THEODOROS PAPAIAKOVOU

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EDUCATION

University of California, Los Angeles (UCLA), Los Angeles, CA| M.S. in Electrical and Computer Engineering | GPA 3.711 — 2023

The University of Edinburgh, Edinburgh, UK| BEng (Hons) Electronics and Electrical Engineering — 2021
First Class degree (1:1), Ranked 5th in program | Student exchange program at UCLA with GPA 3.473

PUBLICATIONS

Khalili, A. Chen, T. Papaiakovou, N. Sehatbakhsh, et al., "Virtual Keymysteries Unveiled: Detecting Keystrokes in VR with External Side-Channels," in 2024 IEEE Security and Privacy Workshops(SPW), San Francisco, CA, USA, 2024 pp. 260-266.
doi: 10.1109/SPW63631.2024.00031

SKILLS

Python, C++, Machine Learning, Deep Learning, Image Processing, Data Processing & Annotation, Computer Vision, OpenCV, PyTorch, TensorFlow, Unity, OCR, Instance Segmentation & Classification, Object Detection, Depth Estimation, Generative AI, Camera Calibration, Docker, GitHub, GCP, Product Development, Adaptability, Team Work, Communication, Leadership, Research

WORK EXPERIENCE

ArguSight AI LLC — Remote
Owner & AI Consultant & Computer Vision Engineer — 12/2023 - Present

Teeth Whitening Before/After Visualization Software
- Implemented teeth whitening visualization Python software in a Bubble.io Webapp using Google Cloud Functions increasing the sales of teeth whitening services in dental offices by 30%.
- Extracted the mouth region using AI facial landmark detection, the teeth using color filtering in HSV & LAB color spaces and produced natural whitening results using histogram matching and Reinhard's color transform.

Teeth Alignment Before/After Visualization Software
- Developed teeth alignment visualization Python software in a Bubble.io Webapp to generate realistic aligned teeth smiles while keeping the natural teeth shape and color of the patient.
- Optimized Docker images to reduce cold start by 40% on Replicate AI to run serverless zero-scale models on GPU.
- Trained UNet models to segment the mouth region and to derive teeth contours from real images in Pytorch.
- Fine tuned a contour teeth alignment UNet to predict the contours of teeth after alignment and a diffusion model guided by the contours to create the mouth with well aligned teeth.

Lip Filling Before/After Visualization Software
- Created lip filling visualization Python software using Google Cloud Functions and hosted AI model on VertexAI.
- Calculated 2D geometric transformations for different lip expansion types (top / bottom lip, cupids bow enhancement).
- Utilized Thin Plate Spline interpolation warping method to "expand the lips" and GFPGAN AI face restoring model to improve the missing texture quality of the warping producing natural looking filled lips.

Secure Facial Recognition System
- Created a facial recognition system to match the identity between a passport photo and a face presented on a webcam.
- Extracted facial landmarks, normalised and vectorized the distances between facial points and calculated the cosine similarity to recognise the faces with 99% accuracy.

Sunglass AI Colorway generation
- Designed 18 new colorways for RAIE Australian sunglass company for the official product reveal showcase.
- Configured ControlNetv1.1 with Stable Diffusion model to generate realistic novel sunglass colour designs using the Canny edges of the skeletons of RAIEs' sunglasses.

IoT Raspberry Pi Cat Toy
- Prototyped the hardware, Backend, API and Frontend of an IoT moving laser cat toy product enabling user to remotely play with their cat by moving a laser pointer and have live video feedback.
- Soldered LEDs, camera, RTC module, servo motor and I2C driver electronic circuit on copper board.
- 3D designed and printed a pan tilt mechanism with servo motors and a case to store the electronic components.
- Created a Flask API of threaded Backend software to set and execute laser pointer actions, schedule them on a calendar, stream live video from camera, update the time using a real time clock and connect to scanned WiFi networks.
- Designed HTML, CSS and Javascript Frontend with user friendly UI to accompany the above options.

Real estate agent AI assistant
- Automated the process of post owner, client and real estate agent communication by creating an AI assistant on top of a Django server that could analyze the details of properties and client searches, send personalized SMS messages, analyze the responses, make updates to PostgreSQL database and notify the real estate agency of successful negotiations.
- Personalized SMS creation, post screening, response screening, post owner and client communication system built with OpenAI Assistants API using prompt engineering reducing the human workload by 70%.

Semi automatic OCR mechanical joint extraction
- Created supervised annotation software to perform OCR on oil distillery drawing PDF files to automatically extract mechanical joint information in an Excel file reducing manual annotation time by 99%.
- Designed a user-friendly GUI in Python in collaboration with the annotators to enable efficient verification and adjustment of algorithm outputs, resulting in 0% error rate and an increase in productivity.

