PSY9511: Seminar 5

Unsupervised learning

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Outline

1. Overview of unsupervised learning
2. Clustering
    - K-means
    - Hierarchical
3. Dimensionality reduction
    - Principal component analysis (PCA)
    - Independent component analysis (ICA)
    - Partial least squares (PLS)

Unsupervised learning

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Unsupervised learning: Motivation

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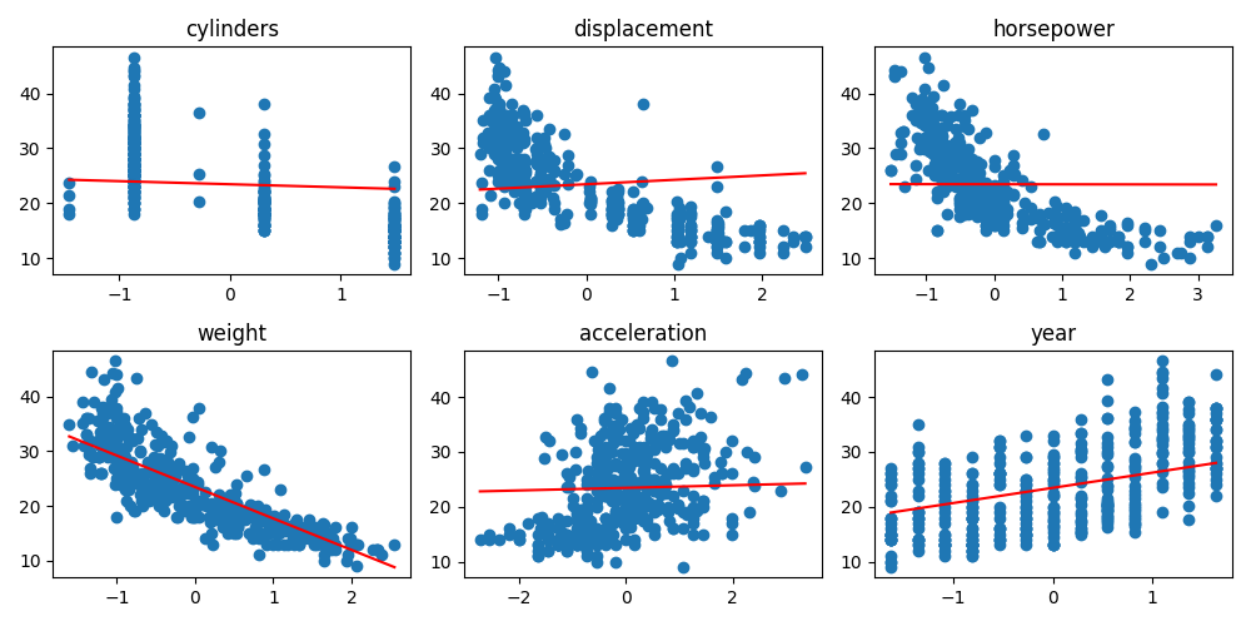
- Descriptive: Understand the relationship between X and y



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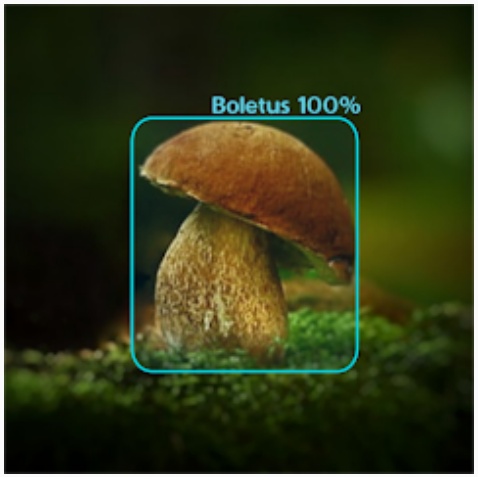

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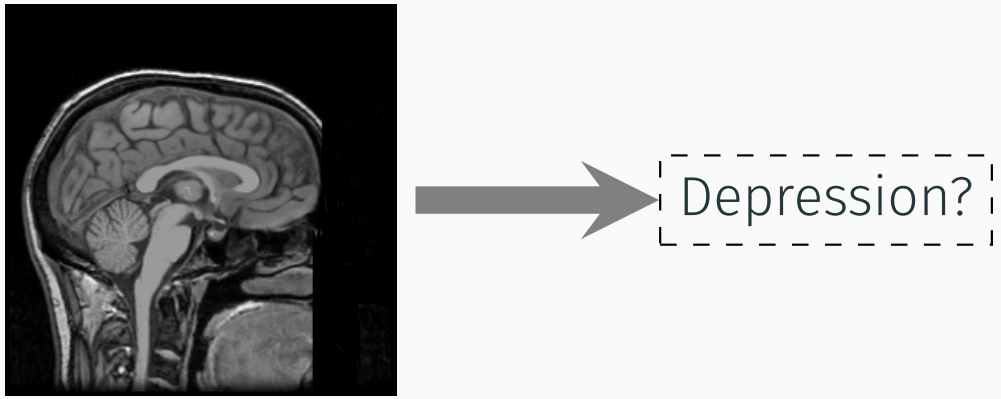

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Unsupervised learning: Are there some interesting patterns in X?

