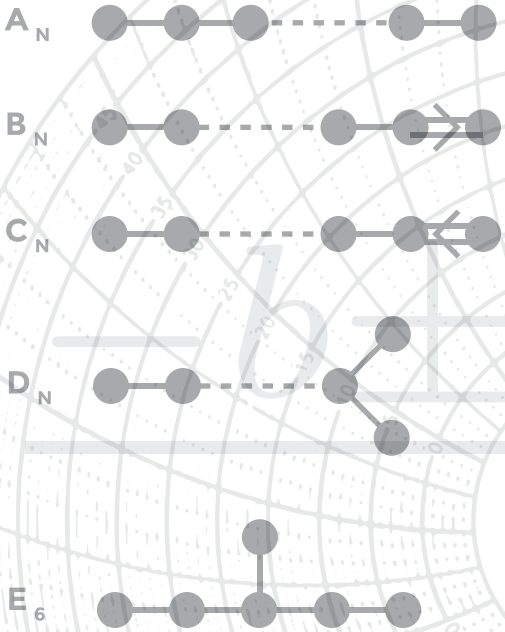
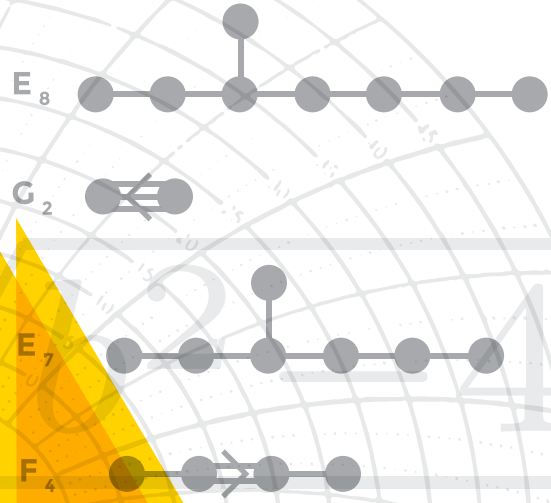




REPRESENTATION AND NUMBER THEORY

ALGEBRA

RESEARCH

WE CONDUCT RESEARCH IN DIVERSE AREAS OF ALGEBRA, INCLUDING commutative and noncommutative rings and module theory, combinatorics, cryptography, Hopf algebras, number theory, representation theory, semirings, and universal algebra. Our research in representation theory includes representations of groups and finite-dimensional algebras, its interactions with algebraic geometry, applications in mathematical physics, and automorphic representations. Our research in number theory is concentrated on the global and local theory of the Langlands program, automorphic forms, and analytic number theory.

STUDENTS

"What I love most about the Math Department at the University of Iowa is the culture of support that exists between the students, and between the students and professors. I came in relatively unprepared for graduate mathematics, but because of the challenging yet encouraging atmosphere in the department, I am now entering into advanced mathematics research with confidence and excitement. Iowa is the place for people of all backgrounds and experiences to come and obtain the type of education and training, which will allow one to succeed in future professional and academic endeavors."

