Curriculum Vitae

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Computer Science
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Education:

- Ph.D. (magna cum laude), Computational Electromagnetics Group, Dept. of Electrical Engineering, Christian–Albrechts–University of Kiel, Germany, 12/2003. Title of thesis: Hybrid Field Analysis of the Canonical GTEM–Cell.
- Diploma in EE, Theoretical Electrical Engineering, Dept. of Electrical Engineering, Ruhr–University Bochum, Germany, 1995. Title of thesis: Investigations on the Field Structure in GTEM–Cells (in German).
- Study of EE, Dept. of Electrical Engineering, Ruhr–University Bochum, Germany, 10/1989 – 10/1995. Major Subjects:
  - Theoretical Electrical Engineering
  - Electrooptics and Electrical Discharges
  - Electronic Circuits and Metrology

Positions Held:

- Associate Professor, School of Science, Technology, Engineering, and Mathematics, Kentucky State University, Frankfort, KY, USA (8/2018–present)
- Assistant Professor, Division of Computer Science, Kentucky State University, Frankfort, KY, USA (8/2013–7/2018)
- Visiting Assistant Professor, Division of Computer Science, Kentucky State University, Frankfort, KY, USA (8/2012–7/2013)
- Adjunct Professor, Department of Computer Science, University of Kentucky, Lexington, KY, USA (8/2011–7/2012)
- Adjunct Professor, Department of Electrical and Computer Engineering, University of Kentucky, Lexington, KY, USA (8/2011–12/2011)
- Assistant Research Professor, Department of Electrical and Computer Engineering, University of Kentucky, Lexington, KY, USA (7/2008–7/2011)
- Senior Scientist – Research Engineer, Center for Visualization and Virtual Environments, University of Kentucky, Lexington, KY, USA (10/2005–6/2008)
- Research Scholar, Center for Visualization and Virtual Environments, University of Kentucky, Lexington, KY, USA (9/2004–9/2005)
- Research Scholar, Department of Electrical and Computer Engineering, University of Kentucky, Lexington, KY, USA (8/2002 – 8/2004)
- Research Assistant, Computational Electromagnetics Group, Dept. of Electrical Engineering, Christian–Albrechts–University of Kiel, Germany (9/1998 – 6/2002)
- Research Assistant, Theoretical Electrical Engineering, Dept. of Electrical Engineering, Ruhr–University Bochum, Germany (11/1995 – 8/1998)
- Student Worker, Electronics Maintenance and IT Group, Dept. of Language Teaching Science, Ruhr–University Bochum, Germany (9/1991 – 10/1995)

Teaching Experience:

Unless otherwise noted, all classes are actively being taught at Kentucky State University.

Courses Newly Designed or Redesigned

- *EE 101/EGR 199 – Creativity and Design in Electrical & Computer Engineering*
  This course provides an introduction to the process and application of creative design and problem solving within science and engineering. Emphasis is placed on applications and case studies in the areas of electrical and computer engineering. Several laboratory-based engineering problems are used to provide practical settings in which to apply and evaluate constraint- and product-focused strategies for creative design and problem solving. In addition to technical and aesthetic considerations, ethical and cultural influences on the creative process are also discussed. Taught in Fall 2011 at the University of Kentucky. Now folded into the new (as of Fall 2016) First Year Engineering Experience

- *COS 107 – Problem Solving, Logic & Design*
  This course serves as the introduction of students to both program design and development. A more modern name for this course would be *Computational Thinking*. The programming language for this class is Python with an emphasis on data types and structures in preparation for object–oriented programming. This course is designed to also be used in online and dual–credit classes. It is heavily modularized along with annotated screencasts.

- *CS 216/DGE 300 – Introduction to Software Engineering*
  This course has been developed from scratch at the request of the University of Kentucky, and introduces the students to the Unix operating system and the tools used in the development of modern, large–scale software systems. Topics covered are advanced object–oriented concepts in C++ (including name mangling and interfacing with legacy C libraries), compilers, linkers, libraries, build systems (make, Autotools, and CMake), revision control systems (git), XML processing and validation (via XML Schema), object serialization and deserialization, command–line argument processing, and mixing compiled and interpreted code using Python scripting. Taught at both the University of Kentucky and Kentucky State University.

