PROGRAM

Southern Regional Algebra Conference (SRAC 2018)

Auburn University at Montgomery
Montgomery, AL

April 20-22, 2018

SCHEDULE OF PRESENTATIONS

Friday, April 20

Goodwyn 307

1:15pm Opening remarks

1:30pm–1:55pm Enoch Lee, *A Revisit of Classical Right Ring of Quotients*

2:00pm–2:25pm Ulrich Albrecht, *Torsion-freeness and Endomorphism Rings*

2:30pm–2:55pm Jared Painter, *The Absence of $G(r)$ Rings for Trivariate Artinian Monomial Ideals*

BREAK

3:30pm–3:55pm Akeel Omairi, *Unique Decomposition of Direct Sums of Ideals*

4:00pm–4:25pm Alan Koch, *Isomorphism Problems for Hopf-Galois Structures on Separable Field Extensions*

4:30pm–4:55pm Robert Underwood, *Hopf-Galois Structures and a Characterization of Dihedral Extensions*

BARBECUE: Eastside Grill, 6667 Atlanta Hwy, Montgomery, 6:30p

Saturday, April 21

(Concurrent Sessions)
Goodwyn 307

8:00am–8:25am Geoff Booth, *On Near-rings of Continuous Functions*

8:30am–8:55am Alan Cannon, *Centers of (Function) Nearrings*

9:00am–9:25am Kent Neuerburg, *Nice Nearrings*

BREAK

10:00am–10:25am Blaise Heider, *Annihilators and Extensions of Idempotent Generated Ideals*

10:30am–10:55am Gary Birkenmeier, *A Classification of Indecomposable QF-rings*

11:00am–11:25am Cornelius Pillen, *Tensor Products and Filtrations*

Goodwyn 318

8:30am–8:55am Drew Lewis, *Subgroups of the Group of Polynomial Automorphisms of Affine Space*

9:00am–9:25am Tony Se, *Ladder Determinantal Rings, The Divisior Class Group, Dualizing Modules and Semi-Dualizing Modules*

BREAK

10:00am–10:25am Wei Gao, *Sign Patterns that Require $\mathbb{H}_n$ and its Generalization to Zero-non-Zero Patterns*

10:30am–10:55am Zhen-Hua Lyu, *An Extremal Problem on* 0-1 *Matrices*

11:00am–11:25am Zhuo-Heng He, *Some New Developments of Sylvester-type Matrix Equations*

LUNCH BREAK

Saturday, April 21

(Concurrent Sessions)
Goodwyn 307

1:30pm–1:55pm Tin-Yau Tam, *Some Pre-order Relations in Semisimple Lie Groups*

2:00pm–2:25pm Guy Biyogmam, *A Structure Theorem for Leibniz Homology*

2:30pm–2:55pm Joerg Feldvoss, *The Second Whitehead Lemma for Leibniz Algebras*

BREAK

3:30pm–3:55pm Irfan Bagci, *On Representations of Map Superalgebras*

4:00pm–4:25pm Elena Poletaeva, *On Representations of finite W-algebras*

4:30pm–4:55pm Mark Colarusso, *The Gelfand-Zeitlin System On Complex Orthogonal Lie Algebras*

Goodwyn 318

1:30pm–1:55pm Jianzhen Liu, *Positive Semi-Definite* 2×2 *Block Matrices and Norm Inequalities*

2:00pm–2:25pm Garrett Johnson, *Subprime Solutions of the Classical Yang-Baxter Equation*

2:30pm–2:55pm Huajun Huang, *The Rank Relation of a Commutative* End(A)

BREAK

3:30pm–3:55pm Ekaterina Kompantseva, *Rings on Direct Products of Torsion-free Abelian Groups*

4:00pm–4:25pm Brad McQuaig, *Non-Commutative Extensions of Torsion-freeness and Divisibility*

