Compositional techniques are widely used in formal verification to check the correctness of large computer programs. The key problem is the complexity caused by the interaction of concurrent processes which leads to high dimensions of the state space. To deal with this problem, the global verification problem for the overall system is simplified by splitting it into several less complex problems for the components.

Models of engineering processes can also become very complex since they are equally characterized by networks of interacting subsystems. Inspired by solution concepts developed in the area of formal verification, we present concepts and tools for compositional analysis and control of dynamical systems. In this talk the focus lies on deduction schemes based on (bi)simulation relations such as compositional and assume-guarantee reasoning. Our approach provides insights in various areas of systems theory and control. Explicit connections are made with classical compositional analysis techniques in systems and control such as passivity theory and with decentralized control.