

ABSTRACT

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Let k be a field and $n \in \mathbb{N}$. We consider the quadruples (V, U', U'', T) where V is a finite-dimensional k -vector space, U' and U'' are subspaces of V , and $T : V \rightarrow V$ is a linear operator with $T^n = 0$ for some fixed n satisfying $T(U') \subseteq U'$ and $T(U'') \subseteq U''$. We say U' and U'' are invariant under T with nilpotent index n . These systems of quadruples form a category with the Krull-Remak-Schmidt property. Thus, classification is reduced to the classification of indecomposable systems.

By translating a seemingly intractable linear algebra problem to that of module theory and quiver representations, we are able to utilize Auslander-Reiten Theory to aid our analysis. We will give a complete classification in this work. The nilpotent index is crucial for classification of the category. For $n \leq 3$, our problem

is classifiable. For $n > 3$, our category is of wild representation type, and no complete classification can be done. For $n = 1, 2$ we will list the finitely many indecomposables, and for $n = 3$, we will give a complete description.