

## On the Combinatorics of the Set of Tilting Modules

Luise Unger, FernUniversität in Hagen

Let  $\Lambda$  be a basic artin algebra and  $\text{mod}\Lambda$  the category of finitely generated left  $\Lambda$ -modules. A  $\Lambda$ -module  $T$  is called a **tilting module** if

- (i)  $\text{pd}M < \infty$  and
- (ii)  $\text{Ext}_{\Lambda}^i(T, T) = 0$  for all  $i > 0$  and
- (iii) there is an exact sequence  $0 \rightarrow T^0 \rightarrow \dots \rightarrow T^r \rightarrow 0$  with  $T^i$  direct sums of direct summands of  $T$  for all  $0 \leq i \leq r$ .

We denote by  $\mathcal{T}_{\Lambda}$  the set of all multiplicity free tilting modules over  $\Lambda$  up to isomorphism.

The set  $\mathcal{T}_{\Lambda}$  carries various combinatorial structures. It defines a partially ordered set  $(\mathcal{T}_{\Lambda}, \leq)$ , the vertex-set of a quiver  $\vec{\mathcal{K}}_{\Lambda}$  and the maximal simplices of a simplicial complex  $\Sigma_{\Lambda}$ .

In the lecture we report on properties of these combinatorial objects and on how they reflect properties of the corresponding algebras. Almost all results are joint work with Dieter Happel and were achieved over a period of more than 20 years.