4:30pm–4:55pm Bekalu Tarekegn Bitew, *Fuzzy Ideals and Fuzzy Filters of an Almost Distributive Fuzzy Lattice*

DINNER: Irish Bred Pub, 78 Dexter Ave, Montgomery, 6:30p

Sunday, April 22

Goodwyn 307

8:00am–8:25am Lucius Shoenbaum, *Algebra and Computation: Towards a Direct Link, via Category Theory*

8:30am–8:55am Selvi Beyarslan, *Bounding Regularity of Powers Edge Ideals via Local Conditions*

9:00am–9:25am Tianran Chen, *An Exclusion Theorem for Intersections of Generic Tropical Hypersurfaces*

BREAK

10:00am–10:25am Justin Lynd, *The Benson-Solomon Fusion Systems*

10:30am–10:55am Lee Raney, *Metabelian Groups and* Γ*-Loops*

11:00am–11:25am Mark Greer, *Connecting Quandals, Quasigroups and Loops*

11:30am Organizational Meeting

ABSTRACTS

Apr. 20
2:00pm
GH307

Torsion-freeness and Endomorphism Rings

Ulrich Albrecht
Auburn University

This talk introduces the notions of K^r-faithfulness and quasi-flatness. They are used to discuss non-singularity and Hattori-torsion-freeness in the context of endomorphism rings. Several additional examples are given.

Apr. 21
3:30pm
GH307

Irfan Bagci

On Representations of Map Superalgebras

University of North Georgia

Given a Lie superalgebra G and an associative, commutative algebra A with unit over the complex field, a Lie superalgebra of the form $G \otimes A$ is known as a map superalgebra. Map superalgebras generalize important classes of Lie superalgebras, such as, loop superalgebras, and current superalgebras. Recently there has been lots of interest in the representation theory of map Lie superalgebras and the particular interest is the classification of finite-dimensional simple representations. The cases when G is a finite dimensional basic classical Lie superalgebra simple finite-dimensional modules recently has been classified. However, beyond these cases, not much is known. In this talk I will address the case when G is a Cartan type Lie superalgebra. In particular, I will present a classification of the irreducible finite-dimensional representations in this case.

Apr. 22
8:30am
GH307

Bounding Regularity of Powers Edge Ideals via Local Conditions

Selvi Beyarslan
University of South Alabama

Let $I(G)$ be the edge ideal of a graph G. It is known that local conditions on the regularity of $I(G) : x$, for all vertices of x, result with a global statement on the regularity of G. In this talk, we focus on using these local conditions to obtain bounds for the asymptotic linear function reg $I(G)^s$ for $s \geq 1$.

A Classification of Indecomposable QF-Rings

Apr. 21
10:30am
GH307

Gary Birkenmeier
University of Louisiana-Lafayette

In this talk I will classify indecomposable QF-rings into at least 3 types and indecomposable basic QF-rings into at least 5 types.

Fuzzy Ideals and Fuzzy Filters of an Almost Distributive Fuzzy Lattice

Apr. 21
4:30pm
GH318

Bekalu Tarekegn Bitew
Bahir Dar University

In this work, we introduce a new mathematical notion of fuzzy ideals and fuzzy filters of an Almost Distributive Fuzzy Lattice (ADFL) in terms of a fuzzy relation. We characterize fuzzy ideals and fuzzy filters of an ADFL by their support sets. We also, define the smallest fuzzy ideal (filter) induced by any non-zero fuzzy set analogous to the classical concepts of ideals and filters of an Almost Distributive Lattice (ADL). In addition, we proved that the intersection of any fuzzy ideals (filters) of an ADFL is also a fuzzy ideal (filter). Furthermore, we also define a fuzzy prime ideal (filter) of an ADFL, and investigate some basic results. Finally, we introduce a homomorphism on fuzzy ideals and filters of an ADFL and investigate some basic results.

