Game Theory

Welcome lecture

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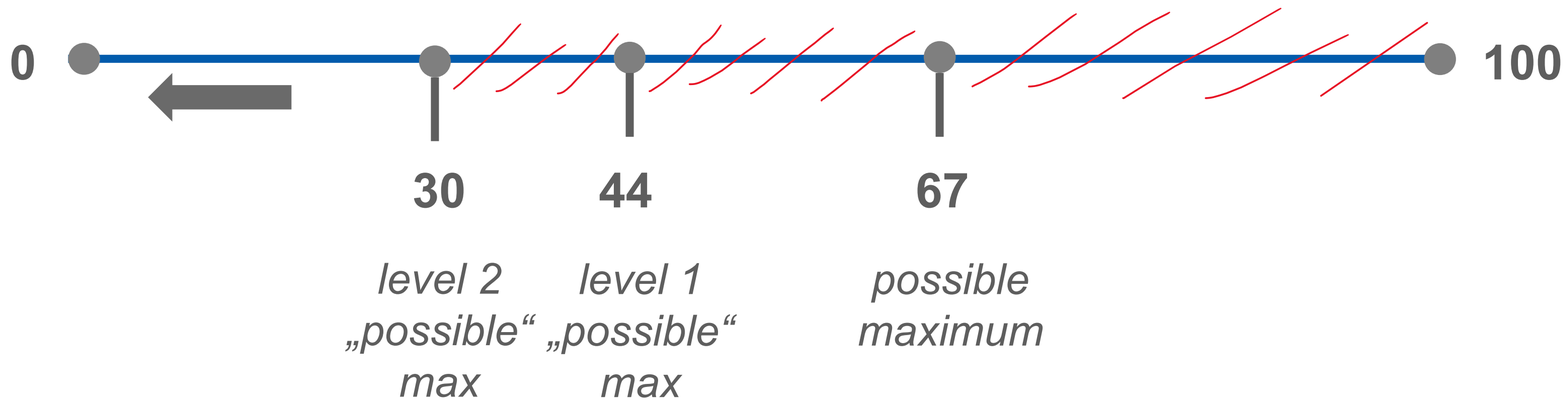
Learning by Doing

- Guess an integer from the interval 0 to 100.
- The winner is the student whose guess is closest to 2/3 times the average of the guesses of all students ...
- … and gets 10€ (for real!).
- If there are multiple winners, the price will be shared equally.

The game-theoretical solution

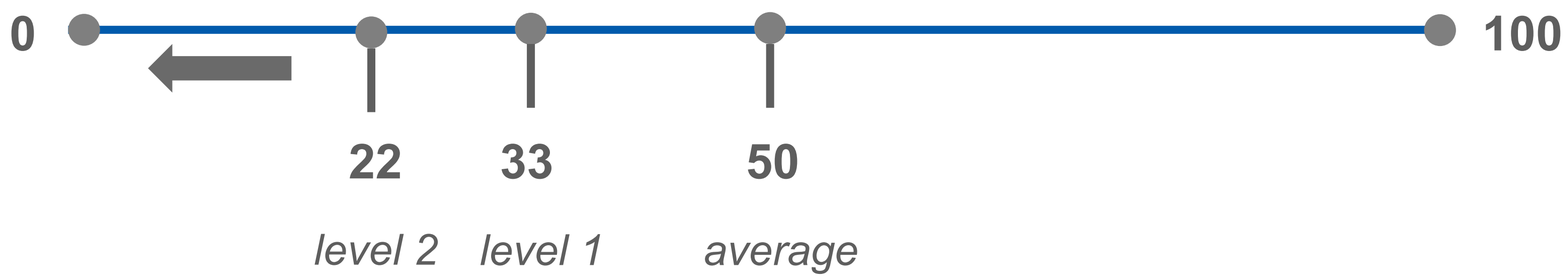
- Dominated strategies
- Iterative elimination of dominated strategies → theoretic equilibrium of 0



And what happens in experiments

It depends on how you think others will behave…

- Theoretically, equilibrium → 0.
- Empirically, average is not 0 → e.g., 23.07 in Camerer (2003).



