Mohammed Hammoud

Medical engineer

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Nationality: Syrian, Permanent residency in Russia

Summary

- A highly motivated specialist, who is passionate about making new technologies and eager to learn new things, looking for opportunities in Embedded systems, robotics, and Computer vision applications based on deep learning. Experience working with microcontrollers, sensors, firmware and real-time operating systems(RTOS) with a good understanding of embedded software design to support Internet of Things(IoT) initiative applications. Ability to combine different technologies in one product like machine learning, and deep learning.

EXPERIENCE

- **Intelligent Ideas**   **Moscow, Russia**
  Embedded system engineer   06 2022 – 11 2022
  Technologies: Embedded system, desktop application development, networking
  Designed a circuit to check the system's validity. Worked with Python to enhance desktop applications used to communicate with the digital helmet

- **Tishreen university**   **Latakia, Syria**
  Teacher assistant   09 2015 – 09 2018
  Prepared lecture content for multiple technical courses, such as C++ programming, control theory, and digital circuits.
  Taught many technical courses, including computer vision, deep learning, Computer architecture, control theory, C++ programming, control theory, and digital circuits

EDUCATION

- **Skolkovo Institute of Science and Technology (Skoltech)**   **Moscow, Russia**
  PhD in Engineering systems   2023-2025
  Thesis title: AI-based Parkinson's disease detection using wearable sensors and video

- **National Research University of Electronic Technology (MIET)**   **Moscow, Russia**
  PhD in System analysis, management and information processing   2021-2025
  Thesis title: Navigation in autonomous cars

- **Skolkovo Institute of Science and Technology**   **Moscow, Russia**
  Master degree in Internet of Things and Wireless Technologies   2021-01.07.2023
  Final grade: A
  Thesis title: Neurological disease detection through eye video recordings based on deep learning
  Coursework: Introduction to IoT, Embedded Systems and intelligent sensors, Digital Signal Processing, artificial intelligence in planning algorithms, computer vision

- **National Research University of Electronic Technology (MIET)**   **Moscow, Russia**
  Master degree in informatics and computer engineering   2019-2021
  Thesis title: Solving the Navigation Problem of mobile robots based on Embedded Systems
  Final grade: Diploma with honors
  Coursework: PCB design with Altium, FBGA programming with Verilog

- **Tishreen university**   **Latakia, Syria**
  Bachelor degree in Electronic engineering   2011-2015
  Final grade: Diploma with honors, with four rewards for academic Excellence for four consecutive years.
  Thesis title:Enhancement of information security based on steganography and cryptography
  Coursework: Computer architecture, sensors, and microcontrollers, control theory, RTOS, computer science, image processing, information security

SKILLS

- **Languages**: **Russian**: upper intermediate **English**: upper Intermidate **Arabic**: Native
- **Programming languages**: Assembly, C, C++, C, java, python, Micro-Python, Matlab, Labview, VHDL, Verilog, LAddar, Linux and Bash programming
- **Embedded systems and IoT**: PLC, ESP32, microcontroller programming(STM32), Raspberry PI, FBGA, Embedded Linux, Yocto, PCB design in Altium, working with measurement devices, Digital signal processing, data transfer protocols(USART, I2C, SPI, etc)
- **Desktop applications** PyQT5, Glade
- **Databases** MYSQL
- **Other Skills** Data Science and Analysis, Computer vision, Machine learning, Deep learning
- **Libraries/Frameworks** OpenCV, TensorFlow, Keras, PyTorch, Flask, Pandas, Numpy, sklearn, matplotlib, Yolo
- **Softwares**: Github, Docker, Latex and MS Office

PROJECTS

1. **Poker cards detection based on deep learning**

   - Technologies & Tools: Computer vision, Deep learning — Python
   - Frameworks: PyQt5, sklearn, OpenCV, numpy, Pandas, Yolov8
   - Outcomes: Designed and trained a deep-learning model with a desktop application

2. **Road and lane segmentation based on deep learning for self-driving cars**

   - Technologies & Tools: Computer vision, semantic segmentation based on Deep learning — Python
   - Frameworks: sklearn, OpenCV, numpy, Pandas, TensorFlow, Keras, PyTorch
   - Outcomes: Designed and trained a deep-learning model based for multi-classification tasks to detect roads and lanes with an IOU of 99.8%.

3. **Neurological diseases diagnosis through eye movements based on deep learning**

   - Technologies & Tools: Computer vision, semantic segmentation based on Deep learning—Python, bash
   - Frameworks: sklearn, OpenCV, numpy, Pandas, TensorFlow, Keras, PyTorch
   - Outcomes: Designed and trained a deep-learning model based on time series imagining for multiclassification tasks to detect diseases(Parkinson's disease and Progressive Supranuclear Palsy) with an accuracy of 96.8%. The project is considered first in this direction.