- Can we find subgroups or interesting axes of variability?
- Visualization

Dimensionality reduction

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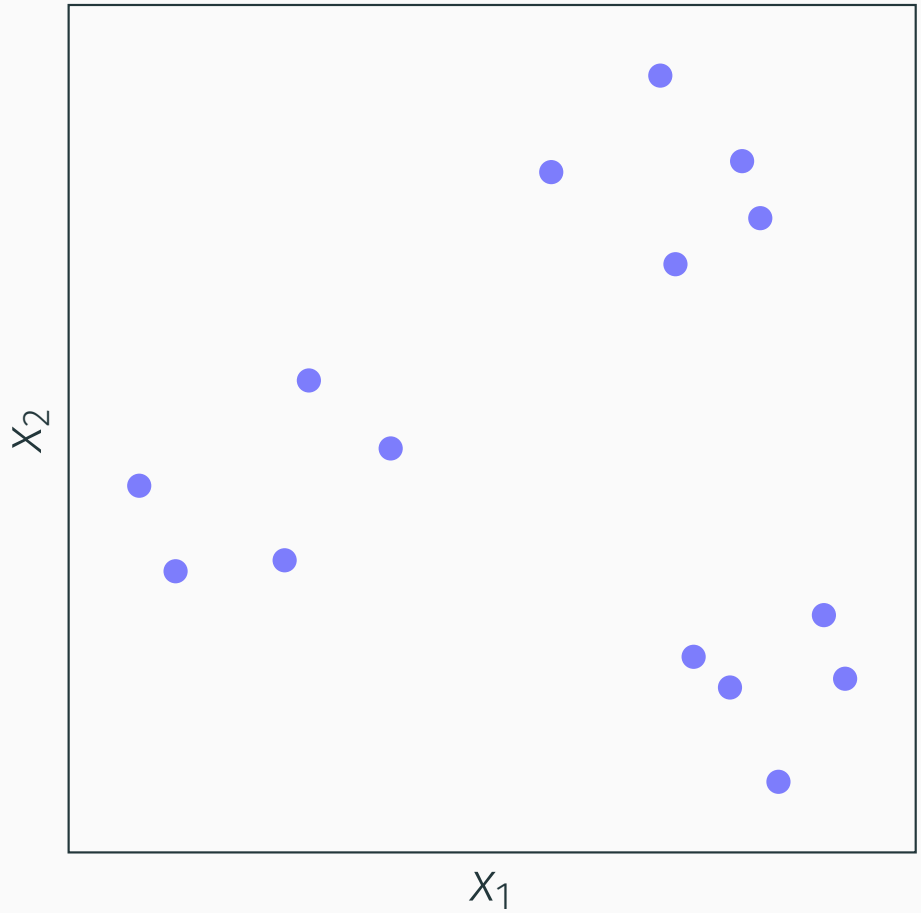

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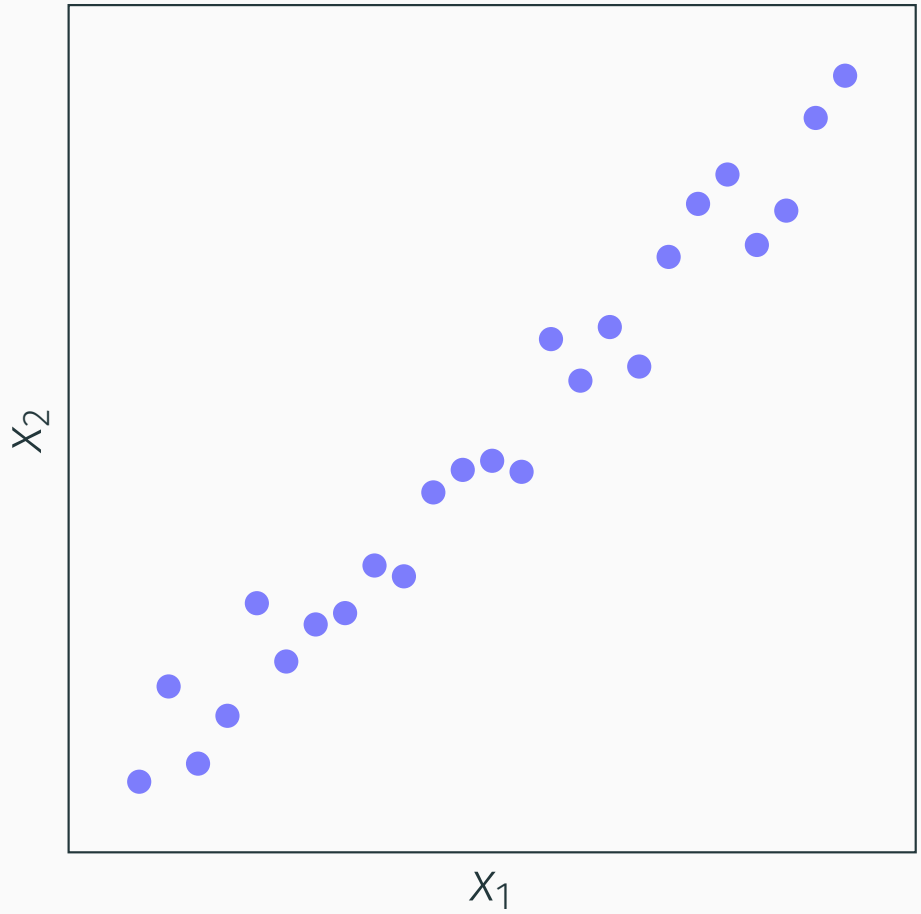

