

Predicting High School Track Times

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Project Luther
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High school track statistics
are collected and stored at
www.athletic.net

Given:
9th grade PR (Personal Record)
10th grade PR
11th grade PR

Predict:
12th grade PR

Athletic.net Track & Field

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Patrick Gibson Track & Field Profile

Claim this Athlete

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All

High School

2013 Outdoor Season

Squalicum HS

12th Grade

800 Meters

2

1:59.1h

Mar 15

Squalicum, Bellingham, and Sehome

V F

1

2:06.60

Mar 28

Lynden vs Squalicum

V F

3

1:58.13 PR

Apr 19

NWC Championship Meet

V F

1600 Meters

1

4:36.24

Mar 28

Lynden vs Squalicum

V F

1

4:16.2h

Apr 6

Birger Solberg Invitational

V F

1

4:30.66

May 2

Mt. Baker & Squalicum @ Sehome

V F

1

4:18.66

May 8

NWC 2A Sub District Meet

V F

1

4:18.66

May 10

NWC 2A Sub Distirct Meet

V F

3

4:19.75

May 15

2A District 1 & 2 Bi-District Championship Meet

V F

3

4:19.75

May 17

2A District 1 & 2 Bi-District Championship Meet

V F

1

4:11.85 SR

May 25

2A, 3A, 4A State Championship Meet All Days

2A F

3200 Meters

1

9:15.11

Mar 22

Bedlington Twilight

V F

1

9:58.35

Mar 28

Lynden vs Squalicum

V F

1

9:39.71

Apr 19

NWC Championship Meet

V F

1

9:53.62

May 2

Mt. Baker & Squalicum @ Sehome

V F

1

9:10.40

May 10

NWC 2A Sub Distirct Meet

V F

1

9:05.78

May 17

2A District 1 & 2 Bi-District Championship Meet

V F

2

9:01.80 PR

May 25

2A, 3A, 4A State Championship Meet All Days

2A F

4x400 Relay

8

4:06.8h

Mar 15

Squalicum, Bellingham, and Sehome

V F

Patrick Gibson, Nick Gallaher, North Bennett, Dillon Rinauro

1

3:36.0h

May 2

Mt. Baker & Squalicum @ Sehome

V F

Patrick Gibson, Chais Sugden, Christopher Fredlund, Nick Gallaher

2012 Outdoor Season

Squalicum HS

11th Grade

400 Meters - Relay Split

56.6h

Mar 16

"City Meet" BHS, SQHS, at Sehome

V F

54.7h PR

Mar 29

Squalicum w/ Ferndale, Sehome

V F

800 Meters

1

1:59.69

Mar 16

"City Meet" BHS, SQHS, at Sehome

V F

2

1:59.3h SR

Apr 28

Tomahawk T&F Classic

V F

1600 Meters

1

4:39.66

Mar 21

Squalicum w/ Burlington-Edison

V F

1

4:25.0h

Mar 23

Bedlington Twilight

V F

1

4:37.7h

Mar 29

Squalicum w/ Ferndale, Sehome

V F

1

4:18.4h

Apr 20

NWC Championships

V F

1

4:30.0h

Apr 26

Mt. Baker, Squalicum at Blaine

V F

5

4:50.11

May 2

Mt. Vernon, Squalicum at LC

V F

1

4:19.00

May 9

NWC 2A SubDistrict Meet - Day 1

V F

1

4:19.00

May 11

NWC 2A SubDistrict Meet - Day 2

V F

1

4:21.52

May 16

2A Northwest District 1 - Day 1

V F

1

4:21.52

May 18

2A Northwest District 1 - Day 2

V F

2

4:11.29 PR

May 26

2A WIAA State Championships - All Days

2A F

SQUALICUM

TRACK & FIELD

Customize

Training Log

5/8

NWC 2A Sub District Meet

0.99 mi.

5/10

NWC 2A Sub Distirct Meet

2.98 mi.

5/15

2A District 1 & 2 Bi-District Cham...

0.99 mi.

5/17

2A District 1 & 2 Bi-District Cham...

2.98 mi.

5/25

2A, 3A, 4A State Championship ...

2.98 mi.

Is this your athlete profile?

Claim this athlete to start tracking your workouts!

