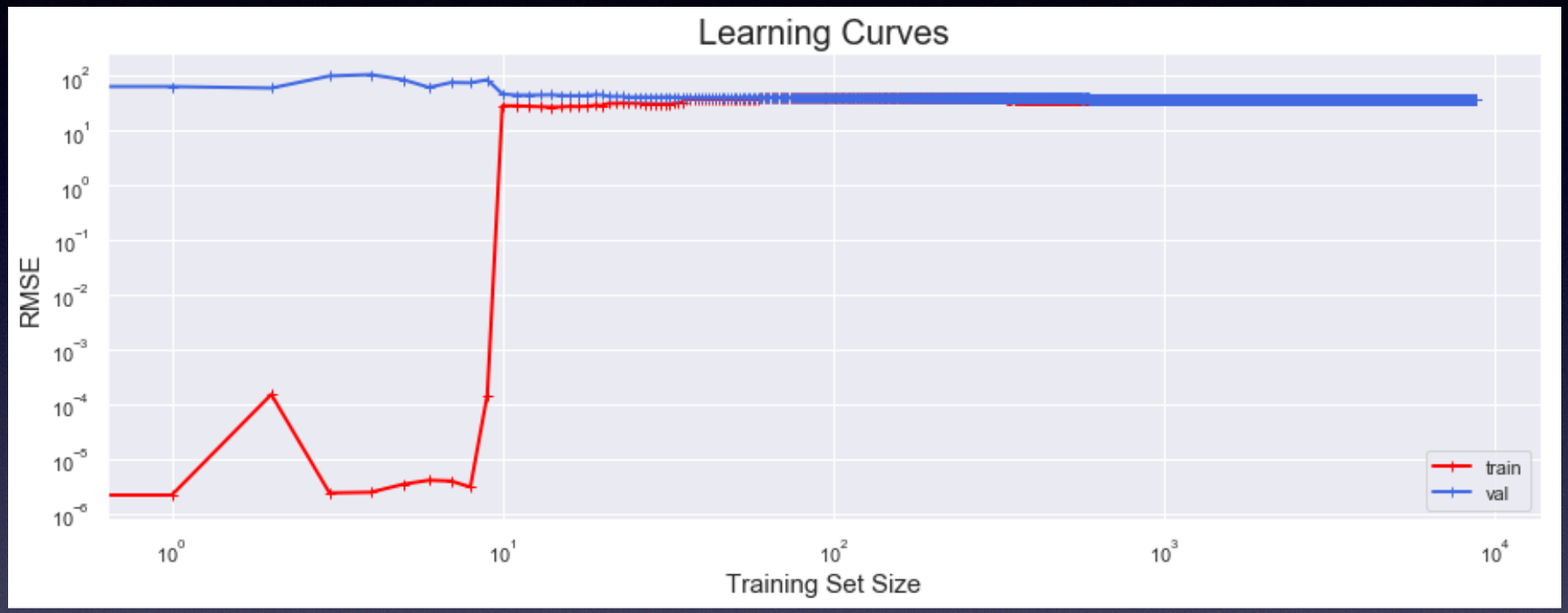
Conclusion

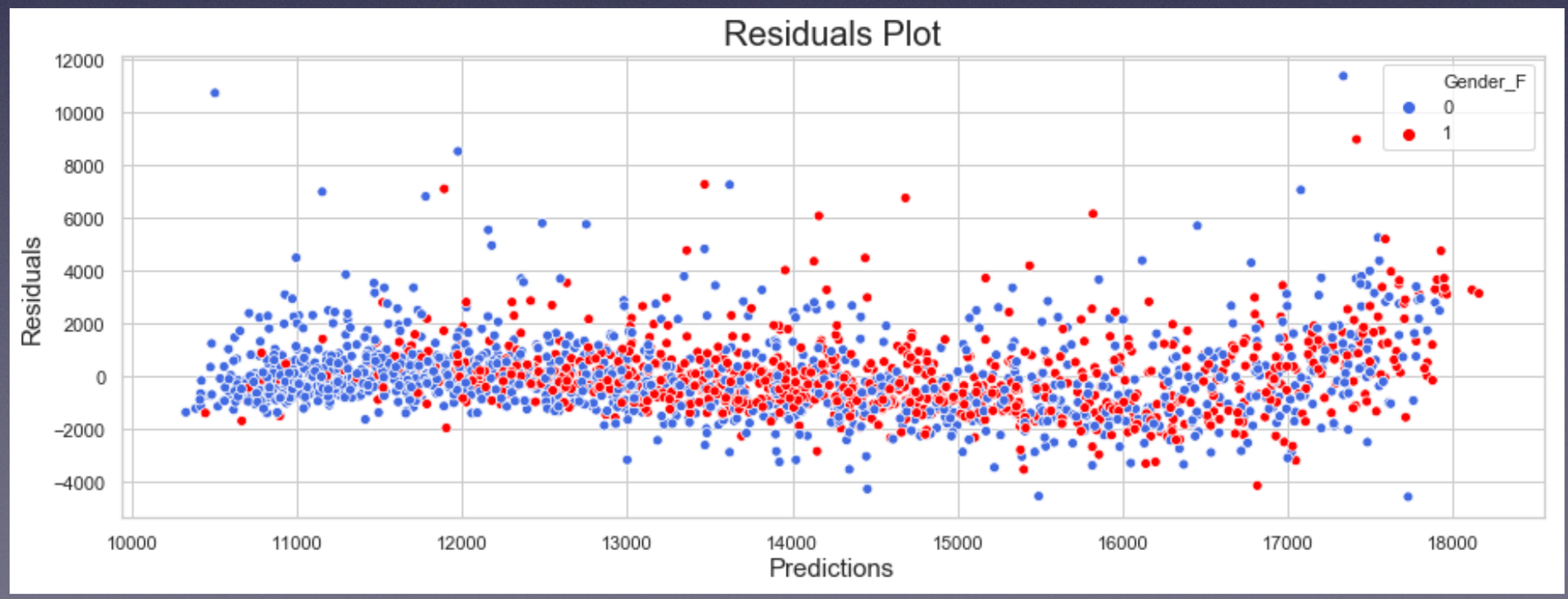
- Linear Regression CV, KFolds = 5
- How did Claudia do?
- 3:20:57 (prediction) -> 3:43:52 (actual)
- Interesting -> Outliers could be cheaters!
- Improvements: City data, interactive features, additional models.
- Questions?

