compsimf20em

Számítógépes szimulációk

Computer simulations

https://icsabai.github.io/simulationsMsc/

Course outline and requirements
2025

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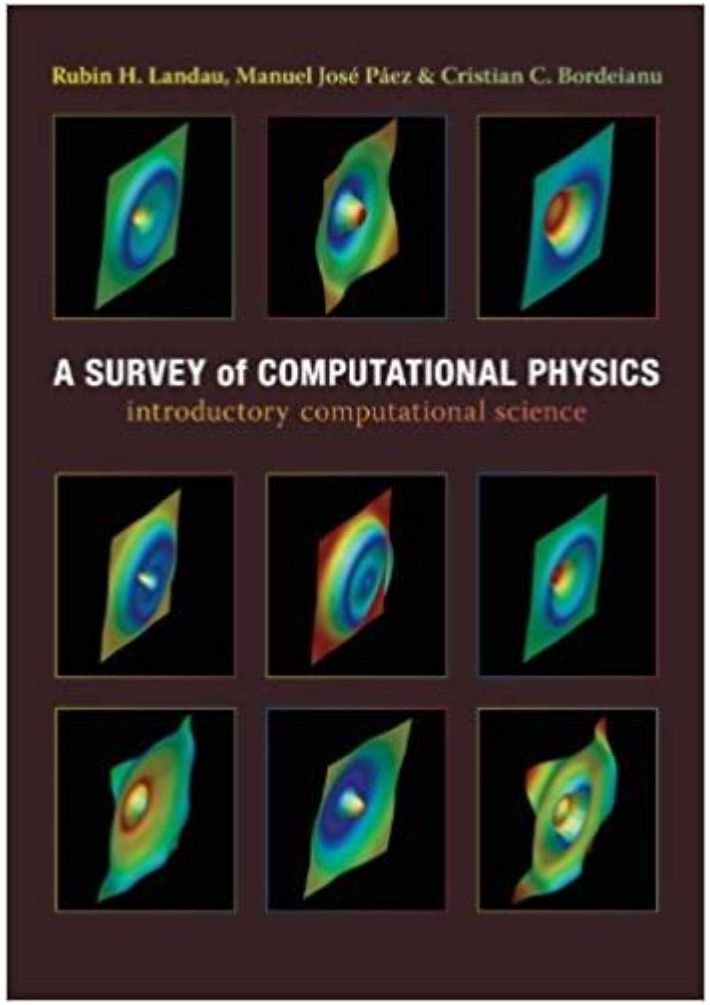
- **Course**: Computer simulations, compsimf20em,
  Tuedays 14:15-15:45, ELTE TTK, 3.67 Békésy György lecture room
  - Only first 4 lectures in person, then consultations + TEAMS presentations
  - See requirements at: https://icsabai.github.io/simulationsMsc/#reqs
- **Lecturer:** István Csabai, office: 5.102
- **Teaching assistants:** Orsolya Pipek, Balázs Pál, Zoltán Kovács
  - Project follow up, evaluation + **consultations. Encouraged!**
- **Contact:** szamszimmsc(at)gmail.com
  - Questions, requests, etc. concerning the class. **Consultation requests**
  - Special problems only: istvan.csabai(at)ttk.elte.hu
- ELTE **Teams channel**: Crs 25-26-1 compsimf20em 1
- **Web page:** https://icsabai.github.io/simulationsMsc/

Goals:

1. Learn about the role of computers in modern sciences -> **“Outlook lectures” (4 first weeks)**
2. Get an overview of computational approach in various areas of physics -> **Textbook, self-paced reading**
3. Improve computer simulation skills -> **Projects**

2. Textbook

- **Rubin H Landau**, Manuel J Paez, & Cristian Bordeianu: **A Survey of Computational Physics** -introductory computational science , Princeton University Press, 2008
  - Links at the class page for: PDF from Compadre, updates at the author's website, annotated local copy
- **YOU** have to **read the book** during the semester self-paced
- Previous year's lecture **recordings** w/ discussion of chapters are available **online** in Teams
- **Consultations**, if needed
- The book's content is the basis of
  - **Projects**' topics
  - **Questions** at semester presentation
  - Part of your **final MSc exam**



3. Projects

- NUMERICAL EXPERIMENT -> REPORT + code/notebook (not just the code!)
  - Detailed **requirements, deadlines**: web page
- Project: Topic related to chapters 9-13 or 15-20 of the course book
  - Ordinary differential equation simulations
  - Fourier analysis
  - Wavelet analysis, data compression
  - Nonlinear dynamics, chaos
  - Fractals and growth processes
  - Statistical physics simulations
  - Molecular dynamics
  - Elliptic partial differential equations
  - Wave equations
  - Fluid dynamics
  - Integral equations

3. Projects – cont'd

Where to get project topic?

- Check out the "Assessment" section at the end of book chapters for ideas
- Check out my notes in the annotated book
- Check out the ideas listed on the course webpage
- Search the web for ideas – but do not copy full projects!
- You may repeat some (simple) numerical experiment from research papers
- Your own (related) ideas are welcome, too! If you are not sure, if it is appropriate: Ask!
- Select something interesting, but doable!
- If you use AI tools, use them responsibly as help and not replacement of you!

- Check out the formal requirements!
  - Submit short descriptions in advance (deadlines!)
  - Submit project report (deadlines!)
  - Review feedback
  - Presentations at the end of semester
  - **More details**: next week lecture – Ask if you have questions!

Use of AI tools

- AI is not here to **replace** our thinking, rather to **empower** us, but only if we stay in control.
  - Very good in language editing, rewording
  - Can help to write code – but can make catastrophic bugs, that are hard to find
  - Can help to explain things. Very patient, don't be shy to ask the same question several times and ask it to clarify details. ("Explain me like I am a 5th grade … ")
  - Always very convincing – but often completely wrong. This is one of the hardest task, how to decide, which replies can be trusted.
  - It can write whole project reports – but the goal here is **not the report**, rather to **grow your skills and knowledge**

"When you stop seeing an LLM **as a 'person' that does work for you** and start viewing it **as a tool that enhances your own ideas**, you can craft prompts to direct the engine's processing power, iterate to amplify its ability to make useful connections, and explore multiple perspectives in different chat sessions rather than accepting one fictional narrator's view as authoritative. You are providing direction to a connection machine—**not** consulting **an oracle with its own agenda**."

https://arstechnica.com/ai/2025/09/chatgpts-new-branching-feature-is-a-good-reminder-that-ai-chatbots-arent-people/