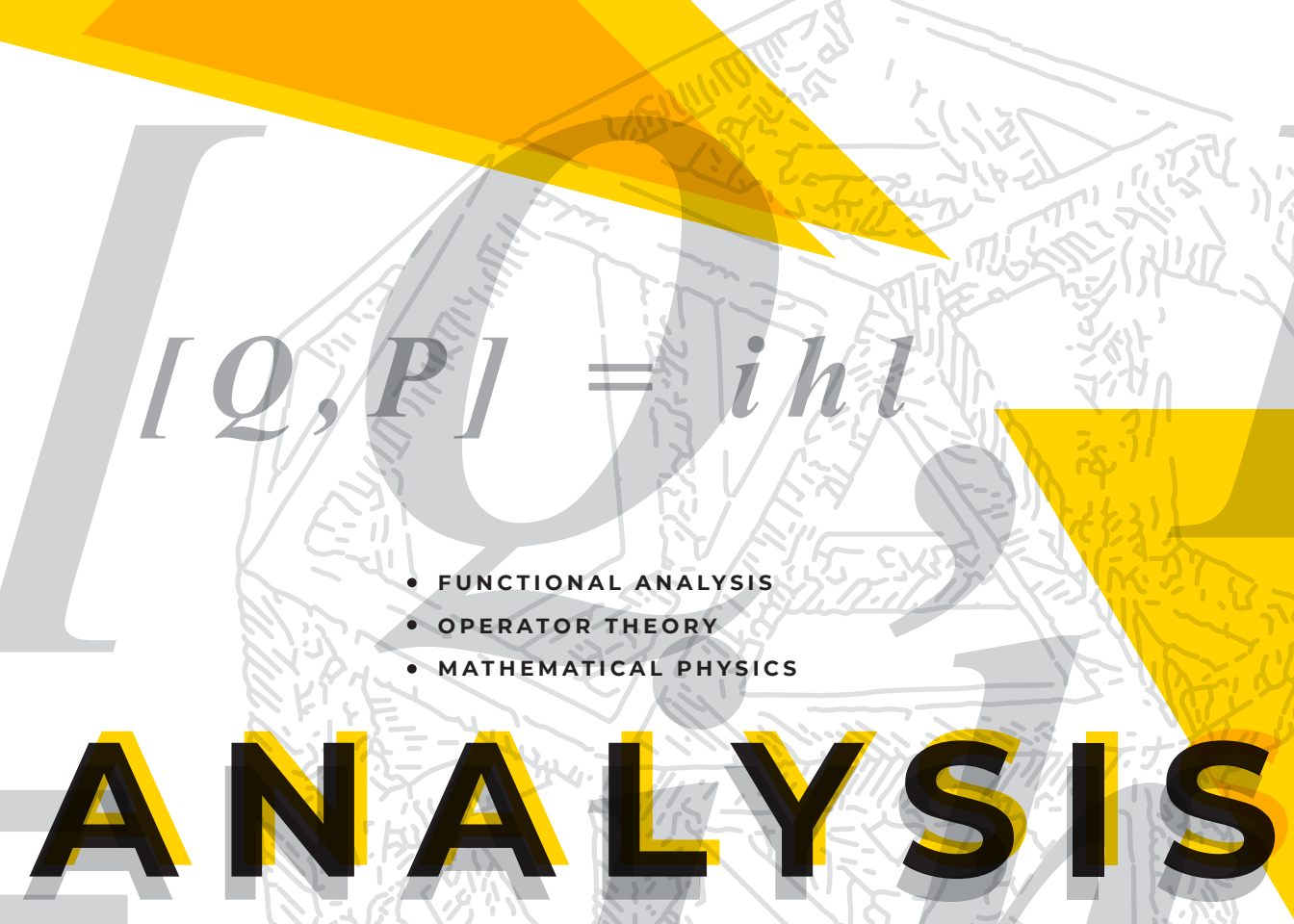
– Nicholas Camacho

"I am learning about number theory and arithmetic geometry with my advisor. I feel that I am being challenged to learn more while also receiving great support and help along the way."

– Adam Wood

FACULTY

DAN ANDERSON
PETER BLANCHARD
FRAUKE BLEHER
VICTOR CAMILLO
LAVINIA CIUNGU
MIODRAG IOVANOV
RYAN KINSER
MUTHU KRISHNAMURTHY
OLGA SOKRATOVA
YANGBO YE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• FUNCTIONAL ANALYSIS
• OPERATOR THEORY
• MATHEMATICAL PHYSICS
ANALYSIS

RESEARCH

WE CONDUCT RESEARCH IN DIVERSE AREAS OF ANALYSIS from pure to applied, modern, and classical. Those areas include analytic number theory, partial differential equations, dynamical systems, linear and non-linear, stochastic analysis, functional analysis, harmonic analysis, commutative and non-commutative, Fourier analysis, abstract and computational, wavelets, operator algebras and theory, Banach spaces, and representation theory. There are applications to physics, biology, engineering (e.g., signal/image processing), statistics, actuarial science, biostatistics, economics, business, and finance. Specific to Mathematical Physics, we work closely with several colleagues in Physics, and together we hold the longest running interdisciplinary seminar in the College. Of special interest in recent years have been problems relating to the mathematics of quantum stochastic processes in general, and in the mathematics of quantum computing.

STUDENTS

"My research experience has been great because of the wide array of resources, and, notably, the professors and graduate students who are constantly willing to have discussions or answer questions. The Functional Analysis group provides many opportunities for students to travel for seminars (as the presenter) and to conduct research overseas. Overall, my research group — really, the whole program — has a cultivating and collaborative environment."

– Aqeeb Sabree

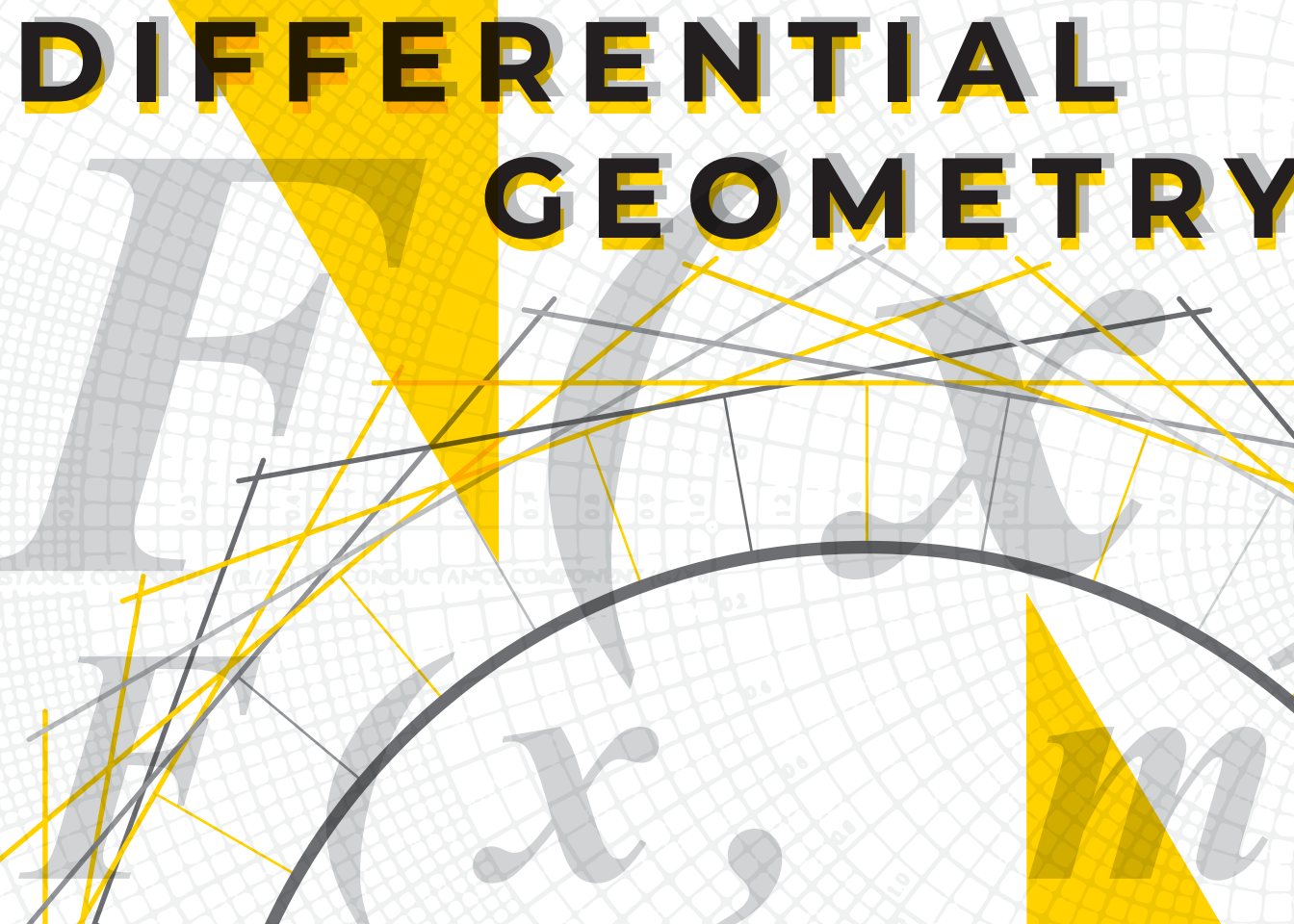
"The operator algebraists at the University of Iowa study a wide variety of topics, mine in particular is the study of von Neumann algebras. von Neumann algebras have many surprising applications to a diverse collection of fields such as group theory, ergodic theory, and physics, to name a few. As this is a highly active research area, working in this field has given me the opportunity to collaborate with mathematicians from all over the world."

