Institute of Medical Informatics, Biometry, and Epidemiology
Chair of Medical Biometry and Epidemiology

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Research Focus
- Computational Biostatistics
- Dermatopanepidemiology
- Cooperative epidemiological and clinical studies

Structure of the Chair
Professors: 2
Personnel: 17
- Scientists: 11 (thereof funded externally: 6)
- Graduate students: 2

Research
The focus of the Institute’s scientific activity is on two distinct areas: Methods development in the realm of machine learning (Computational Biostatistics) and dermatopanepidemiological research, respectively. Moreover, the Institute cooperates with numerous research projects addressing different topics with different departments or institutes. Usually, the Institute is responsible for statistical aspects of study design and analysis.

Computational Biostatistics
PI: PD Dr. W. Adler, Prof. Dr. O. Gefeller, Dr. B. Hofner, Dr. A. Mayr, Dr. E. Waldmann
The statistical analysis of high-dimensional data containing large numbers of features has become increasingly important in biomedical practice. Consequently, statistical methods for analyzing data with complex dependency patterns and for separating informative features from non-informative ones are needed. Boosting is a promising statistical method to address these issues. The project focuses on improving and developing boosting methodology for data structures that cannot yet be analyzed with the help of classical boosting techniques. For example, a new boosting algorithm for modeling ordinal outcomes was developed. The suggested algorithm can e.g. be used to predict cancer stages (measured on an ordinal scale), using small sets of marker genes that are automatically selected by the boosting algorithm. Classical boosting methods were further extended to generalized additive models for location, scale, and shape (GAMLSS). GAMLSS is a popular statistical approach for simultaneously modeling multiple parameters of a response distribution in regression models. Current fitting procedures for GAMLSS are feasible for high-dimensional data setups and require heuristic (or potentially biased) feature selection methods. The new algorithm allows for simultaneous estimation of predictor effects and feature selection in GAMLSS. In the course of the project, boosting methods were further analyzed with regard to their general performance as optimization method for AUC-based performance criteria in classification and survival analysis.

Dermatopanepidemiology
PI: Prof. Dr. A. Pflahberg, Prof. Dr. W. Uter
In clinical contact allergy research, a close cooperation with the German contact dermatitis group (DKG) e.V. and the multi-centric project information network of the departments of dermatology (IVDK), maintained by an institute at the University of Göttingen, has been established. Pooled data collected in the participating allergy departments are analyzed in terms of contact allergy surveillance, i.e. early detection of trends in contact allergy (increase, possibly in particular subgroups) and for quality control purposes. Additionally, research projects prompt special analyses, for instance sensitization to common biocides and fragrances. Moreover, the network European Surveillance System on Contact Allergies – Data Centre (ESSCA-DC) has been collecting and analyzing such data on a European level since 2002, with the data center located at the Chair of Medical Biometry and Epidemiology. The epidemiology of malignant melanoma and acquired melanocytic nevi is a further research interest: Acquired melanocytic nevi, surrogate or potential precursor of malignant melanoma, are addressed by the current MOANA-study which includes standardized assessment of student cohorts. In 2015/16, two surveys (“Erliking Sun 2015”, “Francis”) addressing knowledge on prevention of UV exposure in kindergarten staff and actual protective measures (shading etc.) in the institutions were conducted with the aim of identifying targets of improvement of primary prevention.

Cooperative epidemiological and clinical studies
This area of activity comprises diverse research topics addressed in cooperation with different departments and institutes. Usually, biometrical aspects of study design and statistical analysis have been performed by our Institute in these cooperative projects. The most important projects in the reporting period include:
- A cohort study in the field of occupational medicine with follow-up of 259 incident cases of psychological stress reactions after accidents in public transports drivers;
- A study in cooperation with the Chair of Psychiatry and Psychotherapy concerning non-pharmacological interventions for dementia and counselling and training of relatives of demented persons;
- A multi-centric European study on “Accelerated Partial Breast Irradiation”, a controlled clinical trial on the multimodal therapy of rectal cancer (CAO/ARO/AIO-04), and a controlled clinical trial on radiochemotherapy in patients with locally advanced head/neck tumors stage III and IVA-B (PACCIS) and radiochemotherapy after induction chemotherapy with gemcitabine and FOLFIRINOX, resp. (CONKO-007 study), all chaired by the Department of Radiation Oncology;
- The ProPricare study with the overall aim to systematically investigate medical overuse in patients undergoing regular thyroid examination, including the identification of events or patient-specific characteristics that trigger this medical overuse.

CLINICAL THEORETICAL INSTITUTES

Weekly counts of norovirus gastroenteritis in Berlin, 2011-W27 to 2015-W26, stratified by age group
The dots correspond to numbers reported to the Robert Koch Institute according to §7.1 of the German Infection Protection Act (data source: SurvStat@ RKI 2.0). The stacked curves are estimates from a spatio-temporal structure between the age groups and thus decomposes the fitted counts into different transmission routes. (From: Meyer S et al. Biostatistics. 2017, 18(2):338-351)
• A European multicenter study “SCOPE” ("Screening for Chronic Kidney Disease among Older People across Europe") in cooperation with the Institute for Biomedicine of Aging.

Teaching

The Chair of Medical Biometry and Epidemiology contributes to curricular teaching in terms of mandatory and optional courses in medicine, molecular medicine and medical process management. Concerning interdisciplinary teaching, the cooperation in the context of “Querschnittsbereich I” with the Chair of Medical Informatics and the Institute and Outpatient Clinic of Occupational, Social and Environmental Medicine is of note.
The Chair supervises Bachelor’s and Master’s theses as well as MD and PhD doctoral theses.

Selected Publications


International Cooperations

Multicentric:
Prof. C. Lidén, Prof. J.D. Johansen, Prof. C. M. Bonefeld, Dr. Ian R. White, Prof. J.-P. Lepoittevin
Karolinska Institutet, Copenhagen University, Kings College London, Université de Strasbourg
Stockholm, Copenhagen, London, Strasbourg
Sweden, Denmark, UK, France