- *COS 301 – Computer Organization*
  This course serves as the introduction to the mathematical and hardware concpepts underlying computer systems. After a short historical overview, it covers the basic circuit and logic elements required to store and represent information in digital form. Considerable time is spent on the various integer and floating point formats for numeric data and the resulting safety implications of their use in embedded systems. In addition to number representation, students are introduced to Unicode for character representation and its various encoding schemes such as UTF-8 and UTF-16. The course explores the internal structure of a simple CPU and

show how it uses buses to talk to external devices. Finally, as an example for a real–world system, studens explore and program the popular AVR microcontroller architecture, which is widely used in the Arduino ecosystem. The course contains significand hands–on experience. Students use TTL chips to build logic circuits such as half and full adders. Students also write AVR assembler programs and upload them to a microcontroller using either dedicated or Arduino–based In–System–Programmers.

- *COS 475 – Game Design and Development*
  This course involves the study of the technology, science and storytelling involved in the creation of computer games. It emphasizes game design concepts from a vantage point of applied psychology. To encourage a shift in perspective, the course begins with an introduction and active play of German–style board games such as *The Settlers of Catan* and *Carcassonne*. It is heavily cross–disciplinary, drawing from psychology, history, art history, entrepreneurship, marketing, computer science, and more.

- *COS 499-02 – Mobile Game Development*
  This course introduced students to cross–platform game development for mobile devices. A simple game has been implemented and deployed on Android tablets. The game engine used was Cocos2d–x, the physics engine used was Box2D. The programming language was C++.

- *DGE 476 – Mobile Game Development*
  Based on the lessons learned from COS 499-02, this course focuses on the latest developments in iOS game development. It uses iOS, Swift, and GameKit as the development tools.

- *COS 495 – Interactive Gaming Project*
  This is the capstone design course. The objective of this course is to produce a solution to a real–world problem posed to student teams. Sources of projects can be research conducted by faculty, needs of entities inside the university, or needs of the community (business or otherwise) with which Kentucky State University engages. Execution of the project takes all applicable aspects into account, such as budget, legal, safety, security, and other constraints. Students use state–of–the–art tools and methodologies for both software engineering and project management. Along the way, students are introduced to concepts not necessarily covered in other classes, such as Git's integration manager workflow, Agile and Scrum, the creative process, entrepreneurship, and intellectual property protection.

- *COS 536 – Software Engineering* The course introduces students to the software engineering process. After a brief introduction to and critique of the Waterfall method, it introduces students to the family of Agile methods like Scrum, Kanban, XP, and Crystal. Students then use Scrum to plan and implement a project using appropriate modern tools and methods, such as Git for Version Control and team–based workflows, Trello as a virtual Scrum Board, Slack for instant team communications and virtual daily scrums, Planning Poker for estimation, etc.

- *COS 570 – Advanced Architecture*
  This course explores modern big data architecture and programming. Students learn how

to build and run an Ambari/Hadoop cluster on bare metal, built out of decommissioned machines. They use PySpark and Kafka to learn about big data storage and processing.

- *EE 599-002 / CS685-002 / COS 599 – High Performance Computing*
  This course focuses on the real–world tool chain for high performance computing on supercomputer clusters and symmetric multiprocessors. Topics include multithreading with Qt and multiprocessing with MPI. Particular attention is paid to profiling and performance analysis of MPI with MPE. Taught at the University of Kentucky and Kentucky State University

Other Courses Taught

- *COS 100 – Introduction to Computers*
  Introductory survey of the concepts and terminology of computer hardware and software integrated with significant computer laboratory experience. Includes hardware organization, operating systems, and skill development projects in commonly used productivity software.

- *COS 101 – Programming in Visual BASIC*
  An introduction to structured programming using Visual BASIC as a programming language. Focus on problem–solving techniques using basic file handling routines, mathematical computation, string handling, decision and repetition structures.

- *COS 108 – Principles of Computer Science I*
  An introduction to the foundations of Computer Science that incorporates the study of computer architecture, problem solving, algorithm development, data organization, storage, and manipulation with the study of structured programming techniques using C++.

- *COS 275 – Game Programming Foundation I*
  Students analyze and modify existing games written in Python which use the Pygame library. Basic GUI event handling like keyboard and mouse input is covered, as well as drawing, animation, playing back sounds, and sprites. Finally, students design and create a simple game from scratch using Python and Pygame.

- *COS 375 – Game Programming Foundation II*
  Students create games from classic genres like space shoot–em–ups using the Unity3D game engine. Additional emphasis is placed on proper version control to enable teamwork, a topic that is not present in most game development tutorials and textbooks.

- *COS 521 – Web System Design*
  This course focuses on the use of system engineering methodologies for designing, coding, and the deploy- ment of web applications. This course will use current industry web technologies.

- *COS 533 – Cryptography Algorithms*
  This course covers the main topics in cryptography focusing on the application of cryptography rather than its pure mathematical background. Mathematical concepts are introduced as

needed. It covers the most important standardized ciphers as well as state–of–the–art security recommendations and implementation issues.