– Rolando de Santiago

FACULTY

RICHARD BAKER
SERGII BEZUGLYI
IONUT CHIFAN
RAUL CURTO
CYNTHIA FARTHING
PALLE JORGENSEN
SURJIT KHURANA
PAUL MUHLY
MOHAMMAD TEHRANI
YANGBO YE
XIAOYI ZHANG

DIFFERENTIAL GEOMETRY



RESEARCH

WE INVESTIGATE THE INTERACTIONS OF GEOMETRY with pure and applied disciplines such as analysis, partial differential equations, and topology. The current focus of the group includes the curvature flow problems, the effects of curvature on the topology and smoothness structures of manifolds, PDEs on complex manifolds, and the ideal shapes of manifolds.

STUDENTS

"I didn't know anything about differential geometry when I began at Iowa, but I knew I liked topology. Over the course of my first year, I also developed a new appreciation for real analysis. Differential geometry provides an avenue for me to satisfy both of these interests. With Professor Durumeric as my advisor, I have investigated a subject called "knot energies." This has been an ideal fit for me, as knot energies allow us to use analytical tools to answer questions about topology. The type of our work has varied considerably, and we have written proofs using everything from trigonometry to the calculus of variations—I even spent several weeks programming in MATLAB to illuminate our exploration. The conceptual diversity present in differential geometry is one of my favorite things about the subject. Mathematics is at its most interesting when different branches are working together!"

– Richard Ligo

FACULTY

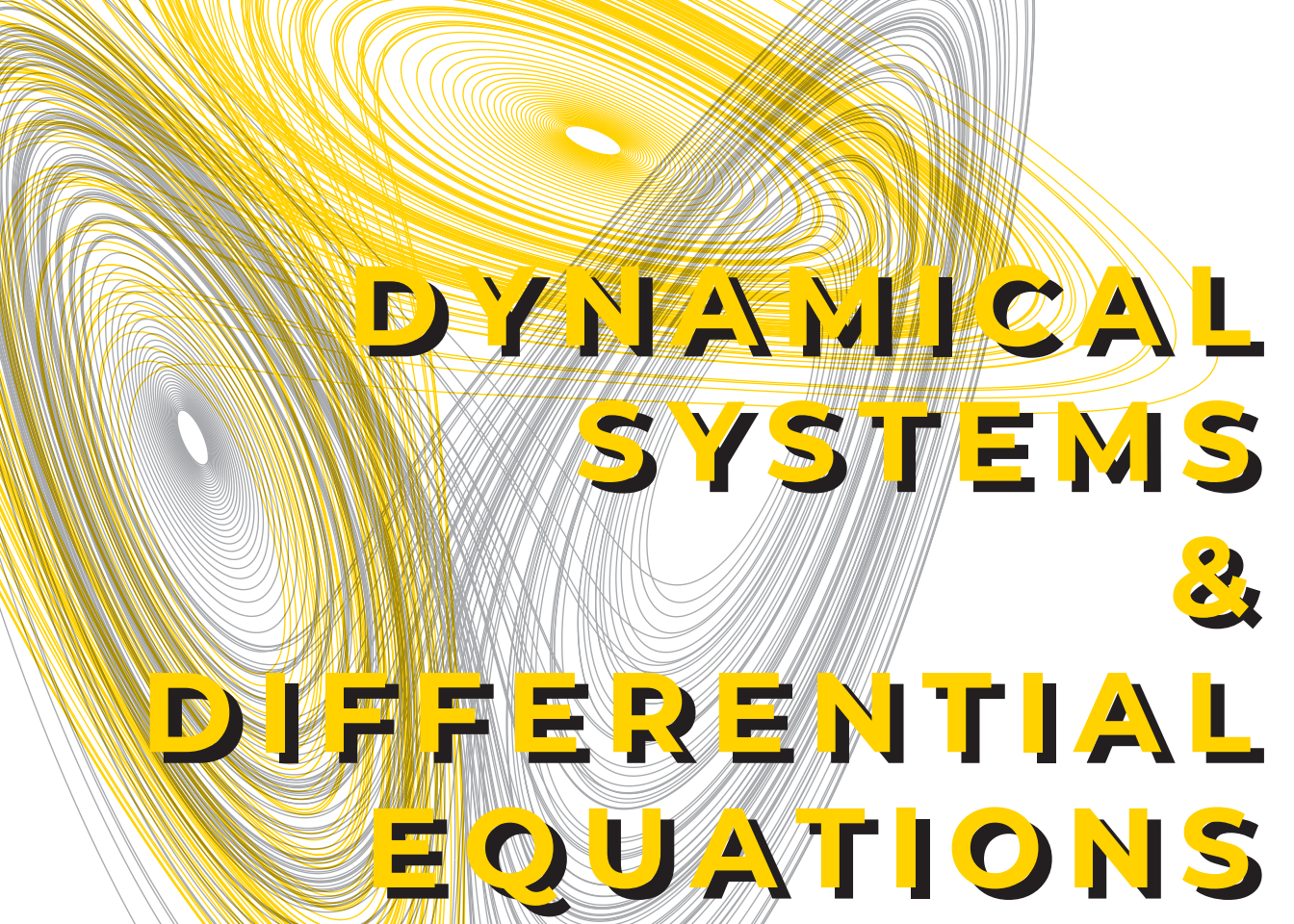
OGUZ DURUMERIC

HAO FANG

WALTER SEAMAN

MOHAMMAD TEHRANI

LIHE WANG


DYNAMICAL
SYSTEMS
&
DIFFERENTIAL
EQUATIONS

RESEARCH

WE CONDUCT RESEARCH IN bifurcation theory, differential equations on manifolds, models in biology and neuroscience, discrete principles in mechanics, numerical integration methods, and topological dynamics.

