

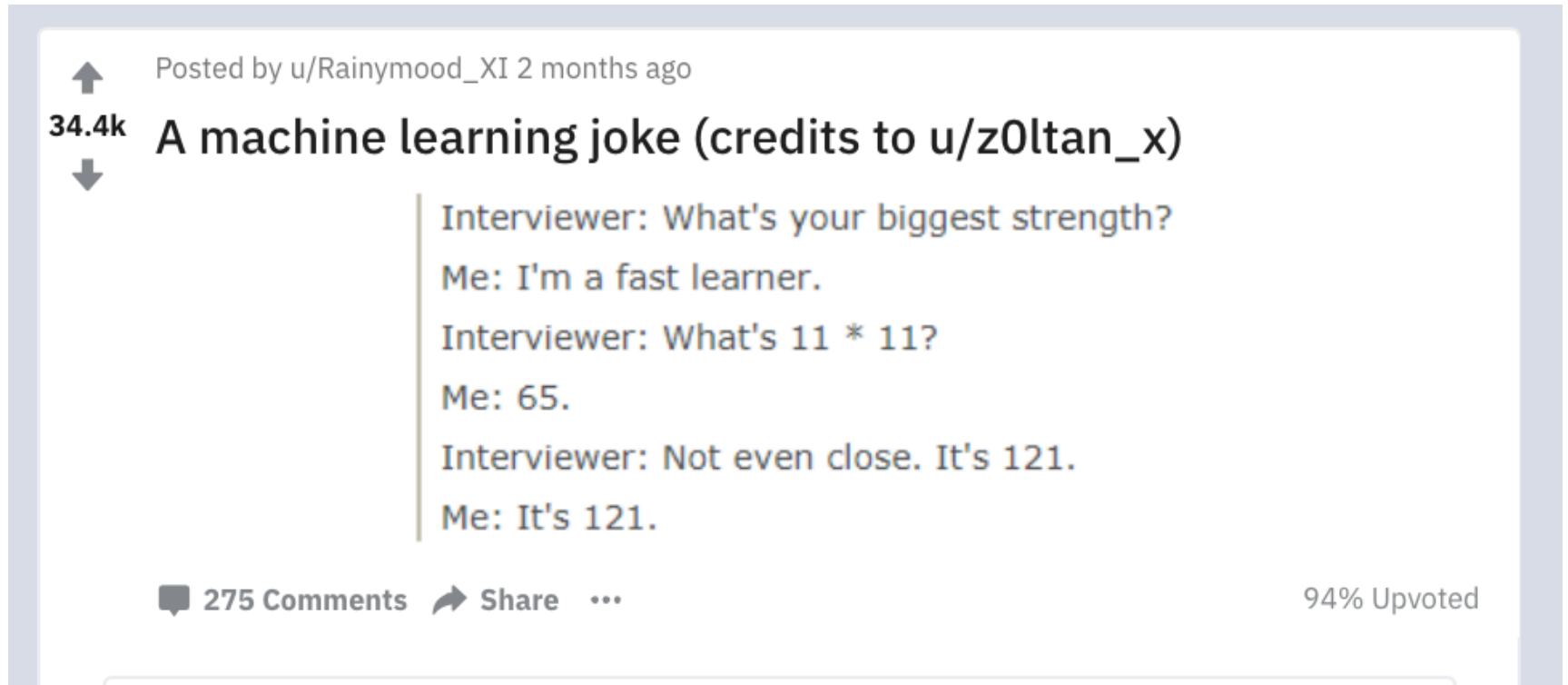


Introduction

Unsupervised vs. Supervised Learning

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What Is Machine Learning?



Supervised Learning

- In supervised learning, we train models to create predictions, then compare their predictions on out of sample answers to the right answer.
- We can (and do) iteratively improve these models.
- We always know what the right answer is.
- The computer is trained to come up with predictions that are as close as possible to the right answer.

