### Monday, May 23, 2022

10:00am-12:00pm  **Dissertation Defense** -- Peter Dillery (UM) *Rigid inner forms over function fields* -- Zoom: https://umich.zoom.us/j/7352196682?pwd=SThvaWpWOXlCSStYd2RmdDZXM3pSZe09 Virtual

2:00pm-4:00pm  **Dissertation Defense** -- Alex Horowa (UM) *Motivic action on coherent cohomology of Hilbert modular varieties* -- Hybird Format

### Wednesday, May 25, 2022

2:00pm-4:00pm  **Dissertation Defense** -- Shubhodip Mondal (UM) *G a-perf-mules and de Rham cohomology* -- 2866 East Hall

2:00pm-4:00pm  **Dissertation Defense** -- Andrew McMillan (UM) *A Note on Dynamic Processes* -- Zoom: https://umich.zoom.us/j/4513572762 Virtual
Abstracts for the week of May 22nd, 2022 - May 28th, 2022

Dissertation Defense
Monday, May 23, 2022, 10:00am-12:00pm
Zoom: https://umich.zoom.us/j/7352196682?pwd=SThvaWpWOXICStYd2RmdDZXM3pSZz09 Virtual
Peter Dillery (UM)
Rigid inner forms over function fields

We define a gerbe $E$ over a (local or global) function field banded by a profinite group scheme whose set of $G$-torsors parametrizes all inner twists of an arbitrary connected reductive group $G$, generalizing the Kottwitz gerbe whose torsors parametrize extended pure inner forms of $G$. We discuss local and global duality results for these sets of torsors and use them to state conjectures regarding the local and global Langlands correspondence and endoscopy. Locally, we give a conjectural parametrization of $L$-packets and construct a Whittaker-normalized absolute transfer factor for an endoscopic datum. Globally, we relate these new local transfer factors to the adelic transfer factor and construct a pairing involving $L$-packets which is used in the conjectural multiplicity formula for discrete automorphic representations. A key part of the thesis is concerned with explicitly understanding $G$-torsors on the stack-theoretic gerbe $E$.

Peter's advisor is Tasho Kaletha.

Dissertation Defense
Monday, May 23, 2022, 2:00pm-4:00pm
Hybrid Format
Alex Horowa (UM)
Motivic action on coherent cohomology of Hilbert modular varieties

In person: 3096 East Hall

Zoom: https://umich.zoom.us/j/97593118091?pwd=YVorcDNCWk90dHRyRkU5aU5wZ0JpUT09
password: motivic

A surprising property of the cohomology of locally symmetric spaces is that Hecke operators can act on multiple cohomological degrees with the same eigenvalues. We will discuss this phenomenon for the coherent cohomology of line bundles on modular curves and, more generally, Hilbert modular varieties. We propose an arithmetic explanation: a hidden degree-shifting action of a certain motivic cohomology group (the Stark unit group). This extends the conjectures of Venkatesh, Prasanna, and Harris to Hilbert modular varieties.

Alex's advisor is Kartik Prasanna.
Dissertation Defense
Wednesday, May 25, 2022, 2:00pm-4:00pm
2866 East Hall
Shubhodip Mondal (UM)
Ga-perf-mules and de Rham cohomology

In this thesis, we prove that algebraic de Rham cohomology as a functor defined on smooth $F_p$-algebras is formally \'{e}tale in a precise sense. This result shows that given de Rham cohomology, one automatically obtains the theory of crystalline cohomology as its \textit{unique} functorial deformation. To prove this, we define and study the notion of a pointed $(G)_{a^{\text{perf}}}$-module and its refinement which we call a quasi-ideal in $(G)_{a^{\text{perf}}}$ -- following Drinfeld's terminology. Our main constructions show that there is a way to \``unwind'' any pointed $(G)_{a^{\text{perf}}}$-module and define a notion of a cohomology theory for algebraic varieties. We use this machine to redefine de Rham cohomology theory and deduce its formal \'{e}taleness and a few other properties.

Shubhodip's advisor is Bhargav Bhatt.
Dissertation Defense  
Wednesday, May 25, 2022, 2:00pm-4:00pm  
Zoom: https://umich.zoom.us/j/4513572762 Virtual  
Andrew McMillan (UM)  
A Note on Dynamic Processes

This dissertation has two parts. In the first part, we overview and extend the auxiliary function method for long-time averages, which computes sharp bounds on time averaged quantities in underlying dynamical variables via convex optimization and semidefinite programming. We use the extended method to study the validity of asymptotic methods for computing long-time statistics in nonlinear or nonautonomous dynamical systems. We show for the Duffing equation and the nonlinear pendulum that the harmonic balance and true solution's mean squared amplitude agree quite well, but truncated Fourier expansions fail to accurately predict the regions of stability for a parametrically driven, coupled oscillator system. In particular, regions of stability are sensitive to the coupling effects across a broad range of modulation frequencies.

In the second part, we overview dynamic choice within the paradigms of Von Neumann-Morgenstern and discounted expected utility. We then discuss the ethical theory of utilitarianism and its connections to social choice theory while overviewing the seminal work of Kenneth Arrow and John Harsanyi. We prove a novel extension of Harsanyi's theorem to an infinite time horizon setting. Under mild assumptions, a Pareto condition is equivalent to utilitarian aggregation with unique utilitarian weights. We study the asymptotic properties of the utilitarian weights as the social discount factor or social risk attitude changes. Among other findings, we show that a higher social discount rate is associated with a more unequal assignment of utilitarian weights across generations.

Andrew's advisors are Silas Alben and Shaowei Ke.