"Being in the AMCS program gives me the unique opportunity to work in truly interdisciplinary fields. Working with my advisor, Dr. Curtu, has given me access to actual neurological data that I may not have at other institutions."

– Pake Hagen

FACULTY

ZAHRA AMINZARE

SERGII BEZUGLYI

IONUT CHIFAN

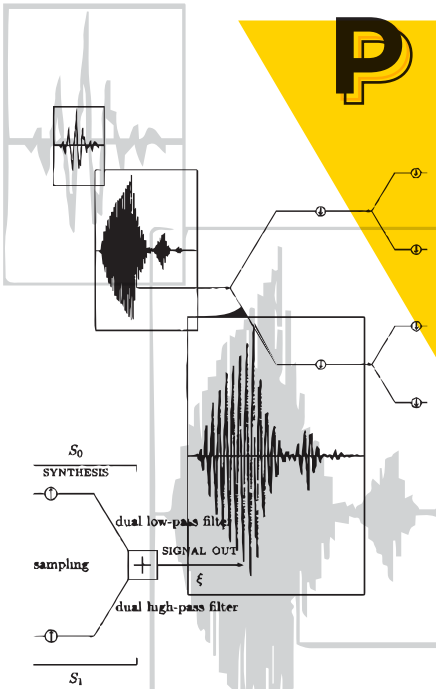
RODICA CURTU

LAURENT JAY

COLLEEN MITCHELL

PAUL MUHLY

IMAGING & SIGNAL PROCESSING



RESEARCH

WE CONDUCT RESEARCH in the mathematical aspect of problems of formation, acquisition, compression, transmission, and analysis of images. This includes inverse problems, compressed sensing, reconstruction algorithms, differential equations, computational harmonic analysis, machine learning, as well as their applications such as medical imaging, computational photography, and seismic imaging.

"The PhD program in Mathematics at UI is a strong supportive environment where you can develop as a competent professional in any career of your choosing."

