



KATHOLISCHE UNIVERSITÄT
EICHSTÄTT-INGOLSTADT

Mathematisches Kolloquium

Cognitive and Neural Modeling with Heterogeneous Neural Fields

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Mittwoch, 06. Februar 2019, KG I/Bau A 103, 17.00 Uhr s.t.
Um 16.30 Uhr werden im selben Raum Kaffee und Tee serviert.



Neural fields are continuum limits of neural networks where each unit has a distinguished spatial position. This makes neural fields particularly interesting for modeling and simulation studies of spatially distributed behavioral and brain patterns, such as fMRI or EEG data on the one hand or abstract representations in so-called feature spaces, on the other hand. Neural field models can be classified with respect to their respective connectivity kernels: if synaptic weights are translationally invariant, the models are called homogeneous. If, by contrast, translation symmetry is broken they are called heterogeneous. Homogeneous connectivities are well-studied in the literature and provide the building blocks of dynamic field architectures. Yet heterogeneous connectivities are subject of intense current investigations, becoming increasingly important for theoretical understanding and practical applications of neural fields. In my presentation, I discuss stationary solutions and their bifurcations of heterogeneous neural fields. It turns out that particular solutions are saddle fields with one-dimensional unstable manifold that could be connected to heteroclinic sequences. Kernels for transient sequential behavior can be rigorously constructed from the prescribed patterns, either cognitive representations or measured brain imaging data. I demonstrate this by means of three examples: a one-dimensional field over an abstract representation space and two two-dimensional fields, one for a counting network and another one for language-related brain potentials.