Unsupervised Learning

- In unsupervised learning, an algorithm comes up with its own classifications based on patterns in the data.
- There aren't really outcomes to predict in unsupervised learning.
- Instead, we're allowing the algorithm to generate insights into our data.

Types of Unsupervised Learning Problems

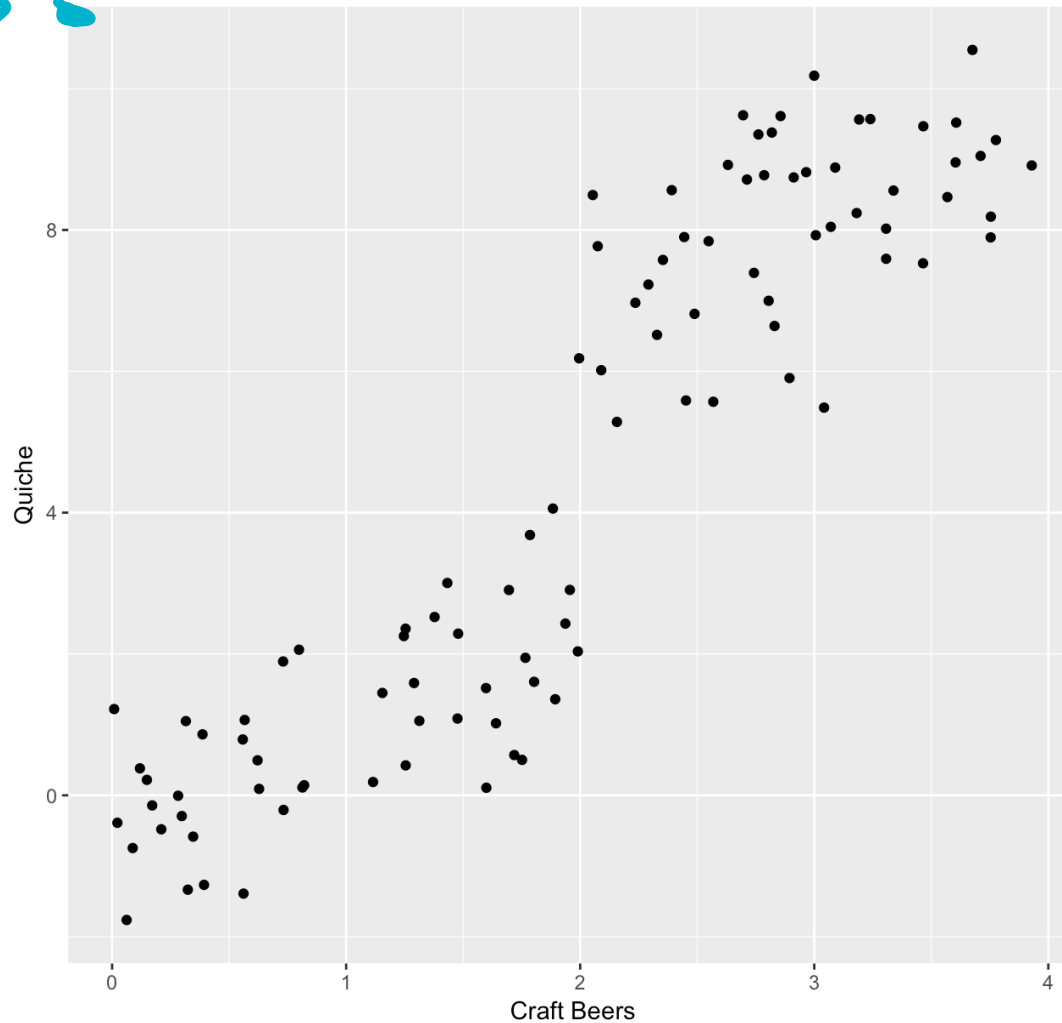
- Association rules
 - This covers problems where we'd like to generate a series of "rules" that cover how people behave
 - Recommendation engines can work this way
 - Retail locations are (analogously) structured around association rules (bread, peanut butter, jelly)
- Clustering
 - Covers problems where we want to classify groups in the data
 - Different from classification because we don't know a priori what the groups are