- Melanie King

FACULTY

OGUZ DURUMERIC

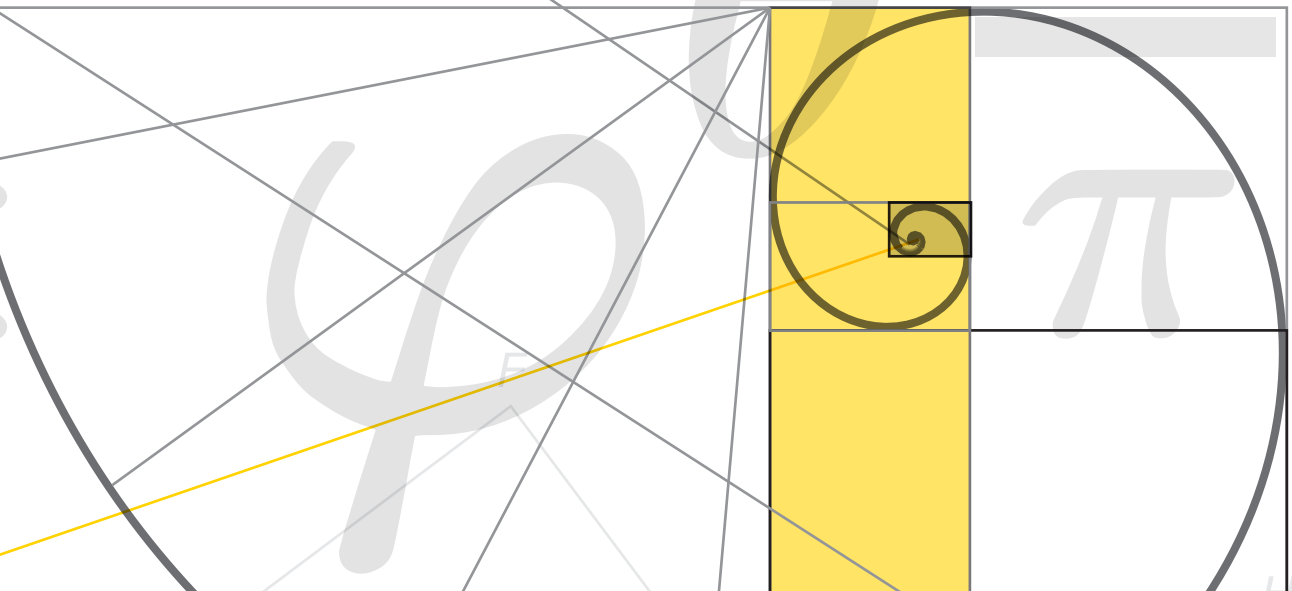
WEIMIN HAN

PALLE JORGENSEN

LIHE WANG

YANGBO YE

MATHEMATICAL & COMPUTATIONAL BIOLOGY



FACULTY

ZAHRA AMINZARE

BRUCE AYATI

RODICA CURTU

ISABEL DARCY

TONG LI

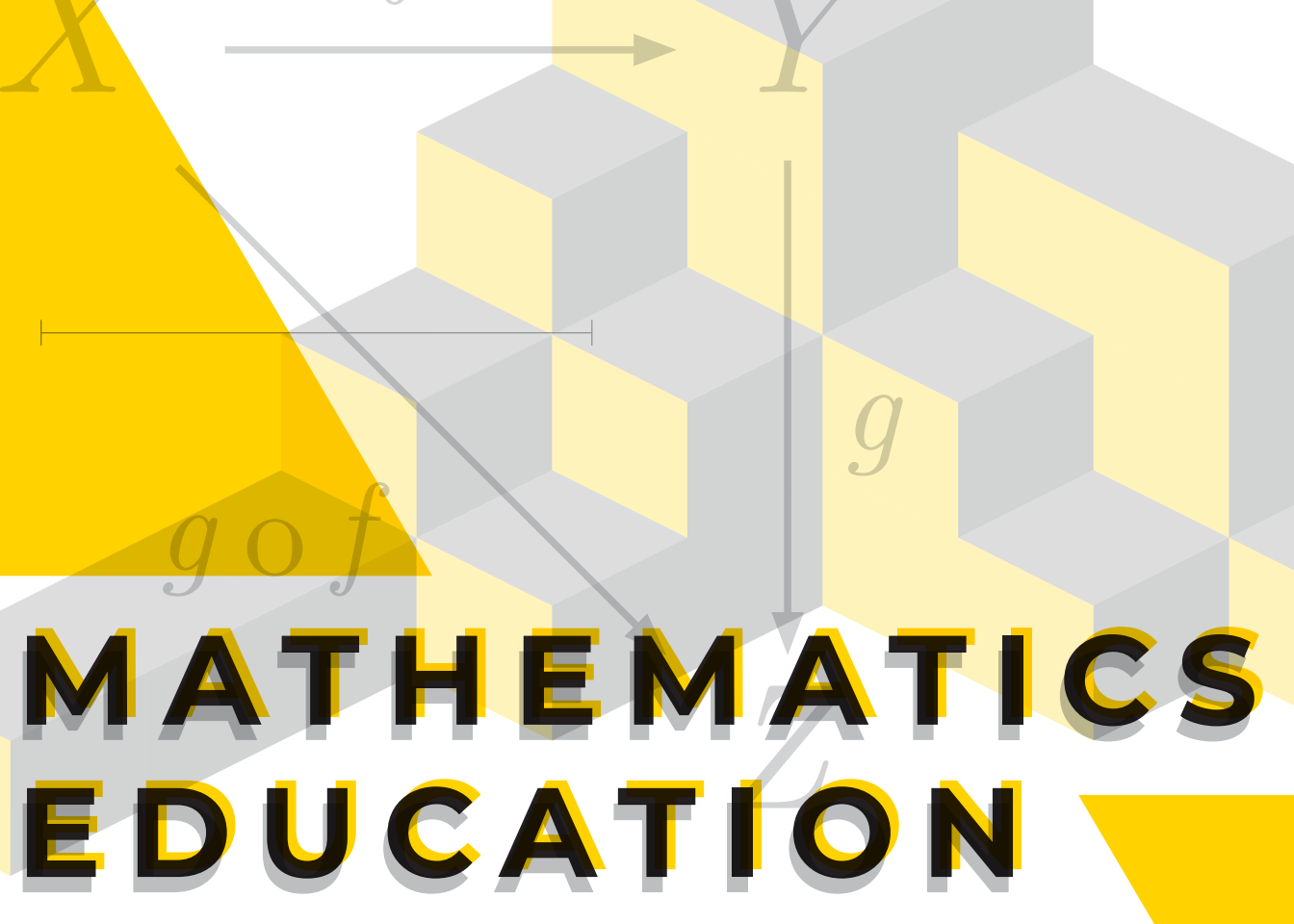
COLLEEN MITCHELL

"The best part about being a graduate student in the AMCS department is that you can choose your research advisor from any department you want. The Mathematics and Applied Mathematics departments are very collaborative. Everyone wants to help each other learn and succeed. Currently I am modeling bone regeneration in stem cells and animals. I enjoy it because one day these experiments may aid people heal cracks in their bones."

– Ruqiah Muhammad

WE ENGAGE IN COLLABORATIVE, INTERDISCIPLINARY RESEARCH with partners across a broad range of the biological and biomedical sciences. Many of our students have secondary advisors in other disciplines, particularly those in the Applied Mathematical and Computational Sciences (AMCS) Ph.D. program. In our research, we strive to develop and leverage a firm foundation in mathematics to solve problems of genuine importance in biology.

RESEARCH



MATHEMATICS EDUCATION

RESEARCH

WE CONDUCT RESEARCH IN SEVERAL AREAS such as the effect of mathematics content interventions on student achievement results (such as ITBS scores), through professional development on mathematics content for their teachers. Effects on teacher content knowledge are also studied with a variety of local and national instruments. Recent research efforts have also included delivery of teacher professional development training in learning-community-type models such as Lesson Study.