- *COS 571 – Software Assurance*
  This course prepares students in methods to assure a level of confidence in software systems and develop expertise to assess the security capabilities and resiliency of the software. Topics include the various coverage criterea, input space partitioning, syntax–based testing, and testing tools.

- *CS 215 – Introduction to Program Design, Abstraction and Problem Solving*
  The course covers introductory object–oriented problem solving, design, and programming engineering. Fundamental elements of data structures and algorithm design are addressed. An equally balanced effort is devoted to the three main threads in the course: concepts, programming language skills (C++), and fundamentals of object–oriented programming and software engineering. Taught at the University of Kentucky

- *COS 302 – Operating Systems*
  Modern operating systems are complex and vary wildly in design and implementation. This course reviews the basic concepts as well as selected deeper topics such as memory management, file systems, I/O, and deadlocks. It uses UNIX, Linux, and Android as a Case Study. There are lab exercises to illustrate key concepts as a hands–on component.

- *COS 385 – Computer Graphics*
  This course introduces students to the modern OpenGL pipeline. It covers the history and future of OpenGL. The necessary mathematics such as homogeneous coordinates, model, view, and projection matrices, and quaternions will be introduced. It explains the various buffers to store and pass date to and from OpenGL shaders. Each stage of the pipeline is illustrated by code examples and programming assignments.

- *EE 305 – Electrical Circuits and Electronics*
  Required Course for MSE and ChE Undergraduate Students.
  Introduction to DC and AC circuit analysis methods, power, transistors, and instrumentation. Lecture, homework, and exams. Taught at the University of Kentucky

- *EE 415 – Electromechanics*
  Required Course for ECE Undergraduate Students.
  Study of electric machines and electromechanical systems. Lecture, homework, and exams. Taught at the University of Kentucky

- Teaching Assistant, Fundamentals of Electrical Engineering, Course for undergraduate students. Responsibilities included preparing and presenting exercises, preparing homework solutions, and preparing and grading exams. Exercises taught in Spring 2001, Fall 2000, Spring 2000, Fall 1999, Spring 1999, and Fall 1998.

- Mentor for freshmen in EE. Responsibilities included introduction of freshmen to university life, introduction students to scientific work style, introduction to Linux and TEX/LATEX. Tutorial given in Spring 2001, Fall 2000, Spring 2000, Fall 1999, and Spring 1999.
- Teaching Assistant, Theory of Electromagnetic Fields, Course for undergraduate students. Responsibilities included preparing and presenting exercises, preparing homework solutions, and preparing and grading exams. Exercises taught in Spring 1998, Fall 1997, Spring 1997, Fall 1996, and Spring 1996.
- Teaching Assistant, Lab Class about Signal Theory and Optical Engineering, Course for Graduate Students. Responsibilities included supervision of laboratory work and grading lab assignments. Lab class taught in Spring 1998, Fall 1997, Spring 1997, Fall 1996, and Spring 1996.
- Teaching Assistant, Computational Electromagnetics, Course for Graduate Students. Responsibilities included preparing and presenting exercises, preparing homework solutions, being second examinator for oral exams. Course taught in Fall 1998, Spring 1998, Fall 1997, and Spring 1997.
- Teaching Assistant, Mathematical Methods of Field Theory, Course for Graduate Students. Responsibilities included preparing and presenting exercises, preparing homework solutions, being second examinator for oral exams. Course taught in Fall 1997, Spring 1997, Fall 1996, and Spring 1996.
- Tutor for freshmen in EE. Responsibilities included introduction of freshmen to university life, assist freshmen with homework in Foundations of Electrical Engineering, Physics, and Mathematical Foundations. Tutorial given in Spring 1993, Fall 1992, Spring 1992, Fall 1991, Spring 1991, and Fall 1990.

Research Experience:

- "Beehive Monitoring": (8/2012–present)
  This research focuses on monitoring beehive health through temperature measurement. The goal is to equip beehive cases with 96 temperature sensors to assess hive health especially during the winter months. Data is collected every 30 minutes and handed off via the cell phone network to a database for visualization and anomaly reporting purposes. All hard- and software is open source and it is envisioned that this will be extended to other sensor types to enable citizen scientists to cheaply build and deploy sensor networks for environmental monitoring.

- "Environmental Monitoring and Citizen Science": (2015–present)
  This project is a collaborative effort with Kentucky State University's Land Grant Program. The goal is to develop cheap, versatile sensors to measure and collect environmental data. Systems should be affordable and easy to set up so that citizen scientists who have a need for environmental monitoring can do so without compromising quality or integrity of the collected data. The hope is to improve the density of existing data collection networks as well as to detect pollution and hold polluters accountable via accurate data and a chain of custody that holds up in court.