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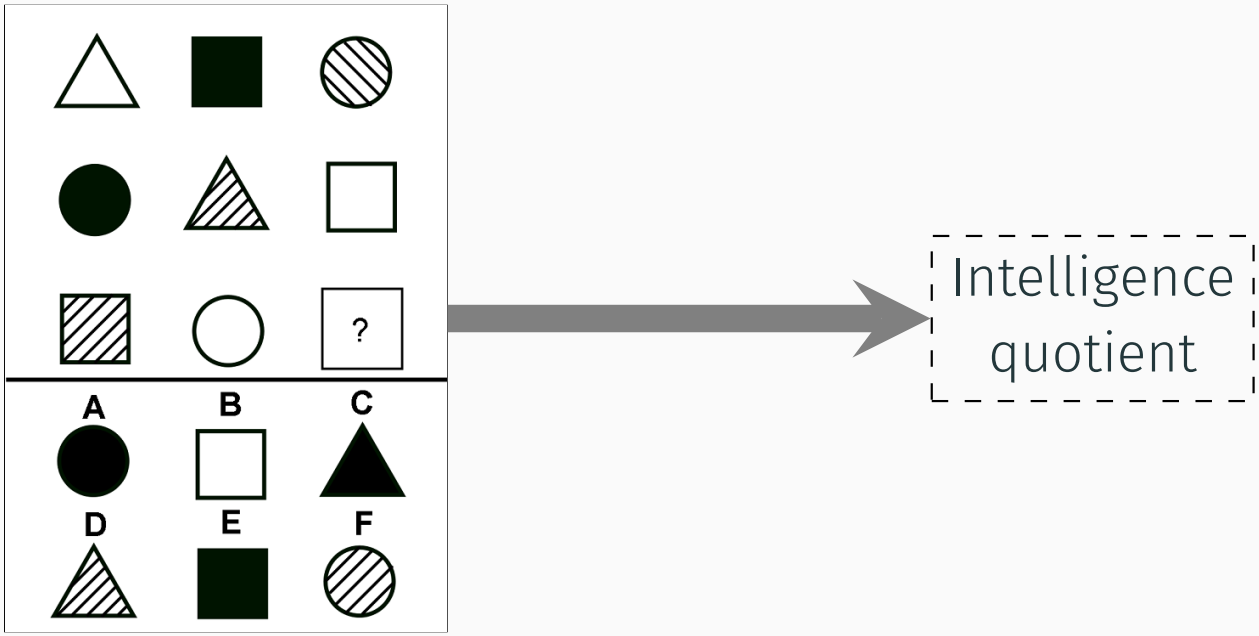

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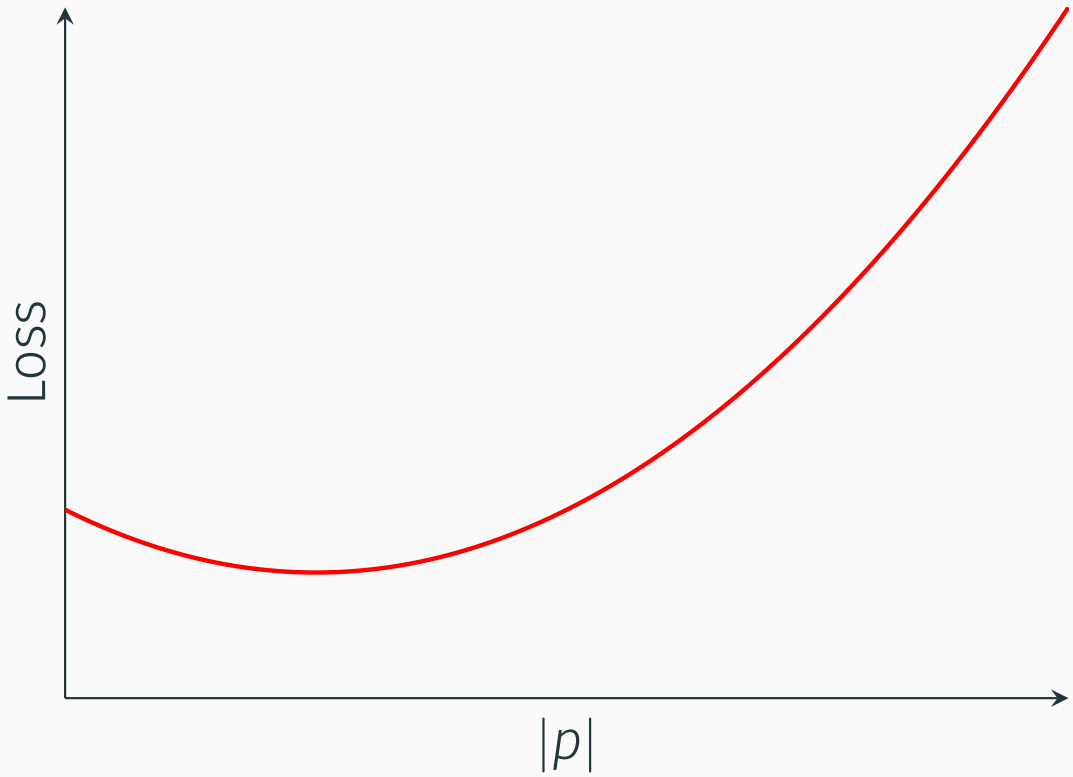

