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PCA derivation

- Video: Welcome to module
 4
 1 min
- Reading: Vector spaces 20 min
- Reading: Orthogonal complements
 20 min
- Video: Problem setting and PCA objective
 7 min
- Reading: Multivariate chain rule
 20 min
- Practice Quiz: Chain rule practice
 3 questions
- Video: Finding the coordinates of the projected data
 5 min
- Video: Reformulation of the objective

 10 min
- Reading: Lagrange multipliers
 20 min
- Video: Finding the basis vectors that span the principal subspace7 min

PCA algorithm

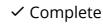
- Video: Steps of PCA 4 min
- Video: PCA in high dimensions
 5 min
- Lab: Principal Components
 Analysis (PCA)

Lagrange multipliers

Check out the basics of Lagrange multipliers at the corresponding <u>Wikipedia page</u>.

The important things are

- 1. We can solve a constrained optimization problem of the form $\min_x f(x), s.t.g(x) = 0$ where g(x) is an equality constraint.
- 2. The constraints can be absorbed into a single objective function, the Lagrangian, which combines the original loss function and the constraints as $\mathcal{L}(x,\lambda)=f(x)-\lambda g(x)$. λ is called a Lagrange multiplier.
- 3. We solve the constrained optimization problem by computing the partial derivatives $\partial \mathcal{L}/\partial x$ and $\partial \mathcal{L}/\partial \lambda$, setting them to 0 and solving for λ and x.



Go to next item