- "Creativity and Software Development": (7/2008–8/2012)
  Research on creativity in the context of software has mostly focussed on applications to enhance and foster creativity. Software development as a creative process has received little attention so far. This multi–disciplinary research project in collaboration with psychologists and software engineers associated with the Center for Visualization seeks to explore the conditions for and assessment of creativity in the software development process.

- "AVA": (3/2007–present)
  The *Ambient Virtual Assistant* project aims to provide a general infrastructure to integrate massive, wide–area sensor and actuator networks to explore new human–computer interaction paradigms.

- "Audio Rendering": (7/2006–present)
  Development of a novel multipole–based algorithm to render audio in immersive virtual environments.

- "Microphone Array": (9/2004 – present)
  Development of advanced algorithms for audio signal processing using a microphone array and a Linux–based cluster of computers. Applications include microphone beamforming, speaker tracking and recognition, and blind signal separation.

- "MSCAT3D": (8/2003 – 8/2004)
  Work towards the parallelization of a 3D multilevel fast multipole simulation code for electromagnetic scattering on a distributed–memory cluster of Linux computers using the Message Passing Interface (MPI).

- "QSPCFFT": (8/2002 – 8/2004)
  Development of high–order boundary integral methods combined with fast solution techniques (Quadrature–Sampled Pre–Corrected Fast Fourier Transform) for the analysis of printed circuit devices in layered media. The goal of this research is towards the accurate analysis of electrically large printed circuits with error control.

- "MeshTool" (8/2002 – 8/2004)
  MeshTool is a mesh preprocessor written in Java. It is capable of generating high–order meshes

from mesh data output by standard tools such as I–DEAS. It serves as an interface between these tools and the other numerical software used by the Computational Electromagnetics Group at the University of Kentucky, such as the QSPCFFT and MSCAT3D projects.

- "Canonical GTEM–Cell" (10/1997 – 6/2002)
  Project goal is to develop a model for a real GTEM–Cell based on an analytical solution for a tapered TEM–waveguide with elliptical cross section using multipole expansion in sphero–conal coordinates. The combination with numerical methods like Finite Elements or the Method of Moments will allow efficient analysis of the coupling between the cell and a device under test. DFG (Deutsche Forschungsgemeinschaft — German National Research Foundation) funded project. Responsibilities include theoretical formulation of the basic problem suitable for the treatment with a hybrid numerical and spherical–multipole method, evaluation and (if necessary) creation of software tools for the solution of the resulting equations, and supervising graduate and undergraduate students.

- "IT and Network Management" (11/1995 – 6/2002)
  at the Computational Electromagnetics Group, University of Kiel and Dept. of Theoretical Electrical Engineering, University of Bochum. Responsibilities include design and implementation of the high performance computing infrastructure, maintenance and system administration, defining and employing a network security policy, and instruction, assistance, and education of users (students and colleagues).

- "TETlib" (10/1997 – present)
  TETlib is an object–oriented library for field theory scientists with an emphasis on flexibility and quality assurance. It incorporates state of the art software engineering concepts. Joint project of Computational Electromagnetics Group, University of Kiel and Chair of Electromagnetic Theory, University of Kassel. Responsibilities include project management, class design, quality assurance, code repository maintenance, and supervision of graduate and undergraduate students working on the project.

Institutional Service:

- Member, Presidential Search Committee (November 2021 – present)
- Member, Faculty Senate (2016 – present)
- Member, Curriculum Committee, Faculty Senate (2020 – present)
- Member, Professional Concerns Committee, Faculty Senate (2016 – 2018)
- SACSCOC Liaison (2016)

- Member, Strategic Planning Committee (2015 – 2016)
- Member, Advisory Board, Computer Science Academy, Fern Creek High School (2014 – present)

Professional Activities and Service:

- Founder and Counselor, IEEE Student Branch Kentucky State University (2017 – present)
- Membership Development Chair, IEEE Lexington section (2016)
- Chair, IEEE Publication Services and Products Board Strategic Planning Committee (2009 – 2011)
- IEEE Strategic Planning Committee (2009 – 2010)
- IEEE Publication Services and Products Board (2004 – 2010)
- IEEE Transnational Committee (2005, 2006)
- IEEE Ethics and Member Conduct Committee (2004 – 2006)
- IEEE Strategic Planning Committee (2003)
- IEEE Region 8 Student News Editor (1998 – 2002)
- Active founding member of IEEE Student Branch Kiel (2001)
- Reviewer for IEEE AP–S Transactions (2000, 2003)
- IEEE Region 8 Student Representative (1997 – 1999)
- Chairman of IEEE Student Branch Bochum (1995 – 1997)
- Vice Chairman of IEEE Student Branch Bochum (1995)

