John Benhart IV

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Research focus: strategic behavior in mobility markets, agent-based simulation, stochastic optimization, applied microeconomics, agentic AI, open-source toolkits

Education

North Carolina State University, Raleigh, NC
PhD, Operations Research, Aug 2022 – present (expected Spring 2027)
Advisor: Michael G. Kay *GPA*: 3.71
Master of Operations Research, Aug 2022 – Dec 2024

Waynesburg University, Waynesburg, PA
Bachelor of Science in Mathematics, Aug 2020 – Dec 2021 *GPA*: 3.95

Previous coursework: Edinboro University (2017–2019), Grinnell College (2019)

Working Papers

- **Benhart, J.** and Kay, M.G., "Designing Tomorrow's Mobility Markets: Strategic Behavior Across the Ride-Hailing to Autonomous Transition." Doctoral dissertation, in progress. An agent-based simulation of strategic driver behavior in ride-hailing markets, built on New York City TLC high-volume for-hire trip records, examining how platform design choices shape driver decisions and market outcomes across the transition to autonomous vehicles.
- **Benhart, J.**, Kay, M.G., and Kirschenman, W., "Strategic Scaffolding, Not Passive Dependency: How AI Use Relates to Academic Success." Conditionally accepted, ASEE *Computers in Education Journal*, August 2026; revision under review.
- Stanko, M., Pollack, J.M., **Benhart, J.**, Michaelis, T., and Joncas, D., "Case Study: Should I Sell to Private Equity Investors?" *Harvard Business Review*, January–February 2027 (forthcoming).
- Stanko, M.A., Pollack, J.M., and **Benhart, J.**, "Gus Macker: Taking Their Best Shot at Growth." Teaching case, accepted, Ivey Publishing; forthcoming.

Presentations & Conferences

- "Who Sets the Price? Mobility Markets, Now and Next." Poster presentation, General Poster Session, 2026 INFORMS Annual Meeting, Moscone South, San Francisco, CA, November 1, 2026.
  URL: https://meetings.informs.org/wordpress/annual/
- "Who Should Set Ride-Sharing Prices?" Poster submitted to the INFORMS OR/MS Tomorrow Mini Poster Competition 2026 (Ph.D. group), October 15, 2026.
  URL: https://www.informs.org/Publications/OR-MS-Tomorrow/OR-MS-Tomorrow-Mini-Poster-Competition-2026
- "Pull-Based Engineering Education at Scale Using Agentic AI." Talk with M.G. Kay, 2026 NC Triangle Research Regional Exchange (NC Analytics and AI Day), Duke Energy Hall, James B. Hunt Jr. Library, NC State University, Raleigh, NC, September 25, 2026. Hosted by the North Carolina INFORMS chapter and the NC State Edward P. Fitts Department of Industrial and Systems Engineering. Presented the course infrastructure (see PBIC Toolkit, below).
  URL: https://jbenhart44.github.io/talks/nc-analytics-2026/
- "Public Ride-Sharing: Who Should Set the Price?" Dissertation research poster, student poster competition, 2026 NC Triangle Research Regional Exchange (NC Analytics and AI Day), NC State University, Raleigh, NC, September 25, 2026. (with M.G. Kay)
  URL: https://ncanalytics.informs.org/
- Dissertation presentation, 2026 PDMA (Product Development & Management Association) Doctoral Consortium, NC State University, Raleigh, NC, July 27–30, 2026. In-progress dissertation forum mentored by *Journal of Product Innovation Management* editors and innovation-management faculty.
  URL: https://poole.ncsu.edu/2026-pdma-doctoral-consortium/
- "Public Ride-Sharing: Who Should Set the Price?" Poster presentation, INFORMS Analytics+ Conference,

National Harbor, MD, April 12–15, 2026. (with M.G. Kay)
URL: https://meetings.informs.org/wordpress/analytics2026/

- "When AI Becomes a Learning Partner: New Research on Student Success." Invited webinar, Pamukkale University Faculty of Engineering, Turkey, February 26, 2026. Co-presenter with M.G. Kay.
URL: https://mgkay.github.io/ai-ed-webinar/ai-ed-webinar-final.html

Technical Skills

Languages: Julia (Agents.jl), Python, R, Lean 4, C++, Java
Tools: LaTeX, Quarto, Git/GitHub, ArcGIS, Claude Code, VS Code
Methods: Agent-based simulation, mathematical optimization (LP/NLP/SP), stochastic modeling, econometric analysis, natural language processing, formal verification (Lean 4/Mathlib)
AI & LLM: Context engineering, multi-agent verification workflows, prompt design for research automation (Claude, Gemini, GPT)
Data: NYC TLC HVFHV trip records (20M+ rows), Chicago TNP data

Software

Personal site and project portfolio
URL: https://jbenhart44.github.io/

Research Amp Toolkit
An open-source (MIT) suite of 24 Claude Code commands that make AI-assisted research auditable rather than merely fast. The toolkit implements spec-driven development for research workflows: planning, construction, and verification are separate, inspectable steps. Commands grep-verify every cited figure against source documents on disk, run parallel agents so errors surface as disagreements, convene multi-perspective review panels, and carry project state across sessions. Every artifact is plain text, so the full authoring path stays readable in version control.
URL: https://jbenhart44.github.io/toolkit/