Who am I?

- **Assistant professor, Economics Department**
  - since September 2024
- **M.Sc. in Economics Engineering**
  - Karlsruhe Institute of Technology (KIT)
  - University of Washington + Erasmus in Spain
  - Philips Group Negotiation (Amsterdam)
- **PhD in Economics (joint doctorate)**
  - University of Amsterdam
  - Ca’ Foscari University of Venice
- **Post-Doc**
  - Bocconi University (Milan)

Who am I?

- **Courses**
  - Experimental Economics (Bachelor & Master/PhD)
  - Game Theory (Master)
- **Research interests**
  - Behavioral & Experimental Economics
  - Decision-making & Consumer behavior
    - financial investments
    - subscription/insurance decisions
    - health decisions: vaccinations
- **For more details:** https://frieder-neunhoeffer.com

What is game theory?

A few formal definitions

- Branch of mathematics
- Studies strategic interactions between decision-makers (players)

→ contrast to decision theory

→ Framework to model situations where the outcome of any player does not only depend on her own decision but also on the decisions of other players

Applied examples

- *The Dark Knight* (2008) – ferry dilemma

- Public transport dilemma

Brief history of game theory

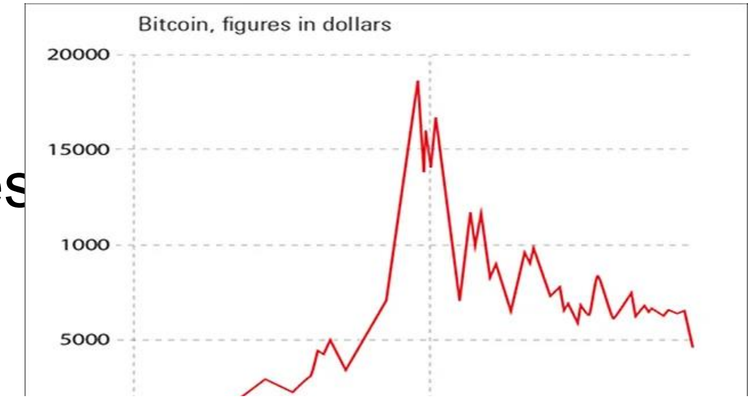
- Military strategies
  - Sun Tzu (5th century BC): *The art of war*
  - Carl von Clausewitz: *On war* (1832)
- Von Neumann & Morgenstern (1944)
  - Expected utility theory → foundation of modern game theory
- John Nash (1951)
  - Nash equilibrium → solution concept
  - Nobel prize in Economics (1994) → as mathematician!!!
  - Movie: *A beautiful mind (2001)*
- Game theory → applied in Experiments

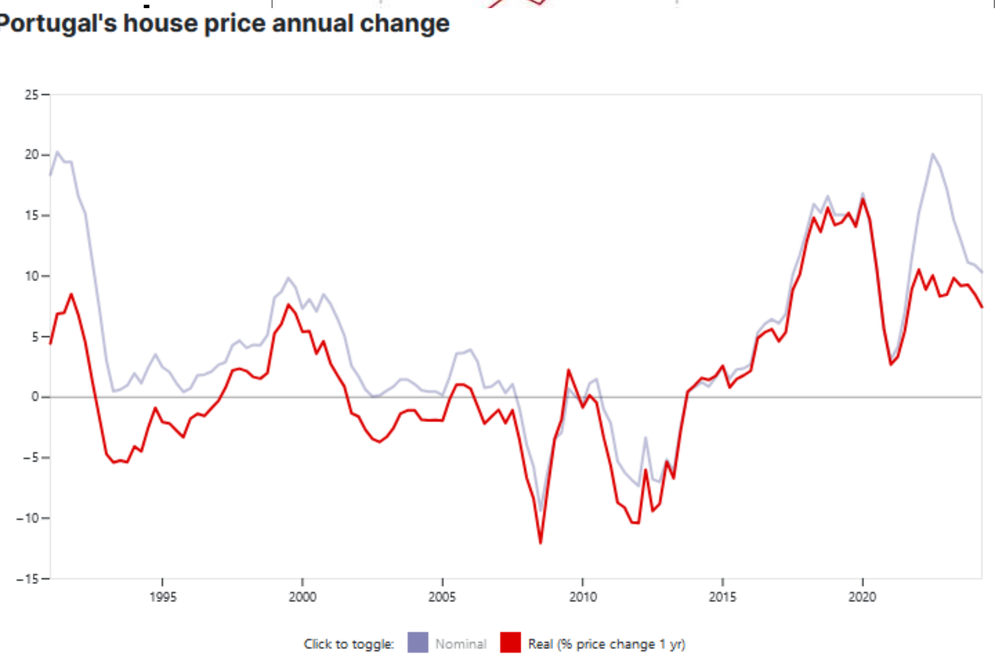
Why is this Economics?

