

Milad Mirjalili

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RESEARCH INTERESTS

- Machine Vision (Motion Analysis, Video Compression, Object Recognition, Action recognition)
- Machine Learning (Supervised Learning, Unsupervised Learning, Reinforcement Learning)
- Deep Learning (Convolutional Neural Networks, Generative AI, Generative Adversarial Networks)
- Image and Video Processing
- Microcontroller Programming

EDUCATION

- **M.Sc. in Electrical Engineering** 2018 - 2021
 - ✓ Department of Electrical Engineering, KNT University of Technology
 - ✓ GPA: 17.21/20 (3.77/4)
- **B.Sc. in Electrical Engineering** 2012 - 2017
 - ✓ Department of Electrical Engineering, University of Shiraz
 - ✓ GPA: 15.27/20 (3.06/4)

RESEARCH EXPERIENCE

Developing a variable-size adaptive block matching motion estimation algorithm

- Using Python, I Created a method for block-matching motion estimation (ME) with a focus on variable-size blocks. First, I designed a fast and efficient way to automatically generate blocks with different shapes and sizes according to the identified location and direction of movement. Next, by utilizing adaptive search tools (e.g., the search window size selection, global motion compensation, changing reference frame), I attempted to decrease the computation load while maintaining the quality of ME
- [Presentation Video](#).
- Supervisor: Dr. Amir Mousavinia (moosavie@kntu.ac.ir)

Developing a deep learning method to enhance block matching motion estimation algorithm

- Using Python and TensorFlow, I designed a model that outputs regions of interest (ROIs) highlighting areas of motion and identifies the best pixel block structures for more efficient video compression. The model utilizes convolutional neural networks (CNNs) for feature extraction and transfer learning, along with fully connected layers for classification. The dataset comprises a variety of video sequences with diverse motion characteristics.
- Supervisor: Dr. Amir Mousavinia (moosavie@kntu.ac.ir)

Implementing a text detection algorithm based on the YOLOv5 model

- Using Python, I programmed an application to extract articles and their body text from the Persian Wikipedia. Next, I created random images with various settings, such as size and background color, and placed the extracted texts on these images. To create a more comprehensive dataset, I applied augmentation techniques like zoom and rotation. Finally, I used these images and their bounding box coordinates to train a YOLO v5 model for text detection.
- Code implementation on my [GitHub](#).

Implementing RGB to gray scale converter and Gaussian blur filter using VHDL and Python

- I implemented two image processing algorithms, RGB to grayscale conversion and Gaussian blur, at both software and hardware levels. Firstly, using Python, I read image files as binary inputs for further processing by the VHDL code. Secondly, after generating inputs for VHDL, I calculated a weighted sum of image pixels at the hardware level to create a grayscale image. Finally, I designed the Gaussian blur filter by implementing convolution, shifting a Gaussian kernel across the image.
- More details on my [website](#).
- Supervisor: Dr.Hossein Hosseini-Nejad (hosseini_nezhad@kntu.ac.ir)

Designing digital to analog converter (DAC) and Analog to digital converter (ADC) using Cadence

- Using Cadence in two different projects, I implemented a 10-bit current steering DAC and a 5-bit Flash ADC in CMOS, 0.18 μ m technology. I carefully selected the width and length of transistors based on the required design criteria, such as achieving a desirable spurious-free dynamic range (SFDR). I studied the effect of ADC and DAC performance on image processing and storage, particularly examining how factors such as bit depth and Signal-to-Noise Ratio influence the quality and accuracy of digital images.
- More details on my [website](#).
- Supervisor: Dr.Hossein Shamsi (shamsi@eetd.kntu.ac.ir)

Designing and creating a portable solar battery charger using AVR

- I designed and created a portable battery charger using AVR, which includes three solar cells arranged in parallel. To regulate the panels' voltage and current to the desired level, I utilized the LM2576 regulator. Additionally, I integrated an ATmega8 microcontroller to display current and voltages on an LCD.
- More details on my [website](#).
- Supervisor: Dr. Mehdi Miri (miri@shirazu.ac.ir)

OTHER PROJECTS

Software for Optical Character Recognition (OCR)

- I developed a proprietary program for extracting text information from catalogs, employing OpenCV to extract regions of interest and preprocess images. For instance, I utilized various morphological transformations like the opening operation to identify horizontal and vertical lines. Ultimately, I integrated Tesseract for performing Optical Character Recognition (OCR) to extract the text from the processed images.
- More details on my [website](#).

