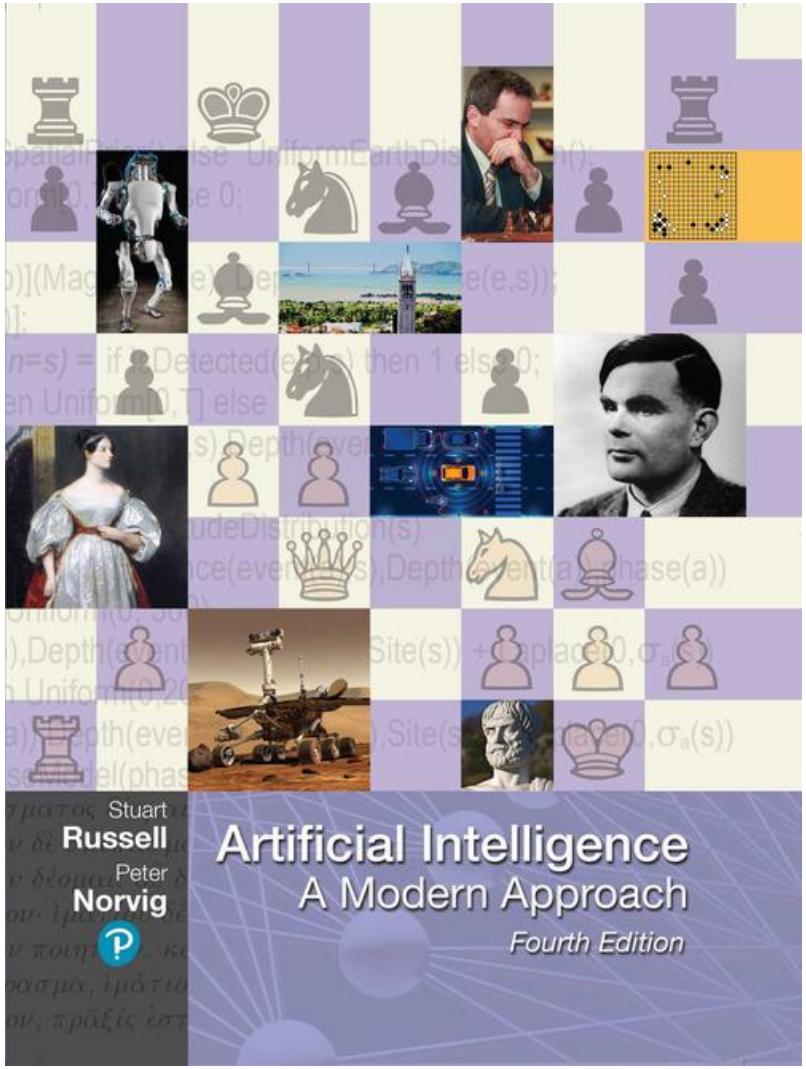
Artificial Intelligence Fundamentals

2022-2023



"Machine intelligence is the last invention that humanity will ever need to make."

– Nick Bostrom

Exam Projects

Outline

- Exam Projects
  - Why?
  - How to create a team
  - How to build the project
  - How to write the project report
  - How to present it
  - How to submit it

- Project proposals and themes

Evaluation

- Team Projects (more details in the 3rd lecture) -> **1/3**
  - in-class presentation + code + written report
- Suggested material (Books, Movies, etc.) -> **1/3**
- Team oral (project intro + 3 questions each) -> **1/3**

Why Projects

- «*Learning by doing*» philosophy
- **1/3** of the exam evaluation will come from projects
- You need to learn how to work in a team: *creativity, collaboration, bigger goals, …*
- You need to learn **how to communicate your work**: orally and in writing
- *It may be hard… but you'll be happy once the course is done!*

How to create a team

- **Team composed by 2-5 members**
  - Exeptions for working/non-attending students
  - The evaluation of the project will be proportional to the number of team members -> less members, more work
  - Try not to choose your close friends -> diverse team will receive a better evaluation
- **Find a team contact reference**
  - For communication with the teacher, submitting the report, etc.
- **Apply with your team here**
  - https://forms.gle/jTd9yVPvv6qMprzn8

How to Build a Project

- **Built entirely on GitHub**:
  - All members should be registered and part of the project
  - All members should partecipate equally with a roughly equal number of commits

- **Only open-source** tools and software allowed
  - If on Windows, I suggest to use Windows Subsystem for Linux (WSL2)