Claim this Athlete

Season Records

400 Meters - Relay Split

2011 Outdoor

10

55.44c

2012 Outdoor

11

54.84c PR *

800 Meters

2010 Outdoor

9

2:08.53

2011 Outdoor

10

2:03.6h *

2012 Outdoor

11

1:59.3h *

2013 Outdoor

12

1:58.13 PR *

1600 Meters

2010 Outdoor

9

4:29.26

2011 Outdoor

10

4:20.62 *

2012 Outdoor

11

4:11.29 PR *

2013 Outdoor

12

4:11.85

1 Mile

2012 Indoor

11

4:18.23 PR

3000 Meters

Methodology

Athletes:

- 400 Meters - 826 athletes
- 1600 Meters - 2056 athletes
- Competed all 4 years in high school
- Graduated between 2006 and 2017

Features
Athlete Name (& ID)
Athlete Sex
9 th grade PR
10 th grade PR
11 th grade PR
12 th grade PR
School
Athletic District
Graduation Year



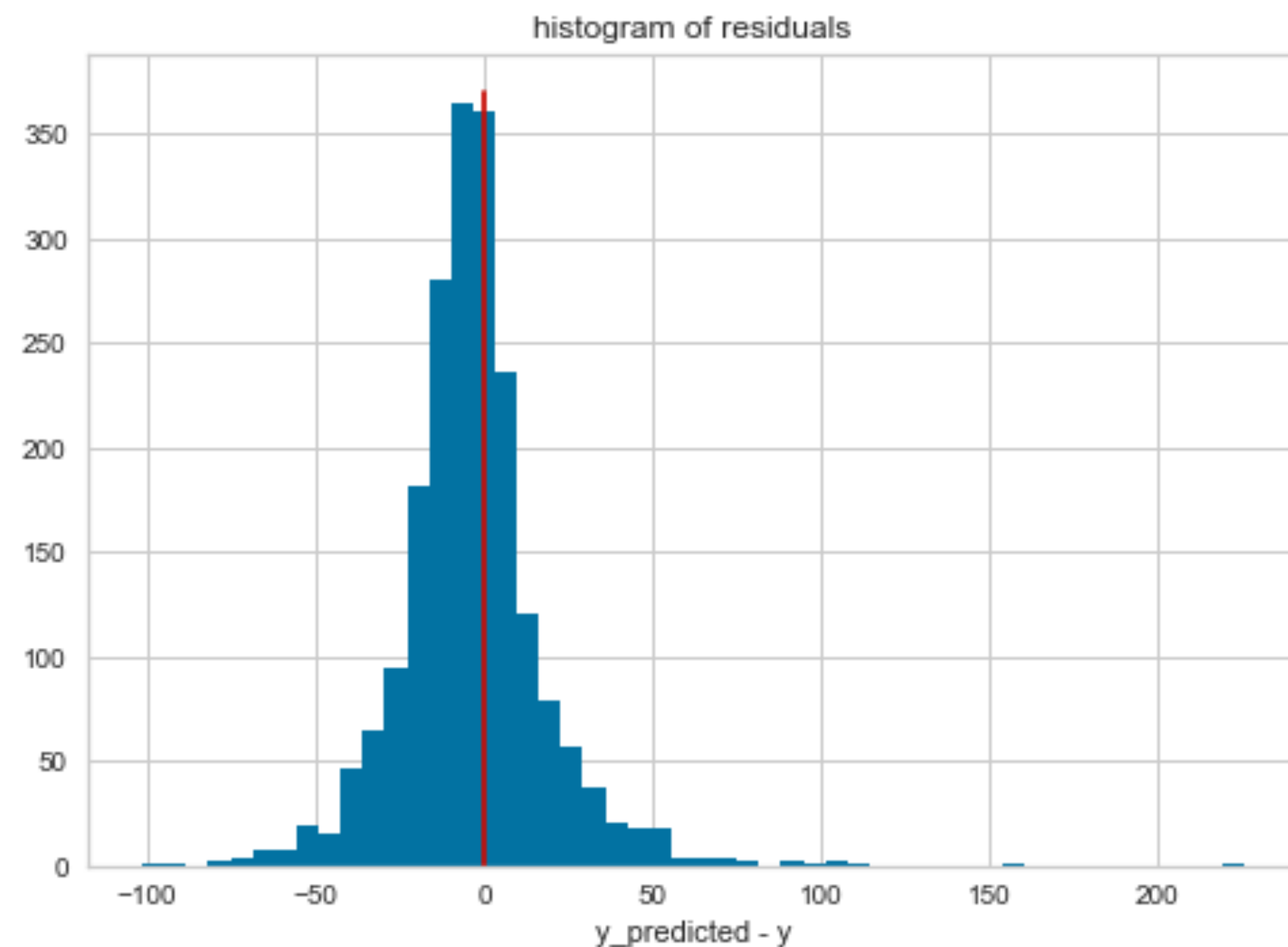
Athletic Districts in Washington State

Results

Algebraic Model

Assume constant growth rate

$$\frac{t_{12}}{t_{11}} = \frac{t_{11}}{t_{10}}$$



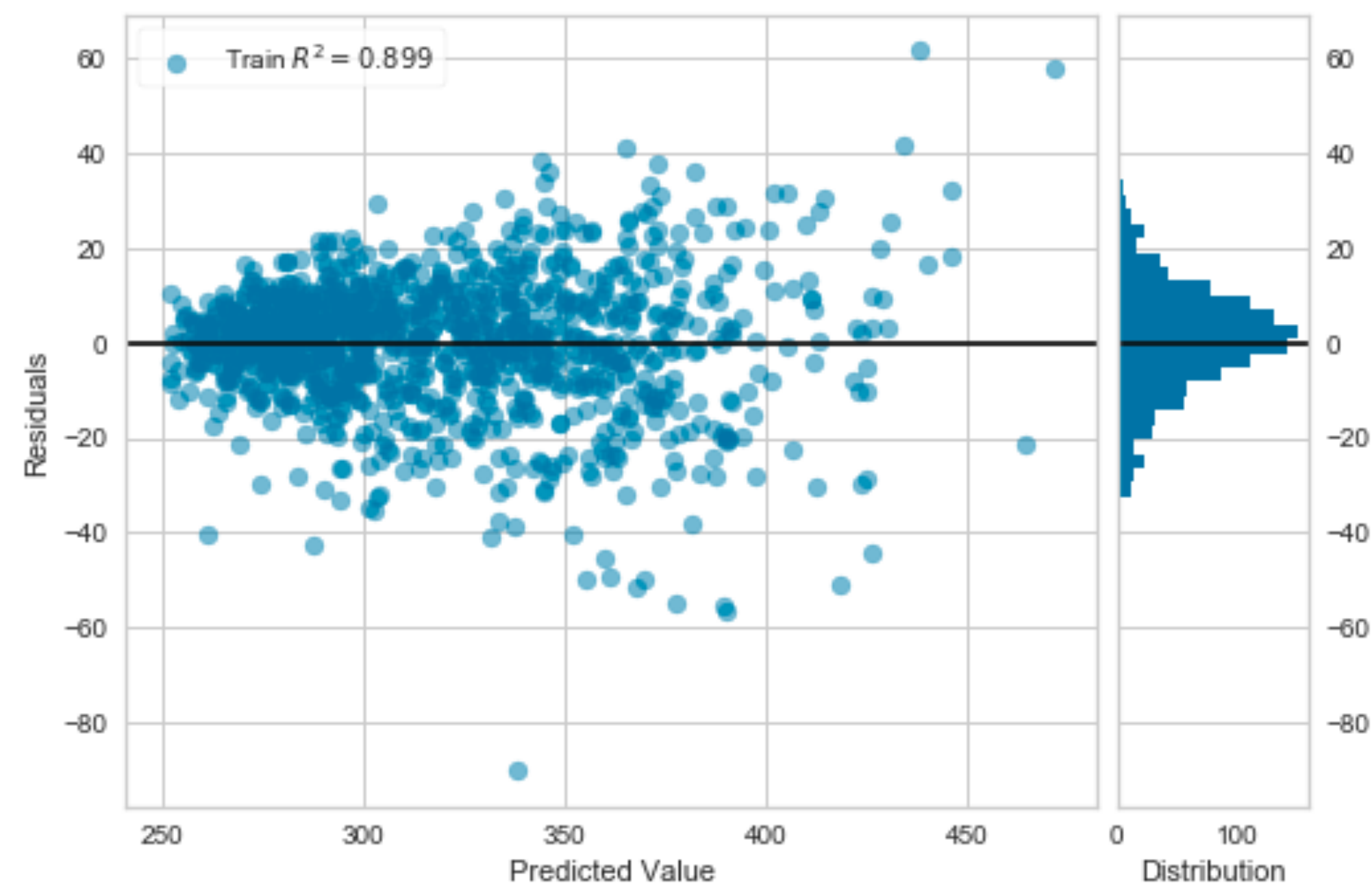
400 Meters. mean = 58.42 seconds

Model	RMSE
Algebra	3.70
Linear regression	
Mixed Effects Model	
Add higher order terms to LR	

