Lecture 000

Why are we here?

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09 January 2020

Admin

Admin

In-class today

- **Course website:** https://github.com/edrubin/EC524W20/
- Syllabus (on website)

TODO list

- Assignment (from Tuesday) due Thursday
- Readings for next time:
  - ISL Ch1–Ch2
  - Prediction Policy Problems by Kleinberg *et al.* (2015)

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With **prediction**, we shift our focus to accurately estimating outcomes.

In other words, how can we best construct $\hat{\text{Y}}_i$?

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... so?

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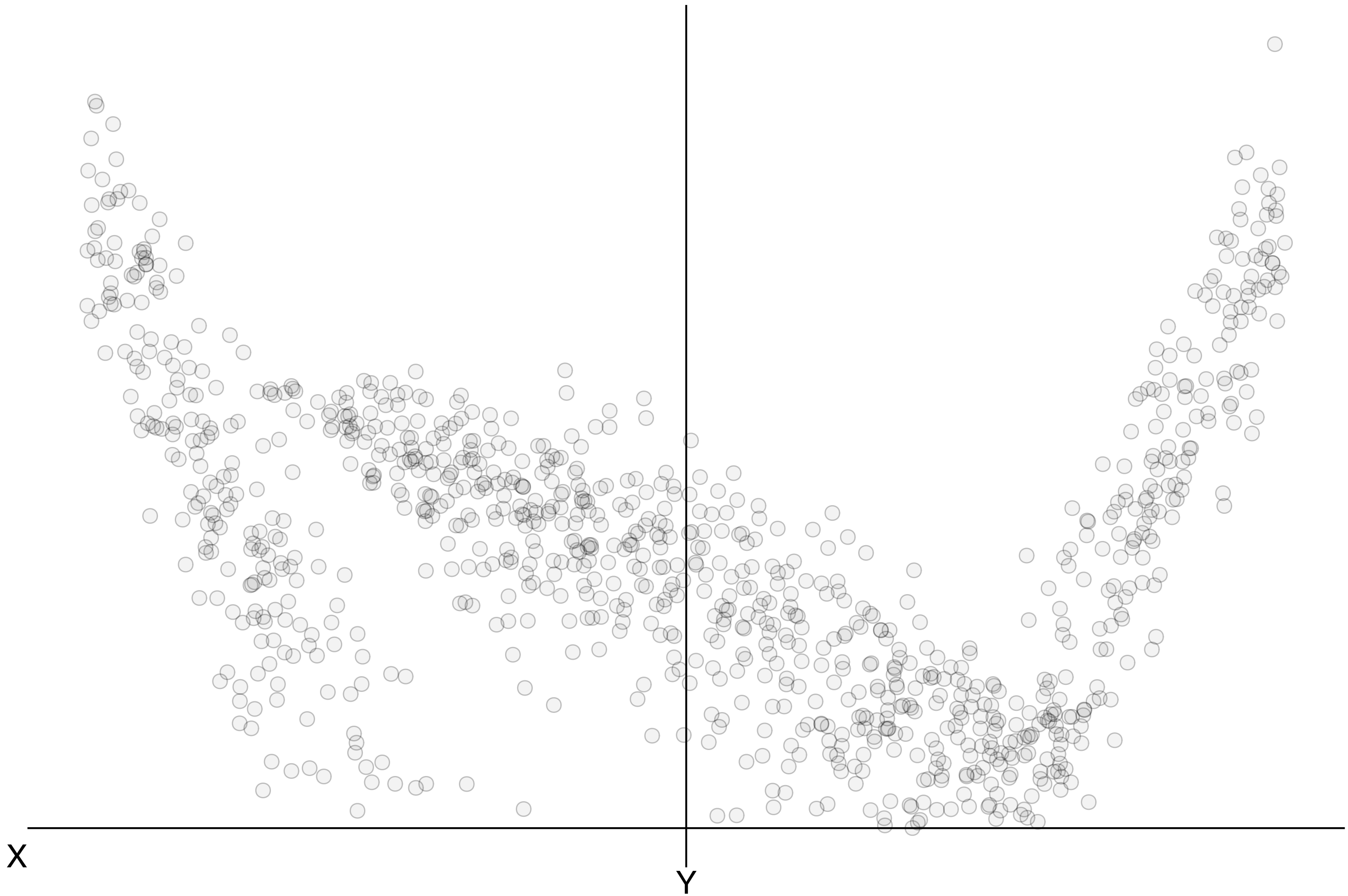
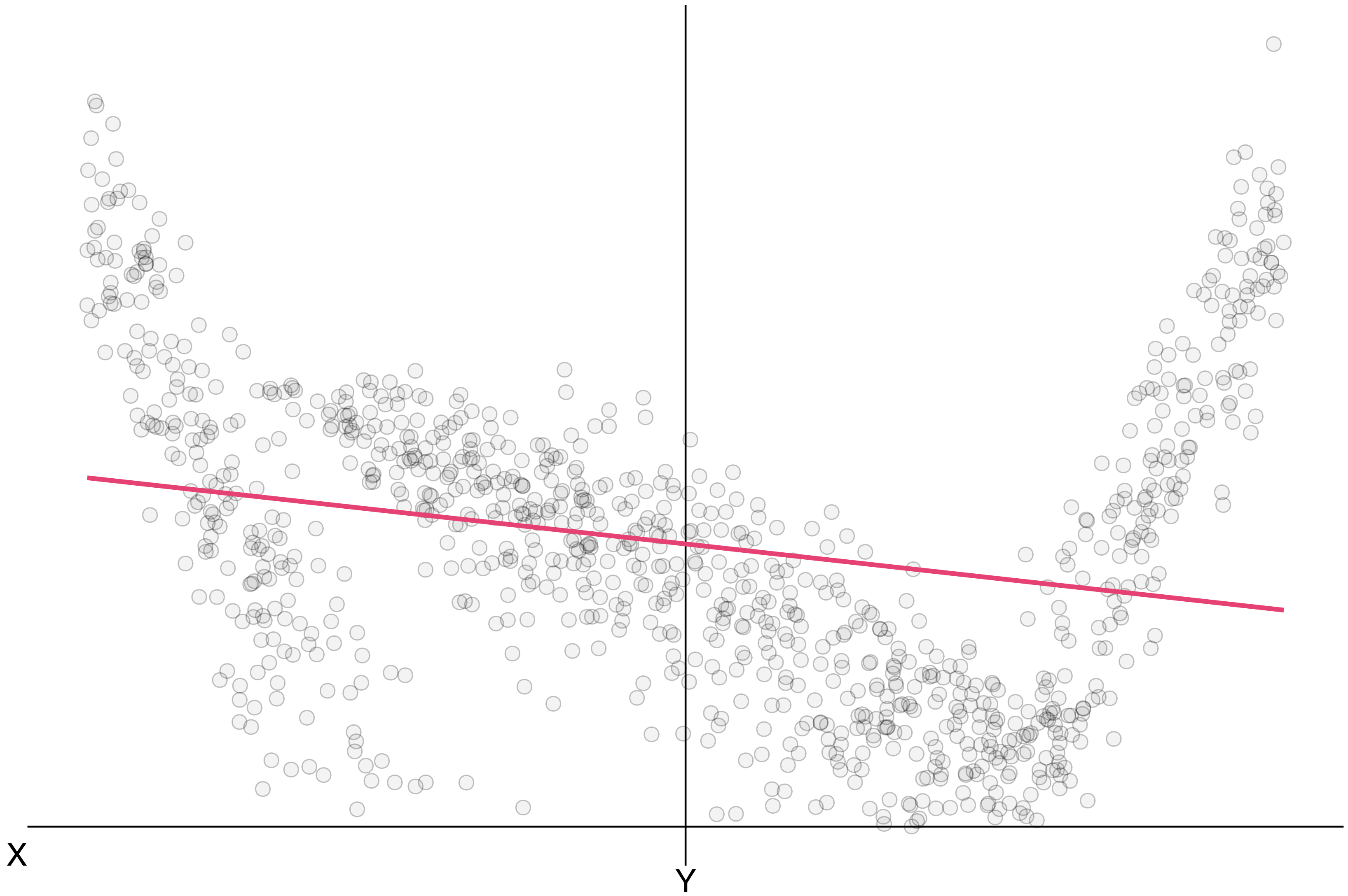
Recall Least-squares regression is a great **linear** estimator.