PolyDesign AI — London, UK
Computer Vision Engineer — 05/2023 - 09/2023
- Produced a Python prototype generating virtual furniture in images of empty rooms using stable diffusion with inpainting achieving 1st place in Queen Mary university startup pitch competition
- Researched Google Cloud Platform solutions to build AI interior design web-app for first 1000 customers

I2S S.A. - AquaManager Athens, Greece
Junior Computer Vision & Machine Learning Engineer 11/2021 - 06/2022

- Collaborated with a research and development team of engineers and marine biologists to develop a smart camera product utilizing computer vision algorithms in Python to optimize biomass production in aquaculture reducing food waste to up to 12% and estimating the biomass of fish to within 5 % error.
- Built custom data pipelines that utilized pre trained models and image processing tools to accelerate data collection and annotation and fed the data in the custom model building, training and evaluation pipeline.
- Trained Image Classification, Instance Segmentation and Video Classification Neural Networks in Tensorflow to detect and track feeding behavior, lost food and fish objects.
- Estimated Depth using Zed 2i stereoscopic camera to detect fish distance from lens and to estimate their biomass to within 5%.
- Performed Camera Calibration using OpenCV to correct for camera and air/water medium interface image distortions.
- Designed electronic circuits and 3D printed cases for electronics and structural components for a portable PoE providing battery and for a custom Raspberry Pi camera scale for fish image - weight data collection.
- Consulted more than 5 international clients by presenting technical solutions on MS PowerPoint and wrote reports on company's datalogger systems.

SELECTED PROJECTS

VISION-HAPTIC SENSORY SUBSTITUTION GLOVE Los Angeles, CA
Team Leader- Embedded Systems 09/2023 - 12/2023

- Facilitated sensory substitution of vision to haptic using a camera and a glove device by converting monocular depth values estimated by a vision transformer to intensities on a mini disc motor array attached on the glove.
- Conducted a user study to assess the usability in way finding and object picking for visually impaired people.
- Built mini disc motor driver circuit and PCB, assembled glove and orchestrated communication between ESP32 microcontroller to Python backend.

NEURAL RADIANCE FIELDS (NeRF) Los Angeles, CA
Individual Coursework 11/2023 - 12/2023

- Implemented neural radiance fields on a scene by modeling the space volume with ray tracing and training an MLP neural network to predict color and opacity and used volumetric rendering to render previously unseen viewpoints of the scene.

CLASSMATE Los Angeles, CA
Team Leader - Human Computer Interaction 04/2023 - 06/2023

- Constructed a Python AI class planning assistant accelerating construction of personalized class schedule for students by 60%.
- Facilitated human - AI collaboration by formulating one desktop user interface (UI) in PyQt5 using interactive design principles.
- Established a sentence transformer AI assistant using Hugging Face API in Pytorch to rank courses based on users' prompt.

VR RANDOMLY DISPLACING KEYBOARD Los Angeles, CA
Research Project, SsysArch Lab 03/2023 - 07/2023

- Developed a countermeasure against the visual side channel attack for the paper “Virtual Keymysteries Unveiled: Detecting Keystrokes in VR with External Side-Channels”
- Created a VR keyboard asset in Unity with a C# script that randomly changes key sizes and keyboard location on every key press effectively reducing the accuracy of the detected attack by up to 90%
- Devised the mathematical formulas that predict the decrease in attack accuracy thanks to this method and the decrease in keyboard usability depending on password character length.

AUGMENTED REALITY FITNESS ASSISTANT Los Angeles, CA
Team Leader - Engineering Interactive Systems 01/2023 - 03/2023

- Devised an AR fitness assistant programmed in C# in the Unity game engine for Oculus VR headset while leading a team of 3.
- Performed user study with interviews and likert scale questionnaires, analysed results and assessed that the usability of the AR assistant outperformed regular video instructions by 34%.

FPS VIDEO GAMES IMITATION LEARNING Los Angeles, CA
Team Project - Computational Robotics 10/2022 - 12/2022

- Constructed Machine Learning model building, training and evaluation pipeline parameterized by a JSON configuration file to enable codeless neural network training and testing.
- Modeled aiming in First person shooter video games as a discrete set of values by analyzing histograms and created human actions and video game data recording system.
- Trained a Recurrent Convolutional Neural Network with LSTM layers for behavioral learning / cloning of human aiming and shooting on first person shooter video games using TensorFlow by predicting the motion to hit a target given the video game image.
- Implemented one-shot transfer learning to generalize NN agent to previously unseen targets using only 1 human demonstration by fine tuning the model to transfer the target shooting knowledge.

DNN FOR MICROPHONE ARRAY DIRECTION OF ARRIVAL ESTIMATION Edinburgh, UK
Dissertation Project 10/2020 - 05/2021

- Introduced a novel deep learning Direction of Arrival estimation algorithm for sound waves, reducing training data requirements by a factor of 6 compared to previously existing techniques by exploiting the resolution of beamforming and the symmetry of the circular embedded Linux microphone array.
- Optimized ML models by pruning and quantization to achieve real time performance (<100 ms delay) on a prototype device with a stepper motor rotary encoder and a graphical user interface (GUI) for demonstration and data acquisition using Python.
- Prototyped a 3D printed rotary stage, controlled by a stepper motor to floating point precision (1/16th of a degree) using an Arduino microcontroller programmed in C++.
- Wrote a research thesis presenting project methodology and evaluated the results of experiments in LaTex.