

# Hochschild Cohomology of Twisted Tensor Product Algebras

Pablo S. Ocal

Texas A&M University

April 6, 2019

## Definition

The *Hochschild cohomology* of a  $k$  algebra  $A$  is  $HH^*(A) = \text{Ext}_{A^e}^*(A, A)$ .

## Definition (Čap, Schichl, Vanžura)

The *twisted tensor product*  $A \otimes_{\tau} B$  of  $A$  and  $B$  via  $\tau : B \otimes A \longrightarrow A \otimes B$  is  $A \otimes B$  with multiplication  $m_{\tau} = (m_A \otimes m_B) \circ (1 \otimes \tau \otimes 1)$ .

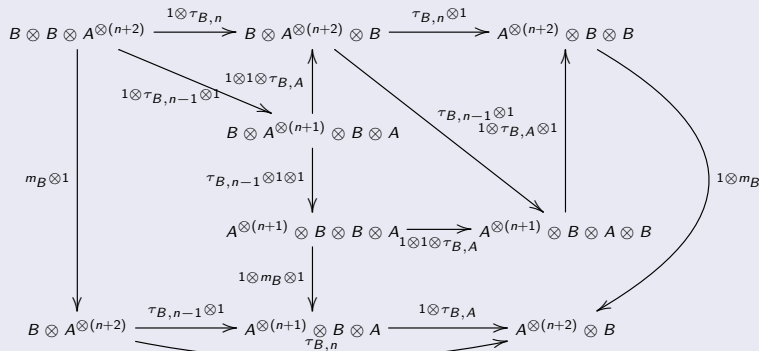
## Goal

Understand  $HH^*(A \otimes_{\tau} B)$  in terms of  $HH^*(A)$  and  $HH^*(B)$ .

Given a resolution of  $A$  as  $A^e$  module, and a resolution of  $B$  as  $B^e$  module, we compute a resolution of  $A \otimes_{\tau} B$  as  $(A \otimes_{\tau} B)^e$  module. We will need these resolutions to be *compatible* with  $\tau$ . (Shepler, Witherspoon)

# Techniques and Results

## Technique(s): fancy diagram chasing



## Applications (Grimley, Negron, Nguyen, Shirikov, Witherspoon)

For some  $q \in k^*$ ,  $k \langle x, y \rangle / (x^2, y^2, xy + qyx)$ , and  $k \langle x, y \rangle / (xy - yx - y^2)$ .