4. **Parkinson disease detection by hand drawing analysis and voice analysis**

   - Technologies & Tools: Computer vision, Machine learning, Deep learning—Python
   - Frameworks: sklearn, OpenCV, numpy, Pandas, TensorFlow, Keras
   - Outcomes: Designed a deep learning model for Parkinson's disease detection based on hand drawing analysis and voice signals to improve cure efficiency by early detection of Parkinson's disease with an accuracy of 98%.

5. **A deep learning model for sign language translator**

   - Technologies & Tools: Computer vision, Deep learning — Python
   - Frameworks: PyQt5, sklearn, OpenCV, numpy, Pandas, media-pipe
   - Outcomes: Designed and trained LSTM-based deep learning model applied on key points extracted from videos. It was created on a small number of sentences.

6. **Design smart bed for infants based on deep learning and embedded systems**

   - Technologies & Tools: Embedded systems, signal processing, Deep learning—Python, Raspberry PI
   - Frameworks: sklearn, numpy, Pandas, PyTorch, librosa, torchaudio
   - Outcomes: Designed a deep-learning model for infant crying classification using Python and PyTorch to recognize the infant's status(hungry, tiredness, discomfort, and belly pain) with an accuracy of 100%. Implemented the built model inside an embedded system in Raspberry Pi to build a smart bed prototype based on the built model to provide an accurate model to detect the baby's status, such as hunger, tiredness, discomfort, and belly pain. In addition to classification, the system provides full control of the bed(shaking). It allows music to be run remotely. The system is fully controlled by a mobile app.

7. **Automatic test corrector based on computer vision**

   - Technologies & Tools: Computer vision, desktop application development—Python
   - Frameworks:Opencv, PyQT5
   - Outcomes: Designed a desktop application for automatic test corrections computer vision to reduce the time for both teacher and student to get results and to save money where there is no need to buy any specified device or specific papers for tests.

8. **An embedded system server for IoT**

   - Technologies & Tools: Embedded systems, Internet of Things, web application, networking, server, temperature sensor—C++, Python
   - Frameworks: Arduino IDE, Plotly
   - Outcomes: Designed an embedded system using Raspberry Pi to provide a data processing center for IoT nodes. Designed a dashboard GUI(website) to allow data monitoring and visualization for the user. Implement the IOT nodes using ESP32 and the server inside Raspberry PI.

9. **Flue shot prediction**

   Technologies & Tools: Machine learning, Exploratory data analysis, feature engineering—Tools: Python
   Frameworks: sklearn, numpy, Pandas
   Outcomes: Designed a machine learning model to analyze the reasons behind avoiding vaccination to save time and money

10. **Smart scale prototype for Grocery**

    - Technologies & Tools: Computer vision, desktop application development,deep learning—Python
    - Frameworks: sklearn, OpenCV, numpy, Pandas, TensorFlow, Keras, PyQT5
    - Outcomes: Trained a deep learning model for product recognition to enhance customer experience and avoid cheating in the system. Designed a desktop application using PYQT5 to validate the built model in a real-world environment.

11. **Implementation of path planning algorithm based on microcontroller STM32**

    - Technologies & Tools: Artificial intelligence, Path planning, Embedded systems, bluetooth— C, Stm32
    - Frameworks: HAL library
    - Outcomes: Investigated and analyzed path-planning algorithms, to select suitable algorithms for microcontroller specification. Implemented and simulated wavefront algorithm in Python to test it before implementation inside STM32 microcontroller. Designed the full circuit and software-based STM32 to achieve navigation ability in a grid environment.

12. **Enhancement of information security based on steganography and cryptography**

    - Technologies & Tools: Computer vision, desktop application development, Encryption steganography, Compression—Matlab
    - Outcomes:Developed different steganography algorithms to improve information security via hiding data including text, images, and even PDF files into images, sound, and video. Developed a hybrid system based on steganography and cryptography to improve information security. Implemented different compression algorithms, such as LZW to improve steganography capacity. Compared to other work, I achieved better capacity and higher security level, with PSNR = 76%

PUBLICATIONS

1. Hammoud, M., Kovalenko, E., Somov, A., Bril, E., Baldycheva, A. (2023). Deep learning framework for neurological disease diagnosis through near-infrared eye video and time series imaging algorithms. Internet of Things, 24, 100914.

2. **Infant crying interpretation based on deep learning using time series imagining algorithms and Mel-spectrogram**, IEEE Sensors(**under review**)

3. Learning-based Infant Crying Interpretation Using Time and Frequency Domain Features, Expert Systems with Applications(**under review**)

4. **Road Detection Based on Semantic Segmentation and Deep Learning**, Annals of Emerging Technologies in Computing (AETiC), London, **submitted**

5. Hammoud, M., Lupin, S. (2023). An optimization of path planning A* for static uniform grid based on pruning algorithms: Experimental experience. International Journal of Open Information Technologies, 11(10), 33-38.

6. Hammoud, M. S., Getahun, M. N., Lupin, S. (2023). Comparison of Outlier Filtering Methods in Terms of Their Influence on Pose Estimation Quality. International Journal of Open Information Technologies, 11(10), 1-5.

References

- **Andrey Somov, PhD**

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- **Lupin Sergey Andreevich, PhD**

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