Departmental Committees and Service at Ruhr–University Bochum:

- Member of University Students' Board (1993 – 1994)
- Member of various appointment committees (1992 – 1994)
- Member of Faculty Board, Dept. of Electrical Engineering (1991 – 1993)
- Member of Students' Board, Dept. of Electrical Engineering (1990 – 1993)

Memberships:

- Member of IEEE (1993 – Present), as well as the IEEE Computer, Signal Processing, and Education Societies

Honors and Awards:

- Outstanding Leadership Award of IEEE Student Branch Bochum (1998)
- Finalist of IEEE Region 8 Student Paper Contest (1996)

Skills:

- Languages: German (native speaker), English (fluent), Norwegian (basics)
- Programming Languages: C++, C, Python, AVR Assembler, Java, Swift, Fortran, C#, Visual Basic, Eiffel, Ada, Modula2, Pascal
- Markup Languages: LaTeX, XML, HTML, XHTML
- Operating Systems: Linux, Solaris, AIX, IRIX, Windows, MacOS X
- Software (Selection): CMake, Git ASP.NET, Matlab, LibreOffice, JACKit, XFDTD, Gimp, Qt, OpenGL, NAG, GSL, MPI, MySQL

List of Publications

Submitted Research Grants

Sponsor:	NASA KY
Investigators:	Christoph Brehm (PI), J. Hannemann, Alexandre Martin, Sean Bailey
Title:	Modeling Transitional and Turbulent Flows with Surface Ablation
Period:	10/2019 to 9/2022
Amount:	$1,050,000
Status:	Funded

Sponsor:	U.S. Department of Education
Investigators:	F. Bigdelli (PI), J. Hannemann, B. Griffis, K. Heavin
Title:	Increasing Minority STEM Retention, Graduation, and Preparedness through a Living Learning Community and Enhanced Experiential Learning at Kentucky State University
Period:	10/2017 to 9/2020
Amount:	$716,236
Status:	Not Funded

Sponsor:	Verizon Foundation
Investigators:	F. Bigdelli (PI), J. Hannemann, B. Griffis, K. Heavin
Title:	Narrowing the Gaps in the STEM Pipeline
Period:	8/2017 to 8/2020
Amount:	$592,850
Status:	Not Funded

Sponsor:	National Science Foundation
Investigators:	M. Qiu (PI), J. Hannemann, S. Cheung
Title:	Multiple Objectives Optimization for CPS – Real-Time, Robust, and Dynamic Scheduling for the
Period:	9/2010 to 8/2013
Amount:	$579,356
Status:	Not Funded

Sponsor:	National Science Foundation
Investigators:	J. Hannemann (PI), C. M. Carswell, J. Hayes
Title:	Exploring the Role of Creativity in Software Engineering
Period:	4/2010 to 3/2012
Amount:	$235,686
Status:	Not Funded

Sponsor:	National Institute of Science and Technology
Investigators:	J. Hannemann (PI), K. Calvert
Title:	DataFlow–Enabled Cluster Computing for Wide–Area Surveillance Networks
Period:	1/2010 to 1/20013
Amount:	$718,586
Status:	Not Funded

Sponsor:	U.S. Army
Investigators:	B. L. Walcott (PI), S. S. Chang, B. Gregory, J. Hannemann, R. Yang
Title:	Large Rapidly Deployable Immersive Visualization for Training and Simulation in Urban Terrains
Period:	7/2008 to 7/2009
Amount:	$910,310
Status:	Funded

Sponsor:	FBI Academy
Investigators:	K. D. Donohue (PI), J. Hannemann
Title:	Assessment of Statistical Array Geometries for Covert Surveillance (continuation)
Period:	10/2008 to 9/2009
Amount:	$80,000
Status:	Funded

Sponsor:	FBI Academy
Investigators:	K. D. Donohue (PI), J. Hannemann
Title:	Assessment of Statistical Array Geometries for Covert Surveillance
Period:	10/2007 to 9/2008
Amount:	$94,740
Status:	Funded

Sponsor:	National Science Foundation
Investigators:	J. Hannemann (PI), K. D. Donohue, I. St. Omer
Title:	IP—Based Microphones for Massive Arrays and Wide—-Area Sensor Networks
Period:	6/2006 to 5/2008
Amount:	$298,106
Status:	Not Funded