- Guessing game (Nagel, 1995) ← Keynesian beauty contest (Keynes, 1936)

Why is this Economics?

- Guessing game (Nagel, 1995) ← Keynesian beauty contes
  → *k-level thinking*
- Used to explain financial markets → bubbles and
- <u>Idea:</u> higher profit from investing in stocks others will buy than in fundamentally most valuable stoc
- Problem → right timing: *leave before it crashes*





Schedule

- Lecture 1: Expected utility — economic decision under uncertainty
- Lecture 2: Static games with complete information – the normal form
- Lecture 3: Relations between strategies – dominance and best replies
- Lecture 4: Nash equilibrium – a definition
- Lecture 5: Nash equilibrium (continuation)
- Lecture 6: The structure of the set of Nash equilibria in a game
- Lecture 7: Existence of Nash equilibria in pure strategies in supermodular games
- Lecture 8: Dynamic games and perfect equilibrium
- Lecture 9: Games of incomplete information – the Bayesian-Nash equilibrium

Grading policy

• Class attendance + participation	**10%**
• Final Exam	**90%**
	100%

Learning sources & how to prepare for class

- **FENIX**
  - Class announcements, lecture slides, and problem sets will be posted on FENIX prior to classes.
  - Make sure you check the course website regularly for updated information about the course.
- **Lecture material**
  - Lecture slides constitute examinable material.
- **General text books (not compulsory)**
  - Tadelis, S. (2013). *Game Theory: An introduction,* Princeton University Press.
  - Mas-Collell, A. & Whinston, M. & Green, J. (1995). *Microeconomic theory*, Oxford University Press.
  - Varian, H. (2014). *Intermediate microeconomics with calculus: a modern approach,* WW Norton & Company

Course code of honor

- Electronic devices (laptop/smartphone)

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Check for updates

The Impact of Smartphone Use on Course Comprehension and Psychological Well-Being in the College Classroom

Melissa Huey[1] · David Giguere[2]

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Abstract
The present study explores the impact of smartphone use on course comprehension and the psychological well-being of students during class. Students in four classes ($N = 106$) were assigned to either a control group or quasi-experimental group. Students in the quasi-experimental group were instructed to place their smartphones on the front desk upon entering the class, while the control group had no instructions regarding smartphone use. Students filled out a brief survey about their course comprehension and psychological state (anxiety and mindfulness) during class. Results indicated that students whose smartphones were physically removed during class had higher levels of course comprehension, lower levels of anxiety, and higher levels of mindfulness than the control group. This study gives a comprehensive picture of the impact of smartphone use on students' psychological well-being in the classroom. The findings can aide educators in curriculum design that reduces technology use in order to improve the student learning experience.

