Catalin Sorin Covaci

Profile

- Determination and eagerness: I like to push myself constantly. I devote my free time to competitive programming, where I enjoy the theoretical computer science realm of algorithms, data structures, complexity analysis, discrete mathematics (probability, combinatorics, number theory, graph theory...) and problem solving (see achievements section). Good competitive programming is essentially more about pure mathematics and computer science than actual programming.
- **Career shift**: After going through *software* oriented jobs for a couple of years, I realized I needed harder challenges and I should try more research-like environments. For this reason I am currently working on an ERC project at CSIC, where I can see how research is like.

Education

•	Universidad Politécnica de Madrid	
	Mathematics and Computer Science degree; Average grade:	8,54

EXPERIENCE

CSIC, ERC WHEP project (Who Has Eaten the Planet)

Research programmer

- Leading heavy modeling programming tasks: The project includes different aspects like agricultural and biogeochemical modeling, geospatial analysis or product footprint tracing. While the main researchers and PhD students work directly on these, I have to actively participate in all of them to implement a wide variety of models efficiently and accurately.
- **Teaching R programming to the team**: The project members come from different fields not directly related to computer science but one of the aim of the project is for them to contribute with their own code in the R programming language when looking for results, ultimately becoming autonomous. I am helping them to achieve this, and building a systematic developing workflow to make them follow best coding practices.
- Automatic data scanning from historical documents: The project relies on being able to digitalize heavy amounts of data from historical documents from the 1850s to the 1960s. I am working on a tool that can be easily used for this purpose not only by our team, but hopefully by any researcher who will be interested in extracting data from old documents in the future.

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Software engineer

- Elixir and functional programming: Quickly learned the Elixir programming language, having had previous functional programming experience with Haskell. This language provides functionality for both backend (Ecto, Phoenix, Oban...) and frontend (Phoenix LiveView), and seamless concurrency support. Also became familiar with PostgreSQL databases, which are the default choice for Elixir projects.
- **Fast-paced internal Property Management System software development**: Worked on developing a PMS from scratch to automate many tasks performed by sales team (lead flow management, automatic contract and payment generation, integration with external marketplaces), customer success team (automatic guest feedback request) and operations team (guest incidences flow management, check-ins and check-outs management). The small startup tech department allowed for fast-paced continuous deployment, delivering new functionality to the company almost every week.
- Agile environment and sprint planning: Being part of a small team, I actively participated in sprint plannings, making suggestions of which tasks to prioritize and providing serious estimations and descriptions for each of them.

NTT DATA

Solutions assistant

Madrid Jul. 2022 - Apr. 2023

- ETL (Extract, Transform, Load): Programming microservices as APIs in Docker containers for data processing, with Python, Flask and SQLAlchemy (relational databases). Use of AWS services (RDS, EC2, S3). Comfortable with Bash and Vim in remote SSH connections. Basic knowledge of NoSQL databases (MongoDB). Git and GitLab usage.
- **Relational models design**: Active participation in designing and restructuring required relational models for various data sources. Specific implementation on Microsoft SQL Server.
- **Data analysis**: Study of specific technological data, using Python in Jupyter notebooks and libraries like Pandas and Plotly to gather relevant conclusions.

Madrid Sep. 2018 – Jul. 2022

> Madrid Oct. 2024 - Present

> > Madrid

Apr. 2023 - Jul. 2024

PUBLICATIONS AND PROJECTS

- The unsolvability of the quintic: an insight into Galois theory (End of Degree Project, Grade: 10): Almost completely mathematical and theoretical work where I study the classical problem of polynomial solvability (finding general formulae which solve equations of a specific degree) from a modern perspective. It includes a Python program which receives a polynomial equation of degree less than or equal to 4 and determines its Galois group, applying the studied theory. [Link to the publication]
- Dynamical systems and chaos: Tools designed to complement the Dynamical systems and chaos subject, aiming to help future students, making diagram visualizations easier. Usage of Matplotlib in Python and some specific data generation in C++, as an alternative to C and gnuplot implementations provided by the course. [Link to Github repository]
- Automatic data extraction from historical documents: A tool written in Python that uses AI text and table recognition models and adds some preprocessing and post-processing techniques to automatically produce an Excel sheet with tabular data from an image or PDF input. While striving to use free and open source models, it also integrates with commercial AWS Textract if the user can afford it. This can still be improved and is currently a work in progress. [Link to Github repository]

Achievements

- AdaByron 2022 National Contest (First place): Competitive programming contest in teams of three university students which involves solving between 10 and 13 problems in 5 hours, and requires knowledge about algorithms, data structures, complexity analysis, discrete mathematics and problem solving. In competitive programming contests I use C++ as language and Vim as text editor. [Link to the contest's web page]
- AdaByron and Spain Olympiad in Informatics problemsetter: After finishing university and not being able to compete anymore, I started volunteering as part of the jury and problemsetting team for competitive programming contests. Problem preparation requires creative thinking to provide interesting and original ideas, as well as enough knowledge to find solutions to proposed problems and prove their correctness. I also tested other problems to make sure they are well prepared. Problems I authored in these contests:
 - Problems A, C, D and E from AdaByron Madrid Regional contest 2023 [Link to ES statements]
 - Problems C and G from AdaByron Madrid Regional contest 2024 [Link to EN statements]
 - $\circ~3$ out of 12 problems from AdaByron National contest 2024 (Statements not publicly available).
 - Problems C and E from Spain Olympiad in Informatics Day 1 [Link to EN statements]
- Top 3% performance in online competitive programming contests and more than 1500 solved algorithmic problems in total: Solving problems and participating in online contests from various competitive programming websites. Achieved top 3600 in global rating rankings out of more than 160000 active participants in Codeforces (the most well-known online competitive programming platform). [Link to my Codeforces profile]

OTHERS

- **Programming paradigms**: Interest in different programming paradigms like imperative programming (Python, C++), functional programming (Elixir, Haskell), declarative programming (Prolog) and array programming (APL). Apart from competitive programming (mainly in C++), I also enjoy casual problem solving:
 - Advent of Code 2021 solutions to all 25 problems in Python and some in Haskell: [Link to Github repository]
 - Advent of Code 2023 solutions to 17 problems in Elixir [Link to Github repository]
 - Some solutions in Ciao Prolog from the classic "99 problems list" [Link to Github repository]
- Languages: Spanish (native), Romanian (native), English (C1), Mandarin Chinese (B1)