Hans Schnedier’s 80th Birthday Celebration at U Conn

November 1st – 2nd
The Conference will be held at the University of Connecticut, Storrs. All the talks (except the Hans Schneider Colloquium) will be given in the Class of 1950 Lecture Center room at the Homer Babbidge Library HBL-1950. The Hans Schneider Colloquium will take place in room MSB-118 in the Mathematical Sciences Building.

Thursday, Nov 1st

- The talks begin in HBL-1950 at 9:00am and will last there till 3:15pm. The library policies prohibit bringing food and drinks to the auditorium, so that coffee breaks will be organized in room 201 of the Information Technology and Engineering Bldg (ITEB-201) which is adjacent to HBL.

- At 3:15 the participants move from the Homer Babbidge Library (HBL) to the Mathematical Sciences Building (MSB), where some refreshments will be offered in the Lounge (MSB-Lounge) on the 1st floor at 3:30pm.

- The Hans Schnedier Colloquium will take place at 4:00pm in room MSB-118 (next to the lounge).

- Soon after Hans’ talk there will be reception (from 5:15 till 6:15) in the Lounge (MSB-Lounge) on the 1st floor. A banquet will be held from
6:30 till 9:30 in the Alumni Center (ALU) which is located within 5 minutes walking distance from MSB.

Friday, Nov 2nd

- The talks begin in HBL-1950 at 8:30am and will last there till 12:30pm.
Fig. 2: U Conn map with INN, HBL, ITE, ALU, MSB, NPRK highlighted

Abbreviations:

- HBL: Homer Babbidge Library.
- ITE: Information Technology and Engineering.
- MSB: Mathematical Sciences Building.
- ALU: Alumni Center.
- NPRK: North Parking Garage.
- INN: Nathan Hale Inn.
## Program

**Thursday, November 1st.**

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Almighty Lyapunov and Sylvester Equations - Hans’ All Time Favorite

Biswa Datta, Northern Illinois University

Abstract

The talk will describe what dominant role the classical Lyapunov and Sylvester equations play in almost all aspects of linear control systems design and analysis: controllability, observability, stability, feedback stabilization, eigenvalue assignment, state estimation, model reduction and many others.

It turns out that an inertia theorem of Carlson and Schneider proved in 1963 forms a basis of many of these results.
Combinatorial Sequences With Positive Definite Hankel Matrices

Emeric Deutsch, Polytechnic University, Brooklyn, N.Y.

Abstract
For a large class of lattice path-counting sequences, we describe their infinite Hankel matrices. Their positive definiteness follows at once, implying the log-convexity of the starting sequences.
High Performance Computing Linear Algebra and Linear Algebra Inspired

Alan Edelman, MIT

Abstract

Modern trends in hardware are bringing new opportunities in high performance computing and also bringing parallel processing to everyone’s desktop. We will discuss the algorithmic implications, the trends in languages such as MATLAB(r) or PYTHON, and what it means to users. We may give a demo of Interactive Supercomputing’s Star-P for MATLAB, Python, and R if conditions allow.
Gersgorin Variations: On Themes of Brualdi, Ostrowski, Schneider and Hoffman

Alan Hoffman, IBM

Abstract

I will begin by describing how much I owe Hans, both personally and professionally; and our common passion for Olga Taussky, who introduced us to the beauty of Gersgorin’s theorem. This leads to: I will outline a new proof, much less fancy than the original, for my theorem on Linear G-functions (1975), using at one stage a theorem of Brualdi, Parter and Schneider. Then I will show how the characterization of linear G-functions encompasses classic results of Ostrowski and their generalizations, by Brualdi and Varga.
Laplacian Integral Graphs With Maximum Degree 3
Steve Kirkland, University of Regina

Abstract
Given a graph $G$, its Laplacian matrix $L$ is the singular M-matrix given by $L = D - A$, where $A$ is the adjacency matrix of $G$, and $D$ is the diagonal matrix of vertex degrees. The last decade or so has seen a number of results on Laplacian integral graphs, i.e. those graphs for which the spectrum of the Laplacian matrix consists entirely of integers. In this talk we identify all of the connected Laplacian integral graphs having maximum degree 3. A mix of algebraic and combinatorial techniques is used to derive the main result.
Davis-Wielandt Shells of Normal Operators
Chi-Kwong Li, College of William and Mary.

