All Completed/In-Progress Projects

Automated High Power Test Strategy (Python)   **Jul 2023 –** *Present*

- **Tools**: Python (PyQt5, Pandas, Numpy, PyVISA, OpenCV, PyTesseract, SMTPlib, Email, Threading)
- **Description**:
    o Independently developed a comprehensive test setup using PyVISA to interface with essential components, including a power supply, power analyzer, electric load, temperature sensor, and oscilloscope.
    o Proficiently utilized SCPI commands and internal device libraries to orchestrate the precise control of each instrument, aligning with the automated test strategy.
    o Overcame challenges related to connecting to a thermal camera by implementing threading, OpenCV, and PyTesseract to perform real-time assessment of radiated device temperature.

Automated Device Parameter Extraction Tool through KLayout API (Python)   **May 2023 –** *Present*

- **Tools**: Python (PyQt5), KLayout API (pya)
- **Achievements**:
    o **Leadership**: Led a team of junior developers in the creation of a comprehensive solution for extracting device parameters from a specific layout design.
    o **GUI Development**: Developed a user-friendly front-end interface, enhancing user accessibility. Enabled users to pinpoint the location of device parameter definitions on the layout by selectively hiding layers and placing rulers at specific positions.
    o **Real-Time Adjustment**: Empowered designers to identify critical device design parameters swiftly, facilitating real-time adjustments to the layout.
    o **Data Management**: Engineered a robust system for generating and saving device parameters in JSON format. Transformed the JSON data into a structured SQL database, providing a repository of design information for future development.

Compact Model Parameter Extraction Application (MATLAB)   **Jan 2021 – May 2022**

- **Tools**: MATLAB (Curve Fitting Toolbox, Optimization Toolbox), LTSpice
- **Description**: Developed an application that simulates Wolfspeed MOSFET devices in LTSpice and extracts data into MATLAB. Employed MATLAB to decompress raw data and optimize parameters to achieve a close match between simulation and actual device measurements.

SiC High-Voltage High-Current IV-Characterization Tool (MATLAB)   Jul 2022 – Aug 2023

-      **Tools**: MATLAB (Optimization Toolbox, Signal Processing Toolbox)
-      **Achievements**:
  - Designed an algorithm to identify switching regions in Double-Pulse Test Results, even in noisy data.
  - Implemented parameter optimization for transconductance, breakdown voltage, and gate voltage threshold to characterize IV behavior in the high-voltage high-current region.
  - Led a team of junior developers in pioneering a Semi-Physical approach to characterize IV-Characteristics of SiC MOSFET devices in the high-voltage high-current region.

Double-Pulse Test Analysis Tool (MATLAB)   Jun 2021 – Present

-      **Tools**: MATLAB (Signal Processing Toolbox)
-      **Achievements**:
  - Developed a custom tool for analyzing switching data, akin to MATLAB's Property Inspector.
  - Utilized thresholding, smoothing, and signal processing techniques to perform Voltage and Current Overshoot analysis, didt, and dvdt comparisons for competitive analysis.
  - Implemented annotations and generated comprehensive reports on UIAxes for efficient cross-referencing and analysis.

xSEM Image Junction Potential Characterization for SiC Wafers (MATLAB)   Mar 2021 – Dec 2021

-      **Tools**: MATLAB (Image Processing Toolbox)
-      **Description**: Employed various image processing functions (e.g., fspecial, edge, superpixels) to analyze SiC wafer potential based on doping concentration. Utilized Regions of Interest (ROI) for generating rapid potential profile reports within the ROI.

Server License Usage Manager for Silvaco tools (Python)   May 2022 – Jul 2022

-      **Tools**: Python (bash script)
-      **Responsibilities**:
  - Developed and maintained a bash script to manage server licenses for Silvaco tools.
  - Utilized the "lmstat" system command to monitor and send warning emails to users when licenses were near maximum capacity.
  - Implemented text filters for generating specialized reports on license usage and distribution.

Automated Silvaco Design Deck Generator using ML (Python)   Dec 2021 – Feb 2023

-      **Tools**: Python (PyQt5, Pandas), Silvaco (TCAD), TXT, JSON
-      **Role**: Collaborated as a team member to enhance a Python script automating device parameter testing for physical simulations in Silvaco (TCAD).
-      **Highlights**:
  - Leveraged JSON generator files to optimize a set of parameters using machine learning, extracting simulated data in TCAD to predict device behavior.
  - Implemented a Monte Carlo approach for random number generation when initial parameters were unknown.