Pull-Based Inverse Classroom (PBIC) Toolkit
The course infrastructure behind ISE 754: Logistics Engineering, rebuilt for Fall 2026 and presented at NC Analytics and AI Day. Each student has a private repository in NC State's GitHub Enterprise organization: they pull what the course publishes, push their work as the submission, and receive feedback as commits. Before each lecture, students work examples with an AI coding agent and record what they could not resolve; a pre-class report built from those records sets what the class hour covers. Student-facing material is published through a tool that refuses anything that has not passed a validation pass. Work in progress: piloted in one course, one term.
URL: https://jbenhart44.github.io/pbic-toolkit/

captioner (v0.5.0)
An open-source (MIT) tool built to make accessibility the path of least resistance for instructors. It reads every picture in a PowerPoint deck, writes a short subject-identifying caption beneath it, and authors WCAG screen-reader alt-text for images that have none, preserving any alt-text already written. Captioning a deck by hand is slow enough that it is usually skipped; the tool removes that cost so accessible slides become the default rather than the exception.
URL: https://jbenhart44.github.io/captioner/

Research Experience

Doctoral Dissertation Research 2025 – present
Agent-based model of heterogeneous, strategically behaving drivers in a ride-hailing market, calibrated to real-world NYC TLC mobility data. Examines how platform mechanisms — pricing, matching, and repositioning incentives — shape driver decisions and market outcomes, under a pre-registered protocol that tests each mechanism claim by structural perturbation before it is reported.

AI-Assisted Learning Research 2025 – 2026
Designed and conducted an empirical study of student–AI interaction patterns in an undergraduate optimization course (ISE 361). Analyzed 35 students' LLM dialogues using three validated cognitive frameworks, built statisti-

cal models linking prompt sophistication and verification behavior to exam performance. Conditionally accepted, ASEE *Computers in Education Journal*, August 2026.

Honors & Awards

- Nominee, Salah E. Elmaghraby Distinguished Student Award, NCSU Operations Research (2024, 2025, 2026)
- Finalist, NC State Graduate Student Association Teaching Assistant Award (2026)
- NCSU College of Engineering Dean's Doctoral Fellowship (2022–2023)
- University Graduate Fellowship (2022–2023)
- Dean's List: Edinboro University (2017–2019), Grinnell College (2019), Waynesburg University (2020–2021)
- Scholar Athlete Award, Edinboro University (2018, 2019)

Teaching Experience

Teaching Assistant, ISE 754: Logistics Engineering Fall 2026
Graduate course rebuilt for Fall 2026 around the shift AI has made in engineering: producing a result is now cheap, so the course teaches judgment, meaning proposing the right model and deciding whether a result can be trusted. Students read each lecture before class with an AI agent that answers their own questions, and the class hour is built from what they could not resolve. Designed and built all of the course infrastructure: a private GitHub Enterprise repository for each student, the AI-agent skills students run to review, submit and receive feedback, the pre-class reports that set each class hour, and the gated tools that publish course material and build the in-class assessments. Also runs the in-class assessments and returns feedback on submitted work.

Course page URL: https://mgkay.github.io/ise754/

Toolkit page URL: https://jbenhart44.github.io/pbic-toolkit/

Course Development, EM 589: Responsible AI in Multi-Agent Systems Summer 2026
Developed the materials for a new graduate seminar on governance, emergence, and control in multi-agent AI systems, first offered Spring 2027 — session decks and reading sets built from a curated research corpus. Also developed course materials for future offerings of EM 534.

Teaching Assistant, EM 534: Artificial Intelligence for Engineering Managers Spring 2026
Graduate course on machine learning and AI applications in engineering management decisions.

Teaching Assistant, ISE 361: Deterministic Models in Industrial Engineering Fall 2025
Undergraduate course covering linear programming, network optimization, and deterministic modeling.

Instructor/Tutor, Upward Bound Math & Science, Indiana, PA Summer 2021
Taught high school mathematics and physics (algebra, geometry, precalculus) in a federally funded college-preparatory program.

Service

Invited Student Panelist, College of Engineering AI Mini-Summit, NC State University October 19, 2026
One of five undergraduate and graduate students on the panel that opened the summit, held at Talley Student Center, Raleigh, NC. Convened by Interim Dean Veena Misra, the summit brought department heads and associate and assistant deans together to discuss how AI should shape engineering education, research and the university's land-grant mission. Also took part in two breakout discussions, on AI infrastructure and shared capabilities and on AI and the student experience.

Selected Graduate Coursework

Queues and Stochastic Service Systems (ISE 761), Stochastic Programming (ISE 791), Nonlinear Programming (OR 706), Stochastic Models (ISE 560, 760), Logistics Engineering (ISE 754), Production Planning and Inventory (ISE 723), Microeconomics I–II (ECG 701–702), Mathematical Economics (ECG 765), Operations Management seminars (BUS 790, with H.S. Heese and T. Kraft).

Professional Memberships

INFORMS (Institute for Operations Research and the Management Sciences)