

Economics in the Age of Big Data

Econ 337 • Spring 2026

Last edited: April 22, 2026

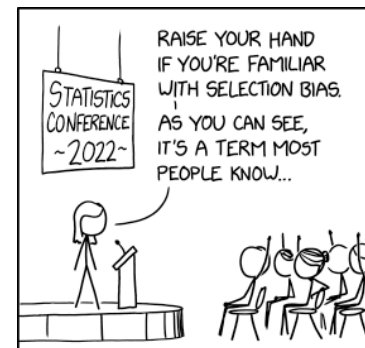
Course page & materials

Instructor	Enes Işık
Email	eisik[at]umass.edu
Venue	Mon & Wed, 17:30–18:45, Machmer Hall, room E-33
Office hours	In person, Gordon Hall , room 108, by appointment
Book an appointment	Click here to make an appointment (book at least 4 hours before it starts)
Semester	January 29 – May 8, 2026 (24 class meetings)
Final grades	Due by 11:59 p.m., May 17
Textbook	Not required. Course materials will be provided by the instructor.

Course Description and Goals

This course gives students ideas, analysis skills, and practical tools to judge data-based knowledge carefully and to create it themselves. Students will need these skills to **take part in public debate**—and to understand the xkcd joke by Randall Munroe shown on the right!

- First, we look at how scientists and social researchers create knowledge, and how their methods often differ. This leads to two big questions: **what makes someone an expert, and how can ideology affect research that uses data?**
- Students will develop the ability to evaluate numbers, statistics, and visually presented information so that they can **critically engage with data-driven statements in public debates**. This helps them examine how the quality of evidence can affect public discourse.
- Students will apply their new analytical skills to some of the largest social problems: **income inequality, growth, climate change, and gender inequality**. To do this, students will learn to program in R and use it to analyze data in a way that other researchers can critically review and replicate.
- By the end of the course, students should be able to evaluate factual claims critically, explain and communicate evidence clearly, and **take a more active part in democratic discussions where data and experts shape group decisions**.



by Randall Munroe, [xkcd](#)

Expectations

- **Readings and mini-quizzes.** Students are expected to complete all required readings before each class session. A brief in-person quiz on the assigned material will be given at the start of class.
- **Midterm exam.** After Week 7, students will take an in-class midterm exam covering Parts I and II of the course.
- **Group presentation.** With a peer, students will present selected research papers and apply their critical evaluation skills to them (see the [general guidelines for presentations](#)).
- **Problem sets.** Three problem sets will be assigned during Part III to help students apply their coding skills to real-world questions, using big data provided by the instructor.
- **Final project.** At the end of the semester, students will submit a final project that uses big data in R to analyze a real-world economic issue (see [tips for the final project](#)).
- **Participation.** In addition to these assignments, students are expected to engage actively in class discussions.

All assignment details can be found on the [Assignments page in Canvas](#).

Grading

Breakdown

Mini-quizzes (best 15 of 18)	15%
Midterm exam	25%
Problem sets (3)	15%
Group presentation	20%
Final project	25%
<i>Bonus: in-class activities</i>	<i>up to 10%</i>

Scale

A	93–100%
A-	90–92%
B+	87–89%
B	83–86%
C+	77–79%

Course at a Glance

#	Date	Topic	Milestone
<i>I · Theory of Knowledge</i>			
1	Mon 02/02	Introduction	
2	Wed 02/04	Knowledge in science and social research	Quiz 2
3	Mon 02/09	Ideology	Quiz 3
4	Wed 02/11	Expertise and conflict of interest	Quiz 4
5	Wed 02/18	Political economy of knowledge in media	Quiz 5

