

# DEFENSE OF THE DOCTORAL DISSERTATION

DEPARTMENT OF MATHEMATICS

## “A Solomon-Tits theorem for rings”

Matt Scalamandre



Monday, March 4, 2024

Time: 12:00 PM

Location: 311 DeBartolo

Examination Committee:

Andy Putman, Advisor

Mark Behrens

Nick Salter

Chris Schommer-Pries



### Abstract:

An analogue of the Tits building is defined and studied for commutative rings. We prove a Solomon-Tits theorem when  $R$  either satisfies a stable range condition, or is the ring of  $S$ -integers of a global field. We then define an analogue of the Steinberg module of  $R$  and study it both as a  $\mathbb{Z}$ -module and as a representation. We find the rank of Steinberg when  $R$  is a finite ring, and compute the length of  $\text{St}_2(R) \otimes \mathbb{Q}$  as a  $\text{GL}_2(R)$ -representation when  $R$  is uniserial. As an application of these results, we produce a lower bound for the rank of the top-dimensional cohomology of principal congruence subgroups of nonprime level