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Ayush Kaushal

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Academics

Year	Education	Grade
2017-2021	*B.Tech* in **Computer Science and Engineering, IIT Kharagpur**	**9.45**/10.0 (Ongoing)
2017	*Higher Secondary School Certificate Examination*, **CBSE**	**93.6%**
2015	*Secondary School Certificate Examination*, **CBSE**	**10**/10

Research Interests

Machine Learning | Deep Learning | Computer Vision | Natural Language Processing

Research Experience

May 19 - Aug 19

Google Summer Of Code, 2019: **JuliaText** **FluxML, The Julia Language**
Guide: Dr Lyndon White and Mr Avik Sengupta

- Added support for Linear Chain Conditional Random Fields in the Flux Machine Learning Library and implemented Viterbi Decode algorithm.
- Explored state of the art end-to-end deep learning models for practical sequence labelling APIs using CNNs for Character Embeddings, Word Embeddings, Bi-LSTMs and Conditional Random Fields. (link)
- Built well tested practical APIs for Named Entity Recognition and Part of Speech Tagging with Neural sequence labelling models as backend.

Key Projects

- **Neural Network solvers for Differential Equations [Ongoing]**
  Ongoing project with JuliaDiffEq organisation on neural network based solvers for differential equations. Implemented a Weak Adversarial Network approach for partial differential equations. Sped it up using the adjoint method of back-propagation through neural-odes.
- **WordTokenizers.jl: Tokenizers for Natural Languages**
  (Guide: Dr Lyndon White)
  The package provides with a variety of word tokenizers and sentence segmenters for various Natural Languages in Julia. The package also provides with an API and its various lexer functions that let the users generate custom high-speed tokenizers with ease. The software provides a variety of prewritten word tokenizers as well. These include a tweet tokenizer, a general purpose NLTK tokenizer, an improved multilingual Tok-Tok tokenizer and a reversible tokenizer.

Coursework

Completed	Algorithms **|** Discrete Structures **|** Software Engineering **|** Probability And Statistics **|** Formal Languages and Automata Theory **|** Algorithms-II **|** Linear Algebra **|** Compilers **|** Algorithms II **|** Knowledge Modelling and Semantic Technologies **|** Computer Organization and Architecture
OnGoing	Operating Systems **|** Computer Networks **|** Machine Learning **|** Principles of Programming Languages
Online Courses	Deep Learning Specialization Coursera **|** CS224n:NLP with Deep Learning **|** CS231n: Convolutional Neural Networks**|** Fundamentals of Reinforcement Learning

Technical Skills

Programming Languages	*Proficient:* Python | Julia | C/C++ *Competent:* JavaScript | Octave | Java | R | Verilog
Libraries / Frameworks	OpenCV | Numpy | Pandas | Scikit-Learn | Tensorflow | Keras | PyTorch | Flux.jl
Systems / Platforms	Git | Linux | Bash | Heroku | Azure | LaTeX

Coursework Projects

Rental Store Software: *(Guide: Dr Sudip Misra)*

Built a Rental store software by applying software engineering principles as a part of coursework. The project was written in Java using Swing and MySQL.

TinyC Compiler: *(Guide: Dr Partha Pratim Das)*

A compiler for Tiny C, a self-defined subset of the C language, built using Compiler principles and techniques in C++ with Flex for Lexical Analysis and Bison for Semantic parsing.

Single Cycle CPU: *(Guide: Dr Bhargab Bikram Bhattacharya)*

Designed a Single Cycle 32-bit CPU with limited instruction set on Verilog and tested the hardware design on FPGA.

Semantic Web based E-Tourguide: *(Guide: Dr Plaban Kumar Bhowmick)*

Used semantic web technologies and linked databases of DBpedia, Wikidata and MealDB to create a tour guide app.

Miscellaneous Side Projects

DigiCon: Parsing handwritten Medical Prescription - The project intelligently parses a doctor's hand-written prescription using OpenCV, Flask, Natural Language Processing with Stanford CoreNLP, CoreNLP REST API, bash scripting and Docker.

Connect All: An application developed to help the disabled communicate and live life normally. Comes with a zulip-bot interface, Website and an android app and multiple web - microservices.

Kronos: Built a WebApp to serve past year's grade distributions of the various courses offered at IIT Kharagpur.

Tethering Wiki to ERP: Wrote a WikiBot, linking the metakgp wiki with the institute's ERP for automatically updating the wiki.

Relevant Open Source Contributions

TextAnalysis.jl: A Julia Package for Text Analysis.

- Fixed the statistical summarizer, Part of Speech Tagger, Naive Bayes Classifier and Rouge score.
- Ported BM-25, Latent Semantic Analysis model and wrote an API for conversion between tagging schemes.
- Gave the documentation a major revamp and added offline documentation to the codebase.

CorpusLoaders.jl: The package provides a variety of loaders for various NLP corpora. I Added lazy loaders for Senseval, CoNLL, WikiGold corpora. I made numerous significant contributions to the package in the form of documentation, CI test and codebase fixes.

Hercules: A REST API written in GoLang, providing details about IIT Kharagpur's academic data. Wrote data scrappers for the API and created a package for auto-login.

DataDeps.jl: A Julia package for managing data dependencies, allowing a reproducible setup. Fixed various bugs and tests.

Activities and Leaderships

Open Source Maintainer *Mar'18-Present*

- Actively involved with the maintenance of open source repositories in the organisations - JuliaText (The JuliaLang Organisation for NLP, Information Retrieval and Computational Linguistics), Kharagpur Open Source Society and Metakgp, IIT Kharagpur.
- Mentored college students new to open source in the 5 week long GSoC styled programme of Kharagpur Winter of Code, 2018.

Kharagpur Open Source Society, Executive Head *May'18-Present*

- Worked towards promoting Open Source culture. Curated the contents of and taught in the Git Workshop and GoLang & Concurrency Workshop in the Open Source Summit 2019. Mentored in the workshops on Python, Git, Ubuntu.
- Successfully organized and conducted Kharagpur Winter of Code 2018 with over 2000 registrations. Responsible for development, deployment and maintenance of the website as well as the smooth going of the program.

Metakgp, Maintainer *Feb'19-Present*

- Active Contributor and maintainer for the Metakgp wiki, documenting the knowledge of the institute, IIT Kharagpur. Successfully conducted various activities like Demo Days and Hack Days to foster collaboration within the institute campus.

Achievements

Nov 2019	Google Code-In, 2019 mentor for The Julia Language Organisation.
May 2018	Part of the contingent to win the General Championship Technology 2018 in the intra campus event.
April 2018	Awarded for excellent academic performance in the first year by the Department of Computer Science and Engineering, IIT Kharagpur.
Dec 2017	Attended a weeklong winter workshop on Image Processing and Path Planning.
May 2017	Ranked 249, among the top 0.12 percentile in IIT Joint Entrance Exam Advanced-2017(IIT-JEE)
April 2017	Ranked 488, among the top 0.05 percentile in Joint Entrance Exam Mains-2017(IIT-JEE Mains)
April 2017	Kishore Vaigyanic Protsahan Yojana(KVPY) Scholar, program by Department of Science & Technology India.
December 2015	First rank in Regional Mathematics Olympiad held in Zone Uttarakhand.
August 2017	Member of the National Sports Organization (NSO) Tennis under the Government of India.
August 2017	Kharagpur Freshers Tennis Tournament : Third position.
Jan 2018	Attended a 3 Weeks long coaching camp for tennis arranged by Gymkhana, IIT Kharagpur