#	Date	Topic	Milestone
<i>II · Critical Evaluation of Data-Driven Knowledge</i>			
6	Thu 02/19	Misrepresenting numbers and visuals	Quiz 6
7	Mon 02/23	Probability and Bayes' rule	Quiz 7
8	Wed 02/25	Correlation, causality, significance	Quiz 8
9	Mon 03/02	LLMs, reasoning and agentic models	Quiz 9
10	Wed 03/04	Replicability and reproducibility	Quiz 10
11A	Mon 03/09	Upcoming assignments and schedule	
11B	Wed 03/11	Midterm exam review session	
11C	Mon 03/23	Midterm exam	Midterm exam
<i>III · Applications: Producing Knowledge in the Data Age</i>			
12	Wed 03/25	R syntax and reproducible workflow	
13	Mon 03/30	Matrices and data.frames	Quiz 11
14	Wed 04/01	Boolean operations, importing data	
15	Mon 04/06	Functions to transform data (1)	
16	Wed 04/08	Functions to transform data (2)	Quiz 12
17	Mon 04/13	Cleaning, pivoting, and joining data	Quiz 13
18	Wed 04/15	Data visualization	
19	Wed 04/22	Communicating your results	Quiz 14; PS 1 assigned
20	Fri 04/24	Application: Well-being	Quiz 15; presentations
21	Mon 04/27	Application: Climate change	Quiz 16; presentations; PS 1 due; PS 2 assigned
22	Wed 04/29	Application: Inequality	Quiz 17; presentations
23	Mon 05/04	Application: Women's employment	Quiz 18; presentations; PS 2 due; PS 3 assigned
24	Wed 05/06	Looking forward	PS 3 due Fri 05/08
—	05/13	Final project	Final project due

Course Outline

All course materials are available on the Modules page in Canvas.

Part I · Theory of Knowledge

#1 Mon 02/02 Introduction

#2 Wed 02/04 The nature of knowledge in science and social research

[Quiz 2]

- Levitin, D. J. (2019). *A Field Guide to Lies: Critical Thinking with Statistics and the Scientific Method*. Penguin, Part 3, “How Science Works” to “Knowing What You Don’t Know,” pp. 181–216.
 - *Optional*: Audi, R. (2010). *Epistemology: A Contemporary Introduction to the Theory of Knowledge*. Routledge, Ch. 12, “Scientific, moral, and religious knowledge,” pp. 298–331.
 - *Optional*: Mankiw, N. G. (2021). *Principles of Economics* (9th ed.). Cengage Learning, Ch. 2, “Thinking like an economist,” pp. 18–33.
 - *Optional*: Chang, H.-J. (2014). *Economics: The User’s Guide*. Bloomsbury, Ch. 1, “Life, the Universe and Everything,” pp. 13–23.
 - *Optional*: Bryman, A. (2016). *Social Research Methods*. Oxford University Press, Chs. 1–2, “The nature and process of social research” & “Social research strategies,” pp. 3–42.
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#3 Mon 02/09 Ideology

[Quiz 3]

- Zalta, E. (Ed.) (2012). “Antonio Gramsci,” in *Stanford Encyclopedia of Philosophy*, Section 3, “Prison Writings,” pp. 8–17.
 - Elster, J. (1986). *An Introduction to Karl Marx*. Cambridge University Press, Ch. 9, “The Marxist Critique of Ideology,” pp. 168–184.
 - Piketty, T. (2020). *Capital and Ideology*. Harvard University Press, Ch. 1: “What is an ideology,” “Taking ideology seriously,” and “Collective learning and social sciences,” pp. 3–12.
 - *Optional*: Arendt, H. (1953). Ideology and terror: A novel form of government. *The Review of Politics*, 15(3), 303–327.
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#4 Wed 02/11 Expertise and conflict of interest

[Quiz 4]

- Levitin, D. J. (2019). *A Field Guide to Lies: Critical Thinking with Statistics and the Scientific Method*. Penguin, Part 2, “Identifying Expertise,” pp. 129–152.
- *Watch*: *Inside Job* (2010), minutes 1:22:19–1:33:34.
- *Optional*: Rodrik, D. (2015). *Economics Rules: The Rights and Wrongs of the Dismal Science*. W. W. Norton, Ch. 1, “The use and misuse of ideas,” pp. 1–8.