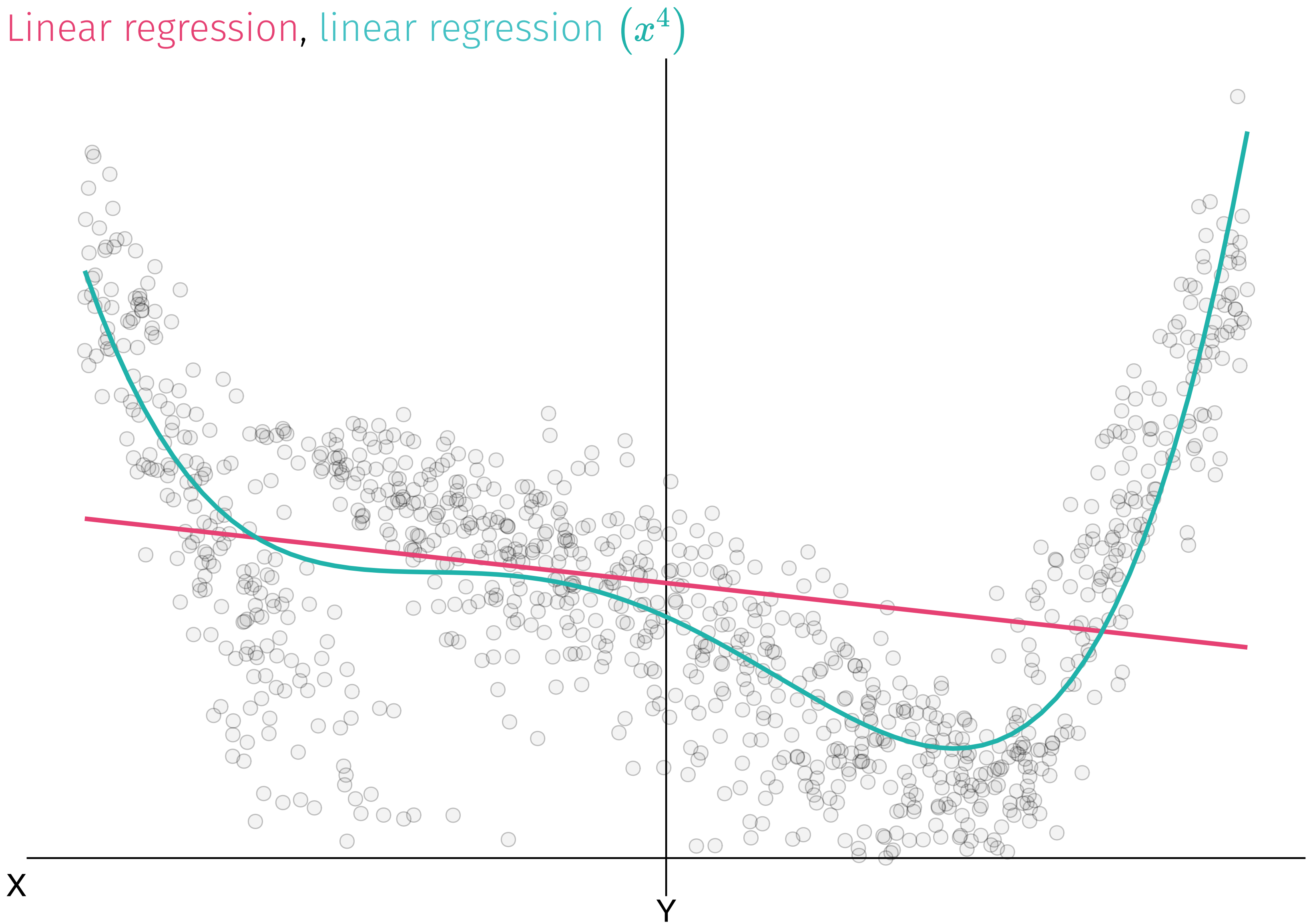
Data data be tricky[†]—as can understanding many relationships.

