Arnav Kumar

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Projects

CLI Chess Engine | *Haskell* Aug 2022 - Present
- Implemented maybe monads to create safe functions for when there is nonsensical function application.
- Created custom haskell data types (such as a position data type) and ensured that no position could be created with had no meaning in the context of the board.
- Employed the use of applicative functors and monad operations on lists to write more concise code for tasks such as finding the cartesian product of two lists.

Modular Personal Website | *Javascript, HTML, CSS* Mar 2022 - Aug 2022
- Built a simple content management system (CMS) with javascript which generates a DOM object from given data.
- Added several different section templates based on the type of information being conveyed.

Braille ASCII Art Generator | *Python, OpenCV* Apr 2021 - Jul 2021
- Used OpenCV to manipulate and scale an input image and used thresholding to determine which cells of the output art should be colored.
- Translated the desired output image array into braille characters where every 2x3 block of cells was turned into a number corresponding to the desired ASCII braille character.

Prognosing Idiopathic Pulmonary Fibrosis (IPF) | *Python, Tensorflow2, Pandas, Scikit-learn* Dec 2020 - Jun 2021
- Predicted and gave a confidence value of the future lung volume of Idiopathic Pulmonary Fibrosis patients based on their initial lung capacity, and demographic (age, sex, smoking status, and more).
- Implemented an auto-encoder, linear regression, dense neural network, and bayesian model, which were able to accurately predict future lung capacity values with a standard deviation of approximately 200mL for the bayesian model.
- Obtained a Laplace Log Likelihood score of approximately -6.9, much better than the baseline score of -8.1.

Blackjack | *C++* Apr 2021 - Jul 2021
- Used object oriented programming to implement a blackjack game which the computer plays as the house.
- Sanitized user input and formatted output to be very readable, while displaying the player total.

Achievements

- 10^{th} in Canada, **Asian Pacific Mathematics Olympiad** 2022
- 11^{th} in Canada, **Canadian Association of Physicists High School Exam** 2022
- 2 time qualifier, 18^{th} in Canada, **Canadian Mathematical Olympiad** ..... 2021 - 2022
- Ranked 12^{th} in Canada and 17^{th} internationally, **Sir Isaac Newton Physics Exam** ..... 2021 - 2022
- Invited to write, **United States of America Mathematical Olympiad** 2022
- Bronze medalist for project on Prognosing IPF, **Canada Wide Science Fair** 2021

Experience

Part-time programmer @ Tektorch.ai Apr 2022 - Aug 2022
- Created a web scraper for a jobs listing website using python, beatiful soup 4, numpy, and pandas to get features such as the job title, location, classification, and pay.
- Analysed and explored the nature of the data through data visualization using matplotlib, and regular expressions.
- Created and learned the project design process by splitting tasks into managable, independant subtasks.

Part-time code sensei @ Code Ninjas West Springs Mar 2022 - Apr 2022
- Worked with over 45 young students to help them complete programming challenges in scratch, makecode, and javascript.
- Summarized the progress of the students and reported to the manager.

Computing Science High School Intern @ University of Alberta Jul 2021 - Aug 2021
- Created graphs and animated GIFs of mouse position data during a psychology experiment using matplotlib.
- Used bash scripting to automate the creation of these graphs for all of the mouse data.
- Created natural language processing models based on word vectors to help determine the cause of a change in depressive language in Tweets.

Education and Skills

Bachelor of Computer Science @ University of Waterloo 2022 - Present
- Recieved the Ronald G. Dunkley National Scholarship and the President's Entrance Scholarship of Distinction.

Languages: Haskell, Python, C++, JavaScript, Java, Bash, LaTeX, HTML, CSS, Markdown, Regex
Libraries: Pandas, Matplotlib, NumPy, Beautiful Soup, Tensorflow, Scikit-learn, OpenCV