Sepand Ali Madad Soltani

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Education

K.N. Toosi University of Technology Tehran, Iran
Bachelor of Science in Electrical Engineering 2018-2023
Concentration: **Electronics Engineering**
GPA: 16.33/20 (Last two years: 17.29/20)

Nokhbegan Pour Sina Highschool Tehran, Iran
Pre-University Degree in Mathematics & Physics 2017-2018
GPA: 18.13

Research Interests

- Machine learning and Artificial Intelligence in Health
- Human Brain Interaction
- Biomedical Engineering
- Data Visualization
- 3D Rendering

Bachelor Thesis

MedVisPy: Python-Based Medical Image Analysis Software with Tissue Boundry Detection Tool Winter-Summer 2023

- Developed "MedVisPy" a Python-based medical image analysis software, from scratch utilizing Python, VTK, and PyQt5 packages
- Demonstrated proficiency in utilizing VTK (Visualization Toolkit) for advanced visualization and manipulation of medical images
- Implemented multiple interactive tools (ruler, shapes, and text insertion tools)
- Developed an image processing algorithm for tissue boundry detection in a smart interactive scissor tool for fast segmentation
- Enabled users to import custom plugins to extend the functionality of the software based on their needs
- Successfully shipped the software for Linux and Windows operating systems and has been continuously supporting it since

Research Experience

Detection of Alzheimer's Disease Patients using Deep Neural Network based on fMRI Functional Connectivity
June 2022 - Ongoing

- Preprocessed and processed raw fMRI and MRI data using the FSL library to extract time-series data
- Studied the previous works on this subject to find the gap
- Implemented a novel RCNN network to extract temporal and spatial features from images
- Achieved 80% accuracy for 3-fold classification (Alzheimer's Disease, Mild Cognitive Impairment and Cognitively Normal)
- Achieved 85% average accuracy for binary classifications between each two class
- Evaluated performance by comparing results with other methodologies and AI techniques such as the use of MRI imagery or pure CNN architecture
- Proved possible clinical applications by achieving high accuracy on a large and diverse dataset taken from more than 1000 people and 80 testing centers

Skills

- **Programming Language:** Python, C++, MATLAB, VHDL
- **Software:** PSpice, Proteus design suite, Altium Designer, FMRIB FSL library, GNU/Linux, Qt Framework, Visualization Toolkit (VTK)
- **Hardware:** Arduino, Various wireless communication modules (BLE, RF, GSM, IR and ESP8266)
- **Language:**Persian (Native), English (TOEFL: **Overall: 101, R: 27, L:27, S:23, R:24**), French (Intermediate)

Academic Projects

Image-based Persian and English Character Sequence Recognition using Recurrent Convolutional Neural Networks(RCNN) Winter 2023

- Implemented the network using the Tensorflow library in Python
- Synthesized images of Persian text of different variety
- Applied data augmentation techniques such as rotating, translating, adding distortion, and adding noise to images

- Successfully trained the model for both languages using the self-made synthesized Persian dataset and public English datasets
- Achieved +85% accuracy for both languages

Automated fMRI Preprocessing and Time-series Extraction Pipeline for Large Datasets using FSL in Python Summer 2022

- Implemented brain extraction from structural reference MR image
- Implemented fMRI preprocessing including motion correction, slice timing correction, spatial smoothing, and co-registration
- Implemented atlas-based ROI time-series extraction
- Enabled parallel processing to accelerate computation for large datasets

Tetris player bot using Deep Reinforcement Learning Summer 2022

- Developed the game from scratch using C++
- Created a custom C++ to Python API for the game using the Pybind11 library
- Developed a Deep Q learning agent for training the AI player to learn how to play the game

The Game of Tetris with a Custom Game Engine Using OpenGL in C++ Spring 2022

- Developed a custom 2D graphics renderer completely from scratch using the OpenGL graphics API in C++
- Implemented user input handling, navigatable menus, and text rendering capabilities to the engine
- Designed and implemented the game of Tetris using the said engine in Object Oriented C++

Implementation of Synthesizable A* Search Algorithm in FPGA-VHDL Spring 2021

- Developed a synthesizable VHDL code for A* algorithm capable of solving any 10x10 mazes
- Developed a Python script for generating random mazes
- Simulated and tested the algorithm for solving random mazes using a VHDL test bench

Smart Temperature Detection PCB Circuit Design Summer 2020

- Designed circuit schematic and PCB layout using Altium designer
  (Key components: ATMEGA64 and SIM800C)

Calculating the Magnetic Field Caused by a Spherical Solenoid Winter 2019

- Derived the formula for the magnetic field caused by a spherical solenoid
- Calculated and graphed the magnetic field on multiple plates
- Integrated the graphs and the calculator in a custom GUI developed using MATLAB App Designer

Work Experience

TECVICO Vancouver, Canada
Medical Image Visualization Software (Freelance Project) summer 2023

- Created a Python-based medical analysis software focusing on user-friendliness and user experience
- Designed and implemented a workflow user interface for bioinformatics analysis and processing using the Qt framework
- Worked with a team of engineers to integrate various machine learning algorithms in to the workflow
- Designed and integrated a medical image visualizer using VTK
- Integrated multiple visualization tools and pipelines such as colormaps, image thresholding and interactive segmentation

ETS, University of Quebec Montreal, Canada
Remote Research Assistant Internship Winter 2022

- Assisted in a project aiming to predict multiple cognitive traits and performances based on EEG using Deep Convolutional Neural Networks

Razeq Co. Tehran, Iran
Electronics Engineer Internship Summer 2021

- Researched the design and development process of a parametric speaker (directional speaker) and examined the feasibility of manufacturing it
- Implemented smart presence detection and remote-control support for the monitor stand in Valiasr Street Museum
- Developed and assembled various hardware for installation in Iran's pavilion in Dubai Expo 2020 (Electric control panel, wiring, lighting and presence detection system)