† "Tricky" might mean nonlinear... or many other things...


X
Y

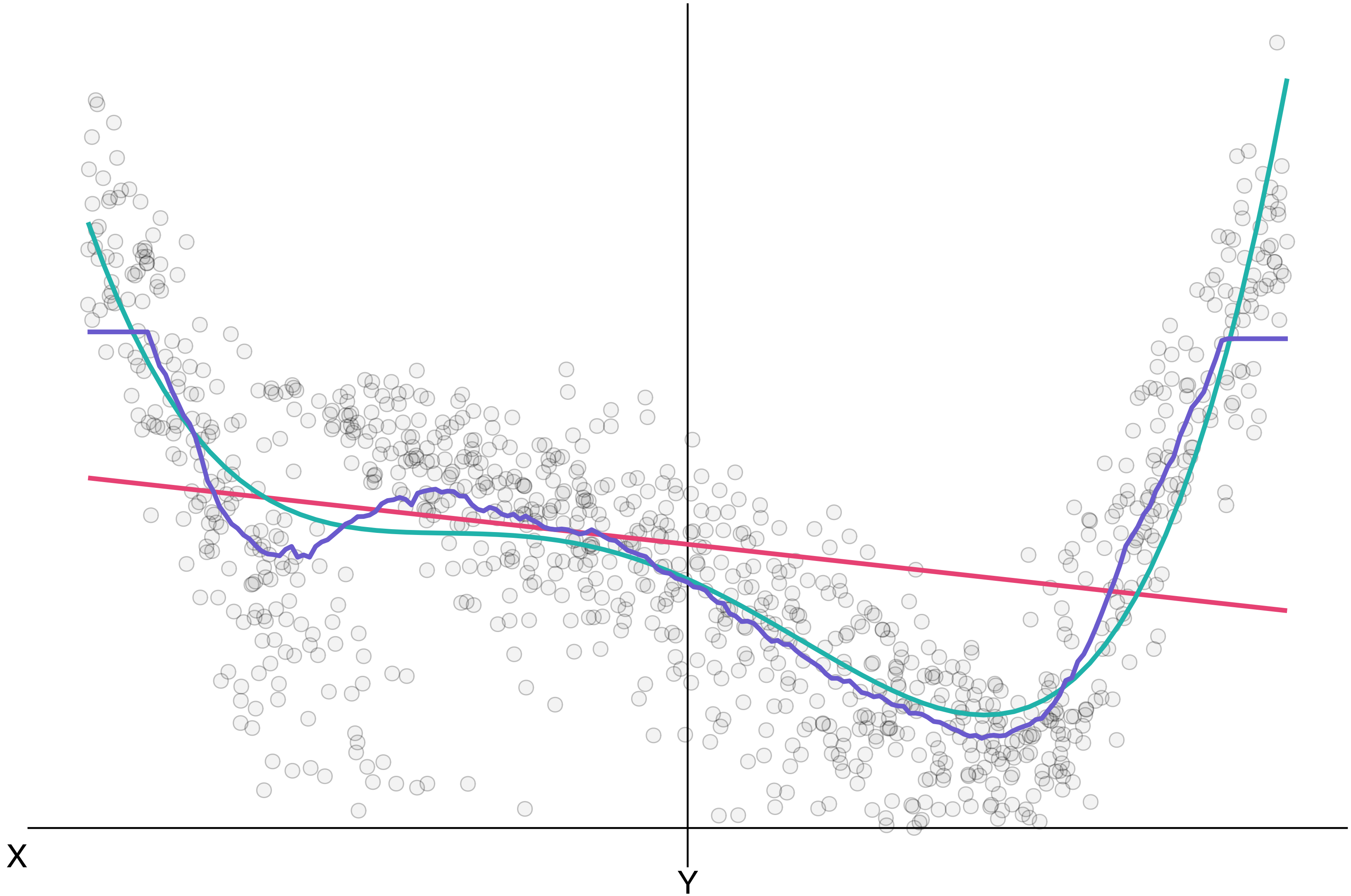
Linear regression

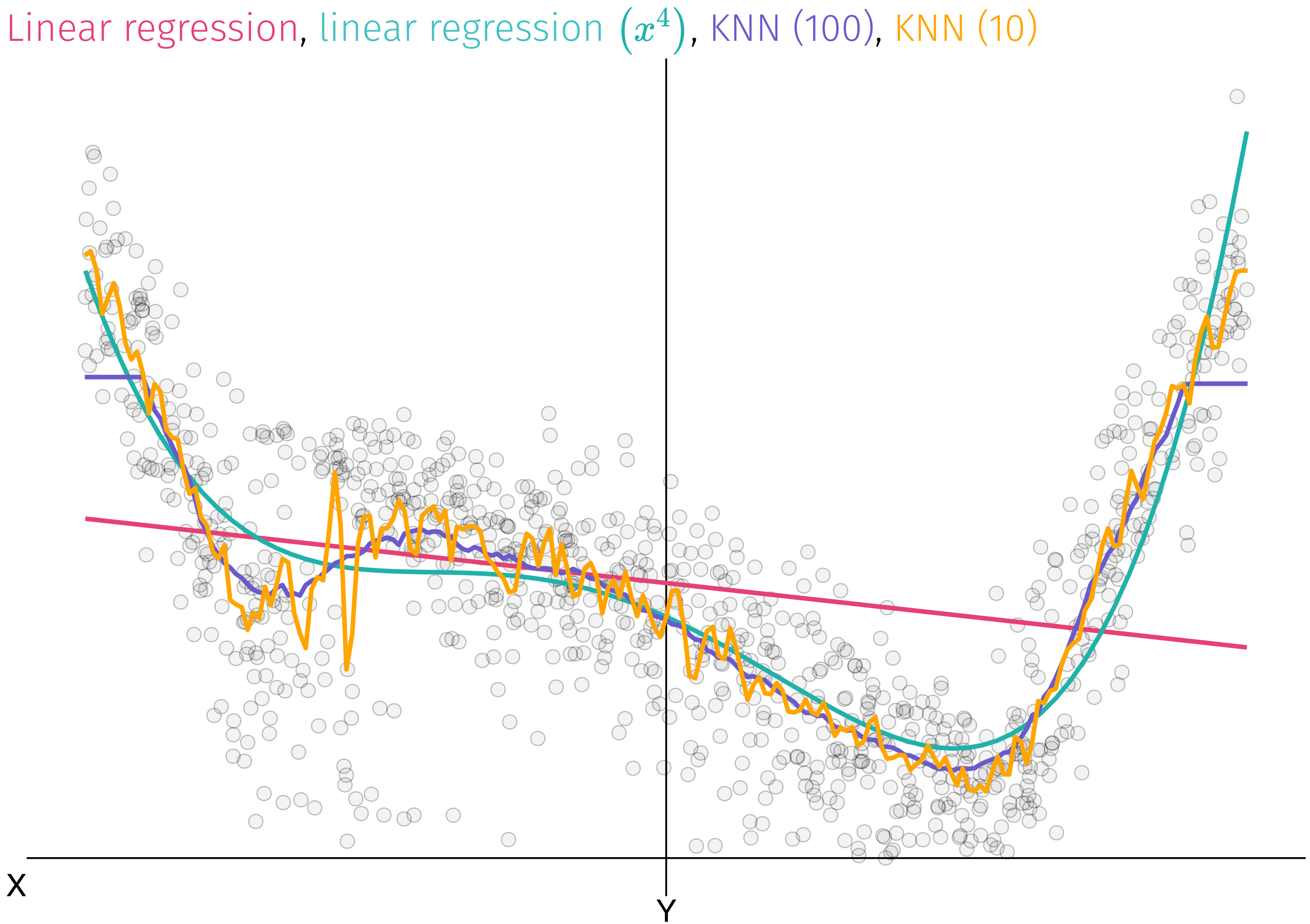