A Structure Theorem for Leibniz Homology

Apr. 21
2:00pm
GH307

Guy Biyogmam
Georgia College & State University

Jerry Lodder constructed a structure theorem for Leibniz homology. In this talk, we discuss how this theorem can be used to calculate the Leibniz homology of various important non semisimple Lie algebras of theoretical and mathematical physics and generate several non-relativistic invariants.

On Near-rings of Continuous Functions

Apr. 21
8:00am
GH307

Geoff Booth
Nelson Mandela University, South Africa

Let G be an additive (but not necessarily abelian) topological group, and let $N(G)$ $(N_0(G))$ denote the set of continuous (zero-preserving) self-maps of G. It is clear that $N(G)$ $(N_0(G))$ is a (zero-symmetric) near-ring with respect to pointwise addition and composition of functions. These near-rings have been studied since the 1970's. In this talk we will present some results concerning their primeness and the associated radicals, and relate this to the topology defined on G.

Apr. 21
8:30am
GH307

Centers of (Function) Nearrings

Alan Cannon

Southeastern Louisiana University

Let $(N, +, \cdot)$ be a nearring. The center of N, $C(N) = \{x \in N \mid xn = nx \text{ for all } n \in N\}$ is not necessarily a subnearring of N. Various classes of nearrings have been investigated with necessary and/or sufficient conditions being found for $C(N)$ to be a subnearring of N. In this talk, we discuss these different types of nearrings and then focus on several different varieties of nearrings of functions.

Apr. 22
9:00am
GH307

An Exclusion Theorem for Intersections of Generic Tropical Hypersurfaces

Tianran Chen

Auburn University at Montgomery

In the ring of Laurent polynomials in n variables, a principal ideal generated by an element with generic coefficients defines a generic tropical hypersurface. In this talk, we discuss the geometric properties of such a surface and explore the computation aspects of the intersection problem in this context.

Apr. 21
4:30pm
GH307

The Gelfand-Zeitlin System on Complex Orthogonal Lie Algebras

Mark Colarusso

University of South Alabama

Kostant and Wallach introduced the Gelfand-Zeitlin (GZ) integrable system on $\mathfrak{gl}(n, \mathbb{C})$ and studied the Lagrangian flows and generic fibres of the moment map of the system. In this talk, we discuss the analogous integrable system on $\mathfrak{g} = \mathfrak{so}(n, \mathbb{C})$. We study the geometry of this integrable system by studying the adjoint action of the symmetric subgroup $K = SO(n-1, \mathbb{C})$ on $\mathfrak{g}$. We use the theory of K-orbits on the flag variety of $\mathfrak{g}$ to describe the nilfibre of the geometric invariant theory quotient $\mathfrak{g} \to \mathfrak{g}//K$. Using our description of the nilfibre and the Luna slice theorem, we develop an analogue of the classical Jordan decomposition for the K-action on $\mathfrak{g}$ and use it to describe the points in the moment fibres of the GZ integrable system where the flows are Lagrangian. If time permits, we will briefly discuss our approach to understanding the geometry of the moment fibres at singular points of the integrable system using the theory of flat deformations of schemes. This is joint work with Sam Evens.

The Second Whitehead Lemma for Leibniz Algebras

Apr. 21
2:30pm
GH307

Joerg Feldvoss
University of South Alabama

In this talk we will discuss Leibniz cohomology which was introduced by Bloh and Loday as a natural framework for a non-commutative analog of Lie algebra cohomology. We will briefly explain this, and we then will prove that the second Whitehead lemma is equivalent to Levi's decomposition theorem. In particular, this will establish the second Whitehead lemma for Leibniz algebras. We will also show that the first Whitehead lemma does not hold for Leibniz algebras.