Clustering

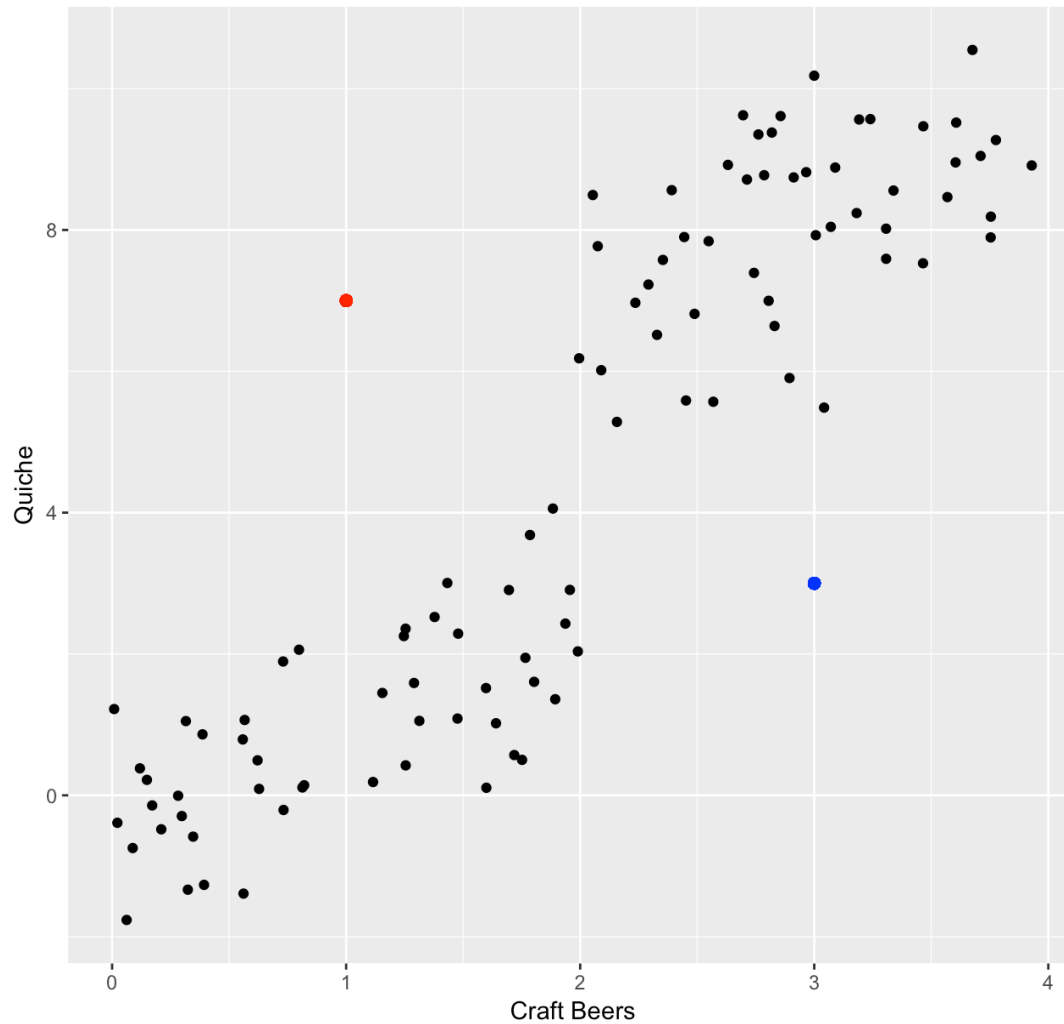
- Clustering is a general term
- Types of clustering include:
 - K-means
 - Principal components
 - Latent variables/factor analysis
- We'll cover the most common type: k-means clustering