1600 Meters mean = 316.99 seconds

Model	RMSE
Algebra	21.64
Linear regression	
Mixed Effects Model	
Add higher order terms to LR	

Linear Regression



400 Meters. mean = 58.42 seconds

Model	RMSE
Algebra	3.70
Linear regression	2.18
Mixed Effects Model	2.14
Add higher order terms to LR	2.26

1600 Meters mean = 316.99 seconds

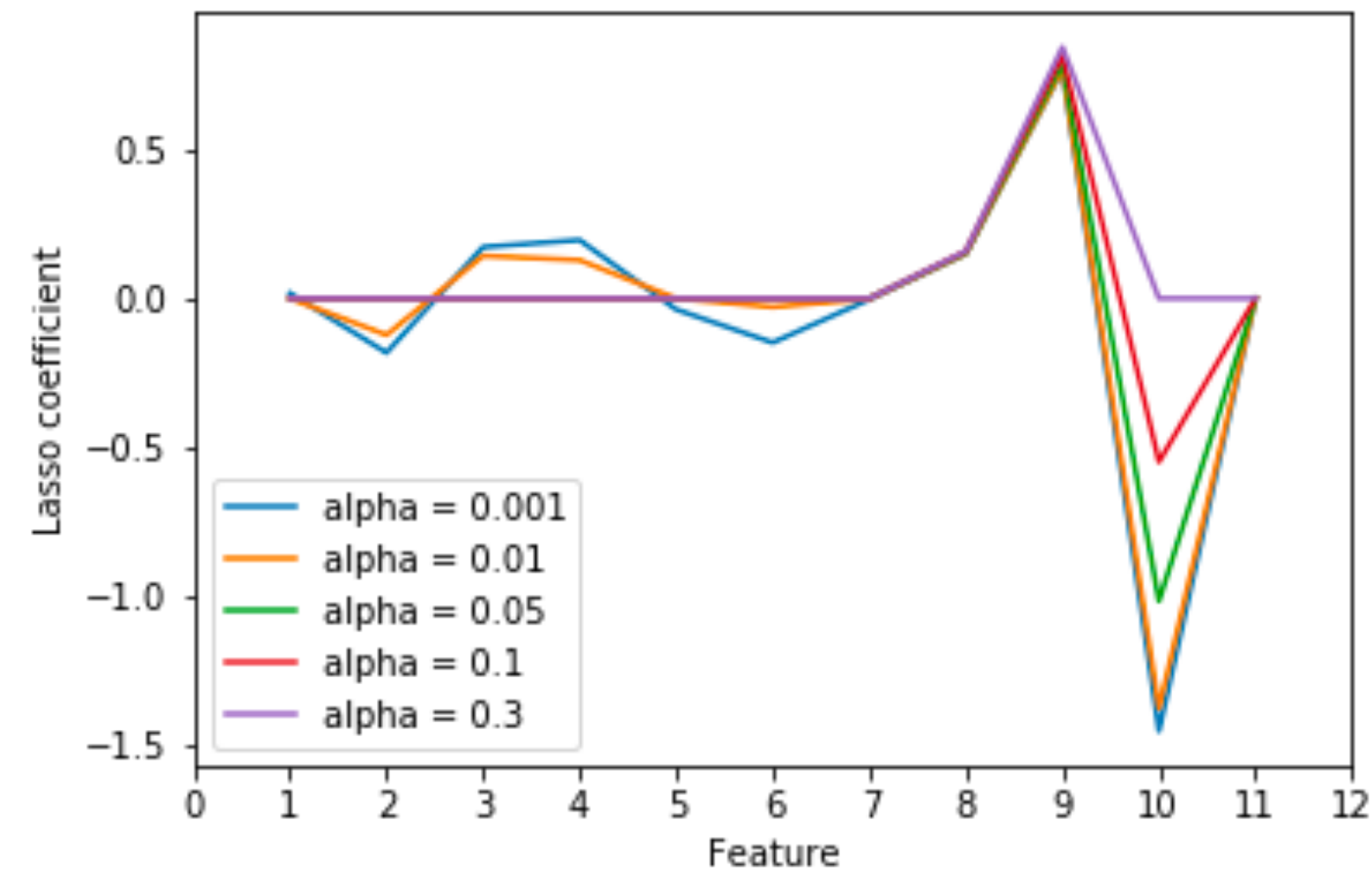
Model	RMSE
Algebra	21.64
Linear regression	13.54
Mixed Effects Model	13.59
Add higher order terms to LR	13.42