Abstract
For a finite dimensional operator $A$ with spectrum $\sigma(A)$, the following conditions on the Davis-Wielandt shell $DW(A)$ of $A$ are equivalent.

(a) $A$ is normal.
(b) $DW(A)$ is the convex hull of the set $\{(\lambda, |\lambda|^2) : \lambda \in \sigma(A)\}$.
(c) $DW(A)$ is a polyhedron.

These conditions are no longer equivalent for an infinite dimensional operator $A$. In this paper, a thorough analysis is given for the implication relations among these conditions.

This is a joint work with Yiu-Tung Poon, Iowa State University.
Submatrices of Laplacian Matrices for Graphs with Cut Vertices

Jason Molitierno, Sacred Heart University

Abstract

In graph theory, a graph $G$ on $n$ vertices labeled $1, \ldots, n$ can be represented by an $n \times n$ Laplacian matrix $L$ where the diagonal entries $\ell_{i,i}$ are each the degree of vertex $i$, and the off-diagonal entries $\ell_{i,j}$ are $-1$ if vertices $i$ and $j$ are adjacent and $0$ otherwise. The submatrix $L_i$ of $L$ is obtained by deleting the row and column of $L$ corresponding to vertex $i$ of $G$. If $\lambda_n$ and $\lambda_{n-1}$ are the largest eigenvalues of $L$, and $\rho(L_i)$ is the largest eigenvalue of $L_i$, it follows from the interlacing theorem of eigenvalues that $\lambda_{n-1} \leq \rho(L_i) \leq \lambda_n$. In this talk, we will investigate the Laplacian matrices for graphs that contain cut vertices. By observing the values of $\rho(L_i)$ when $i$ represents a cut vertex, we will be able to classify such graphs $G$ into two categories based on whether $G$ contains a cut vertex $i$ such that $\rho(L_i) = \lambda_{n-1}$. We will also investigate the values of $\rho(L_i)$ for non-cut vertices and obtain some surprising results, especially when there exists a vertex such that $\rho(L_i) = \lambda_n$. 
Marked Invariant Subspaces
Leiba Rodman, College of William and Mary.

Abstract
An invariant subspace $M$ of a complex matrix $A$ is said to be marked if there is a Jordan basis for $A - M$ which can be extended to a Jordan basis in the whole space for $A$. This notion was introduced about two decades ago. In the talk, various properties of matrices in relation to their marked invariant subspaces will be reviewed.
Splittings of Linear Operators: Lyapunov and Perron-Frobenius

Hans Schneider, University of Wisconsin

Abstract

A special case of Lyapunov’s famous theorem on the stability of solutions of differential equations was formulated by Gantmacher as a theorem on matrices. With some further reformulation, the theorem bears a remarkable similarity to some splitting theorems on M-matrices that may be found in Varga’s book. Using the Krein-Rutman cone version of Perron-Frobenius this leads to common generalizations of the Gantmacher-Lyapunov and Stein theorems which has recently found several applications.
Perron-Frobenius Properties And a Generalization of M-matrices

Daniel B. Szyld, Temple University, Philadelphia

Abstract

Nonnilpotent nonnegative matrices have a positive dominant eigenvalue that corresponds to a nonnegative eigenvector. This property is called the Perron-Frobenius property. We say that \( A \) is a GM-matrix, if \( A = sI - B \) and both \( B \) and \( B^T \) have the Perron-Frobenius property. Here \( B \) is not necessarily nonnegative. In this talk we present results on matrices, which are not necessarily nonnegative, having the Perron-Frobenius property and similar properties. We also analyze GM-matrices. In particular, certain results associated with nonnegative matrices and M-matrices are extended to these new classes of matrices. Thus, we show that the Perron-Frobenius property is what leads to these results, and nonnegativity is not necessary. (joint work with Abed Elhashash)