Implementing bitcoin mining

- Utilizing Python, I engaged in a series of calculations to construct a block header, and subsequently employed a random number guessing mechanism to repeatedly adjust the value until achieving a result lower than the specified target value. This process is commonly employed in blockchain mining to validate new blocks and ensure the security and integrity of the decentralized network.
- More details: [1](#), [2](#)

Software for managing patients' medical insurance information

- Using Python, I developed a commercial software designed for registering patients' information. I constructed the user interface utilizing the PyQt5 library. Data storage was facilitated through the sqlite3 module, while reporting functionalities were implemented using the Pandas library. I ensured

ease of access and interactivity for users by presenting information through Python visualization libraries such as Plotly and Matplotlib.

- More details on my [website](#).

Software for extracting speaking parts from a movie based on the subtitle file

- I designed and developed a commercial software that extracts dialogue segments from a movie using subtitle timing and generates new subtitle files corresponding to the edited video. The software also allows users to adjust various encoding settings, including options for using HEVC or AVC encoding for the output video.
- More details on my [website](#).

PUBLICATIONS

1. “Efficient Block Matching Motion Estimation Using Variable-Size Blocks and Predictive Tools” (Submitted)
Mirjalili M, Mousavinia A
2. “Deep Learning-Based Approach for Optimal Block Size Determination in Block Matching Motion Estimation” (In Preparation)
Mirjalili M, Mousavinia A

PRESENTATIONS

1. Adaptive Block Matching Motion Estimation
Mirjalili M
Presentation video ([in English](#)), ([Original in Persian](#))
[Presentation slides](#)
[*Recognized the best seminar in 5th Student Seminar on Electrical and Computer Engineering Innovation 2020*](#)
2. In my YouTube channels, I tried to show different practical usage of computer vision in real life, such as [colorizing black and white images](#), [object detection using haar features](#), and [creating a virtual pen using OpenCV](#).
3. In this [video](#), I discuss the fundamentals of bitcoin mining.

INTERNSHIPS AND WORK EXPERIENCES

- **Working at Bargh-Aseman e Fars Co., Shiraz, Iran** 2023
I specialize in programming diverse applications for various purposes, including image processing and computer vision. Some of my projects involve monitoring industrial production lines for errors and faults, while others focus on researching new and efficient methods to reduce costs and increase efficiency. I achieve this by leveraging cutting-edge technologies in areas such as computer vision and machine learning.
- **Working as a freelancer on Ponisha.ir** 2018-2023
I provided commercial applications, which encompassed tasks like video and image processing, machine learning, and computer vision.

➤ **Intern at Khane Sakhtafzar, Shiraz, Iran**

2016

I learned to read computer circuits schematics, how they're operating, and testing different electrical components. Additionally, I got familiar with the safety protocols during working in an industrial environment. I improved my collaborative skills by learning how to communicate effectively with others.

COMPUTER SKILLS

- **Programming:** Python, C, VHDL, Java
- **Libraries:** OpenCV, Pandas, TensorFlow, scikit-learn, NumPy, Matplotlib, Seaborn, SciPy
- **Software:** Android Studio
- **Game Engine:** Unity

LANGUAGE

- **English:** TOEFL iBT score: 100 (Reading: 28 Listening: 27 Speaking: 21 Writing: 24)
- **Persian:** Native.

CERTIFICATIONS

- **Advanced Computer Vision with TensorFlow (2022)**, Coursera
- **Convolutional Neural Networks (2022)**, Coursera
- **Neural Networks and Deep Learning (2022)**, Coursera
- **Electrical components testing and repairing (2016)**, Khane Sakhtafzar
- **Designing and installation of solar panels (2014)**, FJT Institute

REFERENCES

- Master's Thesis Supervisor | [Dr. Amir Mousavinia moosavie@kntu.ac.ir](mailto:moosavie@kntu.ac.ir); +98 -21-84062228
- Bachelor's Thesis Supervisor | [Dr. Mehdi Miri miri@shirazu.ac.ir](mailto:miri@shirazu.ac.ir); +98 -71-36133190
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