FACULTY

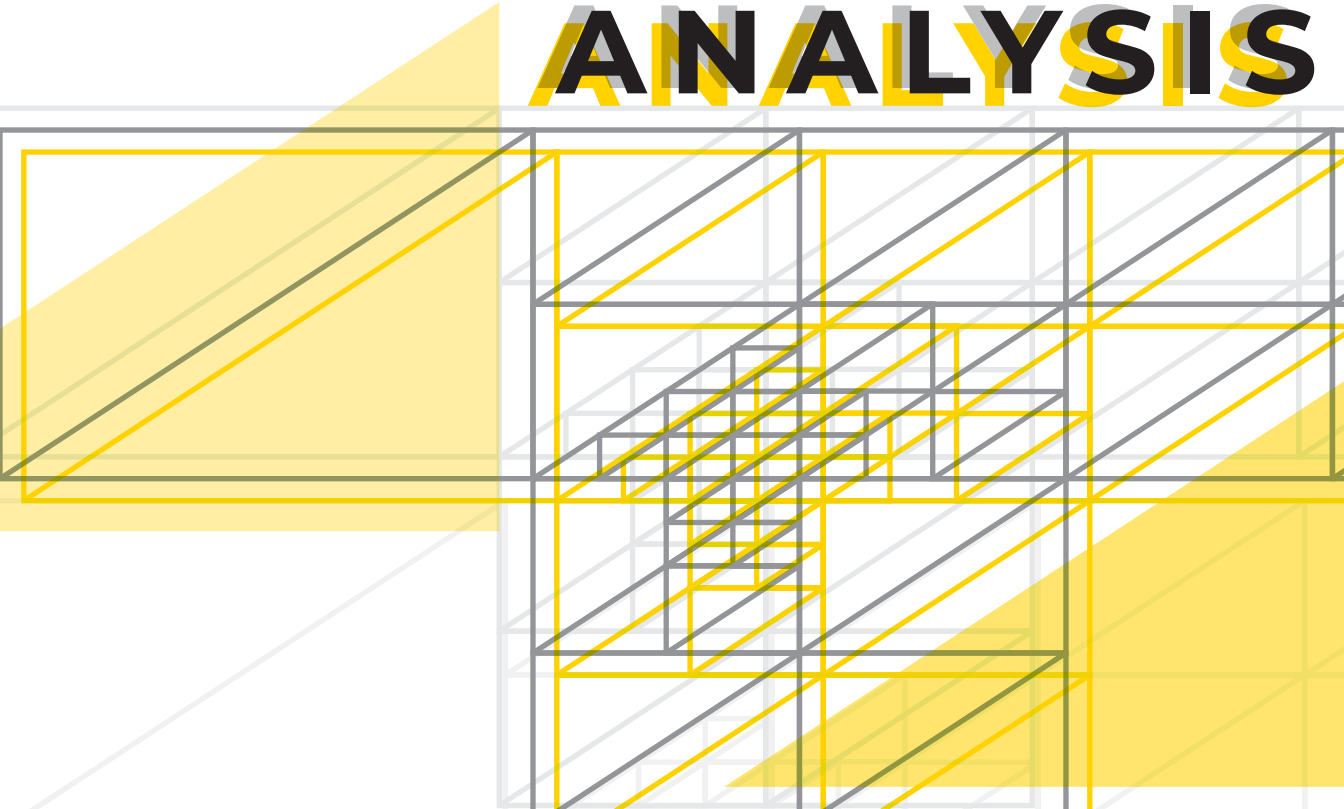
WALTER SEAMAN

DENISE SZECSEI

"My experience at Iowa has been great! As an AMCS student, I have had the chance to pick an advisor from an applied field so I can apply mathematics to important research topics from other discipline. Although my advisor is very busy working on multiple projects related to meta-analysis, he is always available to meet with me to help me move forward in my research. He has been a great teacher, very supportive and has helped me to expand my research interests and to improve my research abilities by making me part of multiple projects."

– **Roberto Toro**

NUMERICAL ANALYSIS



RESEARCH

THE NUMERICAL ANALYSIS GROUP HAS INTERESTS THAT INCLUDE the numerical solution of ordinary and partial differential equations, integral equations, optimization, variational inequalities, approximation theory, computational stochastics, and computational sciences. Researchers also work with applications in several areas, including mechanics, computer graphics, imaging, and biomathematics.

STUDENTS

"As part of the numerical analysis group, I know that other students in the group are always interested in getting together and discussing our research. While none of us have similar topics, these conversations are often very productive and I find myself learning a lot about others' research as well as my own. In addition to these informal conversations, we have organized a student applied math seminar to further discuss any topics that interest us; this has been a great way for me to become a more well-rounded student."

– Cole Steigler

"As a graduate student in the AMCS program, I am part of the Numerical Analysis research group. Within the numerical analysis group, interests range from the numerical solution of differential equations to various optimization problems. As a result, there are numerous projects that a student can take part in. The faculty is very approachable and it is not uncommon for students to discuss their research with members other than their advisor. Additionally, many fruitful results come from informal discussions with other students in the group."

