

**UNIVERSITY OF MACAU**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**DEPARTMENT OF MATHEMATICS**

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**“Tensor train and QTT decompositions for high-dimensional tensors with applications to high-dimensional integration and global optimization”**

by

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**Venue : J216**

**Abstract**

In this talk we study the tensor-train decomposition, which can be considered as natural extension of singular value decomposition to high dimensions. It does not suffer from the curse of dimensionality, and can be computed with the reliability and SVD. Basic subroutines are simple to implement and are available online. QTT decomposition opens a new application area for tensor decompositions --- approximation of tensors of "physically small" dimension. It includes compact representation of functions on sufficiently fine tensor grids with 2D points in each direction, leading to  $d \log n$  complexity. When the tensor is in structured format, it is interesting to perform some operations with it. Some operations are very intuitive in the tensor-train format, however some are not. An important operation is finding maximal and minimal elements. It appears that finding maximal in modulus element (i.e. solving a global optimization problem) can be done in a finite amount of operations for an array in TT and QTT format.

**ALL ARE WELCOME!**