Doctoral Day Mathematics — April 24, 2015

Time and Place: 10:30–13:00, Seminarraum 2 des Inst. f. Geometrie, Kopernikusgasse 24/IV, TU Graz.

10:30 — Raheel Anwar (KFU, advisor F. Kappel):
A Neural Network Controller for the Administration of Erythropoietin to Dialysis Patients

Abstract: The thesis project would require constructing a neural network (NN) controller that generates an input sequence of control values (ESA) to meet desired red blood cell count (RBC) of adults. NN Controller will be adapted for two classes of adults. At first step, a neural-network model will be created which takes ESA values as input sequence and generates output sequence for RBC. Previously generated output sequence will be used as feedback to the plant model. The plant is then trained with input/target pairs until it successfully gets the dynamics of Erythropoiesis process. The combination of plant and controller will help to compare and determine different administration regimens and to predict future red blood count of patients.

11:00 — Caroline Moosmüller (TU, advisor J. Wallner): **Hermite Subdivision on Manifolds**

Abstract: Hermite subdivision schemes are iterative methods for refining discrete point-vector data in order to obtain, in the limit, a function together with its derivatives. They have been studied successfully in the linear setting, i.e., for functions that take values in a vector space. In recent years modifications of linear subdivision schemes that work on manifold-valued data have been of interest, also in terms of applications. In this talk we give an introduction to linear (Hermite) subdivision schemes. Furthermore, we derive a manifold-valued Hermite subdivision scheme from a linear one using the exponential map of the manifold.

11:30 — Break (coffee and refreshments)

12:00 — Konrad Schrempf (TU, advisor F. Lehner):
Noncommutative Rational Functions and their minimal Representation.

Abstract: Noncommutative rational functions play a role in free probability theory. One wants to understand the distribution of a selfadjoint noncommutative polynomial $P = p(x_1, \ldots, x_n)$ as an operator in some noncommutative probability space. For nonlinear polynomials one can use its linear representation. Although there are various characterizations for a minimal representation, algorithms for constructing one are rare. I will give an overview how to describe rational functions and how to reduce a given representation to a minimal one.

12:30 — Rostislav Staněk (TU, advisor E. Dragoti-Cela):
A special case of the data arrangement problem on binary trees.

Abstract: The data arrangement problem on regular trees (DAPT) consists of assigning the vertices of a given graph G to the leaves of a d-regular tree T such that the sum of the pairwise distances of all pairs of leaves in T which correspond to edges of G is minimised. Luczak and Noble have shown that this problem is NP-hard for every fixed $d \geq 2$. The question about the computational complexity of the DAPT in the case where the guest graph is a tree is still open. We deal with one special case of this problem where both the guest and the host graph are binary regular trees. Using the k-balanced partitioning problem as a tool, we provide an upper bound, a lower bound, and an approximation algorithm