– Anonymous

FACULTY

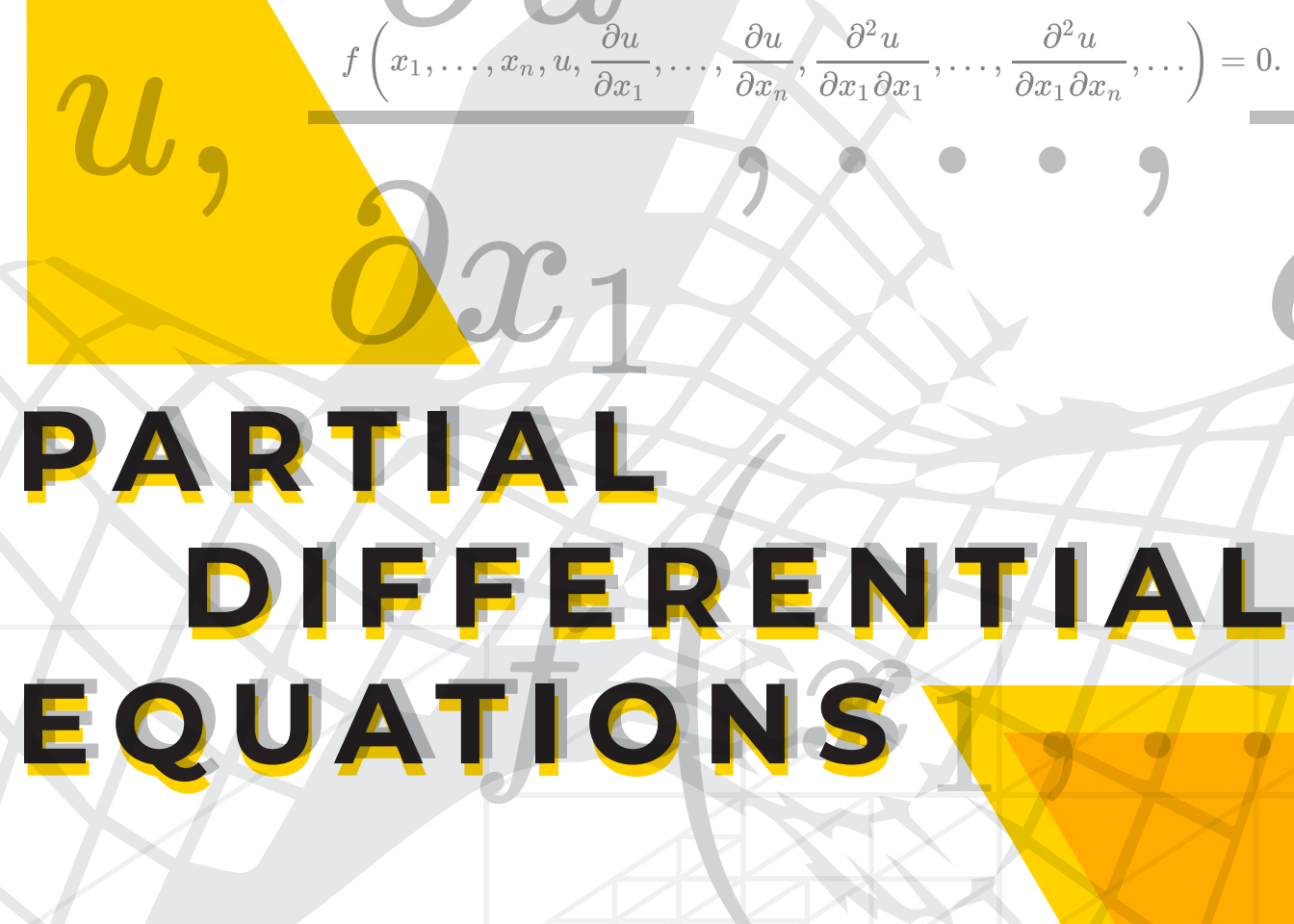
BRUCE AYATI

WEIMIN HAN

LAURENT JAY

DAVID STEWART

XUEYU ZHU


$f\left(x_1, \ldots, x_n, u, \frac{\partial u}{\partial x_1}, \ldots, \frac{\partial u}{\partial x_n}, \frac{\partial^2 u}{\partial x_1 \partial x_1}, \ldots, \frac{\partial^2 u}{\partial x_1 \partial x_n}, \ldots\right) = 0.$
PARTIAL
DIFFERENTIAL
EQUATIONS

FACULTY

TONG LI

GERHARD STROHMER

LIHE WANG

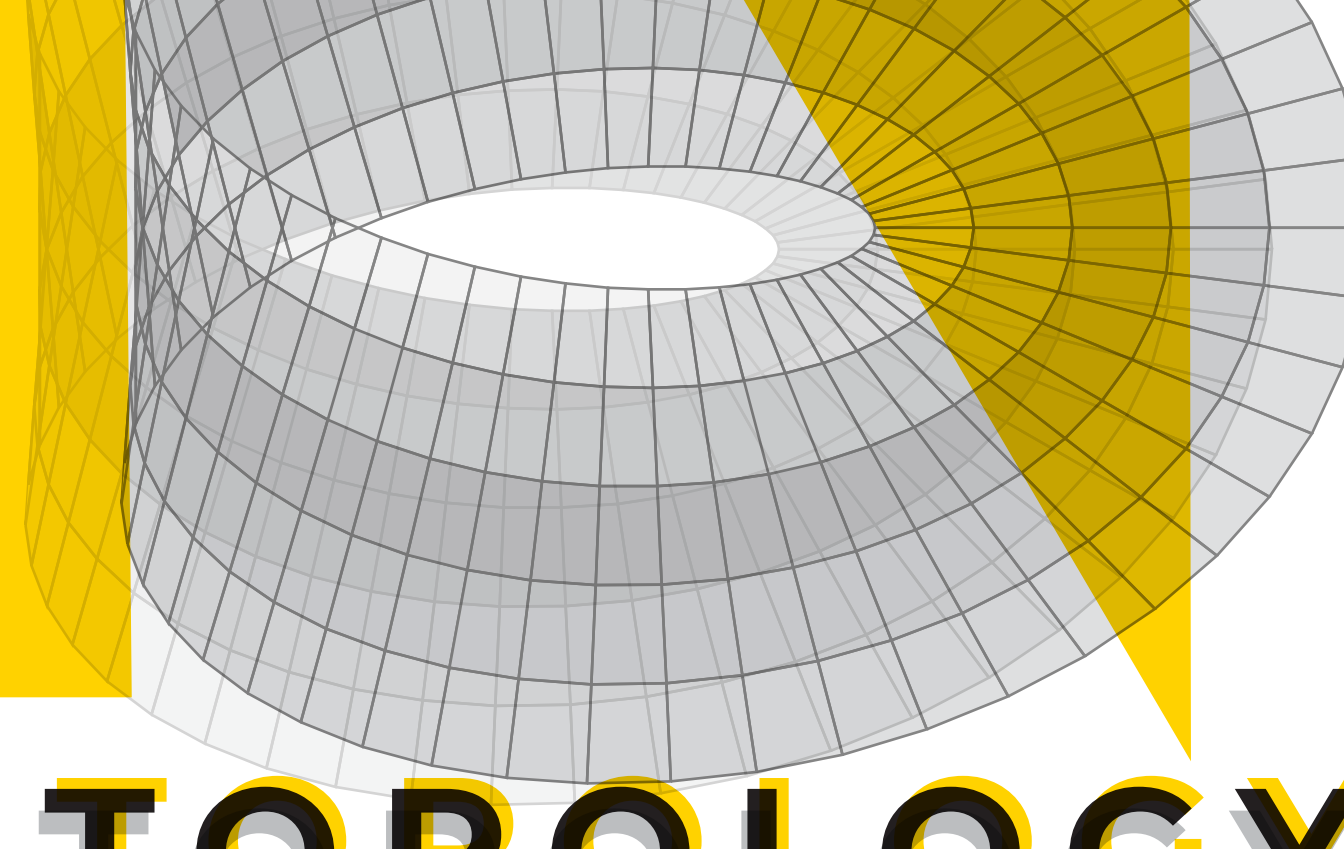
XIAOYI ZHANG

WE CONDUCT RESEARCH on many different types of partial differential equations. These equations come from problems in biomathematics, combustion theory, fluid mechanics, geometry, medical imaging, and traffic management. The research is focused on the existence, regularity, stability and other properties of such solutions. To a greater or lesser extent, our research also encompasses ordinary differential equations, numerical methods, and the functional-analytic methods used in the area.

"I am a fifth year student, under the supervision of Professor Tong Li. My research interests lie in Partial Differential Equations, in particular conservation laws; currently I am focusing on existence, stability and long-time behaviors of traveling wave solutions to problems arising in applied science—for instance, image denosing and the Keller-Segel models from chemotaxis."

