

2018 Talent Development Competition Awardees

Title: Computational Longitudinal Modeling of Disease Co-Progression and Genetic Network Analyses in Depression and Dementia

Anne-Christin Hauschild

Supervisor: Daniel Mueller

Abstract: Recent studies show that late-life depression in elderly adults is associated with dementia. Genetically mediated treatment might help to overcome the challenges in finding the right antidepressant medication. Another challenge for clinical diagnostics and therapy are the variation in disease progression and undetected subtype which likely requires a tailored treatment approach.

In our study, I am to use advanced data mining and systems biology technologies to investigate the molecular background of depression, dementia and treatment response. Incorporating information about interactions between proteins involved in the disease will lead to a deeper understanding of the causal mechanisms within the human brain. Subsequently, I will use a novel longitudinal analysis to assess the molecular mechanisms during the development of depression and dementia to seek insights about the disease co-progression and their molecular relationships. Deep learning algorithms have proven to be highly successful classifying genetic and imaging data of different cancer types (e.g. skin cancer). Thus, I will apply these novel and promising methods using millions of genetic markers and magnetic resonance imaging (MRI) data of patients with depression and dementia.

To the best of my knowledge, this is the first study to transfer a formerly validated systems biology approach in cancer research to psychiatric research. In particular, this award will enable me to use a multi-omic machine learning approach and novel network analysis in two common and debilitating neuropsychiatric disorders. The proposed work has the potential to significantly broaden our knowledge on the mechanisms driving the disease progression and drug response and will pave the way for optimized and personalized treatment.