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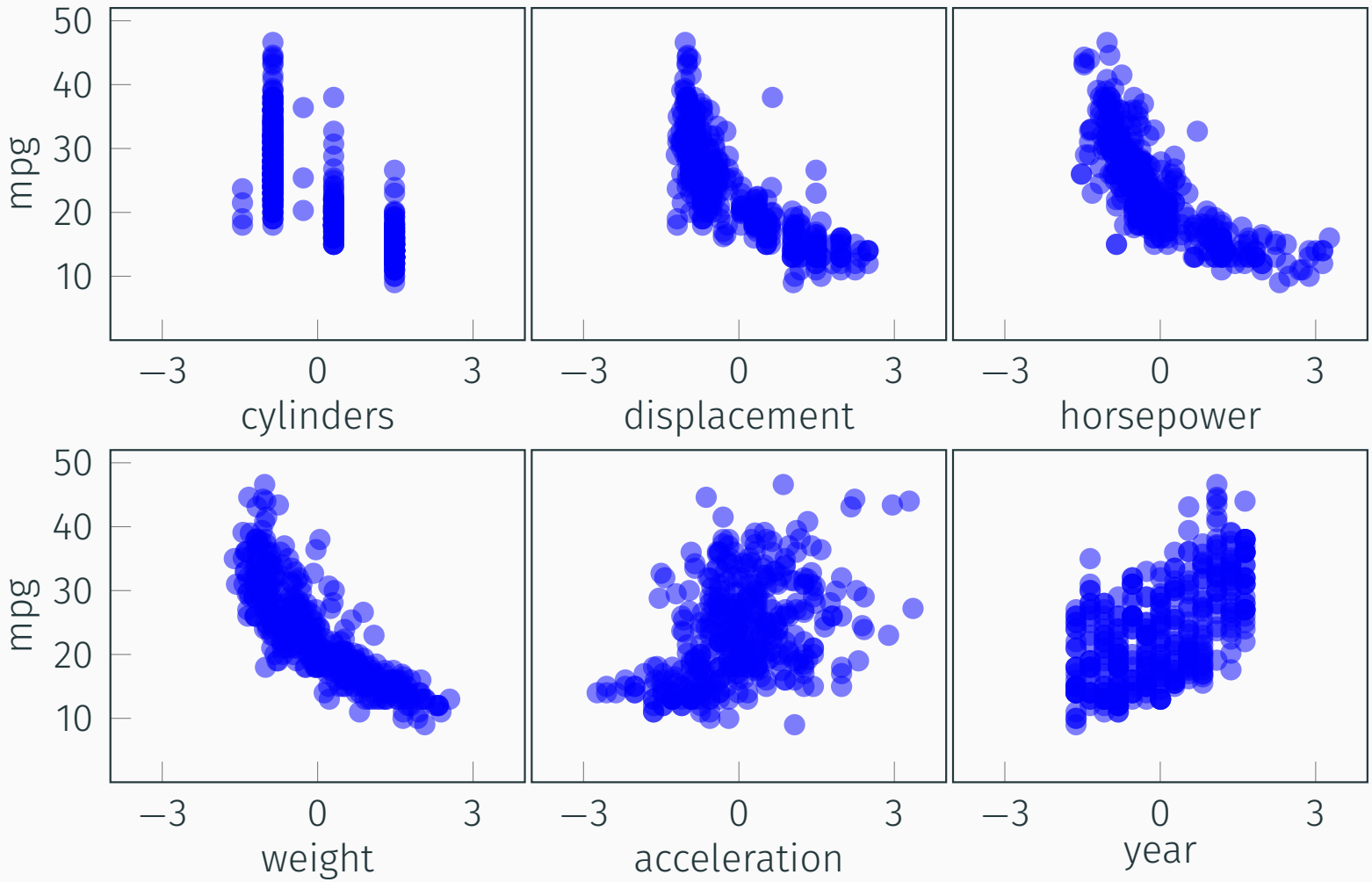

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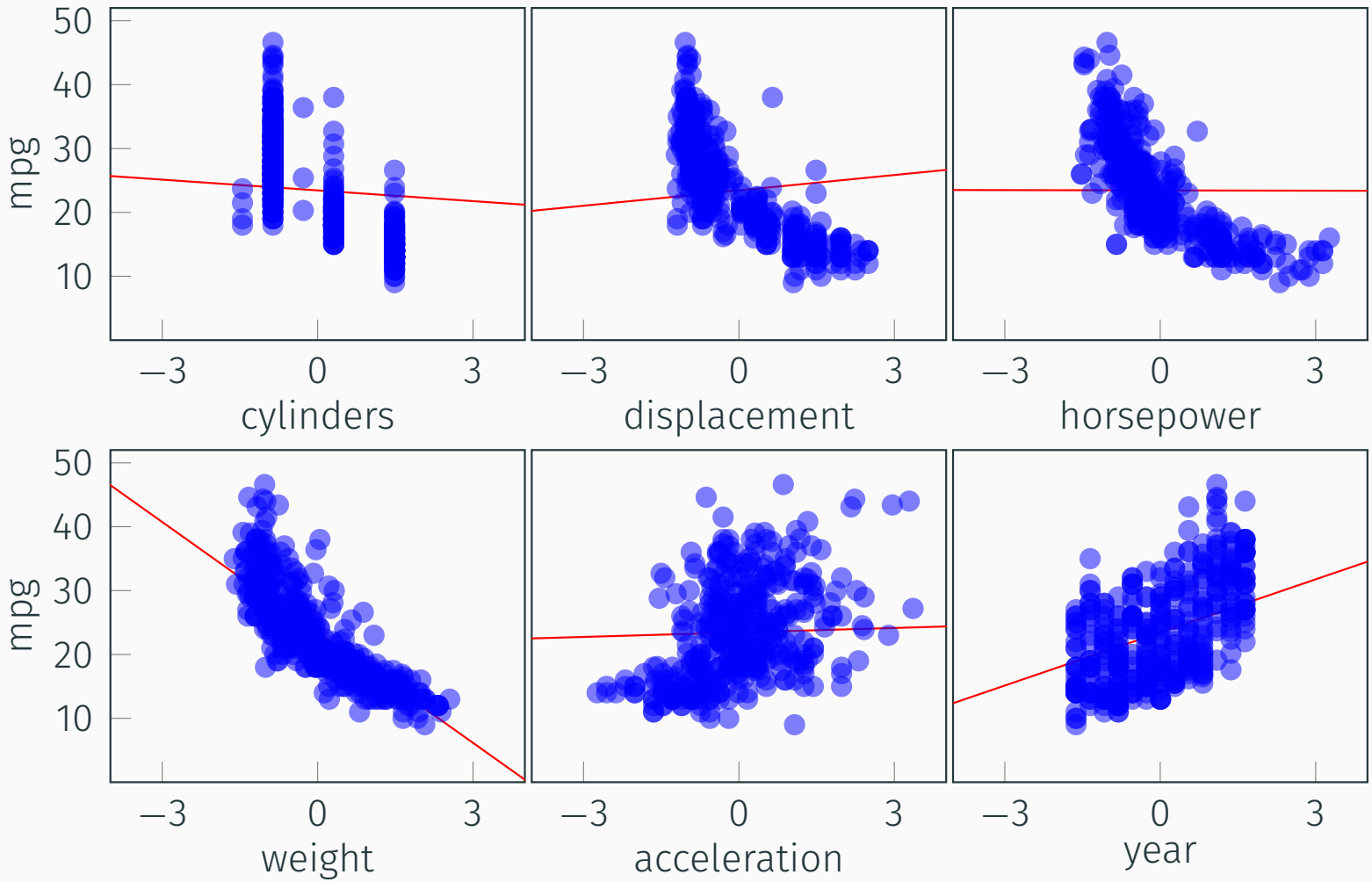