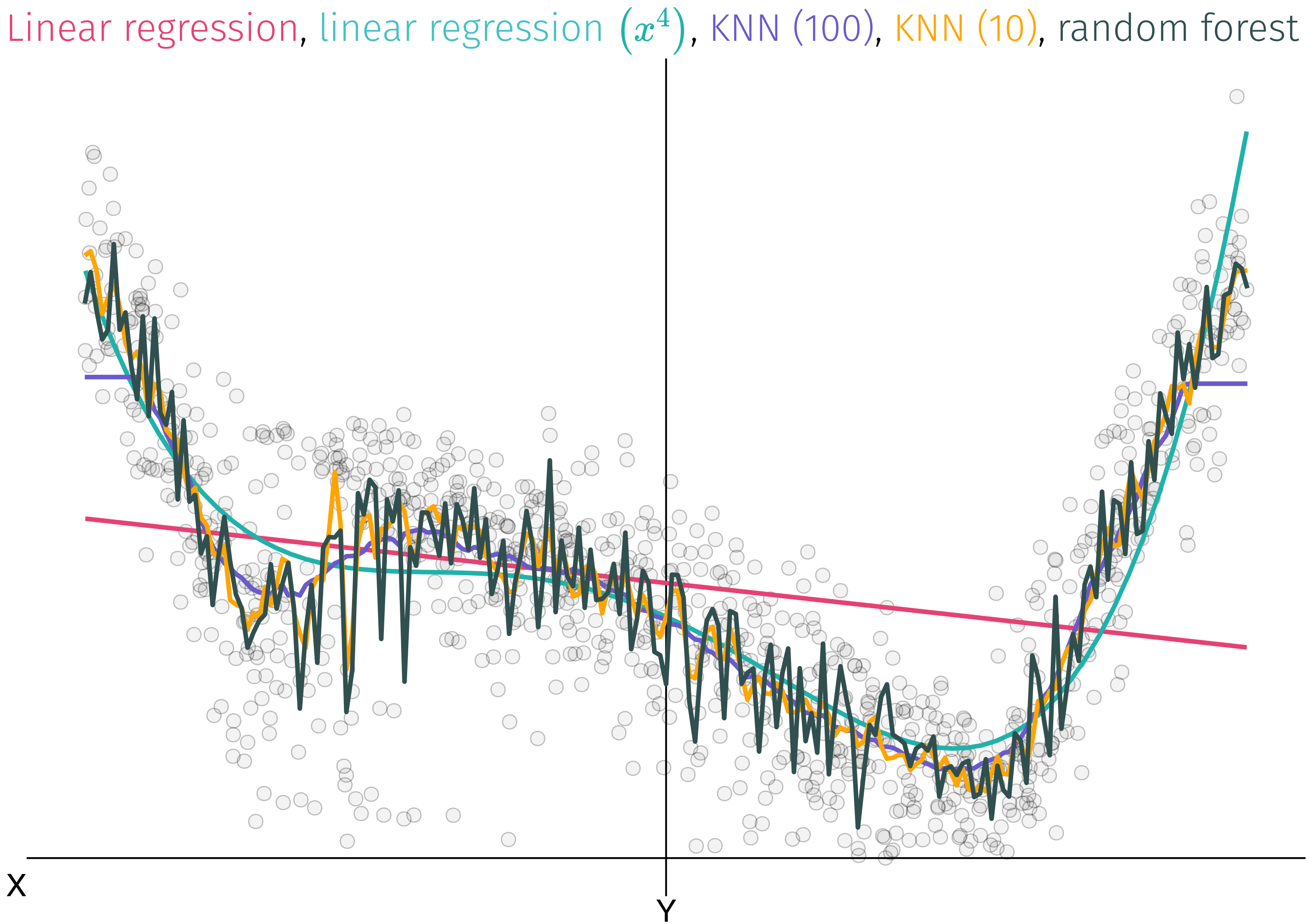


Linear regression, linear regression (x^4)
X
Y

Linear regression, linear regression (x^4), KNN (100)




Linear regression, linear regression (x^4), KNN (100), KNN (10)
X
Y



Linear regression, linear regression (x^4), KNN (100), KNN (10), random forest
X
Y

Note That example was only in one dimension...

