Key points of the last two lectures!

A lot of technical proofs this week. Here's the tl;dr summary:

- $\bullet \ \cos\theta = \frac{\langle \vec{v}, \vec{w} \rangle}{\|\vec{v}\| \|\vec{w}\|},$
- ullet $ec{v}$ and $ec{w}$ are orthogonal if and only if $\langle ec{v}, ec{w}
 angle = 0$,
- the projection of \vec{v} on \vec{w} is $p_{\vec{w}}(\vec{v}) = \frac{\langle \vec{v}, \vec{w} \rangle}{\langle \vec{w}, \vec{w} \rangle} \vec{w}$,

Projections

This vector describes how much \vec{v} is in the direction of \vec{w} , and is known as a projection of \vec{v} onto \vec{w} .

Definition

Let $ec{v},\,ec{w}\in\mathbb{R}^n$ be non-zero vectors. Then the *projection of* $ec{v}$ *onto* $ec{w}$ is

$$p_{\vec{w}}(\vec{v}) := \|\vec{v}\| \cos \theta \hat{w}.$$

Can we write it using the scalar product?

Projections

Proposition

Let $\vec{v}, \ \vec{w} \in \mathbb{R}^n$ be non-zero vectors. Then the *projection of* \vec{v} *onto* \vec{w} is

$$ho_{ec{w}}(ec{v}) = rac{\langle ec{v}, ec{w}
angle}{\langle ec{w}, ec{w}
angle} ec{w}.$$

Proof.

ecture 4: Projections (2.6-2.7) (Dr. Nick Se

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Projections

Proposition

Let $ec{v},\,ec{w}\in\mathbb{R}^n$ be non-zero vectors. Then the projection of $ec{v}$ onto $ec{w}$ is

$$ho_{ec{w}}(ec{v}) = rac{\langle ec{v}, ec{w}
angle}{\langle ec{w}, ec{w}
angle} ec{w}.$$

Definition

The component of \vec{v} on \vec{w} is

component :=
$$|\langle \vec{v}, \hat{w} \rangle| = ||p_{\vec{w}}(\vec{v})||$$
.