- **The project topic is free**, but it is mandatory to contain methodologies studied during the course -> *the more, the better.*

- **It needs to contain a demostrator / empirical evaluation**

Target Project Complexity

- **Make it small**: high complexity is not demanded.
- **Re-use**: you can use all available assets you want: libraries, other exams project pieces, scripts in the internet, etc. but make sure to mention it in the report.
- **I look for**: *creativity, good ideas, good aiming & planning, quality, attention to details*.
- **Rule of thumb**: you need to spend about 150 hours to pass the course (6 CFU):
  - about 50 in frontal lectures
  - About 50 to study the book
  - About 10 to study additional materials
  - About 40 on the project (e.g. 3 hrs/week for 3 months, 5 days if full-time)

How to Write a Report

- **The written report is key for evaluation**:
  - The evaluation will be based on this + github repo + presentation
  - Attention to details is key, length is not (make it 2-3 pages max)

- **Latex is mandatory** (on overleaf or github)

- **The written report should contain**
  - *Introduction, related works, methodologies, assessment, conclusion*
  - Appendix: team contributions, github metrics, relationship with the course

How to Present it

- **You'll get the chance to present your project in December**
  - Main idea, dev. plan, issues, partial results, etc.
  - 5-20 minutes team presentation depending on the teams number
  - All members should take part to the slides preparation and oral presentation
  - The exact schedule will be decided with the team ref contacts
- **Basic tips to present**
  - Face your audience, look them in the eyes
  - Don't put hands in pockets, in front of your mouth
  - Do not rush it, be calm
  - High energy is key!!!

How to Submit it

- **Once you have completed the project**
  - The team ref. can submit it via email to vincenzo.lomonaco@unipi.it
  - Use the subject **"[AIF Project Submission] – X Team"**
  - Once approved it will be *valid 1 year* and you'll get access to the oral exam in the ordinary exam sessions.
- **Orals**
  - The oral session will be based on the teacher questions about the project + ordinary course questions
- **Top-3 projects**
  - will receive a public acknowledgement on the course website, can be continued as Master dissertations or scientific publication

Project Themes

Possible Project Themes

- The NetHack game
- The Social Network
- Conversational Agents
- Internet-of-things
- UniPi racing team
- ...only the sky is the limit!

NetHack

[Version 3.6.6 | Contact Us]

NetHack

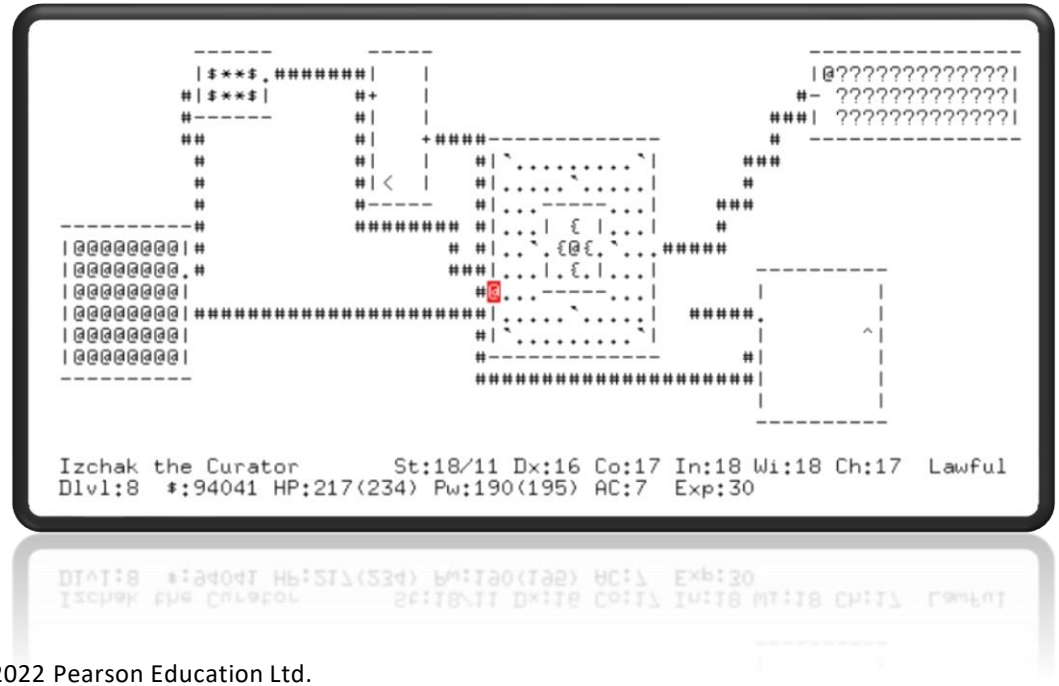
Congratulations adventurer!
Your quest is at an end for you have reached the home of NetHack.
Within, the Wizard of Yendor has no power, the Oracle speaks with utmost clarity, and the grid bugs do not bite.
Click friend and enter.

