formed by dynamical weather models as one might expect when considering the difference is effort needed to produce a forecast.

Nonlinear cognitive science

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The presentation reviews some of Jürgen Kurth's direct and indirect, linear and nonlinear contributions to various domains of cognitive science such as rhythm production of expert pianists, fixational movements of the eyes, covert shifts of visual attention, and language processing.

Influence of the network topology on epidemic spreading

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The influence of the network's structure on the dynamics of spreading processes has been extensively studied in the last decade. Important results that partially answer this question show a weak connection between the macroscopic behavior of these processes and specific structural properties in the network, such as the largest eigenvalue of a topology relatedmatrix. However, little is known about the direct influence of the network topology on the microscopic level, such as the influence of the (neighboring) network on the probability of a particular node's infection. To answer this question, we derive both an upper and a lower bound for the probability that a particular node is infective in a susceptible-infective-susceptible model for two cases of spreading processes: reactive and contact processes.

Applications of Nonlinear Dynamics to Spintronics: STNOs and Microwave Generation

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Spintronics is a fast emerging field of nanotechnology where giant magnetoresistance (GMR) effect plays a pivotal role. Spin tansfer nano oscillators (STNOs) are fascinating entities based on GMR where the flow of spin polarized current perpendicular to thin ferromagnetic layers can induce the magnetization of the free layer either to switch its direction very fast (<200 ps) or make it to precess at GHz range, leading to potential applications in computer discs and microwave devices. The underlying dynamics is governed by the so called Landau-Lifshitz-Gilbert- Slonczewski equation for the spin, which is a patently nonlinear dynamical equation. Then the theory of synchronization and networks central to nonlinear dynamics play a major role towards development in designing potential devices based on STNOs. I will briefly review these theoretical developments in my talk.

Nonlinear dynamics and complex networks in epilepsy

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Epilepsy is a complex malfunction of the brain that affects approximately 1% of the world's population. Epileptic seizures are the cardinal symptom of this multi-facetted disease and are usually characterized by an overly synchronized firing of neurons. Seizures cannot be controlled by any available therapy in about 25% of individuals, and knowledge about mechanisms underlying generation, spread, and termination of the extreme event seizure in humans is still fragmentary. Over the last decades, an improved characterization of the spatial-temporal dynamics of the epileptic process could be achieved with tools from nonlinear dynamics, statistical physics, synchronization and network theory. I will summarize these research findings that already have opened promising directions for the development of new therapeutic possibilities.

Isochronal Synchronization in Complex Network with Propagation Delay

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Isochronal synchronization is a unique phenomenon in which physically distant oscillators wired together relax into zero-lag synchronous behavior over time. Such behavior is observed in natural processes and, recently, has been considered for promising applications in communication. Towards technological development of devices that explore isochronal sync, stability issues of the phenomenon need to be considered, both in the context of a pair or a network of coupled oscillators. This study concerns such stability issues by using the Lyapunov-Krasovskii theorem to propose a framework to study synchronization stability by using accessible parameters of the network coupling setup. As a result, relations between stability and network parameters are unveiled and the comprehension of roads leading to stability is enhanced.