Sign Patterns That Require $\mathbb{H}_n$ and its Generalization to Zero-nonzero Patterns

Apr. 21
10:00am
GH318

Wei Gao
Auburn University

The refined inertia of a square real matrix is the ordered 4-tuple $(n_+, n_-, n_z, 2n_p)$, where n_+ (resp., n_-) is the number of eigenvalues with positive (resp., negative) real part, n_z is the number of zero eigenvalues and $2n_p$ is the number of pure imaginary eigenvalues. The set of refined inertias $\mathbb{H}_n = \{(0, n, 0, 0), (0, n-2, 0, 2), (2, n-2, 0, 0)\}$ is important for the onset of Hopf bifurcation in dynamical systems. In this talk, I will introduce some results about sign patterns, i.e. matrices whose entries are from the set $\{+, -, 0\}$, that require $\mathbb{H}_n$. Recently, Berliner et al. expend $\mathbb{H}_n$ to $\mathbb{H}_n^*$ for zero-nonzero patterns, i.e. matrices whose entries are from the set $\{*, 0\}$. In this talk, I will show that there is no zero-nonzero pattern that requires $\mathbb{H}_n^*$.

Connecting Quandles, Quasigroups and Loops

Apr. 22
11:00am
GH307

Mark Greer
University of North Alabama

Quasigroups are magmas (groupoids) with both left and right translations being bijections. Loops are quasigroups with an identity element. Quasigroups, and hence loops, are generalizations of groups. Quandles are self distributive, left (right) idempotent quasigroups with every left (right) bijection an automorphism. Historically, quandles have been of interest due to their connection with Knot Theory. This talk will focus on results dealing with certain varieties of quasigroups and loops with their associated quandles.

Apr. 21
11:00am
GH318

Some Systems of Sylvester-type Quaternion Matrix Equations

Zhuo-Heng He

Auburn University

In this talk, we consider some systems of Sylvester-type quaternion matrix equations. We give some necessary and sufficient solvability conditions for some systems of Sylvester-type quaternion matrix equations in terms of ranks and generalized inverses of matrices. We also derive the general solutions to these systems when they are solvable.

Apr. 21
10:00am
GH307

Annihilators and Extensions of Idempotent Generated Ideals

Blaise Heider

University of Louisiana at Lafayette

In this talk, I will present a a new "Baer-like" condition on the class of cyclic projective modules. We call a ring right cP-Baer if the right annihilator, in the ring, of a cyclic projective R-module is generated by an idempotent. I will give a large class of examples which satisfy this definition. I will show the existence of a cP-Baer hull; and I will also show that the cP-Baer condition can be transferred between the base ring, polynomial ring, formal power series ring, upper triangular matrices. This work was done jointly with my advisor, Dr. Gary Birkenmeier.

Apr. 21
2:30pm
GH318

The Rank Relation of a Commutative $\mathrm{End}(A)$

Huajun Huang

Auburn University

Schur showed that for a field $\mathbb{F}$, the maximal dimension of a commutative subalgebra of $\mathrm{End}(\mathbb{F}^n)$ is $\lfloor n^2/4 \rfloor + 1$. We consider the relation between the ranks of $\mathrm{End}(A)$ and A, where A is a torsion-free abelian group of rank n and $\mathrm{End}(A)$ is commutative. When A is quasi-flat, we prove that the rank of $\mathrm{End}(A)$ is no more than the rank n of A. When A is not quasi-flat, we construct examples to show that $\mathrm{End}(A)$ could be any rank between 1 and $\lfloor n^2/4 \rfloor + 1$. This is a joint work with Professors U. Albrecht and P. Goeters.