- *Optional:* Carrick-Hagenbarth, J., & Epstein, G. A. (2012). Dangerous interconnectedness: Economists' conflicts of interest, ideology and financial crisis. *Cambridge Journal of Economics*, 36(1), 43–63.
- *Optional:* Javdani, M., & Chang, H.-J. (2023). Who said or what said? Estimating ideological bias in views among economists. *Cambridge Journal of Economics*, 47(2), 309–339.

#5 Wed 02/18 Political economy of knowledge in media

[Quiz 5]

- Herman, E. S., & Chomsky, N. (1988/2002). *Manufacturing Consent*. Knopf Doubleday, Ch. 1, “A propaganda model,” pp. 1–37.
- *Optional:* Cagé, J., & Dewitte, E. (2021). It Takes Money to Make MPs: New Evidence from 150 Years of British Campaign Spending, pp. 1–57.
- *Optional:* Chmel, K., et al. (2025). How social media creators shape mass politics: A field experiment during the 2024 US elections.

Part II · Critical Evaluation of Data-Driven Knowledge

#6 Thu 02/19 Misrepresentation of numeric and visual information

[Quiz 6]

- Levitin, D. J. (2019). *A Field Guide to Lies: Critical Thinking with Statistics and the Scientific Method*. Penguin, Part 1, “Plausibility” to “How Numbers are Collected,” pp. 3–97.
- *Optional skim:* Huff, D. (2023). *How to Lie with Statistics*. Penguin Press.
- *Optional skim:* Tufte, E. R. (1983). *The Visual Display of Quantitative Information*, Ch. 1.

#7 Mon 02/23 Probability, conditional probability, and Bayes' rule

[Quiz 7]

- Levitin, D. J. (2019). *A Field Guide to Lies: Critical Thinking with Statistics and the Scientific Method*. Penguin, Part 1, “Probabilities,” pp. 97–123.
- *Optional:* Stock, J. H., & Watson, M. W. (2003). *Introduction to Econometrics*. Pearson, Ch. 2, “Review of Probability.”

#8 Wed 02/25 Correlations, causal inference, and statistical significance

[Quiz 8]

- Levitin, D. J. (2019). *A Field Guide to Lies: Critical Thinking with Statistics and the Scientific Method*. Penguin, Part 2, “Overlooked, Undervalued Alternative Explanations,” pp. 152–168.

- Cunningham, S. (2021). *Causal Inference: The Mixtape*. Yale University Press, Ch. 1, “Introduction,” pp. 1–14.
- *Optional*: “Our obsession with statistical significance is ruining science” (*Reason*, 2025).
- *Optional*: Amrhein, V., Greenland, S., & McShane, B. (2019). Scientists rise up against statistical significance. *Nature*, 567(7748), 305–307.

#9 Mon 03/02 Large language models, reasoning and agentic models

[Quiz 9]

- Bender, E. M., Gebru, T., McMillan-Major, A., & Shmitchell, S. (2021). On the dangers of stochastic parrots: Can language models be too big? In *Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency* (pp. 610–623).
- *Optional*: Korinek, A. (2024). Generative AI for economic research: Use cases and implications for economists. *Journal of Economic Literature*, 61(4), 1–38.
- *Optional*: Korinek, A. (2025). “AI Agents for Economic Research: August 2025 Update to ‘Generative AI for Economic Research: Use Cases and Implications for Economists.’”

#10 Wed 03/04 Replicability and reproducibility of scholarly research and experiments

[Quiz 10]

- Dreber, A., & Johannesson, M. (2025). A framework for evaluating reproducibility and replicability in economics. *Economic Inquiry*, 63(2), 338–356.
- *Optional*: Nosek, B. A., et al. (2015). Promoting an open research culture. *Science*, 348(6242), 1422–1425.
- *Optional*: Ankel-Peters, J., Fiala, N., & Neubauer, F. (2025). Is economics self-correcting? Replications in the *American Economic Review*. *Economic Inquiry*, 63(2), 463–485.

