Curriculum Vitae for Robert Hagala

Personal information

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Born:	12 June 1991	Nationality:	Norwegian

Summary

I hold a PhD in astrophysics from the University of Oslo, where my field of research was large scale numerical N-body simulations. Through my research and work I have developed expertise in numerical modeling, statistical and visual analysis of big data sets, signal processing, pattern recognition, high- and low-level programming, and code optimization. I have learned many complex concepts in science and technology, and demonstrated my ability to understand and combine many areas of knowledge. I consider myself an analytical, adaptive, and open-minded person with the ability to work highly individually and quickly adapt to unforeseen circumstances. I am experienced with having a holistic overview of a project, while at the same time being able to focus on details.

Technical skills

Languages	Python, FORTRAN, C/C++, Java, PHP, SQL, R, Clojure
Frameworks	Numpy, Scipy, Flask, Matplotlib, MPI/OpenMP
Tools	Git, Unix, Windows, Jupyter Notebook, OpenOffice, LaTeX, MS-SQL, TimescaleDB, Docker, Microsoft Azure, Amazon Web Services (AWS), CI/CD pipelines, Google

Education

2015 - 2019	Ph.D. in astrophysics (cosmology) at the University of Oslo, thesis titled "Astrophysical Simulations for Uncovering Signatures of Gravity". Supervisor: David F. Mota.
2013 - 2015	M.Sc. in Astronomy at the University of Oslo, thesis titled "Cosmological Simulations with Disformally Coupled Symmetron Fields".
2010 - 2013	B.Sc. in Physics, Astronomy and Meteorology at the University of Oslo. Several extra courses in informatics.

Professional experience

2019 –	Consultant, Expert Analytics. Focus on physical understanding, data preparation, and data analysis.
2015 – 2019	PhD student, University of Oslo. Developed and extended several pieces of high-performance parallel software for studying alternative theories of gravity. Collaborated in a highly international research field. 25 % teaching duty in bachelor level astronomy course, including development of software for the students.
2012 – 2015	Four semesters as group teacher (Teaching Assistant) in different courses at UiO and HiO (now OsloMet). Subjects include mathematics, physics and informatics. I answered questions about programming and science concepts, as well as graded exams.
2013 – 2014	27 % position as mathematics teacher with responsibility for a class of VG1 mathematics students. Blackboard and powerpoint lectures, and helping students with exercises. Designing and grading tests. Final grading of students.

Languages

Norwegian	Native
English	Fluent
Polish	Intermediate
French	Basic

Personal skills

Analytical and creative	Good ability to understand and break down a new problem in a logical way, and to provide creative solutions when needed.
Modeling and data analysis	Able to implement a physical model into computer code in an efficient way, while avoiding numerical problems. Developing custom tools to analyse the output and compare it with measurements.
Audio data and equipment	Experience with audio recording, editing and analysis. Both hardware and software.
Intuitive and curious	Not afraid to explore unknown problems and technology. Ability to get an overview and learn necessary material quickly.
Communication and teaching	Many years of experience in teaching science and programming. Good ability to understand and explain difficult concepts.

Some interests and hobbies

Sports and nature	Weightlifting, yoga, hiking, skiing, golf
Music	Digital music editing, as well as several analog instruments including: drums, guitar, sitar, piano and gong
Personal	Personal development, learning and experiencing new things, traveling, puzzles, cooking, cultivating friendships

Extended descriptions of selected projects

Activity	Audio Analytics for diagnosing generators and industrial machinery
Period	2020 - 2020
Role	Architecture developer
Staffing	Team of 10
Description	This Statkraft project is aimed at detecting and diagnosing changes in operation of hydro power generators through analysis of recorded audio. I had a key role in the installation of microphones, setup of edge compute equipment, and collection and organization of data. I contributed with several important ideas for the analysis, as well as development of several algorithms and frameworks used on the edge computing device in the power plant.
Tools	Python, Amazon Web Services, TimescaleDB, Docker, physical theory (acoustics), edge computing

Activity	Automation of physical systems based on weather forecast
Period	2019 - 2020
Role	Lead developer
Staffing	Team of 4
Description	A cloud based application for modelling and optimising an automated industrial control system. The application can be accessed from a compatible system through a RESTful API; the cloud application performs a calculation based on online weather data and physical models, and returns the calculated optimal parameters for the automated system. I developed most of the physical model, and implemented the cloud based application from scratch. I was also responsible for assessing and minimising security risks, developing a complete testing pipeline, as well as writing user documentation.
Tools	Python, Azure Web App, Azure SQL, physical modelling (meteorology, thermodynamics)

Activity	Cosmological simulations with scalar fields
Period	2013 - 2019
Role	Researcher
Staffing	Team of 3

Description	Together with my supervisors (David Mota and Claudio Llinares), I extended the freely available cosmological N-body code RAMSES to simulate an additional disformal scalar degree of freedom. This introduces a highly non-linear hyperbolic differential equation for the scalar field, as well as complex equations for the extra forces on the N-body particles. RAMSES is written in FORTRAN, and is designed to run in parallel on supercomputing clusters. Hence, I paid special attention to memory usage, efficient MPI parallelism, and low level code optimization. The output data ranged from gigabytes to terabytes, and statistical analysis of the output was necessary to draw scientific conclusions. I wrote several auxiliary tools for data and image analysis, as well as a 1-dimensional hyperbolic solver in spherical symmetry for more detailed study of the non-linear equation of motion of the scalar field.
Tools	Physical modeling, statistical data analysis, image analysis, scientific writing, FORTRAN, Python

Activity	Development and use of student software: AST2000 Mission Control
Period	2015 - 2017
Role	Developer and tester
Staffing	Team of 8
Description	As part of my work as a group teacher in AST1100/AST2000, I had a leading role as developer of the Python backend that the students used for visualisation. The code procedurally generates a virtual solar system for each student, and during the course the student interacts with this code to launch a satellite from one planet, achieve orbit around another planet and land a landing module safely. After finishing development and writing the exercises and user manual, I had the main responsibility for updating the codebase when students reported bugs and inconsistencies.
Tools	Analytical modeling, procedural generation, user interfacing, pedagogical writing, Python, LaTeX