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Tradeoffs

In prediction, we constantly face many tradeoffs, *e.g.*,

- **flexibility** and **parametric structure** (and interpretability)
- performance in **training** and **test** samples
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Many machine-learning (ML) techniques/algorithms are crafted to optimize with these tradeoffs, but the practitioner (you) still needs to be careful.

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Multi-class classification problems

- Rather than {0,1}, we need to classify y_i into 1 of K classes
- *E.g.*, ER patients: {heart attack, drug overdose, stroke, nothing}

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- Comb though sentences (pixels) to glean insights from relationships
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Unsupervised learning

- You don't know groupings, but you think there are relevant groups
- *E.g.*, classify spatial data into groups

Stanford University (Stanford, CA) researchers have developed a deep-learning algorithm that can evaluate chest X-ray images for signs of disease at a level exceeding practicing radiologists.

Parking Lot Vehicle Detection Using Deep Learning

THE NEW YORKER

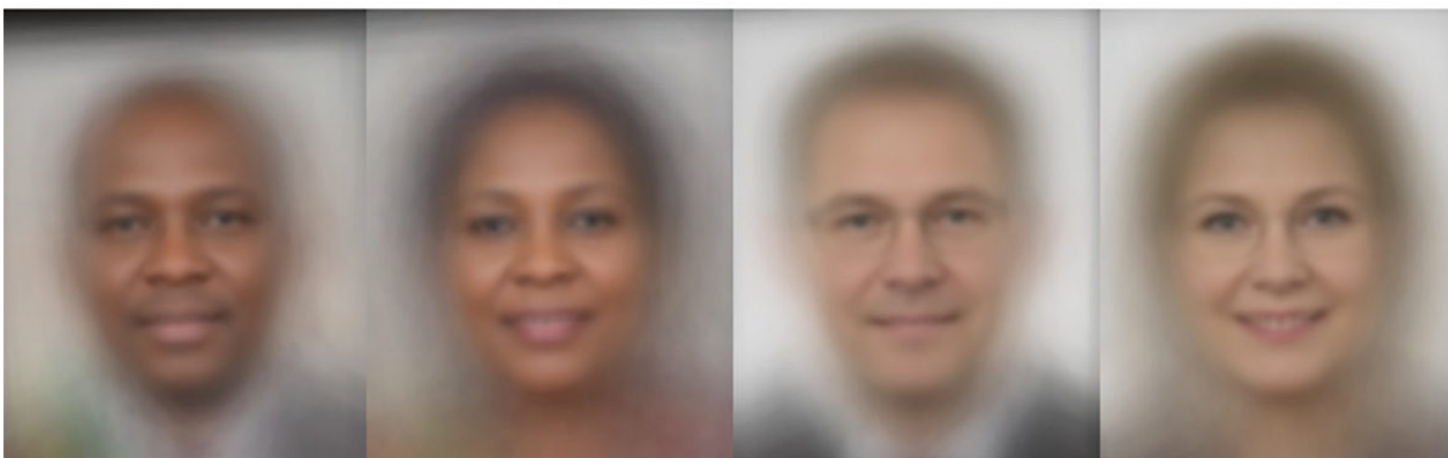
A REPORTER AT LARGE OCTOBER 14, 2019 ISSUE

The Next Word

Where will predictive text take us?

Text by John Seabrook

Gender Classifier	Darker Male	Darker Female	Lighter Male	Lighter Female	Largest Gap
Microsoft	94.0%	79.2%	100%	98.3%	20.8%
FACE++	99.3%	65.5%	99.2%	94.0%	33.8%
IBM	88.0%	65.3%	99.7%	92.9%	34.4%



Q What have you learned/noticed in your first project?

Next time Start formal building blocks of prediction.

Sources

Sources (articles) of images

- Deep learning and radiology
- Parking lot detection
- *New Yorker* writing
- Gender Shades

Table of contents