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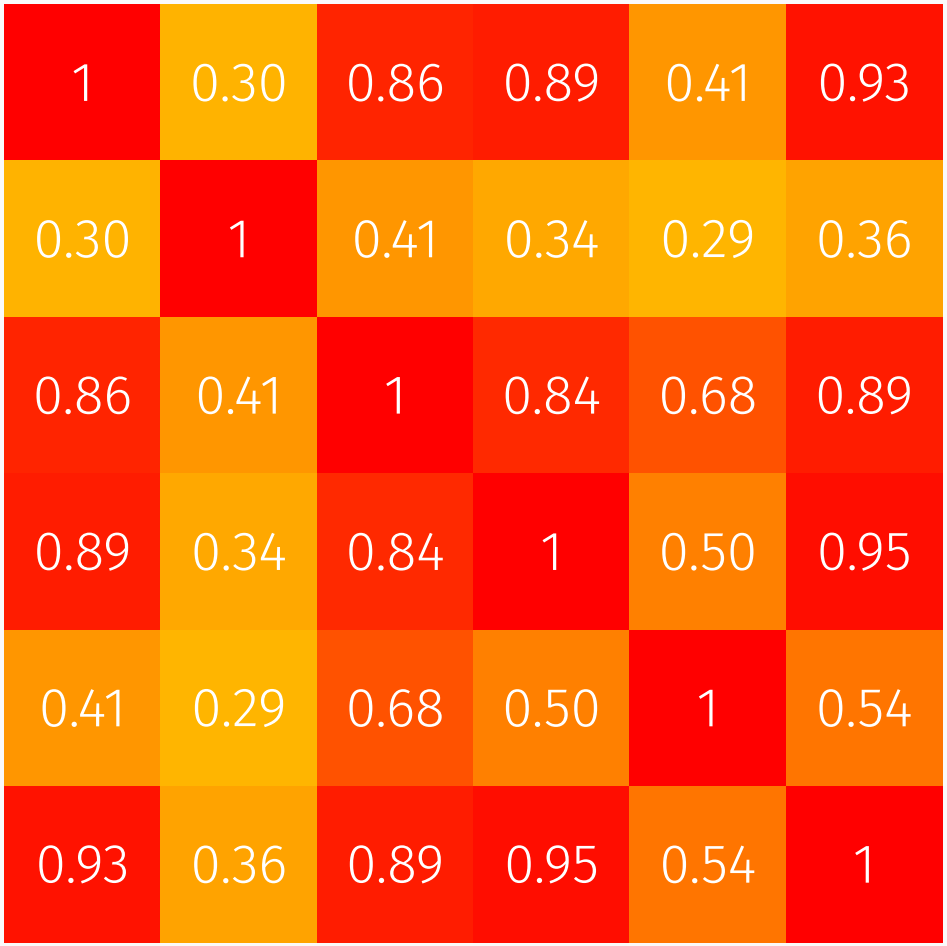