Build fix A fix for a build error with glibc 2.34 (the default under Ubuntu impish 21.10) has been pushed to branch NetHack-3.6

Updated Windows binaries released. Fixes an issue where NetHackW.exe delays updating the cursor position when using farlook.

Current Version

Click here for information on version 3.6.6



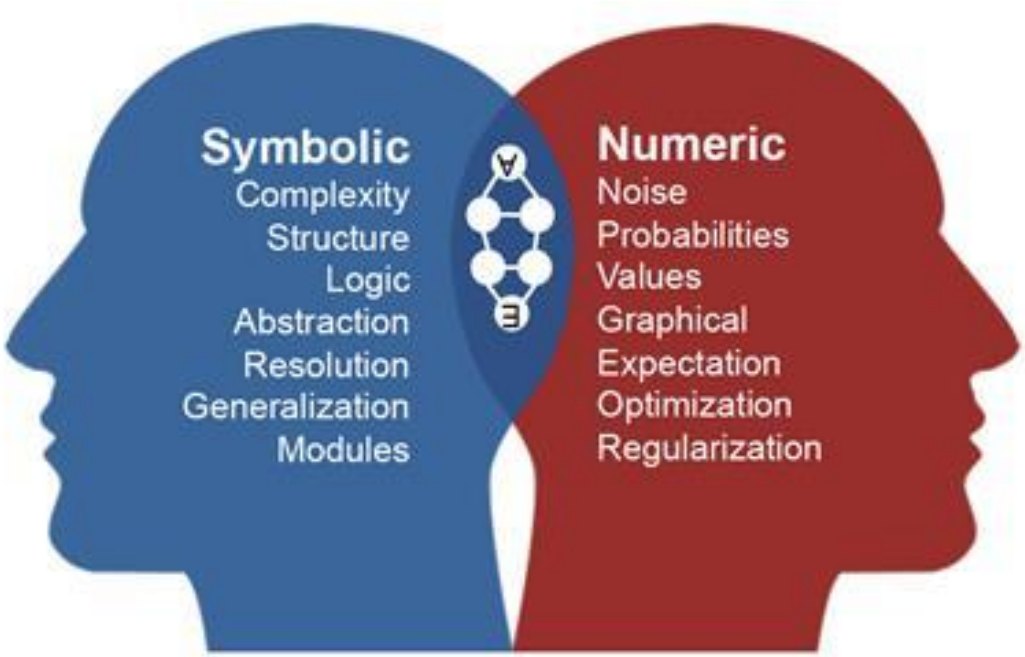
NetHack

Useful references:

- YouTube video (super nice introductory video)
- The NetHack Learning Environment (paper)
- MiniHack (paper)
- NetHack Challenge (witht python notebooks)
- Alt.org server (play in the browser, telnet, ssh)