– Jeungeun Park

RESEARCH


TOPOLOGY

STUDENTS

"My advisor is wicked invested in my success. He constantly pushes me to learn new math and develop my critical thinking skills so I can become a better student and future mathematician."
– Beccah Mackinnon

"I am currently working on Topological Data Analysis, TDA, which is an area of mathematics that utilizes topological tools (such as persistence homology) in analyzing the shape of underlying space of a data. I have learned very useful skills such as writing algorithms and thinking critically."
– Wako Bungula

"I have enjoyed my experience here at Iowa because it is a non-competitive environment with many opportunities for collaboration. I regularly meet with my advisor and with a group of graduate students all researching topological data analysis. The casual conversations, as well as formal seminars, across all disciplines have been invaluable to me."
– Katie Betancourt

FACULTY

BENJAMIN COOPER

ISABEL DARCY

CHARLES FROHMAN

KEIKO KAWAMURO

MAGGY TOMOVA

WE ARE A DIVERSE GROUP whose interests are focused around dimensions two, three, and four. Currently members of the group are working on: applied knot theory, topological data analysis, contact and symplectic topology, mapping class groups, geometric braid theory, categorification, applications of homotopy theory to the study of topology in low dimensions, Heegaard splittings of three manifolds, trisections of four manifolds, quantum topology and skein theory. The group has a lively culture of seminars with a focus on including students in their current research.

RESEARCH

APPLIED MATHEMATICAL AND COMPUTATIONAL SCIENCES (AMCS)

APPLIED MATHEMATICAL AND COMPUTATIONAL SCIENCES (AMCS) at the University of Iowa is a broad-based interdisciplinary Ph.D. program for students desiring to study mathematics and a companion science so that they can apply their mathematical skills to significant scientific problems. The main goal of the program is to nurture applied mathematicians with sufficient professional experience and versatility to meet the research, teaching, and industrial needs of our technology -based society. The program is rigorous, flexible, and successful. Students in this program receive solid training in mathematics and in an outside area (any area in mathematical sciences, physical sciences, social sciences, medical sciences, and engineering), and apply mathematical and computational techniques to solve problems from the outside area. Graduates of the program have been very successful in their academic and industrial careers. For online information about AMCS, please visit *www.amcs.uiowa.edu/.*

FACULTY

KARIM ABDEL-MALEK	BIOMEDICAL ENGINEERING
KURT ANSTREICHER	MANAGEMENT SCIENCES
MARC ARMSTRONG	GEOGRAPHY
BRUCE AYATI	MATHEMATICS
ERWEI BAI	ELECTRICAL AND COMPUTER ENGINEERING
SAMUEL BURER	MANAGEMENT SCIENCES
ANN CAMPBELL	MANAGEMENT SCIENCES
GREGORY CARMICHAEL	CHEMICAL AND BIOCHEMICAL ENGINEERING
JOSEPH CAVANAUGH	BIOSTATISTICS
YONG CHEN	MECHANICAL AND INDUSTRIAL ENGINEERING
KYUNG CHOI	MECHANICAL AND INDUSTRIAL ENGINEERING
JAMES CREMER	COMPUTER SCIENCE
RODICA CURTU	MATHEMATICS
ISABEL DARCY	MATHEMATICS
SOURA DASGUPTA	ELECTRICAL AND COMPUTER ENGINEERING
WEIMIN HAN	MATHEMATICS
GREGORY HOWES	PHYSICS AND ASTRONOMY
MATHEWS JACOB	ELECTRICAL AND COMPUTER ENGINEERING
LAURENT JAY	MATHEMATICS
PALLE JORGENSEN	MATHEMATICS
ALAN KAY	BIOLOGY
JOSEPH KEARNEY	COMPUTER SCIENCE
CAGLAR KOYLU	GEOGRAPHY
JOHNA LEDDY	CHEMISTRY
TONG LI	MATHEMATICS
CHING-LONG LIN	MECHANICAL AND INDUSTRIAL ENGINEERING
QIHANG LIN	MANAGEMENT SCIENCES
AMBROSE LO	STATISTICS AND ACTUARIAL SCIENCE
JIA LU	MECHANICAL AND INDUSTRIAL ENGINEERING
MICHAEL MACKEY	BIOMEDICAL ENGINEERING
JOHN MANAK	BIOLOGY
CLAUDIO MARGULIS	CHEMISTRY
SARA MASON	CHEMISTRY
YANNICK MEURICE	PHYSICS AND ASTRONOMY
COLLEEN MITCHELL	MATHEMATICS
JEFFREY OHLMANN	MANAGEMENT SCIENCES
SUELY OLIVEIRA	COMPUTER SCIENCE
WAYNE POLYZOU	PHYSICS AND ASTRONOMY
SHARIF RAHMAN	MECHANICAL AND INDUSTRIAL ENGINEERING
VINCENT RODGERS	PHYSICS AND ASTRONOMY
ALBERTO SEGRE	COMPUTER SCIENCE
ELIAS SHIU	STATISTICS AND ACTUARIAL SCIENCE
MILAN SONKA	ELECTRICAL AND COMPUTER ENGINEERING
SANVESH SRIVASTAVA	STATISTICS AND ACTUARIAL SCIENCE
DAVID STEWART	MATHEMATICS
GERHARD STROHMER	MATHEMATICS
QIHE TANG	STATISTICS AND ACTUARIAL SCIENCE
BARRETT THOMAS	MANAGEMENT SCIENCES
ANNE VILLAMIL	ECONOMICS
JUN WANG	CHEMICAL AND BIOCHEMICAL ENGINEERING
KAI WANG	BIOSTATISTICS
LIHE WANG	MATHEMATICS
TONG WANG	MANAGEMENT SCIENCES
CHUN-FANG WU	BIOLOGY
SHAOPING XIAO	MECHANICAL AND INDUSTRIAL ENGINEERING
WEIYU XU	ELECTRICAL AND COMPUTER ENGINEERING
TIANBAO YANG	COMPUTER SCIENCE
NICHOLAS YANNELIS	ECONOMICS
YANGBO YE	MATHEMATICS
HANTAO ZHANG	COMPUTER SCIENCE
XIAOYI ZHANG	MATHEMATICS
XUEYU ZHU	MATHEMATICS