Keywords Smartphones · College students · Course comprehension · Learning · Student mindfulness · Student anxiety

The smartphone has become an integral part of society, including our educational and professional lives. Smartphone use is highest amongst people aged 18–29, and therefore is highly represented in the University setting. Statistics show that 97% of students own a smartphone (Pew Research Center, 2021), and 95% of students bring that smartphone to class (Tindell & Bohlander, 2012). Given the frequency of smartphone use in the college student population, it is not surprising ample research

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On or off task: The negative influence of laptops on neighboring students' learning depends on how they are used

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ARTICLE INFO

Keywords:
Adult learning
Improving classroom teaching
Media in education
Pedagogical issues
Multitasking

ABSTRACT

Previous research indicates that students' classroom laptop use distracts their peers and negatively affects the learning of their neighbors. The purpose of this study was to determine whether the types of activities that laptop users undertake (i.e., on-task note-taking versus off-task Web browsing) differentially affect their neighbors' learning. Sixty-two participants listened to a lecture in a classroom setting while seated either in front of, to the left of, to the right of, or behind a laptop-using confederate who switched from taking notes on their computer to browsing the internet at specified points during the lecture. Participants performed better on post-lecture quiz questions that asked about material covered while the confederate was on task than those that asked about material covered while the confederate was off task. This effect was comparable regardless of where participants sat in relation to the confederate. Our results support previous evidence that students' laptop use distracts neighboring students and expands on prior literature by further demonstrating that the types of activities that laptop users engage in during lecture matters for all neighboring students' comprehension of material.

1. Introduction

As the use of technology becomes more prevalent in teens and young adults (Pew Research Center, 2015; Pew Research Center, 2018), it also becomes more prevalent within educational settings (Gray, Thomas, & Lewis, 2010; U.S. Department of Education, 2000a;2000b). Although many instructors and researchers praise technology as one way to enhance student engagement within classrooms (e.g., Debevec, Shih, & Kashyap, 2006; Driver, 2002; Finn & Inman, 2004; Hall & Elliott, 2003; Hyden, 2005; Lindorth & Bergquist, 2010; McVay, Snyder, & Graetz, 2005; Weaver & Nilson, 2005), ample evidence shows that laptops can also distract students and decrease their in-class learning (Barak, Lipson, & Lerman, 2006; Bugeja, 2007; Driver, 2002; Finn & Inman, 2004; Hembrooke & Gay, 2003; Kraushaar & Novak, 2010; Sana, Weston, & Cepeda, 2013; Wood et al., 2012; Wurst, Smarkola, & Gaffney, 2008). This is perhaps not surprising given a long-standing literature that has documented the limits of attentional resources and the consequences of exceeding them. Posner (1982), for example, applied this idea to the ability to attend to and process material in the specific context of encoding and later retrieval of new information. Both prior and subsequent to Posner's study, many researchers have documented the limitations of our attentional resources (e.g., Konig, Buhner, & Murling, 2005; Navon & Gopher, 1979; Pashler, 1994; Wickens, 2002) as well as the decreases in learning and memory that result when those limits are surpassed in distracting environments (see, for example, Broadbent, 1958; Rubinstein, Meyer, & Evans, 2001; Tulving & Thomson, 1973).

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0360-1315/

Course code of honor

- Electronic devices (laptop/smartphone)
- Be on time
- Cheating (e.g.,copying during exam)
- Plagiarism (famous cases)

Elizabeth Holmes
(blood testing fraud)

Ruja Ignatova (cryptocurrency fraud)

Bernie Madoff (Ponzi scheme)

~~Dr.~~ Karl-Theodor zu Guttenberg
(fromer German Minister of Defence)

Course code of honor

- Electronic devices (laptop/smartphone)
- Be on time
- Cheating (e.g.,copying during exam)
- Plagiarism (famous cases)
- GenAI (e.g., ChatbotGPT) → use responsibly

Q&A and your feedback

- **For any questions or feedback you may have on the material or the course in general, you are welcome to**
  - ask during class
  - use the discussion feature on FENIX
  - write an email to me: neunhoeffer@iseg.ulisboa.pt
  - or come to my office during office hours