A study of Neuro-Symbolic Approaches for NetHack

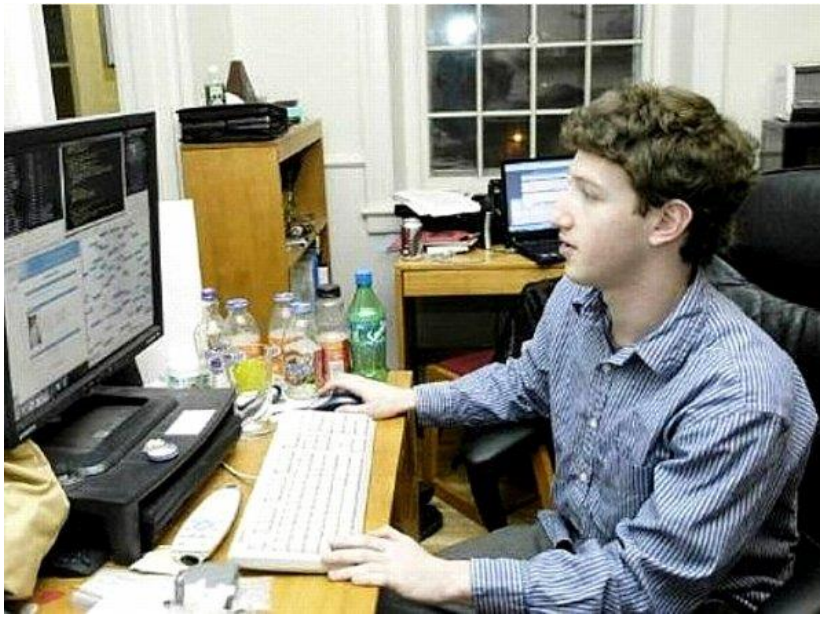
By *Luigi Quarantiello*



The Social Network

Social networks: the new internet?

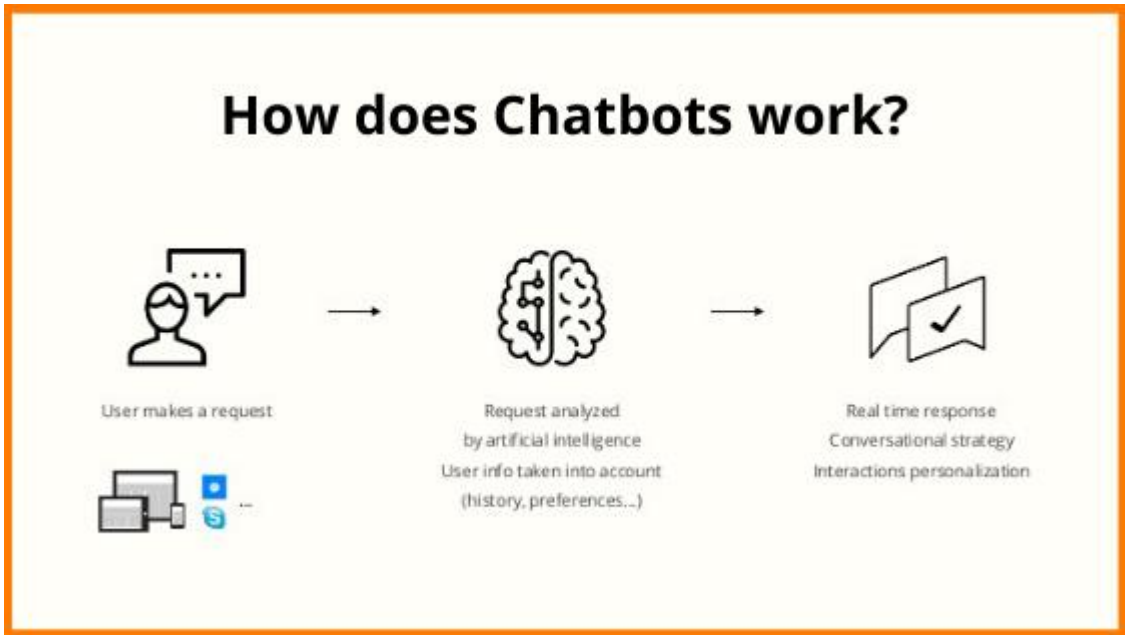
- **They are full of AI systems**: *auto-tagging, sentiment analysis, reccomendation systems, knowledge graphs, policy violation detection, etc.*
- **You can build yours** with basic tools like *Flask, MongoDB, etc.* or use an *already prepared datasets* for your methods.



Conversational Agents

Chatbots are now everywhere

- They are used for *customer service, for digital assistants, smart home devices*, etc.
- They will become more and more pervasive over time.
- **You can build your own!** For your house, for the sending messages, for gathering information. You can build it easily *with Python, Telegram and a rasberry pi* for example…



Internet of Things

On the concept of Pervasive AI

- Sensors and computing devices are everywhere and create a perfect distributed substrate for computation
- You can build a project putting together multiple devices and compute infrastructure. Examples:
  - **Shake hands with smartwatch** -> connects you on linkedin
  - **Control room** temperature, pressure, etc.
  - **Processes placement** in a distributed, dynamic setting: which process to migrate, which process to run, on which device in order to maximize the desired performance measure.
  - ….

UniPi Squadra Corse

By Giacomo Antonioli

In the next lecture...

- Problem-solving agents
- Example Problems
- Problem formulation
- Search Algorithms
- Uninformed Search Strategies
- Informed (Heuristic) Search Strategies
- Heuristic Functions