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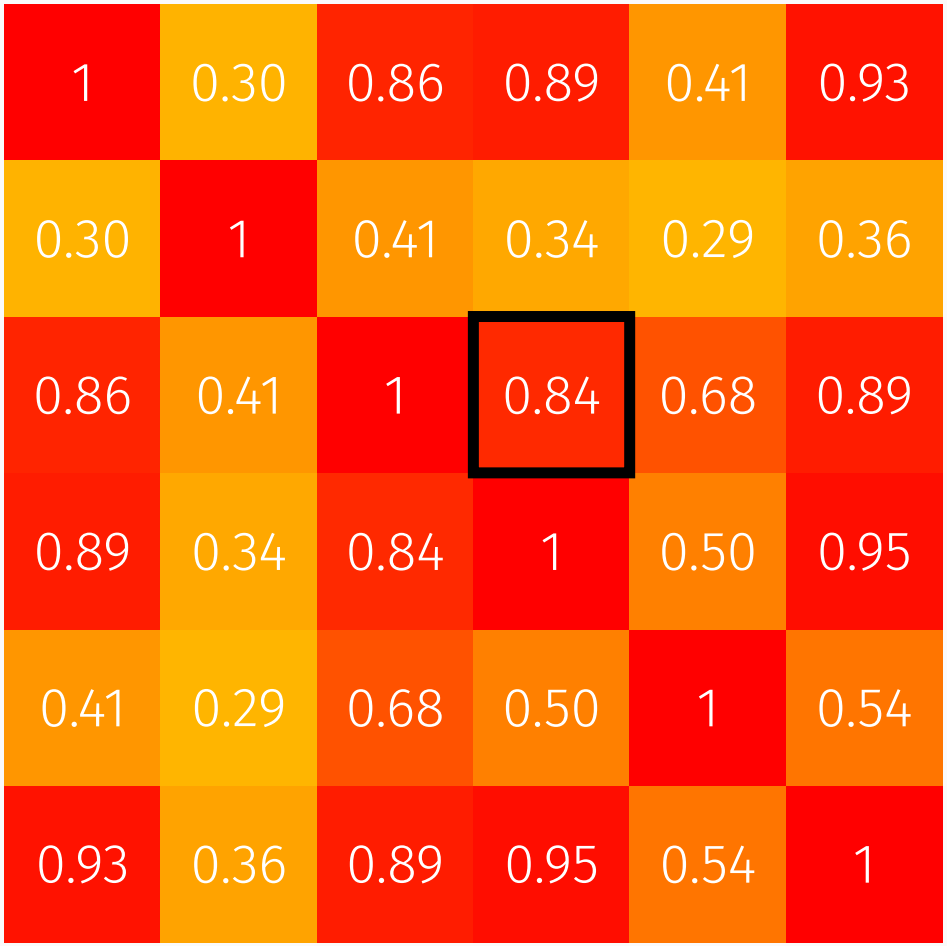
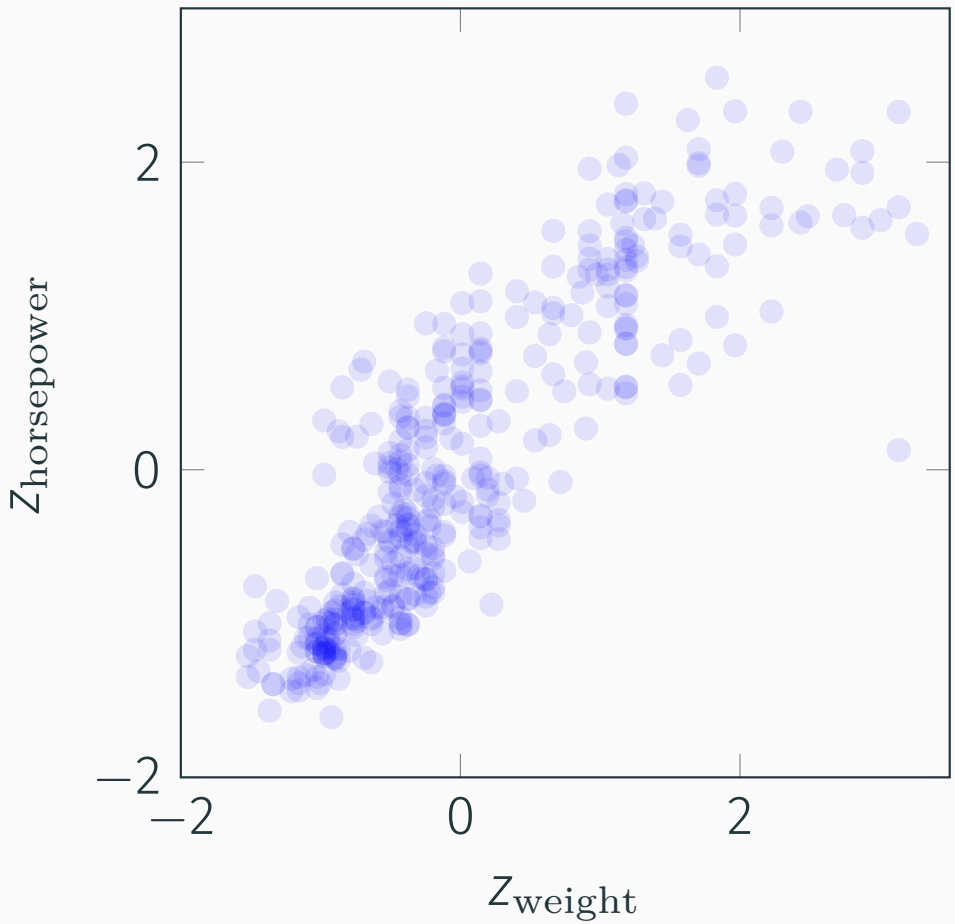