Appendix

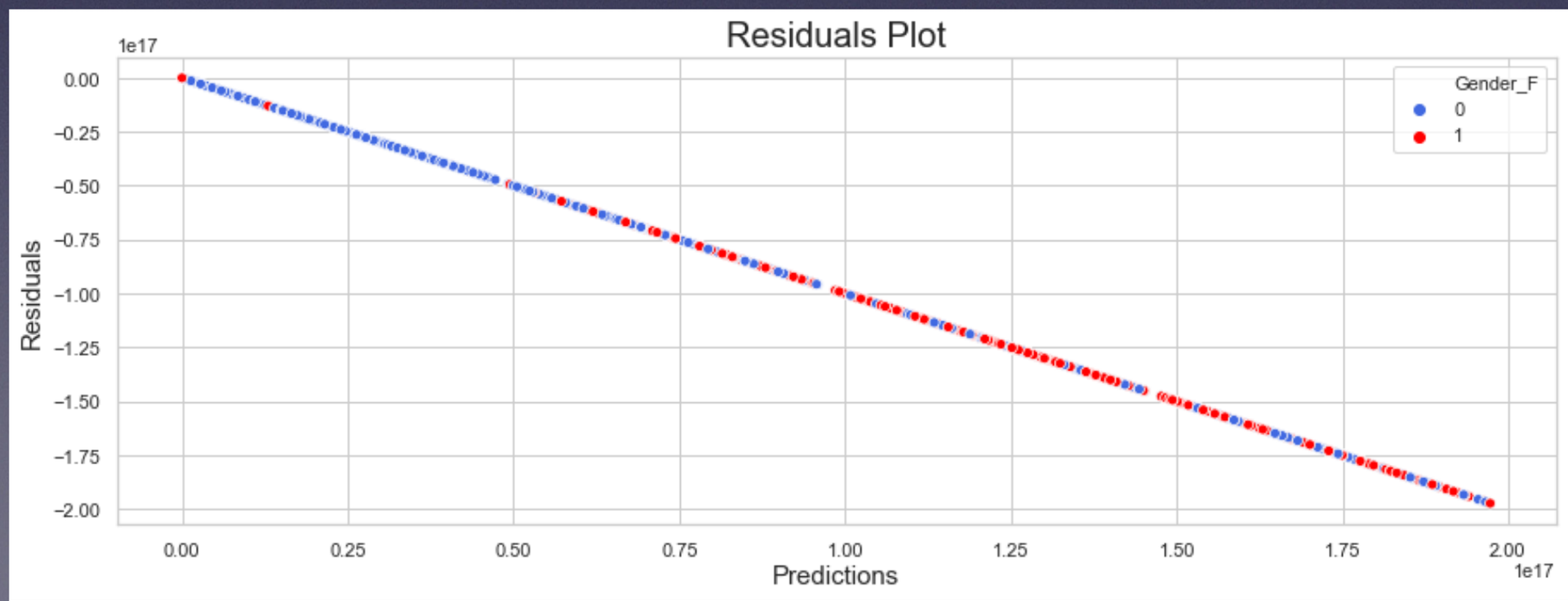


Linear Model Learning Curve and Residual Plot

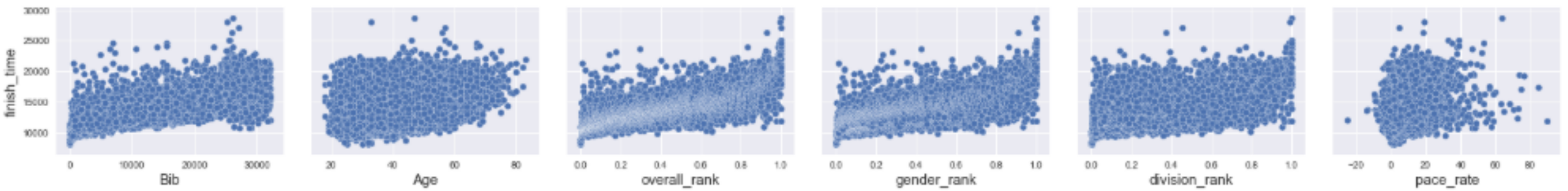