Mixed Effects Model
District as mixed effect

Add second order terms for
(10th grade PR)²
(11th grade PR)²

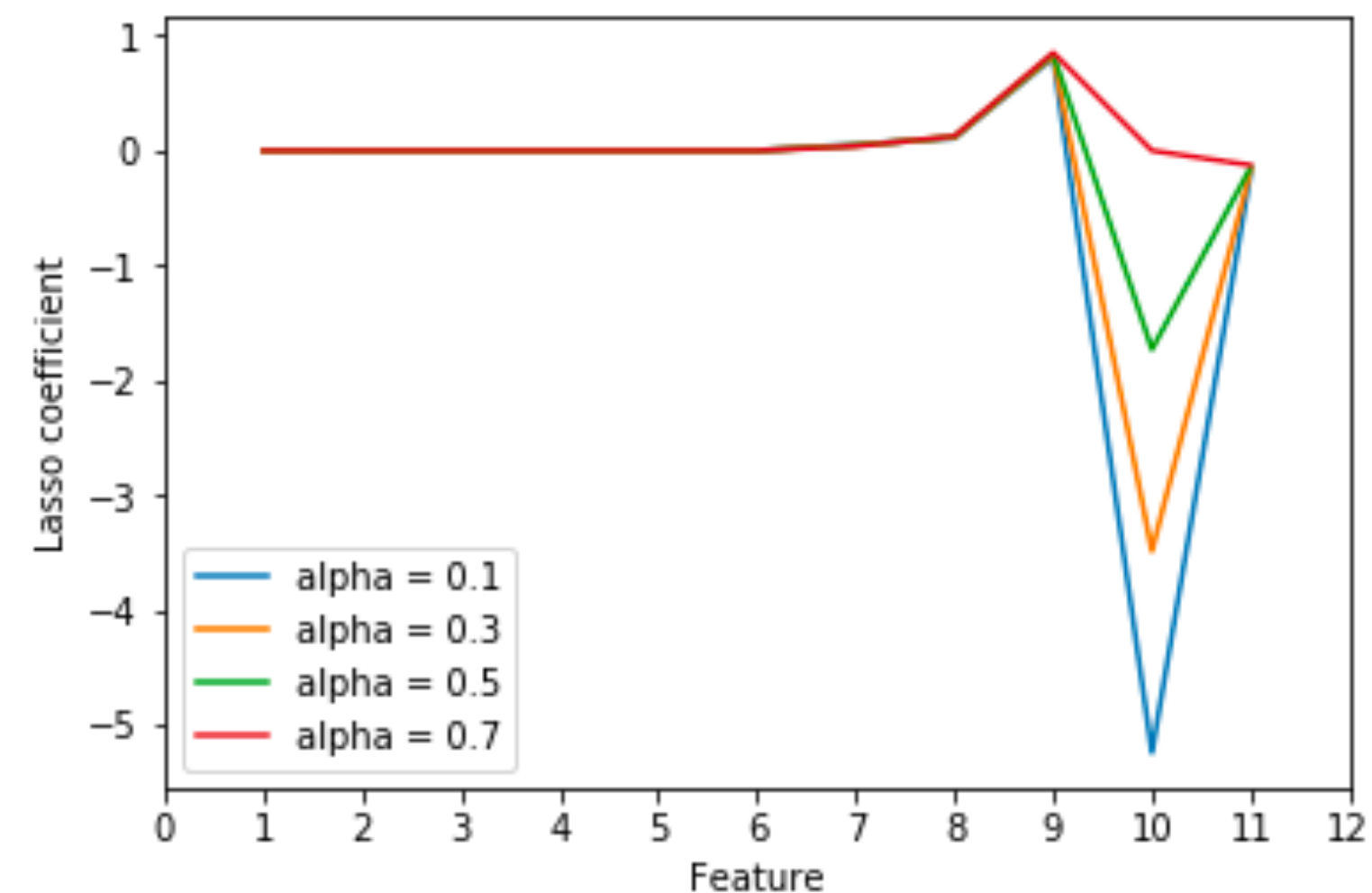
Lasso

400 Meters



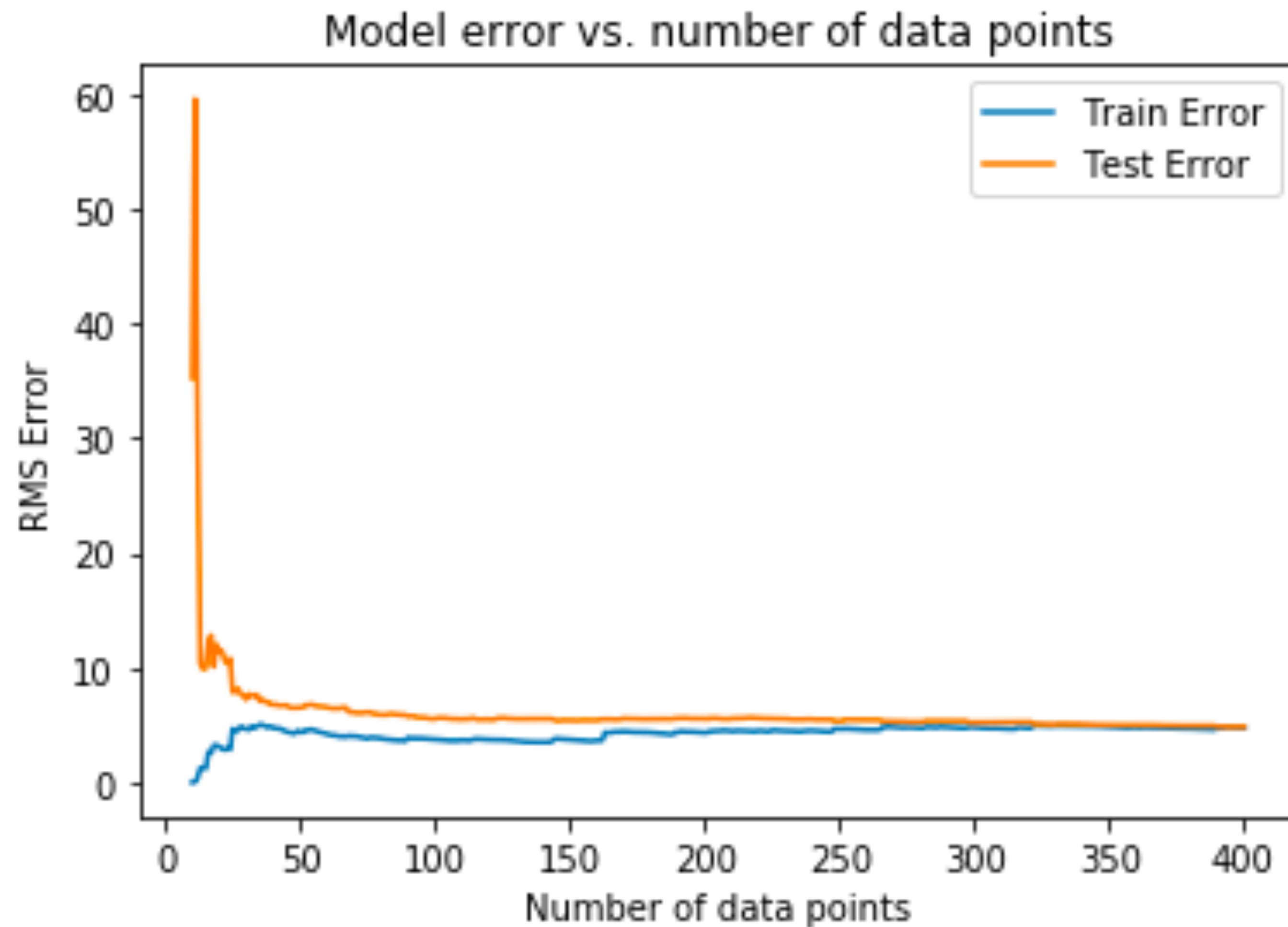
- **11th grade time**
- **10th grade time**
- Sex
- Athletic district becomes important

1600 Meters



- **11th grade time**
- Sex
- Graduation year becomes important

Effect of #data points on model



It is possible to model with relatively few points

Conclusions

- Machine learning models offer improvement over the algebraic model
- Require more features to get better prediction

Future Work

- Add more features
 - Times for individual races
- Use this technique to predict field events
- Extrapolate to predict college times based on high school times (for recruiting)

Appendix

Data sources:

Washington State Athletic Districts

<http://www.wiaa.com/subcontent.aspx?SecID=379>

Track & Field data

www.athletic.net