Subprime Solutions of the Classical Yang-Baxter Equation

Apr. 21
2:00pm
GH318

Garrett Johnson

North Carolina Central University

We introduce a new family of classical r-matrices for the Lie algebra $sl(n)$ that lies in the Zariski boundary of the Belavin-Drinfeld space M of quasi-triangular solutions to the classical Yang-Baxter equation. In this setting M is a finite disjoint union of components; exactly $\phi(n)$ of these components are $SL(n)$-orbits of single points. These points are the generalized Cremmer-Gervais r-matrices $r(i,n)$, which are naturally indexed by pairs of positive coprime integers, i and n, with $i < n$. A conjecture of Gerstenhaber and Giaquinto states that the boundaries of the Cremmer-Gervais components contain r-matrices having maximal parabolic subalgebras $p(i,n)$ as carriers. We prove this conjecture in the cases when $n \equiv \pm 1$ (mod i). The subprime linear functionals and the corresponding principal elements play important roles in our proof. Since the subprime functionals are Frobenius precisely when $n \equiv \pm 1$ (mod i), this greatly explains our need to require these conditions on i and n. We conclude with a proof of the GG boundary conjecture in an unrelated case, namely when $i = 5$ and $n = 12$.

Isomorphism Problems for Hopf-Galois Structures on Separable Field Extensions

Apr. 20
4:00pm
G307

Alan Koch

Agnes Scott College

Let L/K be a separable field extension, and let E be its Galois closure. Thanks to the work of Greither and Pareigis, the problem of finding Hopf-Galois structures on L/K–that is, pairs $(H, \cdot)$ where H is a K-Hopf algebra acting on L via $\cdot$ to make L/K an H-Galois extension–can be reduced to a group-theoretic problem depending only on $\mathrm{Gal}(E/K)$. For Hopf-Galois structures $(H_1, \cdot_1)$, $(H_2, \cdot_2)$ on L/K, we give a simple criterion, necessary and sufficient, for $H_1 \cong H_2$ as K-Hopf algebras. Furthermore, in the case H_1 is commutative, we give a necessary and sufficient condition for $H_1 \cong H_2$ as K-algebras. As an application we consider the case L/K cyclic of prime power degree: if $[L : K] = p^n$ it is known that L/K admits p^{n-1} Hopf-Galois structures; we will partition these structures into Hopf algebra isomorphism classes and then again into K-algebra isomorphism classes. This is joint work with Timothy Kohl, Paul J. Truman, Robert Underwood.

Apr. 21
3:30pm
GH318

Rings on Direct Products of Torsion-free Abelian Groups

Ekaterina Kompantseva

Moscow State Pedagogical University

A multiplication on an abelian group G is a homormophism $\mu\colon G \otimes G \to G$. The abelian group G with a multiplication on it is called the ring on the group G. This ring is denoted by (G, μ) or $(G, \times)$ if $\mu(g_1 \otimes g_2) = g_1 \times g_2$ for all $g_1, g_2 \in G$. The aim of this work is to continue our studies of rings on the direct products $\prod_{i\in I} A_i$ of slender abelian groups A_i $(i \in I)$. The class of slender groups was discovered by J. Los. Note that this class contains, in particular, all countable reduced torsion-free abelian groups. For definitions and notations, see *Abelian Groups* by L. Fuchs. We denote by π the projection of the group $G = \prod_{i\in I} A_i$ onto $A_k (k \in I)$. The multiplication $\times$ on the direct product $G = \prod_{i\in I} A_i$ of abelian groups $A_i (i \in I)$ is componentwise finite if for every $k \in I$ there exists a finite set $F_k \subseteq I$ such that $\pi_k(G \times \prod_{i\in I\setminus F_k} A_i) = \pi_k(\prod_{i\in I\setminus F_k} A_i \times G) = 0$.

Theorem 1. *Let $(G, \times)$ be a ring on the group $G = \prod_{i\in I} A_i$, A_i $(i \in I)$ be slender abelian groups, and the set I be non-measurable. Suppose that $S = \bigoplus_{i\in I} A_i$ and $S \times S = 0$, then $G \times G = 0$.* It is shown that Theorem 1 is the best result in the sense that if either at least one of the groups $A_i (i \in I)$ is not slender or the set I is measurable, then $S \times S = 0$ no longer implies $G \times G = 0$. The following theorem allows us to construct multiplications on non-measurable direct products of reduced torsion-free abelian groups of finite rank.