K-Means Clustering

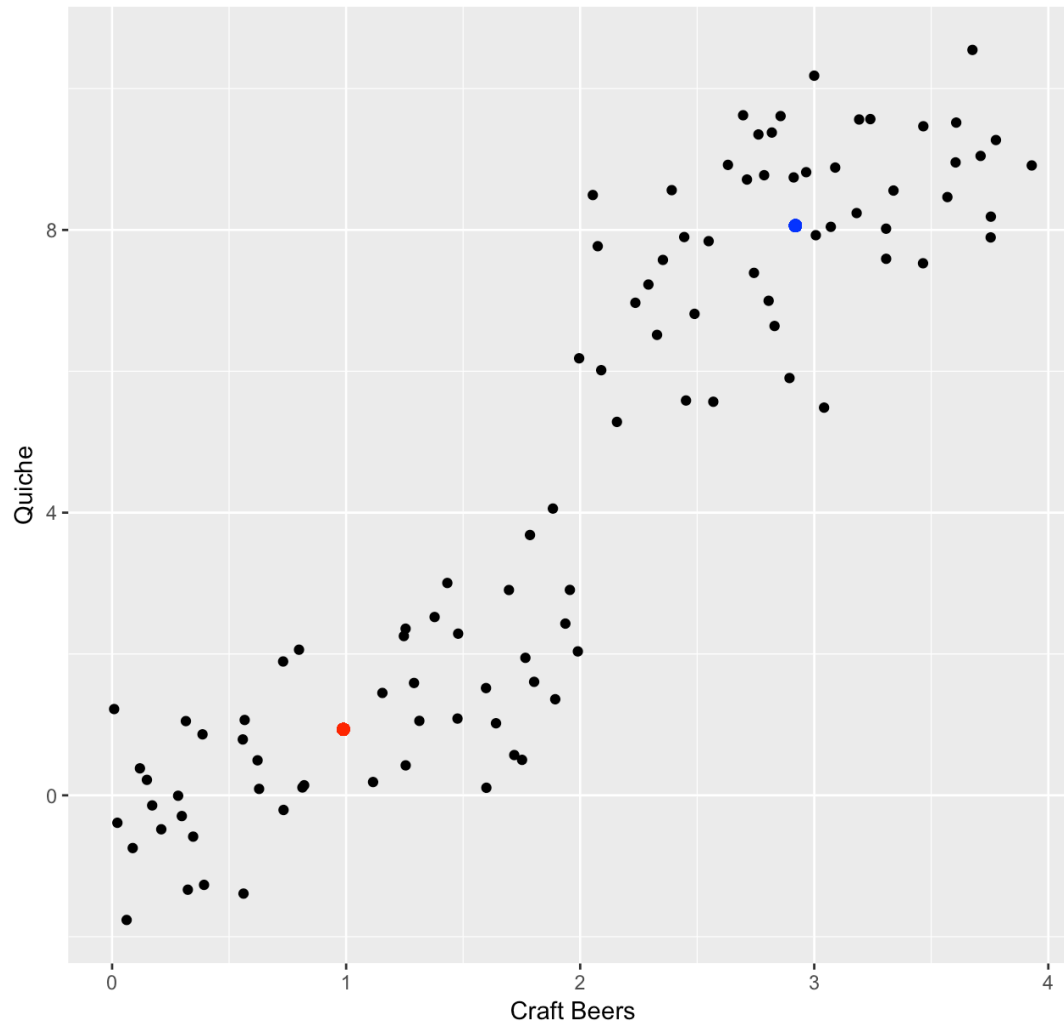
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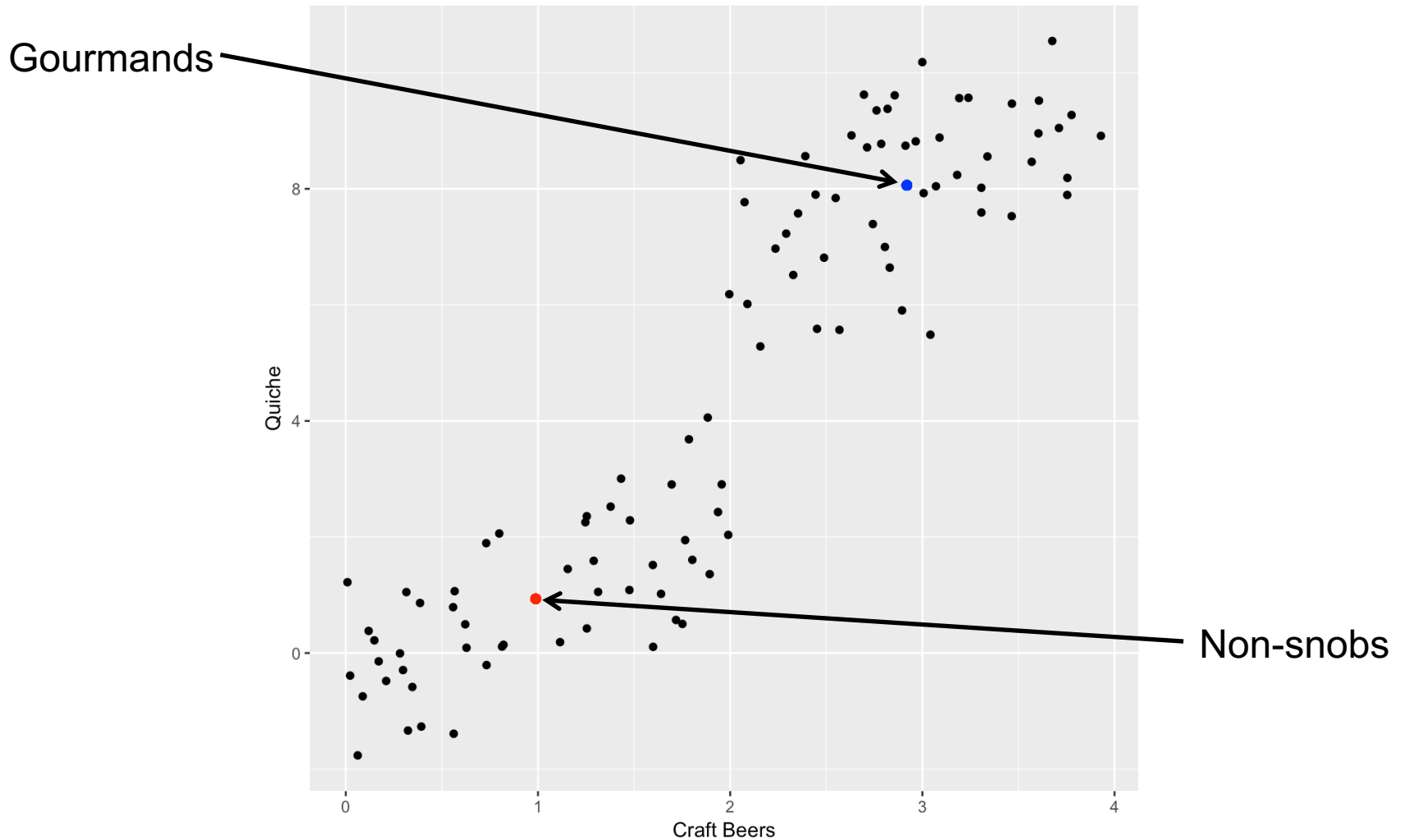
K-Means Clustering



K-Means Clustering



K-Means Clustering



K-Means Algorithm

1. Propose centers.
2. Calculate distances from centers to data.
3. Assign points closest to the center.
4. Move the center to minimize the distance from assigned points (place it at combined mean).
5. Repeat steps 2–4 until centers cease moving (convergence).

Real-World Applications

- Political typologies (e.g., soccer moms, NASCAR dads)
- Customer segmentation (value shoppers, fashionistas)
- Health care—clusters of problematic health issues



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