Quantum-inspired ℓ^2 sampling

and applications to machine learning

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Machine Learning

Quantum Machine Learning

Classical ℓ^2 sampling

Machine Learning

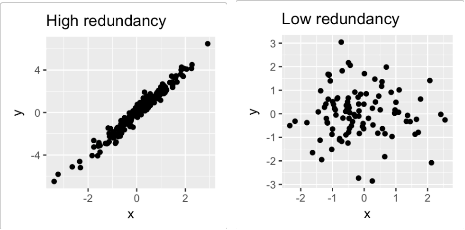
Introduction

- Machine learning is a broad term for algorithms which are capable of finding patterns in data.
- Fundamental goal: capture these patterns in a "model" that *generalizes*.
- These algorithms have two components:
  1. A learning element. Updates the model depending on its performance on the considered dataset.
  2. A performance element. Provides the measure of performance.
- Bottom line: "machine learning" is a somewhat hollow term. Many ML algorithms are in fact familiar linear algebraic techniques.

PCA

Motivation: Singular value transformation

- "Training" dataset $\mathcal{T}$ consists of the accessible samples of data. $\mathcal{T}$ is drawn from a subset of $\Omega \subset \mathbb{R}^d$ where each component represents a "feature".
- Samples from Ω are assumed to be drawn according to some distribution $\mathcal{D}$.
- Example: data is collected on the heights and lengths of cherry blossom petals.



- How and why may it make sense to reduce the dimensionality of the feature space?

Moore-Penrose Pseudoinverse

Motivation: Singular value transformation

- Say we wish to solve the linear system

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