#11A Mon 03/09 On upcoming assignments and schedule

#11B Wed 03/11 Midterm exam review session

#11C Mon 03/23 Midterm exam

In-class midterm exam covering Parts I and II.

Part III · Applications: Producing Knowledge in the Data Age

#12 **Wed 03/25** R syntax and reproducible workflow in R and RStudio

- *Optional:* Wickham, H., & Grolemund, G. (2023). *R for Data Science: Import, Tidy, Transform, Visualize, and Model Data*. O'Reilly Media, Ch. 2 “Workflow: basics,” Ch. 4 “Workflow: code style,” Ch. 6 “Workflow: scripts and projects,” Ch. 27 “A field guide to base R.”
- *Optional:* Lecture notes.

#13 **Mon 03/30** Matrices and data.frames

[Quiz 11]

- *Optional:* Lecture notes.

#14 **Wed 04/01** Boolean operations and importing data.frames

- *Optional:* Lecture notes.

#15 **Mon 04/06** Functions to transform data (1)

- *Optional:* Lecture notes.

#16 **Wed 04/08** Functions to transform data (2)

[Quiz 12]

- *Optional:* Wickham, H., & Grolemund, G. (2023). *R for Data Science: Import, Tidy, Transform, Visualize, and Model Data*. O'Reilly Media, Chs. 12–19, “Transform.”
- *Optional:* Lecture notes.

#17 **Mon 04/13** Cleaning, pivoting, and joining data

[Quiz 13]

- *Optional:* Lecture notes.

#18 Wed 04/15 Data visualization

- Chang, H.-J. (2012). *23 Things They Don't Tell You about Capitalism*. Bloomsbury, Ch. 10, “The US doesn’t have the highest living standard in the world,” pp. 102–112.
 - *Optional*: Wickham, H., & Grolemund, G. (2023). *R for Data Science: Import, Tidy, Transform, Visualize, and Model Data*. O’Reilly Media, Chs. 28–29, “Quarto” and “Quarto formats.”
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#19 Wed 04/22 Communicating your results**[Quiz 14]**

- *Optional*: Lecture notes.

Problem set #1 assigned. [Problem set #1](#)

#20 Fri 04/24 Application: How economists measure and analyze well-being using data**[Quiz 15]**

- The CORE Econ Team (2025). *The Economy 1.0*, “Measuring income and living standards.”
- The CORE Econ Team (2025). *Insights*: “Public debt.”

Class presentations on:

- Reinhart, C. M., & Rogoff, K. S. (2010). Growth in a Time of Debt. *American Economic Review*, 100(2), 573–578.
- Herndon, T., Ash, M., & Pollin, R. (2014). Does high public debt consistently stifle economic growth? A critique of Reinhart and Rogoff. *Cambridge Journal of Economics*, 38(2), 257–279.

Tips: [Reinhart & Rogoff \(2010\) discussants](#) · [Herndon, Ash & Pollin \(2014\) discussants](#)

#21 Mon 04/27 Application: What data reveal about climate change**[Quiz 16]**

- Masson-Delmotte, V., Zhai, P., Pirani, A., et al. (2023). Summary for policymakers. In *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report of the IPCC, pp. 3–32.
- Mastrandrea, M. D., Field, C. B., Stocker, T. F., et al. (2010). *Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties*, pp. 1–6.

Class presentations on:

- Oreskes, N., & Conway, E. M. (2011). *Merchants of Doubt*. Bloomsbury, Ch. 3, “Sowing the Seeds of Doubt: Acid Rain,” pp. 66–107.
- Oreskes, N., & Conway, E. M. (2011). *Merchants of Doubt*. Bloomsbury, Ch. 6, “The Denial of Global Warming,” pp. 169–216.

Tips: Oreskes & Conway Ch. 3 discussants · Oreskes & Conway Ch. 6 discussants

Problem set #1 due. Problem set #2 assigned: Problem set #2

#22 Wed 04/29 How economists measure and examine inequality using big data

[Quiz 17]

- Chancel, L., Piketty, T., Saez, E., & Zucman, G. (Eds.). (2026). *World Inequality Report 2026*. Harvard University Press.
- *Watch:* video (YouTube).
- *Read:* “Inequality is a global problem that needs a global answer, say eminent economists” (*Politico Europe*).