Theorem 2. *Suppose $G = \prod_{i\in I} A_i$, where $A_i (i \in I)$ are reduced torsion-free abelian groups of finite rank. If the set I is non-measurable, then every multiplication on G is componentwise finite.* It is shown that Theorem 2 is false if at least one of the groups A_i $(i \in I)$ has infinite rank (even if all A_i $(i \in I)$ are slender).

Apr. 20
1:30pm
GH307

A Revisit of Classical Right Ring of Quotients

Enoch Lee

Auburn University at Montgomery

TBD

Subgroups of the Group of Polynomial Automorphisms of Affine Space

Apr. 21
8:30am
GH318

Drew Lewis
University of South Alabama

We describe some recent results on the group structure of the group of polynomial automorphisms of $\mathbb{C}^n$. First, we describe *co-tame automorphisms*, those that together with the affine subgroup generate the entire tame subgroup; these turn out to be related to answering the question of whether the affine subgroup is a maximal subgroup of the tame subgroup. We then describe *normally co-tame automorphisms*, which are key to understanding normal subgroups of the special automorphism group.

Positive Semi-Definite 2×2 Block Matrices and Norm Inequalities

Apr. 21
1:30pm
GH318

Jianzhen Liu
Auburn University

We study the positive semi-definite 2×2 block matrix $M = \left[\begin{smallmatrix} A & X \\ X^* & B \end{smallmatrix}\right] \in \mathbb{C}^{2n \times 2n}$. A counter-example is constructed for the conjecture that $\|M\| \leq \|A + B\|$ when X is normal for all unitarily invariant norms. A special pattern among the eigenvalues of M when $A + B = kI$ and X commutes with A, or $X^* = e^{i\theta}X$ for some $\theta \in \mathbb{R}$ is explored. Two new sharp upper bounds on norm inequalities regarding positive semi-definite 2×2 block matrices are provided.

The Benson-Solomon Fusion Systems

Apr. 22
10:00am
GH307

Justin Lynd
University of Louisiana at Lafayette

Given a finite group G and a prime p, one can form the fusion system of G at p. This is a category whose objects are the subgroups of a fixed Sylow p-subgroup S, and where the morphisms are the conjugation homomorphisms induced by the elements of G. The notion of a saturated fusion system is abstracted from this standard example, and provides a coarse representation of what is meant by "a p-local structure" of a finite group. Once the group G is abstracted away, there appear many exotic fusion systems not arising in the above fashion. Exotic fusion systems are prevalent at odd primes, but only a single one-parameter family of "simple" fusion systems at the prime 2 are currently known. These are closely related to the groups $\mathrm{Spin}_7(q)$, q odd, and were first considered by Solomon and Benson, although not as fusion systems per se. I'll explain some of the coincidences that allow the Benson-Solomon systems to exist, and then discuss various results about these systems as time allows. This may include a description of their outer automorphism groups (joint with E. Henke), the number of simple modules these systems would have if they arose from blocks of group algebras in characteristic 2 (with J. Semeraro), as well as fusion systems at the prime 2 in which a Benson-Solomon system is subnormal in the centralizer of an involution (with E. Henke).

Apr. 21
10:30am
GH318

An Extremal Problem on 0-1 Matrices

Zhen-Hua Lyu
Hunan University

Let n and k be integers larger than or equal to 2. What is the maximum number of nonzero entries in an matrix A of order n such that both A and A^k are 0-1 matrices? Characterize the matrices that attain the maximum number. This is joint work with Zejun Huang, Pu Qiao.

Apr. 21
4:00pm
GH318

Non-Commutative Extensions of Torsion-Freeness and Divisibility

Brad McQuaig
Auburn University

We look to extend certain notions from Abelian group theory and module theory over integral domains to modules over non-commutative rings. In particular, we investigate generalizations of torsion-freeness and divisibility. In the general setting, a right R-module M is *torsion-free* if $Tor_1^R(M, R/Rr) = 0$ for every $r \in R$, and a right R-module D is *divisible* if $Ext_R^1(R/Rs, D) = 0$ for every $s \in R$. This leads to a discussion of two-sided submodules of the maximal ring of quotients Q. More specifically, we consider the structure of Q/R in the case that its projective dimension is ≤ 1 and R is a right and left duo domain. In this setting, we find that h-divisibility and classical divisibility coincide, and Q/R can be decomposed into a direct sum of countably-generated two-sided R-submodules, extending Matlis' Theorem for integral domains to a non-commutative setting.

