

UNIVERSITÄT DORTMUND

Fachbereich Mathematik

MATHEMATISCHES KOLLOQUIUM

Im Rahmen des Kolloquiums spricht

Prof. Dr. Andreas Fischer

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in Zusammenarbeit mit Peter Kaletta
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über das Thema:

Strukturoptimierung und Designklassifikation im Flugzeugbau mit Support Vector Machines

Termin: Montag, den **6. Februar 2006**, 17.15 Uhr

Ort: Hörsaal E 28, Mathematikgebäude

Tee: 16.45 Uhr, Raum 614

Abstract:

Structural Optimization in Aircraft Engineering using Support Vector Machines for Design Classification

The main objectives in the development of future aircrafts are the reduction of manufacturing costs and structural weight. One promising way to achieve these aims is the use of fibre reinforced composite materials in primary aircraft structures. Modelling such structures leads to a class of discrete optimization problems for which Evolutionary Algorithms are well suited. However, these algorithms require expensive computational costs, because the structural response of many structures has to be evaluated and each evaluation is based on a finite element code. Therefore, an efficient approximation of the structural response is of high importance. The use of Support Vector Machines turned out to be a promising method for the classification of structures into feasible and non-feasible ones.

As an example stiffened composite panels under compressive and shear loading are considered. Thereby local and global buckling as well as strength constraints are formulated. For the decision whether these constraints are satisfied or not the Support Vector Machine is trained on geometrical data such as the height and the number of the stiffeners and material data. The latter are used in terms of the elements of the extensional stiffness, bending stiffness and extension-bending coupling stiffness matrices of skin and stiffener laminats. The results show a reasonable reduction in computational costs during the evolutionary optimization process.