Class presentations on:

- Mankiw, N. G. (2013). Defending the one percent. *Journal of Economic Perspectives*, 27(3), 21–34.
- Chancel, L., & Piketty, T. (2021). Global income inequality, 1820–2020: The persistence and mutation of extreme inequality. *Journal of the European Economic Association*, 19(6), 3025–3062.

Tips: Mankiw (2013) discussants · Chancel & Piketty (2021) discussants

#23 Mon 05/04 Application: What data reveal about women’s employment

[Quiz 18]

- Blau, F. D. (2025). Gender inequality in the labor market: Continuing progress? *ILR Review*, 78(2), 275–303.

Class presentations on:

- Waring, M. (1988). *If Women Counted: A New Feminist Economics*. Harper, Chs. 3–4, “The Boundary of Conception: How the UNSNA Makes Women Invisible” and “Nothing Sexist Here: Statisticians in Action,” pp. 74–11.
- Folbre, N. (2006). Measuring care: Gender, empowerment, and the care economy. *Journal of Human Development*, 7(2), 183–199.

Tips: [Waring \(1988\) discussants](#) · [Folbre \(2006\) discussants](#)

Problem set #2 due. **Problem set #3 assigned:** [Problem set #3](#)

#24 Wed 05/06 Looking forward

- *Optional:* Lang, K. (2025). How credible is the credibility revolution? *Journal of Labor Economics*, 43(2), 635–663.
- *Optional:* Bowles, S., Edwards, R., & Roosevelt, F. (2005). *Understanding Capitalism*. Oxford University Press, Ch. 20, “Future of Capitalism,” pp. 527–551.
- *Optional:* Piketty, T. (2021). *Time for Socialism: Dispatches from a World on Fire, 2016–2021*. Yale University Press.
- *Optional:* Naidu, S., Rodrik, D., & Zucman, G. (2020). Economics after neoliberalism: Introducing the EfIP project. *AEA Papers and Proceedings*, 110, 366–371.

Problem set #3 due Friday, 05/08.

— 05/13 Submission of final project on inflation and economic instability

Final project due. [Tips for final project](#)

Course Policies

Resources: [Title IX / Equal Opportunity & Access Office](#) · [Dean of Students Office](#) · [Disability Services](#)

Presentations

Please follow the [general guidelines for presentations](#).

Accommodations

UMass is committed to ensuring that all students have the opportunity to learn and succeed in their studies. Students who have a noted disability on file with [Disability Services](#) may be eligible to receive accommodations for coursework or assignments. Please be sure to notify the instructor early in the semester so we can create an appropriate learning plan together. All students are encouraged to speak to me about what might make learning for this class more accessible to them even if you do not have a disability on file.

Academic Honesty

Academic honesty is essential to this class. Cheating and academic dishonesty of any kind are strictly prohibited and students found guilty of such misconduct will be penalized. Students are expected to know and understand the policies regarding academic honesty. In the case that a policy is unclear to you, please reach out to the instructor for clarification. If you see another student engaging in dishonest activity please report it to the instructor immediately.

Resource Statement

If you find yourself in need of access to food or a safe, stable living environment, please inform the [Dean of Students Office](#) so they can help you find resources in the community. If you feel comfortable doing so, you may also inform the instructor, who may be able to connect you with resources as well.

Late Assignments

Any assignments turned in late will be penalized by a percentage grade reduction for each day they are late. If you encounter any unexpected circumstances that prevent you from completing an assignment on time, you may request an extension. This request must be received before the due date in order to be considered. If your request is approved, you will be given a new due date.

Guidance on Generative Artificial Intelligence

You may use ChatGPT or other AI software to aid you in your coursework, but any assignments turned in must be your own original work. You may not turn in work that was done entirely by an AI or another person. If you have questions about how much use of AI, if any, is permitted for an assignment please consult the instructor.