ARIEL LUBONJA

PhD Student in Computer Science, Johns Hopkins University

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EDUCATION

Doctor of Philosophy, Computer Science

Johns Hopkins University

05/2022 - Ongoing

Master of Science in Engineering - Data Science

Johns Hopkins University

01/2021 - 05/2022 Baltimore, Maryland, USA

- Parallel Programming: Message-Passing Interface, Multithreading, Memory Hierarchy, joblib, MapReduce & Hadoop, PySpark, Dask, Ray, OpenMP. Study of strong/weak scaling, Amdahl's Law, multicore architecture, distributed and high-performance computing, GPU/TPUs etc.
- Master Thesis in Computer Science - Parallel Execution of Dynamic/Temporal Graph Algorithms on a single shared-memory multicore machine (Ongoing, see Projects for more)
- Machine Learning & Deep Learning: Regression (Linear & Logistic), Neural Nets - MLP & Convolutional, Decision Trees, Random Forests, SVMs, some exposure to Markov Random Fields & Belief Propagation.
- Great grasp of Algorithm theory: correctness, complexity theory and NP-Completeness, big-O, sorting, advanced data structures, dynamic programming, graph algorithms
- Topics in Computer Vision: Superpixels, Weak Membrane Models, Deep Neural Nets, Max-Flow Min-cut for image segmentation, Edge & boundary detection, Epitomes, orthogonal & overcomplete dictionaries, sparsity etc.
- Strong knowledge in Mathematical Statistics - estimators, convergence, hypothesis testing, Regression.
- Strong knowledge of Nonlinear Optimization - convex, (non-)smooth problems, linesearch. Gradient Descent (+ Stochastic & Coordinate Descent), Newton and Quasi-Newton's Method such as BFGS, Trust Region Methods
- Signal Processing: Compressed Sensing - solving an underdetermined system by picking the simplest (sparsest) x - known NP-Hard problem. Minimization via L1 (Lasso) and L0 regularization (Matching Pursuit). Project: GPU & fast CPU implementation of Orthogonal Matching Pursuit. Signal reconstruction problem & applications in facial recognition and image processing

GPA

3.88 / 4.0

Bachelor in Computer Science

American University in Bulgaria

09/2014 - 05/2018

PROJECTS

Master Thesis: Parallel Graph Embedding in Ligra

01/2022 - 05/2022

Supervisor: Prof. Randal Burns.

- Many problems can be expressed as graphs/networks. Static/unchanging graph algorithms have been thoroughly studied, but less attention has been paid to analysis of the change in graphs (i.e. not what is a node's centrality, but how does it change over time? what can we learn from this?).
- Closest existing graph engines today are Aspen (https://dl.acm.org/doi/10.1145/3314221.3314598) and TEGRA (https://www.usenix.org/conference/nsdi21/presentation/iyer). However, Aspen doesn't support graph history and TEGRA is optimized towards distributed computing
- We used Ligra, the precursor to Aspen, to achieve order of magnitude speedup on Graph Encoder Embedding.

Class Project: Efficient & Parallel Orthogonal Matching Pursuit

03/2021 - 05/2021

Paper: https://github.com/Ariel5/Ariel5.github.io/blob/46011d96c2858ecd9385660d441971fb3267a557/Compressed_Sensing_Report.pdf

- Working with Sebastian Praesius, a fellow student, we implemented a version of Orthogonal Matching Pursuit that is 200x faster than the Scikit-Learn version
- Orthogonal Matching Pursuit approximates the sparse solution to a linear system of equations and is widely used in Signal Processing
- Optimized memory layout/made contiguous, used einsum, BLAS matrix multiplication instructions etc. to maximize efficiency
- Used PyTorch to create an implementation that runs on nvidia CUDA-enabled GPUs

WORK EXPERIENCE

Full Stack Developer - Python, JavaEE, Angular, AWS

jBoxers

11/2018 - 08/2021 Sofia, Bulgaria

jBoxers is a company that offers software solutions in the fields of AI, Microservices, DevOps and Cloud Solutions

- Built and developed a Chatbot application for the University of Southern California with Dr. Laura Toloși, using Mycroft as a Speech-to-Text and Google BERT and Dialogflow as language models
- Met and discussed with the Library of Congress project owners to develop Use Cases and gather requirements for future development of the project
- Developed client-facing pages and backend solutions for the Library of Congress, specifically the Virtual Card Catalog, Braille, etc.
- Supervised 2 summer interns for a period of 3 months

Junior Developer - JavaEE, Angular, Python (Django), SQL

jBoxers

09/2017 - 11/2018 Sofia, Bulgaria

- Ongoing project for Library of Congress, using Angular for front-end and JavaEE/Spring for backend
- Developed tests using frameworks & tools such as Sonar, JUnit, Selenium, Protractor

Summer Internship

jBoxers

05/2017 - 08/2017 Sofia, Bulgaria

- Focused on the JavaEE technology stack and Spring framework. Covered topics such as: JAXRS, WebSockers, Web Servers and application deployment, Git, Maven, etc
- Developed my initial skills in working with a software team, experienced the Scrum/Agile methodology in action and improved my teamwork skills

ACHIEVEMENTS

Full Scholarship to Johns Hopkins University

My Masters program was funded by the Government of Albania's Ministry of Education, in their program called Funds for Excellence (Alb. Fondi i Ekselences), awarded to those who are admitted to top-15 universities as well as have outstanding academic standing in their Bachelor.

Full Scholarship to American University in Bulgaria

Merit-based scholarship given to 11 students by the America-Albania Development Fund in order to promote academic achievment and allow students to experience the benefits of a Liberal Arts education.

334/340 in the GRE exam

I did particularly well - 168/170 in Quantitative (93rd percentile) and 166/170 in the Verbal section (97th percentile)

PROJECTS

Industry work: Chatbot for Dialog with Book Characters for the University of Southern California (USC)

05/2019 - 07/2020

Demo: https://alice.wonderland.usc.edu/chat/alice-endpoint.html

- Helped build a Google Dialogflow chatbot for USC Libraries, based on Alice and the Cheshire Cat, from The Adventures of Alice in Wonderland by Lewis Carroll
- My role on the project was to develop the interface and backend, and to assist in the AI development. Implemented Mycroft as a SpeechtoText engine
- Used JavaEE WebSockets to allow for the non-request-response chatting/instant messaging
- I was also solely responsible for developing the Desktop app of the page, and, by using Electron, I managed to create the app in 3 weeks instead of the months that developing a native app would take.
- Built, deployed and served from AWS EC2 instances. Vagrant, GitLab were used for Constant Integration

Industry work: Use Case Gathering for the Library of Congress

05/2020 - 10/2020

- Participated and facilitated planning meetings for a new module to be introduced for future development
- Helped guide the conversation by giving helpful hints, reminders, creating easy to understand graphs, spreadsheets, and other methods of tracking new requirements discussion.

PASSIONS

I love skiing. I keep being reminded by the Aspen paper

Cars. I know way too much about them, like chassis codes for most German brands, which engines are reliable, etc.