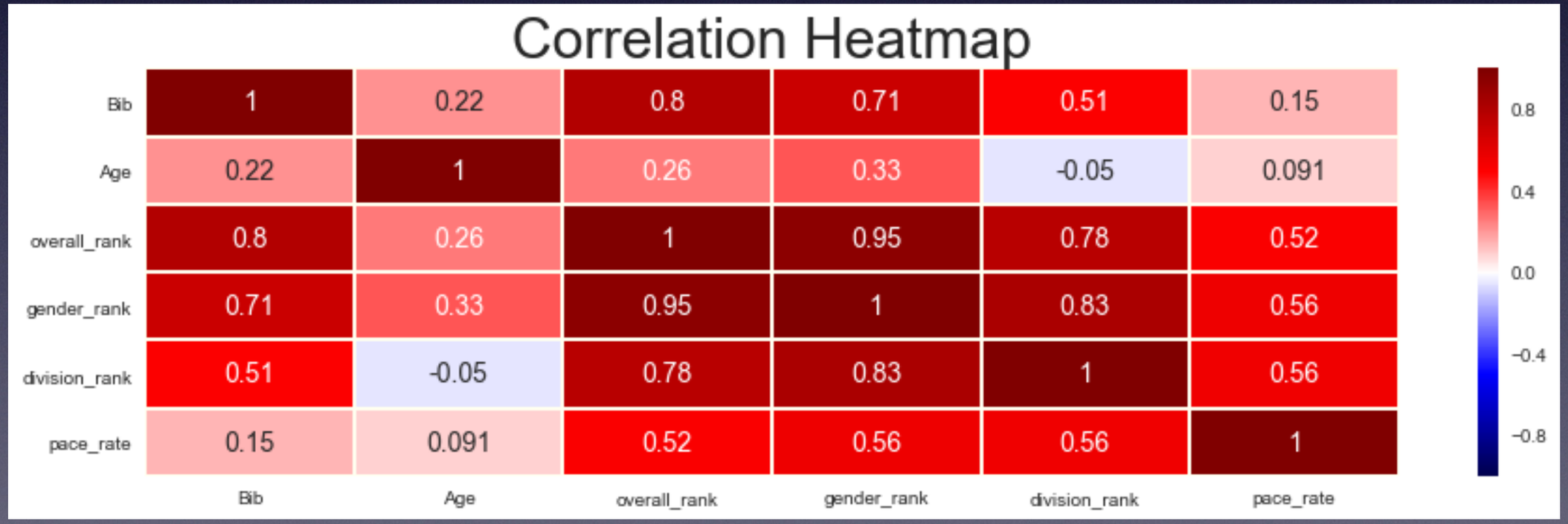


SDGRegressor with No Convergence



Correlation of a Few Predictors





More on Metrics...