Email Detection and Movement Application (Python)   **Jul 2022 – Present**

- **Tools**: Python (PyQt5, PyTorch, Pandas, IMAPlib, SMTPlib, Email, BeatifulSoup)
- **Description**:
    o Developed an email management application with Python that leverages various libraries and tools.
    o Utilized Windows internal Task Scheduler to create an hourly event for checking unseen emails.
    o Implemented a Machine Learning algorithm to classify emails as Spam or not, and dynamically created a Spam folder for efficient email sorting.
    o Designed the application to support flexible folder management systems.
    o Enabled email key generation for mail systems with two-factor authentication, allowing access to any general email using the email key and the dedicated IMAP server.

Bookkeeping Data Automation Tool (Python) – AirBNB and VRBO   **Feb 2021 – Present**

- **Tools**: Python (Pandas, Numpy, XlsxWriter, Unidecode)
- **Description**: Developed a data automation tool for streamlining bookkeeping processes related to Airbnb and VRBO. The tool retrieves data from Excel files generated by QuickBooks and performs the following tasks:
    o Collects data using standard bookkeeping procedures.
    o Filters and organizes data by customer and property.
    o Generates invoices and journal entries.
    o Outputs the processed data into a final output file.
    o Stores collected data in a Microsoft Office repository for future reference.
    o Decreased current workload by around a week for each client every month

Free Facebook Ad Bot (Python)   **Aug 2023 – Present**

- **Tools**: Python (Selenium, Email, SMTPlib, re), JSON
- **Description**: Developed a Python bot that utilizes Windows Task Scheduler to periodically visit predefined URLs and parse their HTML content for user-defined keywords. When it identifies a post meeting the criteria that hasn't been alerted before, the bot sends an email notification, indicating the presence of a new Facebook Ad offering free items. Configuration and task management are handled through JSON.

Allocated Bourbon Finder Bot (Python)   **May 2023 – Jul 2023**

- **Tools**: Python (Pandas, Requests, Selenium, SMTPlib, Email, BeautifulSoup)
- **Description**: Created a Python bot that sends requests to a server, parses HTML content using BeautifulSoup, and searches for the availability of a specific bourbon brand. The bot then interacts with the webpage to determine where the bourbon is in stock and generates comprehensive reports in Excel format.

Recipe Generator Bot (Python)   **Feb 2023**

- **Tools**: Python (Tkinter, Pandas, Selenium)
- **Description**: Developed a Python bot that uses Pandas to manage a database of known recipes and their ingredients. Users can input the ingredients available in their fridge, and the bot generates a list of possible recipes to help users decide what to cook for the evening.

Drowsy Detector (Python)   **Mar 2023**

-      **Tools**: Python (SciPy, OpenCV, FbChat, JSON)
-      **Description**: Designed a Python tool for detecting drowsiness in users, particularly aimed at enhancing driver safety. It utilizes a prediction model generated with SciPy and imutils.face_utils based on a shape predictor dataset. OpenCV is used to monitor the user's eye state, and if closed for a predefined duration, the tool sends alerts to designated contacts to alert them of the drowsy individual.

Master's Thesis: An Efficient Distance Tracking Algorithm in NIR for Biomedical Applications (MATLAB)
         May 2020 – Aug 2020

-      **Tools**: MATLAB (Image Processing Toolbox, Signal Processing Toolbox)
-      **Description**:
  - o Developed an algorithm for tracking the distance between a scope and a subject through post-processing of training images.
  - o Utilized a set of training images for specific organs to track beam profile movement and intensity.
  - o Created a lookup table in MATLAB for the imaging device to recognize height above a surface.
  - o Investigated various effects using both coherent and incoherent light sources.

Dielectrophoretic Device Modeling using COMSOL   **Jan 2020 – May 2020**

-      **Tools**: COMSOL
-      **Description**:
  - o Developed a simulation to efficiently separate platelets from blood cells using dielectrophoresis.
  - o Designed a dielectrophoretic device with alternating electrodes and considered fluid dynamics in COMSOL.
  - o Conducted testing with different parameters to ensure effective platelet separation between channels.

Mach-Zehnder Interferometers using K-Layout and Mode Interconnect   **Jan 2020 – May 2020**

-      **Tools**: KLayout, Lumerical Mode Interconnect
-      **Description**:
  - o Utilized K-Layout for designing Mach-Zehnder Interferometer (MZI) structures capable of creating 50/50 split interference patterns.
  - o Analyzed parameters such as distance and bends to assess transmission loss and optimize results.
  - o Employed Lumerical Interconnect to simulate the designed MZIs and compared results with measured data.