Dimensionality reduction: Principal component analysis



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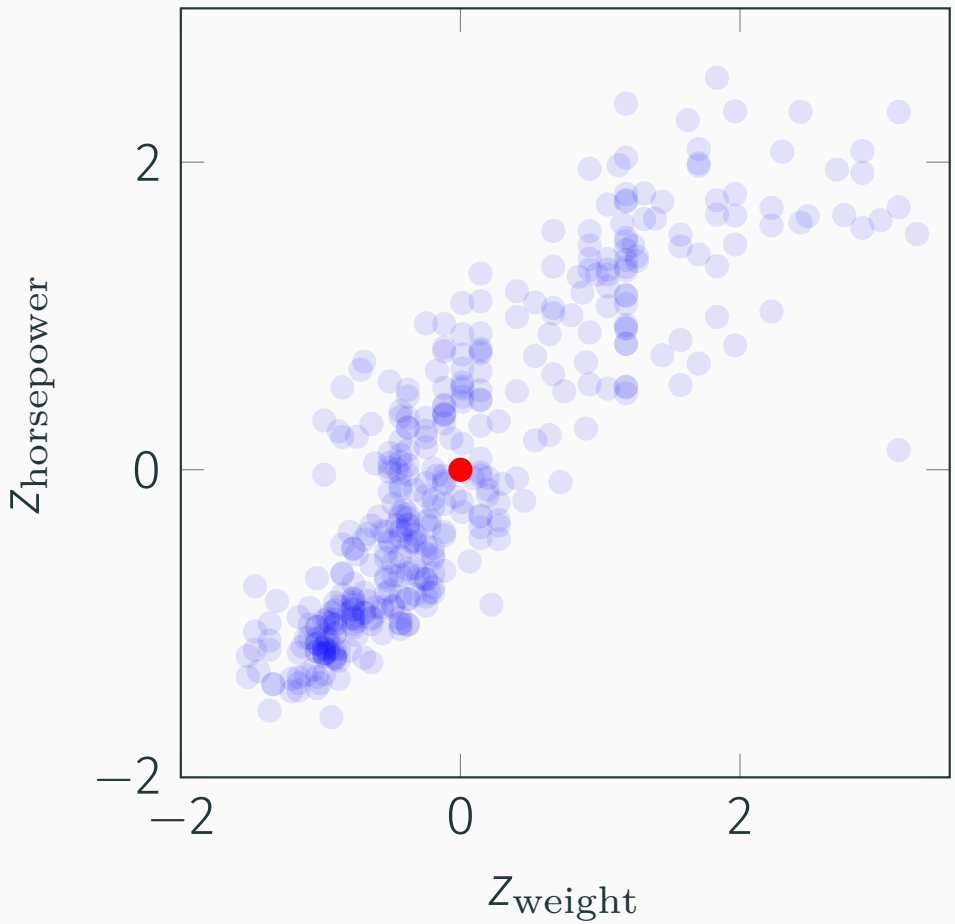

$c \rightarrow$ center of the data

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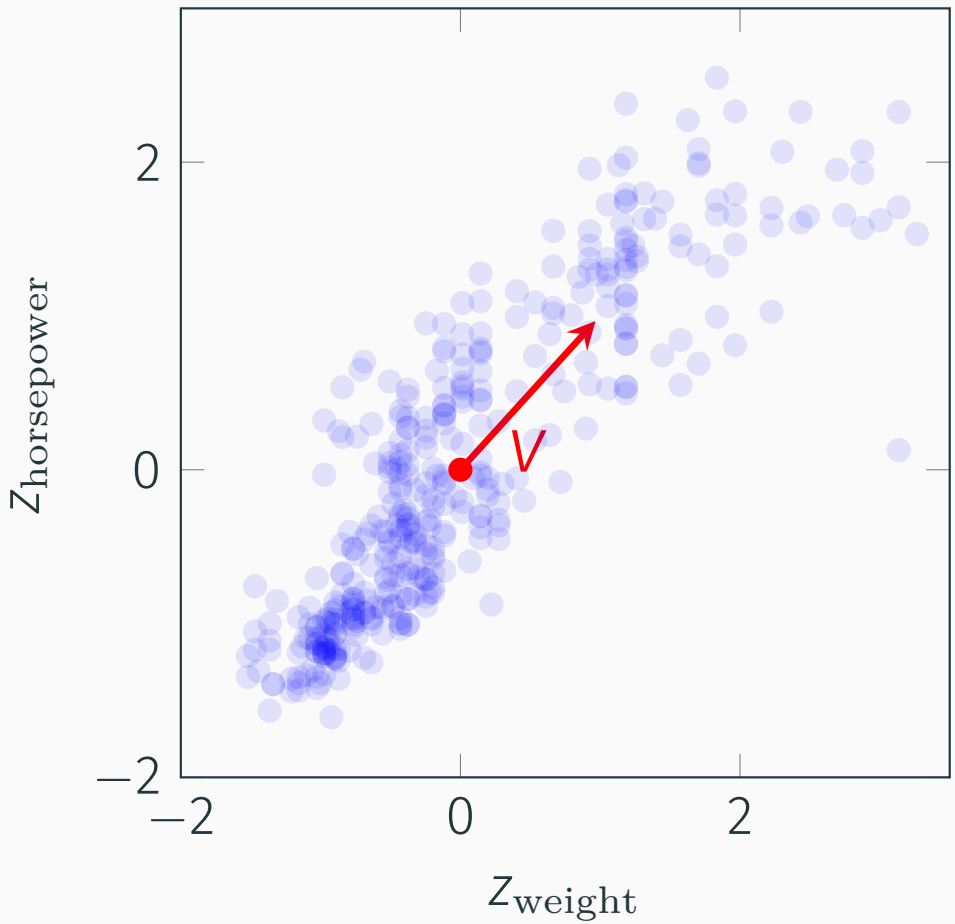
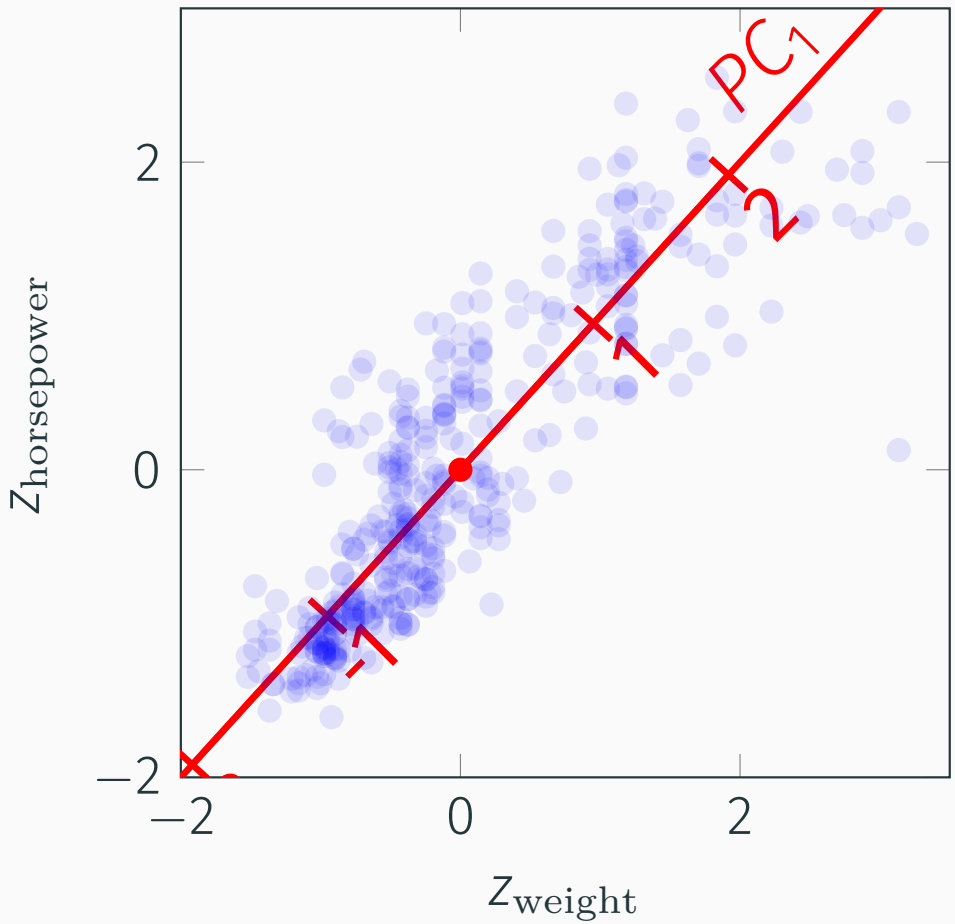