Apr. 21
9:00am
GH307

Nice Nearrings

Kent Neuerburg
Southeastern Louisiana University

A fundamental problem in information processing is the detection and correction of transmission errors. The development of quantum computing has brought new questions to this issue. One solution to the error correction problem in quantum coding theory has been the use of error operator bases as developed by Steane. A class of error bases that is of particular interest are the "nice error bases." Originally, nice error bases were indexed by the elements of a group which was the product of copies of a finite field; e.g., $G = \mathbb{F}_q \times \mathbb{F}_q$. This method was later generalized to allow for the use of certain finite rings as the indexing structure, particularly Frobenius rings. Recently, Klappenecker has generalized further to find nearrings that admit a nice error basis. Such nearrings are called "nice nearrings." We will discuss conditions necessary for a nearring to be "nice" and give the currently known classes of nice nearrings. This is joint work with A. Cannon, L. Kabza and C. Maxson.

Unique Decomposition of Direct Sums of Ideals

Apr. 20
3:30pm
GH307

Akeel Omairi
Florida Atlantic University

Let R be a commutative Noetherian ring. We say that R has the unique decomposition into ideals (UDI) property if each finite direct of ideals of R is uniquely decomposable as direct sum of indecomposable R-ideals. For integral domain R, Goeters and Olberding showed that R has UDI if and only if R has at most one nonprincipal maximal ideal and has UDI locally at that nonprincipal maximal ideal (if it exists). For local domain R, they gave necessary and sufficient conditions that R has UDI in terms of its integral closure. Their results were extended to reduced (commutative Noetherian) rings by Ay and Klingler. In joint work with Klingler, we show that if R is any commutative Noetherian ring, then R has UDI if and only if R has at most one nonprincipal maximal ideal and has UDI locally at that nonprincipal maximal ideal (if it exists). We also give example of a ring without UDI but which has UDI modulo its nilradical, so that UDI property does not lift modulo the nilradical.

The Absence of $G(r)$ Rings for Trivariate Artinian Monomial Ideals

Apr. 20
2:30pm
GH307

Jared Painter
University of North Alabama

We will explore the existence of specific Koszul structures for $R = S/I$, where $S = \Bbbk[x, y, z]$ and I is a monomial ideal. Our study relies on the organization of the Koszul algebra done by L. Avramov, where he classifies the behavior of the Bass numbers of embedding codepth 3 commutative local rings into five categories. We begin by introducing examples of monomial ideals in four of the five categories and observe the absence of examples in the category $G(r)$ for Artinian monomial ideals in S. For monomial ideals in more than three variables, examples in $G(r)$ are known and will be presented. Our main result will outline a proof that there are no Artinian monomial ideals from S in $G(r)$.

Tensor Products and Filtrations

Apr. 21
11:00am
GH307

Cornelius Pillen
University of South Alabama

Let G be a simple algebraic group over an algebraically closed field of prime characteristic p which is split over the prime field. If p is roughly twice the size of the Coxeter number or larger it is well-known that the tensor product of a Steinberg module and any simple G-module with restricted highest weight is a tilting module. Not much is known about these tensor products for smaller primes. This question is of interest because it is closely related to two long-standing conjectures by Stephen Donkin. The first concerns the lifting of projective modules of the Frobenius kernels to G. The second deals with various types of filtrations and their connection. This talk is a survey of known results together with explicit examples.

