## $1 \mid$ orthogonal decomposition

An orthogonal decomposition is a way of writing some vector  $v \neq 0 \in V$  as the scaled other vector  $u \in V$  plus an orthogonal component

Suppose 
$$u,v\in V$$
, with  $v\neq 0$ . Set  $c=\frac{\langle u,v\rangle}{\|v\|^2}$  and  $w=u-cv$ . Then, 
$$\langle w,v\rangle=0 \text{ and } u=cv+w$$

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