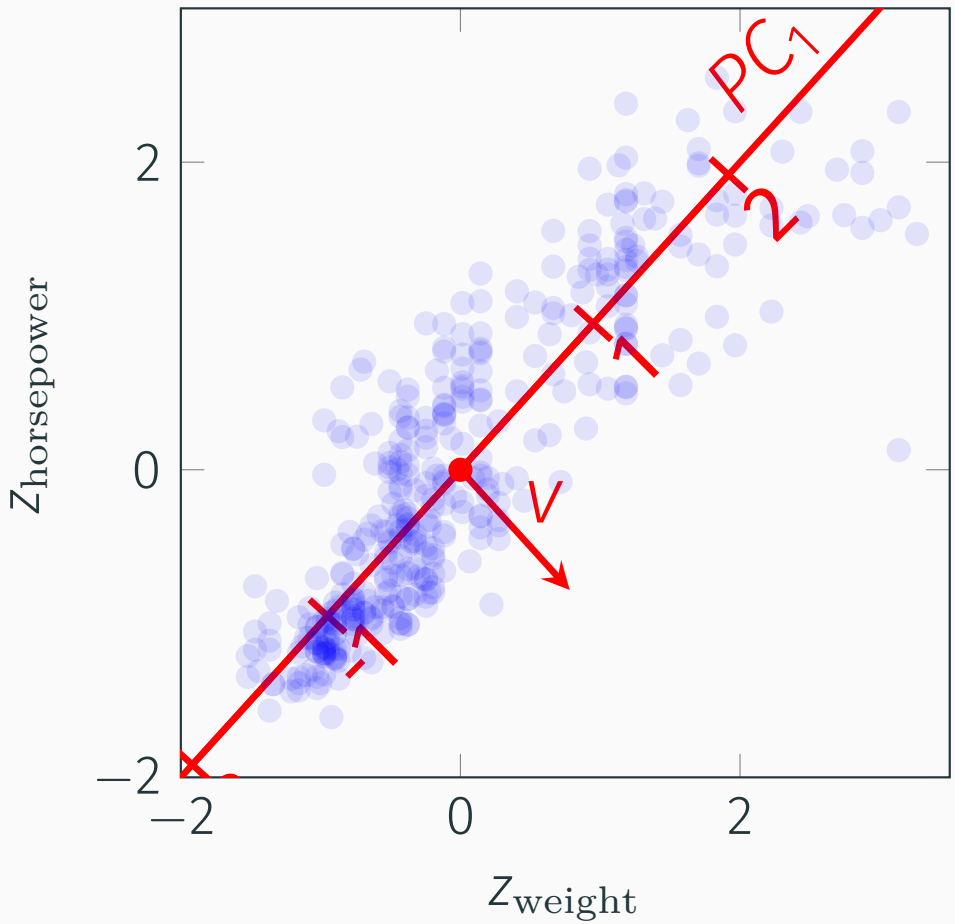
$v \rightarrow$ direction of maximum variance

Dimensionality reduction: Principal component analysis



$$PC_1 \rightarrow 0.69 * z_{\text{horsepower}} + 0.71 * z_{\text{weight}}$$

Dimensionality reduction: Principal component analysis



$v \rightarrow$ direction of maximum variance **orthogonal** to PC_1