Apr. 21
4:00pm
GH307

On Representations of Finite W-Algebras

Elena Poletaeva
University of Texas Rio Grande Valley

A finite W-algebra is a certain associative algebra attached to a pair (g, e), where g is a complex semisimple Lie algebra and $e \in g$ is a nilpotent element. We study representations of finite W-algebras associated with regular even nilpotent elements for the queer Lie superalgebras $Q(n)$.

This is a joint work with V. Serganova.

Apr. 22
10:30am
GH307

Metabelian Groups and Γ-Loops

Lee Raney
Univesity of North Alabama

Γ-loops are commutative loops which often arise from finite groups of odd order via a construction known as the Baer trick. Utilizing a known correspondence between certain classes of Γ-loops and Bruck loops, we provide structural results on Γ-loops of order p^2q (where p and q are odd primes) and determine whether such a loop is an automorphic loop.

Apr. 21
9:00am
GH318

Ladder Determinantal Rings, the Divisor Class Group, Dualizing Modules and Semi-dualizing Modules

Tony Se
University of Mississippi

Consider an $m \times n$ matrix (X_{ij}) of variables over a field k. A ladder Y is a subset of the variables in the shape of a ladder. More specifically, Y is a ladder if and only if $X_{ij}, X_{hk} \in Y$, where $i \leq h$ and $j \leq k$, imply $X_{ik}, X_{hj} \in Y$. A ladder determinantal ring is a quotient ring of the form $R = k[Y]/I_t(Y)$, where t is a positive integer, and $I_t(Y)$ is the ideal of $k[Y]$ generated by all $t \times t$ minors in Y. Aldo Conca gave a description of the dualizing module of R in terms of an element in the divisor class group $\mathrm{Cl}(R)$. We will use $\mathrm{Cl}(R)$ to give a description of the semidualizing modules of R, which are generalizations of dualizing modules. We will show how the number of isomorphism classes of semi-dualizing modules of R is related to the shape of Y. Definitions of relevant terms will be provided, and various examples will illustrate our results. This is joint work with Sean Sather-Wagstaff and Sandra Spiroff.

Algebra and Computation: Towards A Direct Link, via Category Theory

Apr. 22
8:00am
GH307

Lucius Schoenbaum
University of South Alabama

Machine-based computation occurs at the lower level through the allocation and manipulation of spaces of memory. Although the work of Seely and recent work by Stay and Meredith are exceptions, it is rare that this aspect of computer engineering is considered from the categorical perspective, and for example, each these authors take objects of their categories to be types (in the computational or logical sense). We discuss a categorical model for this aspect of reasoning about computation where objects are not types, but instead spaces of allocated memory. We show that in many ways this model is ideal for thinking about the relative efficiency of computations mathematically. We show that the category used for the model is a monoidal two-category with an associated topos structure. We discuss the implications of this observation from the perspective of compiler optimization, hardware design, programming language theory, and from the perspective of pure algebra.

Some Pre-order Relations in Semisimple Lie Groups

Apr. 21
1:30pm
GH307

Tin-Yau Tam
Auburn University

We will discuss some classical matrix inequalities and their extensions in the form of pre-orders in the context of semisimple Lie groups including Schur-Horn inequalities, Sing-Thompson's inequalities, Weyl-Horn's inequalities, Bhatia's inequality etc. Most of them are related to my new book *Matrix Inequalities and Their Extensions to Lie Groups*.

Hopf-Galois Structures and a Characterization of Dihedral Extensions

Apr. 20
4:30pm
GH307

Robert Underwood
Auburn University at Montgomery

Let L/K be a Galois extension with non-abelian group G. Then L/K admits both a classical and canonical non-classical Hopf-Galois structure via the Hopf algebras $K[G]$ and H_λ, respectively. By a theorem of C. Greither, $K[G] \cong H_\lambda$ as K-algebras. In this talk we apply Greither's result to the case $K = \mathbb{Q}$, $G = D_3$ to yield a characterization of Galois extensions with group D_3.
